TILTERS WITH WINDMILLS

THE COEVOLUTION OF THE APPROPRIATE TECHNOLOGY MOVEMENT IN AMERICA

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by

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ABSTRACT

In the first part of this dissertation (chapter 1),a new 'coevolutionary' approach is developed for analyzing the mutual evolution of new themes,leaders,forms of organization,designs and cultural products within cultural movements. This approach emphasizes the role of pioneering cultural designers and cultural 'quests' in triggering and guiding the emergence of new cultural movements.

In the second part (chapters 2 and 3),this new approach is used to analyze the early evolution of a contemporary American cultural movement,the 'Appropriate Technology' or AT movement,which sought to develop and promote small scale,'alternative' tools and technologies,such as,windmills and solar collectors,ecological houses, organic agriculture and aquaculture and waste recycling,during the 1970's. Here,the overall AT movement is first analyzed as a coevolving cultural movement made up of a series of overlapping cultural quests seeking to discover new cultural themes and designs. Then,a more detailed analysis is done of one exemplary group of AT pioneers and designers,the New Alchemists,and how their innovative 'bioshelter' designs,their leaders' lives,and their social organization all coevolved together.

In the third part (chapter 4),a later portion of the AT movement- the 'Small' War on Poverty,in which agencies and AT pioneers sought to promote AT use and community technology development in low income communities- is analyzed using the coevolutionary approach. Here,a detailed case study of the stormy evolution of the National Center for Appropriate Technology (NCAT),which was created by the Carter administration to promote and implements ATs
in low income communities is made and four of the pioneering local community technology development efforts,in San Bernardino,Chicago, Eugene and Seattle,are briefly analyzed.

Thesis Committee: Dr.Hayward Alker(chair),Dr.Leo Marx,Dr.Sharon Traweek and Dr.Sherry Turklele

PREFACE

This is a study of how ideas and people 'coevolved' together in one contemporary cultural movement,the 'appropriate technology' or 'AT' movement in America,which sought to design and promote small scale alternatives to Big Science and High Technology during the 1970's. In producing it,my own thinking about the AT movement and cultural movements in general and the long sequence of draft chapters I produced likewise 'coevolved' through a series of stages,which I describe in the first chapter. During this long evolving exploration,I was guided and helped by many people to whom I would like to express my appreciation. First,I would like to thank my first advisor,Langdon Winner,who introduced me to the notion of AT and started me on this intellectual quest. Second,I would like to thank my final dissertation committee,made up of Hayward Alker(chairman),Leo Marx,Sharon Traweek and Sherry Turkle, who guided me in turning my evolving ideas into this final product.

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Finally,I would like to thank all the people and friends that gave of their time and ideas for this study in that 'small but beautiful' fellowship that was the appropriate technology movement, including: John and Nancy Todd,Earl Barnhart,Fran Koster,Tom Bender, Lane DeMoll,Lee Johnson,Kye Cochran,Jim Parker,MaryAnn McKenzie, David Morris,Harriet Barlow,Dick Saul,Jerry Plunkett,Cecil Cook,Sam Love,Eugene Eccli,Ken Bossong,Alan Okagaki,Isao Fugimoto,Michael Bobker,Fred Good,Scott Bernstein,Ramon Rueda,Ron and Susan Anastasia,Frank Laird and Dick Sclove.

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Prologue:
Knight Errants on the Endless Frontier

New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness and drive with which we have waged this war we can create...a fuller and more fruitful life.

-Franklin Roosevelt quoted in Science-The Endless Frontier, 1945

We can already see the conflict of attitudes which will decide our future. On the one side, I see the people who think they can cope with our crisis by the current methods, only more so; I call them the people of the forward stampede. On the other side, there are people in search of a new life-style, who seek to return to certain basic truths about man and his world; I call them homecomers...

-E.F. Schumacher in Small Is Beautiful

"What giants?" said Sancho Panza.

"Those thou seest yonder," answered his master, "with their long arms; for some are wont to have them almost of the length of two leagues."

"Look, sir," answered Sancho, "those which appear yonder are not giants, but windmills; and what seem to be arms are the sails, which, whirled about by the wind, make the mill-stone go."

"It is very evident," answered Don Quixote, "that thou art not versed in the business of adventures...

-From Cervantes' Don Quixote

World War II marked a turning point for American science and technology. Whereas, before the war the doing of science and the invention of new technologies had largely been an individual endeavour, during the war scientists and engineers were organized by the military into large research projects on a scale never seen before. After the war, such large scale research efforts as the Manhattan Project and the Radiation Lab at M.I.T., where radar was perfected, were used as models

for civilian research and development.

In 1945 in his report, Science-The Endless Frontier, Vannevar Bush, Roosevelt's science advisor, layed out a blueprint for continued Federal support of large scale research projects, arguing that Science was America's last frontier (the "frontier of the mind") and like its other frontiers should be exploited and harnessed by the Government for the nation's well-being:

> It has been basic United States policy that Government should foster the opening of new frontiers. It opened the seas to clipper ships and furnished land for pioneers. Although these frontiers have more or less disappeared, the frontier of science remains. ...Scientific progress is, and must be, of vital interest to Government. Without scientific progress the national health would deteriorate; without scientific progress we could not hope for improvement in our standard of living or for an increased number of jobs for our citizens; and without scientific progress we could not have maintained our liberties against tyranny(Bush, 1945, p6).

After the war, Bush's plan was set in motion, despite some protests about it being too elitist [1]. The military continued to fund defense related research and development and new agencies like the National Science Foundation and later the National Aeronautics and Space Administration (N.A.S.A.) were created to support civilian R and D. As a result, American science became bigger, more centralized and more bueaucratized. Moreover, as Federal patronage of science increased, American science and technology came to occupy a more central place in American culture. America had won the war by harnessing its science and technology and it would insure its peacetime prestige and prosperity the same way as it entered the "Atomic Age", quickly to be followed by the "Space Age" and most recently the "Computer Age".

Initially, these trends were greeted with enthusiasm by both the scientific community and the American public, but as Science continued to become Bigger and Technology to become Higher, problems began to emerge. As historian Daniel

Boorstin observes in The Americans: The Democratic Experience, the very scale and momentum of America's scientific and technological accomplishments began to undermind Americans' traditional sense of individual mission and self-reliance:

> Now the American assignment seemed to come no longer from the conscious choice of individual citizens, but from the scale and velocity of the national projects themselves...(Splitting the atom and landing on the moon) were American conquests of the impossible. (But) they would symbolize even more than any other success of New World Civilization what democratic man was sacrificing for his successes. For, oddly enough, their national triumphs would give individual Americans a new sense of powerlessness(Boorstin, 1973).

While this vague, underlying sense of growing powerlessness festered, more specific concerns about Big Science and High Technology began to be voiced in the 60's. The emerging environmental movement raised concerns about the pollution and other environmental damage caused by modern technologies. War protesters questioned the way science and technology was being used to subdue Vietnam. Critics began to question the safety of nuclear power and other large scale technologies. Consumer advocates argued that science and technology development were now serving special interests rather than the interests of the general public. And members of the "counterculture" sought to disconnect themselves from complex technological systems[2].

While these voices of protest raised concerns about the direction in which American science and technology was now going, they were unable to articulate and advocate a clear alternative direction. In the early 70's, however, a ragged fellowship of "outlaw" designers, disgruntled young scientists, utopian thinkers, environmentalists, radicals and grassroots activists sallied forth to challenge the dominant vision of Big Science and High Technology as "Endless Frontier" to be conquered and exploited and to champion a simpler, more modest and traditional vision for science and technology. This quixotic quest to reform and revitalize

science and technology became collectively known as the "Appropriate Technology" or "AT" movement in America, after a term first coined by British economist E. F. Schumacher, one of the prophets of the movement.

In the late 60's, Schumacher became concerned with the plight of Third World nations, where he believed that the large scale, capital intensive technologies being imported from the West were often inappropriate for the needs and resources of the indigenous people. He, therefore, advocated a simpler, smaller scale technology, one which would facilitate "production by the masses" rather than "mass production". He initially called this technology "intermediate technology" to signify that it was in between the primitive technology of undeveloped areas and the complex High Technology of the West:

> As Gandhi said, the poor of the world cannot be helped by mass production, only by production by the masses... The technology of mass production is inherently violent, ecologically damaging, self-defeating in terms of non-renewable resources, and stultifying for the human person. The technology of production by the masses, making use of the best of modern knowledge and experience, is conducive to decentralisation, compatible with the laws of ecology, gentle in its use of scare resources, and designed to serve the human person instead of making him the servant of machines. I have named it intermediate technology to signify that it is vastly superior to the primitive technology of bygone ages but at the same time much simpler, cheaper, and freer than the super-technology of the rich. One can also call it self-help technology, or democratic or people's technology-a technology to which everyone can gain admittance and which is not reserved to those already rich and powerful (Schumacher, 1973, p145).

It didn't take long for critics of Big Science and High Technology in America and other Western nations to begin arguing that Schumacher's advocacy of a smaller scale technology was not only relevant for developing nations, but also for Western countries, where large scale technologies were causing pollution, resource depletion and human alienation. Schumacher and other advocate, accordingly, began using the broader term, "appropriate technology", to signify technologies

that were appropriate to and in harmony with the local environmental and human needs and resources of the setting in which they were utilized, be that setting a rural Third World village or a community or neighborhood in a Western nation.

While other terms, such as, "alternative", "utopian", "radical", "eco-", and "soft" technology, competed for a time, "appropriate technology" was the term that caught on and was most widely used in America. AT came to characterize designs and devices that were: (1) small in scale, (2) simple to understand and operate, (3) labor rather than capital intensive, (4) ecologically sound, utilizing renewable resources, and (5) decentralized, enhancing individual and local self-reliance.

The evolution of the AT movement in America nicely spanned the decade of the 70's. In the late 60's, as social alienation and protest over the Vietnam war reached its height, the notion of smaller scale options and arrangements was in the air. Social critics and heros of the emerging "counterculture", including, Theodore Roszak, Charles Reich, Paul Goodman and Murray Bookchin, attacked Big Science and High Technology and suggested that smaller scale alternatives were possible[3]. "Outlaw" designers, homesteaders and commune members began experimenting with geodesic domes, solar collectors and other small scale technologies; and Stewart Brand produced his first Whole Earth Catalog (1968), which heralded many of the ideas and values of the coming AT movement.

In the early 70's, growing out of and building on the countercultural spirit of the late 60's, a number of intellectual prophets wrote books, which began to articulate the themes and values that would characterize and underpin the AT movement in America. Foremost among these was E.F. Schumacher's Small Is Beautiful (1973), which became the bible and the battlecry for the movement. But, there was also social critic Ivan Illich's Tools for Conviviality (1973), which outlined his vision for a post-modern "convivial" society based on responsibly limited tools,

and anarchist philosopher Murray Bookchin's Post Scarcity Anarchism (1971), which advocated a "liberatory technology" and began to develop Bookchin's ideas about "social ecology". In addition, anthropologist Gregory Bateson's Steps to an Ecology of Mind (1972) began laying the foundation for what would later be called "deep ecology"[4], and cultural historian William Irwin Thompson's books At The Edge of History (1971) and Passages About Earth (1974) began to explore and advocate a transition from industrial culture to a "planetary" culture. Finally, almost as important as Schumacher's Small Is Beatiful in the American context, was Robert Pirsig's tale of his quest for "quality" in Zen and the Art of Motorcycle Maintenance (1974), which became an exemplary myth and model for the quest for AT and "convivial" designs in America.

Also in the early 70's, several grassroots research and development groups sprang up across the country and began to actually design, develop and promote ATs, such as, solar collectors, windmills, organic farming, ecological shelters and waste recycling. These pioneering groups included Zomeworks and Integrated Living Systems, which built domes and alternative energy systems in the Southwest; the New Alchemists, who experimented with aquaculture and designed bioshelters on Cape Cod, Massachusetts; Max's Pot (Center for Maximum Potential Building Systems), which developed methane digestors in Texas; the Farallones Institute, which experimented with composting and organic gardening and ecological shelters in California; and the Ouroboros Project, which designed ecological houses in Minnesota.

The Arab oil embargo in 1973 and resulting "energy crisis" acted as a powerful stimulant for the then embryonic AT movement. During and after it, interest in AT, especially alternative energy technologies, really mushroomed.

In the mid 70's the movement became more coherent and recognizable as new publications, such as, the CoEvolution Quarterly, RAIN Magazine, Solar Age, People

and Energy, and New Roots, emerged to communicate and disseminate AT and related ideas. Also, a number of loose regional AT networks were formed to share information and promote AT in different parts of the country. These included the network around RAIN magazine in the Northwest, A.E.R.O.-the Alternative Energy Resources Organization in Montana, M.E.A.N.-the Midwest Energy Alternatives Network in the Midwest, NEAT-NET-the New England Appropriate Technology Network in the Northeast, and MAT-NET-the Midatlantic Appropriate Technology Network on the Atlantic coast.

Also, in the mid 70's the first efforts to actually use ATs to make existing communities and neighborhoods more self reliant were launched in Washington, D.C. and New York City. In D.C. a group organized by radical thinker Karl Hess and calling itself Community Technology, Inc. began experimenting with and implementing ATs, such as, fish tanks, solar cookers and hydroponic greenhouses in the racially and ethnically mixed Adams-Morgan neighborhood (Hess and Morris, 1975; Hess, 1979). And on New York's Lower East Side, a group of neighborhood residents, guided by Travis Price, an "outlaw" designer from the Southwest, rehabed a burnt out tenement building at 519 East 11th Street and installed solar collectors and a windmill on its roof. These pioneering community projects were well publicized and became models for other community technology development projects and demonstrations across the country.

By the late 70's, AT was no longer seen as a radical idea of the countercultural fringe. It was moving into the mainstream and progressive politicians and bureaucrats at the Federal, state and local level were falling over one another in their effort to get on the AT "bandwagon" first. In Washington, D.C. the Solar Lobby was organized by Congressional staffers and public interest groups to promote AT and renewable energy legislation and programs. Its organization of the first national Sun Day on May 4, 1978 reflected the growing influence and

confidence of the movement.

President Jimmy Carter was sympathetic to the notion of AT and his administration initiated a number of AT programs. The Community Services Administration (CSA), the small successor agency to President Johnson's Office of Economic Opportunities (OEO) and War on Poverty in the 60's, under Carter launched what might be called a "small war on poverty" by supporting a number of community technology demonstration projects across the country and creating a National Center for Appropriate Technology (NCAT) to support these projects and develop additional ATs for low income communities. The Department of Energy (DOE) dramatically increased its support of renewable energy and established a regionalized AT small grants program. The National Science Foundation (NSF) launched a pilot AT research program and the Department of Housing and Urban Development funded a number of community solar and urban homesteading demonstration projects. Also, Carter appointed solar activist and Sun Day organizer Dennis Hayes to head the Solar Energy Research Institute (SERI) in Colorado.

At a state level, liberal politicians were also sowing their OATs-Offices of Appropriate Technology. California governor Jerry Brown appointed AT pioneers Stewart Brand, Sim Van der Ryn and Wilson Clark to advise him and created the first state OAT to design and promote AT in California. Shortly thereafter, the commissioners of Lane County, Oregon created the first county OAT.

On the local level, a new wave of community technology demonstration projects were launched in places, such as, the South Bronx, New York City; Chicago; San Bernardino, California; Eugene, Oregon; and Seattle, Washington, and a number of local organizations were formed to support local AT and community technology development on an ongoing basis, including the Institute for Local Self Reliance in Washington, D.C., the Energy Task Force in New York City, the Center for Neighborhood Technology in Chicago and the Neighborhood Technology Coalition

in Seattle. Also, innovative small towns and cities, like Davis, California, were passing tough energy conservation and waste recycing ordinances and beginning to build all solar communities and subdevelopments.

AT appeared to have arrived, but despite its growing popularity, all was not well in the movement. Many pioneers and some critics of the movement felt it was being "coopted" and absorbed into the mainstream without any real resulting social or cultural change. The gadgets and devices of AT were being adopted, but without the new visions and values that were suppose to go along with them. The sudden and unexpected dead of E.F. Schumacher (from a heart attack) in late 1977, seemed to trigger a critical reevaluation and stocktaking within the movement, with the editors of RAIN Magazine, for example, wondering if it might not be best to let AT die with Schumacher:

> It was frustrating to see people interpret his visions as technologies rather than as illustrations of the need to generate and transform all our institutions on the basis of the kind of culture and people we wish to be. Maybe it would be good to let "Appropriate Technology" die with Fritz. His vision was broader and more organic than what is becoming an empty slogan (RAIN, 1977)

And shortly thereafter, Witold Rybczynski, one of the pioneers of AT for developing countries, concluded that:

> AT has been hoisted by its own technological petard. Having begun as a protest movement against too much of the wrong kind of technology, it now finds itself outflanked by the "high" technologists who are ready, willing and able to produce appropriate technologies, not instead of, but in addition to, the other kind...AT is not a failure, it is just too much of a success (Rybczynski, 1978).

Besides these nagging self doubts there were more visible and immediate conflicts for the movement to deal with. Different perspectives and parties of interest within and outside the movement clashed during the planning and implement-

ation of the various new AT programs. Throughout the stormy planning process and first year of operations of the National Center for Appropriate Technology (NCAT), for example, there was a constant struggle for influence and control among different factions within the NCAT board, staff and CSA headquarters, finally culminating in the firing of NCAT's first director and a number of the staff loyal to him leaving in protest. At the local level, similar conflicts developed during community technology development projects among city officials, AT advocates from outside the community and indigenous community activists and leaders. At the end of the 70's, in fact, two of the most promising pioneering community technology and urbanhomesteading projects, the East 11th Street Movement on New York's Lower East Side and the People's Development Corporation in the South Bronx, collapsed because of these conflicts and government pressures to do too much, too fast without adequate capacity building.

At the close of the 70's, however, the movement appeared to be dealing with some of these conflicts- the planning of newer AT programs went more smoothly than the NCAT process had, and the newer wave of community technology demonstration projects in places like San Bernardino, California; Eugene, Oregon and Seattle, Washington were more cooperative and less conflictual than the pioneering efforts in New York had been. The movement seemed to be learning and evolving. But then in the early 80's, the Reagan admistration came in, announced that the "energy" and "environmental" crises were over and proceeded to dismantle or drastically reduce the AT and renewable energy programs launched by the Carter administration, which didn't fit in with its growth ideology. CSA and its "small war on poverty" were dismantled and as a result NCAT lost most its funding. NSF's pilot AT research program was cut and the funding for DOE's small grants program and HUd's solar demostration programs drastically reduced. Also, Dennis Hayes was removed from his post as director of SERI. Moreover, a new conser-

vative adminstration also came in California and did away with Brown's Office of Appropriate Technology. Interest in AT in Washington and at State capitals and city halls seemed to wane as rapidly as it had risen in the late 70's. The quest for convivial designs went on,however, at the grassroots and the movement left a legacy and some lessons for newer efforts to reform science and technology which emerged in the 80's.

AT as Cultural Movement and Product

Throughout the approximately fifteen year life cycle of the AT movement,from initial stirrings in the late 60's to decline in the early 80's,there was a tendancy among observers and some advocates to focus mainly on the "hardware" of the movement. But as the quote from the RAIN editors above (on p9) underscores, the "hardware" of the movement- the solar collectors,windmills,greenhouses, composting toilets and so on- were merely the more visible "tip" of the AT "iceberg". The technologies and devices cultivated by the movement were not solely ends in themselves,but rather,were the living symbols and emblems of the broader and deeper themes which the movement tried to develop and promote.

This is made very clear in Schumacher's seminal essay,"Technology with a Human Face",first presented in 1971,where he contrasts the dominant theme of progress and "the forward stampede" with his alternative theme or vision of "homecoming"-a theme which became a key one in the movement. "I think,"he wrote,"we can already see the conflict of attitudes which will decide our future. On the one side,I see the people who think they can cope with our (present) crisis by the current methods,only more so; I call them the people of the forward stampede. On the other side,there are people in search of a new life-style,who seek to return to certain basic truths about man and his world; I call them homecomers."(Schumacher,1973, p146) He goes on to say that "the forward stampede" is currently the dominant theme

in our culture:

> Let us admit that the people of the forward stampede, like the devil, have all the best tunes or at least the most popular and familiar tunes. You cannot stand still, they say; standing still means going down; you must go forward; there is nothing wrong with modern technology except it is incomplete... The slogans of the people of the forward stampede burst into the newspaper headlines every day with the message, 'a breakthrough a day keeps the crisis at bay' (Schumacher, 1973, p146-7).

This is the same "tune" or theme that was sounded twenty five years earlier by Bush in his vision and blueprint for science as "endless frontier". As an alternative to this dominant theme of science and culture as "forward stampede" or "endless frontier", Schumacher advocates an updated version of the traditional theme or myth of "coming" or rediscovering "home":

> 'Home-comer' has, of course, a religious connotation. For it takes a good deal of courage to say 'no' to the fashions and fascinations of the age and to question the presuppositions of a civilisation which appears destined to conquer the whole world... The genuine 'home-comer' does not have the best tunes, but he has the most exalted text, nothing less than the Gospels. For him, there could not be a more concise statement of his situation, of our situation, than the parable of the prodigal son (emphasis added)...
>
> The home-comers believe that the direction which modern technology has taken and is continuing to pursue- towards ever-greater size, ever-higher speeds, and ever-increased violence, in defiance of all laws of natural harmony- is the opposite of 'progress'. Hence the call for taking stock and finding a new orientation. The stock-taking indicates that we are destroying our very existence, and the reorientation is based on remembering what human life is really about (Schumacher, 1973, p147, 149).

Here, Schumacher takes the biblical theme or myth of the prodical son and attempts to adapt and rework it into a new myth or theme of "home-coming", which underlies and informs his vision of AT. This theme of "returning" or "rediscovering" "home" and the values associated with "home" (rootedness, simplicity, self reliance, conviviality, community, harmony with nature), in fact, crops up again and again in the evolution of the movement, and seems to have influenced and motivated many

of the designs and activities of the movement, including the development of ecological shelters and homesteads and the creation of neighborhood and community technology development projects.

The larger symbolic or thematic nature of AT was also underscored by the editors of RAIN Magazine when they included "dreams and values" as well as hardware in their definition of AT:

> Appropriate technology reminds us that before we choose our tools and techniques we must choose our dreams and values, for some technologies serve them, while others make them unobtainable ...(AT) is not merely a question of machines and tools, but of the nature of all the conceptual, political, physical and spiritual tools and techniques which we bring into play by our actions...It may seem wrong to categorize dreams and values together with machines and tools as "appropriate technology", but those very different things need desperately to be brought together. Action without vision and vision without action are equally impotent, but together they can perform miracles (Rainbook, 1977, p 1-2).

Thus, it's more proper, I believe, to view the AT movement in America as an intellectual and cultural movement rather than a narrow technological one. Accordingly, in this study I've sought to describe the emergence and evolution of the AT movement as a new cultural movement in America and to treat the designs and devices developed and promoted by the movement as cultural products with cultural and symbolic as well as practical significance. Through this approach I've attempted to uncover and clarify the underlying cultural themes and meanings which the movement organized around and sought to promote and which were reflected in and reenforced by the alternative designs, devices and products developed by the movement, and to assess the impact that these themes and meanings had on the larger American culture during the short life of the movement in the 70's and thereafter.

The study that follows is divided into four parts. In Chapter 1 I describe the elements of a new conceptual approach, the "coevolutionary approach", which I have

developed for analysing the coevolution of new cultural meanings, themes and designs within new cultural movements, and which I will use to analyze the evolution and cultural significance of the AT movement in America. In Chapter 2 I briefly describe the cultural roots of the movement in America, its intellectual prophets and formative themes, and its emergence out of the radical/reform oriented "cultural ecology" of the '60's' and four distinctive, AT related "cultural quests" triggered by this cultural ecology and climate. Then, in Chapter 3, I focus on one exemplary AT group, the New Alchemists, and analyze in detail the step by step evolution of their series of "ark" bioshelter designs and how these designs and the themes reflected in them coevolved with the ideas of the New Alchemy leaders, John and Nancy Todd, and the social and cultural structure of the group as a whole. Finally, in Chapter 4 I focus on the portion or quest within the AT movement that sought to implement AT in low income communities, or what I refer to as community technology development and the "Small War on Poverty". Here, I'll describe and analyze both the stormy design and evolution of the National Center for Appropriate Technology (NCAT) at the national level, and the evolution of local neighborhood technology development projects in San Bernardino, Chicago, Eugene and Seattle. This will be followed by a short epilog that summarizes my conclusions about the cultural meaning(s) and significance of the AT movement in America.

Chapter 1. Transforming Themes, Leaders, and Designs: The Coevolution of New Meanings in Cultural Movements and Quests

> The social world is a world in becoming, not a world in being.
> -Victor Turner, Dramas, Fields, and Metaphors

> The person is as much an activity as a thing- an ever progressive motion engaged in giving itself a new form.
> -Robert Kegan, The Evolving Self

> Social process does not mold a new being merely to housebreak him; it molds generations in order to be remolded, to be reinvigorated, by them.
> -Erik Erikson, Young Man Luther

> Cities rise and fall... Buildings are taken down and new ones go up. Rooms are redecorated... The site is subject to transformation. When we see the site over time, we can study the changes that occur. This will reveal the powers that act on the site and the ways in which they relate to one another.
> -N J Habraken, Transformation of the Site

> Story formulas are cultural products and in turn have some sort of influence on culture... The process through which formulas develop, change and give way to other formulas is a kind of cultural evolution with survival through audience selection.
> -John Cawelti, Adventure, Mystery and Romance

Nothing stays the same. Cultures and societies change. Creative lives and cultural leaders change. Buildings, designs and cultural products change. Even, the stories we tell which guide our lives change. And, during periods of cultural crisis and within new cultural movements, these four ways of making meaning- through our cultures, our personal lives, our designs and products and our stories- tend to change together or "coevolve" in complementary ways.

This "coevolutionary" nature of cultural movements and cultural change is the guiding principle on which this study of the evolution of the AT movement and its

cultural designs and products is based. From this principle I've developed a new approach for analyzing the evolution and products of cultural movements which focuses on how new personal and cultural themes, systems of meaning, new social structures and new cultural designs and products, all "coevolve" together during such movements.

In this chapter I'll describe the theoretical roots and important component elements of this coevolutionary approach, starting with the six key questions which I feel a thorough study of a cultural movement and its products should address. I'll then briefly describe the disciplinary areas and studies within the general study of culture and cultural products which most influenced me in addressing these key questions and formulating my own approach to them.

Next, I'll describe how my own thinking about the AT movement and how to analyze it has evolved through six distinctive stages and how these stages and the key ideas generated in each ultimately came together in my present coevolutionary approach. Then, I'll briefly enumerate the important component elements of this approach. The rest of the chapter will then be spent in fleshing out these component element, tracing their intellectual roots, and showing how they build on one another to ultimately form a unified framework and method of analysis for systematically addressing my six key questions and integrating the results of these queries.

Six Key Questions

Through my mentors (particularly Langdon Winner, Leo Marx, Sharon Traweek, Sherry Turkle, Robert Kegan and Hayward Alker), my reading of the literatures on the social study of culture and my reflections on AT as cultural movement and product, I've come to believe that a thorough scholarly study of a new cultural movement and its meanings and cultural products should address itself to six key questions[1]. The first of these is the question of general cultural themes and meanings, namely:

1. What were the general cultural ideas, themes and meanings which the movement developed and sought to promote?

Here, the scholar studying the movement is interested in the new intellectual concepts and themes promoted by the movement and how these fit together into larger, hopefully coherent, "systems" of meaning. Moreover, he or she should be interested in how these new ideas and systems of meanings compared and contrasted with those of the parent culture or cultures out of which the movement grew and in how these ideas and systems evolved over the life of the movement and impacted upon the ideas and meaning systems of the parent culture. This leads naturally to the second key question, that of cultural continuity and change:

2. What were the general cultural processes and dynamics by which the movement emerged from and sought to change the themes and meanings of its parent culture?

Here, the scholar is interested in what caused the movement to emerge from its parent culture and how this emergence took place. He or she should also seek to understand how the movement interacted with its parent culture over time and the extent to which the new ideas and meanings of the movement were ultimately adopted or incorporated by its parent culture.

Next, the scholar should be concerned with the question of leadership:

3. Who were the leaders of the movement and how did their life themes and creative designs guide the movement?

Here, he or she is interested in the life themes and goals and personal systems of meanings of the founders and leaders of the movement and how these personal themes and meanings inspired and coevolved with the general themes and meanings of the movement.

Besides studying the movement's leaders and the dynamics of leadership within the movement, the scholar should address the the question of the social organization of the movement:

4. How did the movement organize itself socially in order to promote its ideas and produce its cultural products?

Here, he or she is interested in the social organizations and structures of the movement and how these evolved during the course of the movement. Also, as with the movement leaders, he or she should look at how the movement's social organization related to and coevolved with its general themes and meanings.

The fifth key question deals with the specific cultural designs and products of the movement:

5. What were the particular cultural designs and products produced by the movement and how did they embody and convey the themes and meanings of the movement?

Here, the scholar is interested in interpreting the particular themes and meanings embodied in and conveyed by the cultural designs and products of the movement, be they texts, paintings, performances, buildings, devices or other artifacts, and in how these particular themes and meanings relate to the movement's general themes and meanings. He or she is also interested in how the designs and products of the movement changed and evolved over time.

Finally, the scholar should address the question of ideological and political conflicts:

6. What ideological and political conflicts occured within the movement and between it and its parent culture and how were these conflicts mediated or resolved?

Here, he or she is interested in both ideological and/or political conflicts among different leaders, groups and factions within the movement and the conflicts which occur between the movement and its parent culture as it seeks to promote its new ideas and meanings.

Clearly, all six of these key questions interrelate and the thorough scholar must not only address each of them in turn, but also must somehow integrate and interconnect his answers to each so as to give a complete picture of the movement's evolution and cultural significance. In this study of the AT movement in America I've sought to provide answers to these six questions and to combine my answers and findings so as to give the reader an integrated and hopefully interesting picture of the movement's themes and meanings, its evolution, and its cultural impact and significance.

The Relevant Social Studies of Culture

In recent years a number of scholars have called for a unified approach and discipline for the social study of modern culture and cultural products, which would bring together the insights of the various disciplines and subdisciplines now studying aspects of contemporary cultural products and systems and how they are socially produced. Sociologist Diane Crane, for example, in the final chapter, entitled "Toward a Sociology of Culture", in her book on "invisible colleges" and collaborating networks in science argued that:

> The sociological study of culture must be viewed as a single field using the same concepts and hypotheses to examine different types of cultural phenomina if progress is to be made in understanding this subject. This type of study should

> be focused upon analysis of the social organization of producers of different types of cultural products and of the themes that guide their creative work... (1972, p 141).

In a similar vein, sociologist of popular music Richard Peterson in his introduction to The Production of Culture (Peterson, 1976), a collection of essays on the production of culture and cultural products in science, the arts, and religion, advocated a unified sociology of culture which would bring together and integrate the findings of the now separate and disjoint "sociologies of art, science, religion, knowledge, law, media, education, sports, and popular music", emphasizing the similarities in how culture was socially produced in each of these areas.

While I sympathize with these calls for a more unified approach and discipline for the study of modern cultural systems and products, and, indeed, see my present study and approach as a small step in that direction, such a unified approach and discipline does not as yet exist and, as a result, the scholar who wishes to study modern cultural systems, products and movements is faced with a bewildering richness of disciplines, subdisciplines, approaches, and conceptual frameworks, all having to do with modern culture and how it is socially produced. In my own case, in seeking to formulate and address my six key questions for the AT movement, I've been influenced by a wide assortment of cultural disciplines, theories and approaches. Looking back, the studies and concepts which have most influenced this study seem to fall into six loose disciplinary categories. I'll briefly describe these categories and the studies within each which most influenced this work in the subsections below.

1. The Social Studies of Science

Under this category I include studies in the related fields of the sociology of science, the history of science, the psychology of science, and science and public policy studies, which treat science and its results as culture. These social studies of science as culture have been a very fruitful area for cultural research in recent years, and cultural

researchers studying other types of culture, such as, the arts, have begun to adapt concepts and models developed in these studies of science as culture for use in studying other types of cultural production. I found certain of these studies useful in approaching each of my six key questions.

In approaching my first two questions, on cultural meanings and change, for example, I found the recent work on the structure of scientific knowledge and how it changes over time quite useful, particularly Kuhn's pioneering study on scientific "paradigms" and the structure of "scientific revolutions" (1962) and the more recent studies by British sociologies on the sociology of scientific knowledge (Barnes, 1974, 1977; Mulkay, 1979; Edge and Barnes, 1982). I was also influenced by the studies of my advisor Sharon Traweek (1988) and Latour and Woolgar (1979) on the social construction of meaning within the high energy physics and molecular biology "science cultures", and by the recent studies on the emergence of new scientific disciplines (Ben-David and Collins, 1966; Mullins, 1972, 1973; Edge and Mulkay, 1976; Lemaine, et. al., 1976) and on "countermovements" in the sciences (Nowotny and Rose, 1979).

In approaching my third question, on leadership and creativity, I found useful Holton's studies on the role of thematin science (1973), Mitroff's study of cognitive styles in science (1974) and Gruber's study on the evolving structure of Darwin's theory of evolution (1974). And, in approaching my fourth question, on social organization, I was influenced by Crane's study on "invisible colleges", circles and networks in science (1972) and Mullin's study of the evolution of networks and theory groups in American sociology (1973).

In approaching my fifth question, on interpreting cultural products and designs, I was influenced by Sharon Traweek's work on interperting the meanings embodied in the stories and equipment of high energy physicists (1988) and Mulkay's and Knorr-Cetina's work on interpreting scientific papers and discourses (Gilbert and Mulkay, 1984; Knorr-Cetina, 1981).

Finally, in approaching my sixth question, on political conflicts, I found the recent studies on scientific controversies and science policy conflicts useful (Greenberg, 1967; Primack and Von Hipple, 1974; Nelkin, 1979).

2. The Social Studies of Technology, Architecture and Design

Under this category I include studies which treat technology and architecture as culture, including relevant studies in the history of technology, architectural history and criticism, technology and society studies, technology and public policy studies, and design studies[3] (studies which analyze the design process). At present this is a less coherent body than the social studies of science. As with the studies of science as culture, I found studies in this area revelant to all six of my key questions.

On my first question of cultural meanings, my approach was informed by my advisor Langdon Winner's study of the cultural theme of "autonomous technology" and its role in society (1977), by Habraken's work on themes and thematic systems in architectural design (1982, 1985), and by Alexander's work on "pattern languages" in architecture (1968, 1977).

On the question of cultural change, my approach was influenced by Mumford's pioneering work on the sociotechnical stages in Western culture (1934, 1970). And, on a more micro level, I was influenced by the studies on the process of technical innovation (Rogers, 1962; Havelock, 1969; Berman and McLaughlin, 1978), Jencks' studies on the evolution of modern architectural design schools and ecologies (1971, 1973), and Habraken's studies on the evolution of designs and building sites (1982, 1985).

On my questions of creative leadership and social organization, my approach was informed by the work of my advisor Sherry Turkle on "computer cultures" and styles of programming (1984), by Schon's work on "reflexive practice" and the use of "generative metaphors" by designers (1979, 1983), and by Bucciarelli research on "design worlds" and the social process of engineering design (1986).

On interpreting cultural designs and products, I was influenced by Schon's work on

interpreting stories and discourse in design (1979, 1983) and Habraken and others work interperting the themes and meanings embodied in buildings (1982).

Finally, on addressing the question of conflicts, I found the studies on the ideological nature of technology and technical controversies useful (Winner, 1977; Noble, 1977; Dickson, 1974; Nelkin, 1979), as well as Habraken's work on the politics of architectural design (1982, 1985).

3. The Social Studies of the Arts

Under this category I include studies which look at the social production of culture in the arts, including relevant studies in the sociology of literature and the arts, the history and cultural criticism of the arts, literary analysis, and artistic politics and public policy. I'm not as familiar with this area as I am with the social studies of science, technology and architecture as culture, so I've relied on a few key works which served to show the parallels and similarities between the cultural production of science, architecture and technology and the cultural production of art.

In particular, in approaching my first and second questions, I found three studies quite useful: Clignet's study, inspired by Kuhn (1962), on the structure of "artictic paradigms" and "artistic revolutions" (1985), Peterson's collection on the social production of culture (1976) and Wolff's study on the social production of art (1981). On my third question of creativity and leadership, I found useful Csikszentmihalyi's work on the role of social "fields and domains" in artistic creativity (1984) and Arnheim's study of the stages of evolution in Picasso's Guernica (1962). And on the question of social organization in the arts, I found Becker's study of "art worlds" (1982) and Kadushin's studies on intellectual circles and networks in the arts (1976) informative.

On the question of interpreting artistic products, I was influenced by Eco's "semiotic" (sign analysis) studies of literary texts (1979), Barthes' interpretation of the myths embodied in modern French cultural products (1972) and Griswold's cross-cul-

tural study of the differing interpretations of literary works in literary reviews (1987). Finally, on artistic conflicts, I found Balfe and Wyszomirski's collection Art, Ideology, and Politics (1985) quite useful.

4. Cultural Studies

Under this category I include theories and studies related to the study of modern cultures and subcultures and their cultural products, including relevant works in anthropology, cultural history, contemporary cultural studies, media studies, cultural studies of religion and the sociology of sub-, counter- and organizational cultures[4]. Studies in this area were very useful in formulating my ideas about the nature of culture and cultural systems of meanings and the dynamics of cultural change.

Specifically, with regard to cultural meanings and structures, I was very influenced by the ideas of the anthropologists Greetz (1973), Turner (1967, 1974), and Levi-Strauss on cultural themes, symbols and systems of meaning. In addition, I found useful the studies by sociologists and cultural scholars on the structure of meanings and process of meaning-making in contemporary sub- and countercultures and movements (Yinger, 1982; Berger, et. al., 1973; Willis, 1978; Hebdige, 1979; Berger, 1981).

In formulating my approach to the question of cultural change, I was very influenced by three scholars' models of cultural change: Turner's model of "social dramas" (1957, 1974), Wallace's model of "revitalization movements" (1956), and Yinger's model of "counterculture" formation (1982)[5]. I was also influenced by the more macro theories of cultural cycles and stages developed by cultural historians Toynbee (1947) and Thompson (1986) and social philosopher Habermas (1979).

This area was also useful in formulating my approach for interpreting cultural products. Here, my approach was influenced by the literature on the interpretation of cultural myths (Propp, 1927; Campbell, 1949; Levi-Strauss, 1955; Jung, 1964; Auden, 1968; T. Turner, 1969; Petty, 1979; Lowry, 1982), and by Turner (1967, 1974) and Myerhoff's (1974, 1975) studies on interpreting cultural rituals and pilgrimages. I also found useful

Csikszentmihalyi and Rochberg-Halton's study on the cultivation of meanings in household objects (1981) and Willis' study of the cultivation of symbolic objects and products in drug and motorbike subcultures (1978).

Finally, in addressing the question of cultural conflicts, I found useful Berger's study of ideological conflicts and their mediation (what Berger calls "ideological work") in a countercultural commune (1981) and Levi-Strauss' (1955) and Turner's (1967, 1974) work on the polar themes within a culture and their mediation through myths and symbols.

5. American Studies

Under this category I include studies which deal with the evolution of American culture and its central themes and products, including relevant studies in the interdisciplinary field of American studies, American cultural history and literature, American popular culture, and American politics and political culture[6]. This area and its methods naturally overlaps to some extent with the more general area of Cultural Studies. I've found studies from this area useful in helping to place the AT movement in an American cultural context and showing its relationship to earlier reform and utopian movements and to traditional American themes and values.

Specifically, in approaching the question of cultural meanings, I was influenced by the work of American studies scholars on American cultural myths and symbols, particularly my advisor Leo Marx' study of the tension between the "pastoral myth" and the myth of the "machine" in American culture and literature (1964) and Smith's pioneering study of the American "West" as cultural symbol and myth (1950).

With regard to the question of cultural continuity and change, I was influenced by four studies on cycles and stages in American history, politics and literature: Williams' study of stages and cycles in American history (1966), Wasserman's study of cycles in American history and culture (1984), Spiller's study of the cycles of American literature (1955) and Schlessinger's study of the thirty year cycle in American politics (1986).

Also, on both my cultural change and social organization questions, I found the literature on American social and political movements and their social structure useful (Hofstadter, 1955; Blumer, 1951; Gusfield, 1963; Ash, 1972), as well as, the literature on Ameican utopian movements and communties and their social organization (Kanter, 1972; Hayden, 1976; Berger, 1981).

On the question of interpreting cultural products, my approach was influenced by by Smith (1950) and Marx'(1964) approach to interperting central cultural symbols and myths in American literature, and Cawelti(1976) and Wright's (1975) more recent work on analyzing the structure and evolution of the American western story formula.

Finally, with respect to the question of political conflicts and their mediation, I found useful the work of Gusfield (1963), Edelman (1964, 1971), and Bennett (1975) on the role of political symbolism and cogniton in American political conflicts and their mediation.[7]

6. Cognitive, Creative and Leadership Studies

Under this category I include studies which deal with the personal, creative and cognitive aspects of the social production of culture, including relevant studies in psychology, psychohistory, cognitive science, creative life studies, family systems studies and leadership studies[8]. I found these studies most relevant in approaching my third key question, on leadership and creative themes, but they proved useful in addressing some of my other questions as well.

On the question of leadership and creativity, my approach was very influenced by Erikson's psychohistoric studies of cultural leaders (1958, 1969) and Burns' study on "transforming leadership" (1978). It was also influenced by Kegan (1982) and Fowler's (1981) work on the structural-developmental stages in the evolution of personal meaning systems and faith, and by the related work of Loder (1981), Feldman (1980), Gruber (1974), Csikszentmihalyi (1984) and Gardner (1986) on the struture and evolution of creative lives and meaning systems. Also useful was the work of Jung and his students

(1964), Berne (1972), Fowler (1981) and Hillman (1983) on personal life themes, scripts, stories and myths.

Also, in relating personal meanings and change with cultural meanings and change, I was very influenced by Erikson's ideas on how personal and cultural crises and their resolution intermesh (1958, 1969), Kegan's ideas about the role of "holding environments" and "cultures of embeddedness" in the evolution of people's lives and meaning systems, (1982) and Csikzentmihalyi's ideas on the role of social "fields" and "domains" in fostering individual creativity (1984).

In approaching the question of social organization, I was very influenced by Laing's work on the myths that families socially construct about themselves (1969), Jacobs' study (1984) of the role of cooperative imagery and myth-making in successful marriages, and Berger and Luchman's essay (1966) on the "social contruction of reality" in marriages. Also useful were Bennis, et.al., (1986), Mitroff's (1983) and studies of the role of stories and transforming leadership in the evolution of organizational "cultures".

On the interpreting of cultural products, I found useful the work of Jung and his students (1964), Berne (1972), Fowler (1981) and Hillman (1981) on interpreting the meanings of personal stories and myths and the psychological significance of cultural stories and myths. I also found relevant the recent work of computer and cognitive scientists using computers to interpret the cognitive structure, themes and meanings of stories (Schank and Abelson, 1977; Lehnert, 1981; Dyer, 1983), particularly the work of my advisor Hayward Alker and Wendy Lehnert using these computer analysis techniques to interpret the structure and cultural power of the Jesus story (Alker, Lehnert, Schneider, 1984).

Finally, with regard to political conflicts and their resolution, my approach was influenced by Erikson's ideas on how the personal conflicts and crises of cultural leaders and the cultural conflicts they helped to resolved intermeshed and served to

mediate one another (1958, 1969), by Burns ideas about the role of "transforming leadership" in resolving political and cultural conflicts (1978), by Jacobs' ideas about the role of shared "images and myths" in mediating family tensions (1984), and by Kegan (1982), Fowler (1981) and Loder's (1981) ideas about the role of personal conflict and tension in the triggering of individual change and meaning restructuring.

This brief survey of the six areas of social studies of culture most relevant to the present study has served to show, I hope, that there already exist in these bodies of literature numerous ideas, theories and methods for addressing each of my key questions. Figure 1 summarizes some of the most important of these concepts and methods for each area of social studies of culture (reading down the columns) and for each of my key questions (reading across the rows). This figure also graphically illustrates the problem I faced in approaching the AT movement and its cultural products, namely, given this wealth of concepts and methods, how was I to select and integrate some of them into a reasonable coherent conceptual framework and methodological approach? How, for example, was I to combine the various theories and methods for analyzing cultural change in each area (the second row in Figure 1) into a coherent approach for treating the AT movement as cultural change? Moreover, having developed a coherent approach to the cultural change question, how was I to incorporate it into coherent overall approach for addressing all six questions in an integrated fashion? The answers to these questions did not come quickly or easily. My thinking on and approach to studying the AT movement evolved through five earlier stages before I was able to successfully weave my ideas and insights together into my present coevolutionary framework and approach.

The Six Stages in the Evolution of My Thinking about the AT Movement

In his book The Evolving Self (1982), one of my mentors Robert Kegan described

Figure 1. Concepts and Methods from the Social Studies of Culture Relevant to My Six Key Questions

Key Questions	Social Studies of Science	Social Studies of Tech, Arch, Design	Social Studies of the Arts	Cultural Studies	American Studies	Creative, Leadership Studies
1. Cultural meanings & themes	paradigms(Kuhn) knowledge(Mulkay) cultures(Traweek)	themes(Winner) systems(Habraken) pattern languages (Alexander)	paradigms (Clignet) social production (Wolff)	themes (Levi-Strauss) symbols(Turner) systems(Greetz) countercultures (Yinger, etc.)	symbols and myths (Smith, Marx)	
2. Cultural continuity & change	revolutions(Kuhn) new disciplines (Mullins, etc.) countermovements (Nowotny, Rose)	technical stages (Mumford) innovation(Havelock) design ecologies (Jencks)	artistic revolutions (Clignet)	dramas(Turner) revitalization (Wallace) stages & cycles (Thompson)	stages & cycles (Wasserman) utopian & social movements (Ash)	cultural leaders (Erikson) transforming leadership (Burns)
3. Leadership & creativity	themes(Holton) styles(Mitroff) evolving theory (Gruber)	computer styles (Turkle) design metaphors, reflexive design (Schon)	fields/domains (Csikszentmihalyi) evolving art (Arnheim)	root paradigms (Turner) mazeways (Wallace)	American leaders(Burns)	life themes (Berne, Fowler) life stages (Kegan, Fowler) creative lives (Gardner, Gruber)
4. Social organization, production	circles, networks (Crane) theory groups (Mullins) science cultures (Traweek, Woolgar)	computer cultures (Turkle) design worlds (Bucciarelli)	art worlds (Becker) circles, networks (Kadushin)	social structure vs. communitas (Turner)	social movement structure (Blumer, Ash) utopian communities(Kanter)	family myths (Laing) marriage myths(Jacobs) organ. leaders (Bennis)
5. Cultural designs & products	discourses (Mulkay) stories, equipmt (Traweek)	design discourse & stories(Schon) building themes (Habraken)	text semiotics (Eco) mythologies (Barthes) literary reviews (Griswold)	myths(Campbell) rituals(Turner) subculture objects (Willis) household objects (Csikszentmilhalyi)	symbols, myths (Smith, Marx) story formula (Cawelti, Wright)	personal myths & stories (Jung, Fowler) scripts, themes (Berne, Dyer) political myths (Alker)
6. Conflicts & their mediation	controversies (Primack, von Hipple, Nelkin) policy conflicts (Greenberg)	tech ideology (Winner, Noble) controversies & policy conflicts (Nelkin) design politics (Habraken)	ideology, politics & public policy in the arts(Balfe, Wyszomirski)	ideological work (Turner) polar themes & their mediation (Levi-Strauss, Turner)	Amer. political symbolism, cognition & conflict (Edelman, Gusfield)	leaders role in cultural conflict mediation (Erikson, Burns)

how people's meaning systems and the way they "construct" their "selves", typically, evolve through a sequence of stages in which the way the person structures his "self" and meanings in each stage has to "move over" and become integrated into a more complex "self" and system of meanings in the next stage. Similarly, Howard Gruber, in his study of the evolving structure of Darwin's theory of evolution (1974), described how Darwin's thinking also evolved through a series of stages in which his ideas and the way they were organized in each stage had to likewise "move over" and become integrated into a more complex structure of ideas in the next.

Like both Kegan's description of the evolution of personal meanings and Gruber's of the evolution of Darwin's thinking, my thinking about the AT movement and how to characterize it has gone through a series of evolutionary stages during my involvement with it over the past twelve years, in which my conceptions of and approach to the movement in each stage have had to "move over" and become integrated into my conceptions and approach in subsequent stages. Each one of these six stages can be characterized by the key theme or metaphor that dominated and served to structure my thinking about the movement at that stage. Each of these key themes or metaphors operated analogously to the way philosopher Stephen Pepper saw what he called "root metaphors" operating to structure people's view of the world around them:

> Desiring to understand the world a man looks about for a clue to its comprehension. He pitches upon some area of commonsense fact and tries to see if he cannot understand other areas in terms of this one. The original area becomes his basic analogy or root metaphor. He describes as best he can the characteristics of this area, or if you will, 'discriminates its structure'. A list of its structural characteristics become his basic concepts of explanation and description (Turner, 1974, p 26, quoting Pepper, 1942, p 38).

Or as anthropologist Victor Turner put it, citing the work of philosophers I.A. Richards and Max Black, in discussing the role of key or root metaphors in his own thinking:

> ... in metaphors 'we have two thoughts of different things active together and

> supported by a single word or phrase, whose meaning is a resultant of their interaction (Richards, 1939, p 93)'...(these two thoughts or subjects, which Black calls the 'principal' and 'subsidiary' subjects of the metaphor are)'systems' of concepts and meanings...(and) the metaphor works by applying to the principle subject a system of 'associated implications' characteristic of the subsidiary subject...the metaphor selects, emphasizes, suppresses, and organizes features of the principle subject by implying statements about it that normally apply to the subsidiary subject (Turner, 1974, p 30).

Such metaphors and metaphorical thinking often play a central role in the evolution of new ideas and conceptual frameworks in the natural and social sciences[9]. In my own case the principle subject of my key metaphors was always the AT movement and its products but in each of the stages in my thinking I sought to apply to it a system of 'associated implications' characteristic of a different subsidiary subject. Thus, drawing an analogy to Kuhn's notion of the way paradigms "shift" during "scientific revolutions"(1962), my own thinking on the AT movement might be described as having undergone five successive "metaphor shifts" during my participation in and study of it[10].

Figure 2 lists the six evolutionary stages in my thinking and the key theme or metaphor which characterized my viewpoint and approach during each. Also listed for each stage are: the disciplinary perspective I approached the movement from; additional themes or metaphors I utilized; mentors, guides and exemplary works which influenced me; the focus of my field research; the relevant reports and other products I produced; and the residual concepts of each stage which have been integrated into the present work. In the subsections below I will briefly describe each of these stages and its relevance to this study and the coevolutionary approach on which it is based.

Stage I: AT as Technology Reform

I was originally trained as an engineer and computer scientist, but during the late 60's and early 70's, like many others my age, I became concerned about the potential harmful effects of computers and other modern technologies and as a result of this concern I became involved in efforts to assess the social impacts of new technologies and in efforts to redirect or "reform" modern technology, first while I was in college

Figure 2: Characteristics of the Six Stages in the Evolution of My Thinking about the AT Movement

Stage/Key Theme	Disciplinary Perspective	Other Themes	Mentors/Guides	Research Focus	Papers/Products	Residual Concepts
Stage I: AT as Technology Reform (Fall '75-1977)	Technology Assessment, Criticism & Reform	technology, society & public policy public interest science & tech.	*Winner('77) Schumacher('73) Pirsig('74) *Coates *Brooks	Assessment of AT for local self reliance Creating NEAT-NET, MIT-ATG	Report on AT for self reliance ('77) NEAT-NET, MIT-ATG	technology reform movements & politics
Stage II: AT as Social Movement (1978)	Functional/ Structural Social Science	AT ideologies, factions & interest group politics	*Coleman Blumer('51) Allison	Social organization of AT movement, factions in movement	Paper on AT as social movement('78)	evolution & social organization of movements
Stage III: AT as Organizational & Community Innovation (1979-1982)	Policy Analysis & Innovation Research	AT organizational politics community technology development	*Pressman Marris/Rein Havelock('69) Berman & McLaughlin('78)	evolution of NCAT and community tech development projects in five cities	Dissertation proposal('79) Report on local AT innovation Report on AT in NYC('82) NCAT proposal & evaluation	stages of evolution of NCAT; role of transformers in AT innovation process
Stage IV: AT as New Technical Discipline(1983)	Sociology of Science	structure of scientific knowledge; science cultures; AT as countermovement	*Traweek *Turkle Mullins('73) Lemaine('76) Nowotny, Rose('79)	New Alchemists &other AT research groups	Paper on AT as new discipline & countermovement in science ('83)	evolution & organization of cultural movements in science
Stage V: AT as Cultural Quest (1983-1985)	Cultural & American Studies Literary Analysis	AT as pastoral impulse; AT cultural themes cultural change process	*Marx('64) Campbell('49) Turner, Myerhoff ('74) Greetz('73) Levi-Strauss('55)	questlike processes & activities in AT movement	Draft chapter on AT movement as cultural quest	AT cultural themes; cultural quests in AT movement
Stage VI: AT as Coevolving Cultural Movement (1986-1987)	American Cultural Sociology, Politics & Design	coevolving meaning systems; transforming themes, leaders & designs intellectual marriages & families	*Traweek *Marx, *Alker *Kegan('82) *Gardner *Schon, Habraken Crane('72), Peterson('76)	coevolution of themes, thematic systems, quests, designs, leaders, & organizations in AT movement	Present study	elements of a coevolutionary approach for studying cultural movements

through the environmental and "futurist" movements[11] and later as a technology assessment consultant and staffer at the newly created Congressional Office of Technology Assessment.

In 1975, after a year at OTA, I enrolled at M.I.T. to do further graduate work on technology assessment and science, technology and public policy issues[12] and it was here that I was first introduced to the notion of AT through studying with Langdon Winner, my first mentor at M.I.T. Not surprisingly, given my background in technology assessment and other technology reform efforts, I was immediately attracted to the concept and began to view AT and the AT movement as a promising new approach to "technology reform" which might work well in conjunction with or as an alternative to the other technology reform efforts I'd been involved with.

My intitial introduction to the notion of AT came through a seminar on "Alternative Technology" taught by political philosopher and critic Langdon Winner in the fall of 1975 at the Massachusetts Institute of Technology, where I'd entered the graduate program in Political Science. In that seminar we focused on the intellectual themes and roots of the then emerging AT movement rather than its hardware, reading and discussing books, such as, the Goodman's Communitas, Schumacher's Small Is Beautiful, Illich's Tools for Conviviality, Pirsig's Zen and the Art of Motorcycle Maintenance and Dickson's The Politics of Alternative Technology (1974). Looking back now, I can see the faint roots of my current approach in that first seminar.

Some of us in the seminar got so excited about AT that we wrote a proposal to the National Science Foundation and received a grant to study the potential of using ATs to make intentional communities more self reliant during the summer of 1976. About a dozen students were involved in the study with Langdon Winner as our faculty advisor (see Decker, 1976 for some results of study). As part of the study, four of us drove across the country in June to visit emerging AT groups and attend the U.N. Conference on Human Habitation, occuring in Vancouver,

Canada. AT groups we visited on this whirlwind tour of the Midwest and Pacific Coast included Windworks, Inc., a wind research group in Wisconsin; the Ouroborous Project in Minnesota; the Alternative Energy Research Organization in Montana; Ecotope, an AT research group in Seattle, Washington; RAIN Magazine in Portland, Oregon; Cerro Gordo, a group planning an ecological community near Cottage Groves, Oregon; the Farallones Institute and the Zen Center near San Francisco, California; and Zomeworks in New Mexico.

That summer was an exciting time for the movement. Interest in AT was beginning to mushroom across the country and the groups we visited were highly optimistic about AT and conveyed a youthful exuberance about its possibilities. We arrived back in Boston from this first sally even more enthusiastic about AT than when we left. I proceeded to get more involved in the movement, helping to organize the Alternative Technology Study Group (which later became the Appropriate Technology Group) at M.I.T. and the New England Appropriate Technology Network (NEAT-NET) and serving as a consultant to the newly established National Center for Appropriate Technology (NCAT), and by the end of 1976 I'd decided to write my Ph.D. dissertation on the AT movement.

The main product of this stage in my thinking was my portion of the report on our NSF summer study in which I compared the AT movement with other technology reform movements and did a systematic "technology assessment" of its potential for making localities and communities more self reliant (Decker, 1976). Other products included the design for a "living-learning community" at MIT to be organized around the study of AT, NEAT-NET which I helped to organize and direct and the MIT Alternative Technology Study Group which I organized.

The lasting importance of this, my activist stage, for the present study is that my active participation in the movement during this period gave me an insider's sense of the movement and its underlying themes and meanings. Also, I've continued to think of

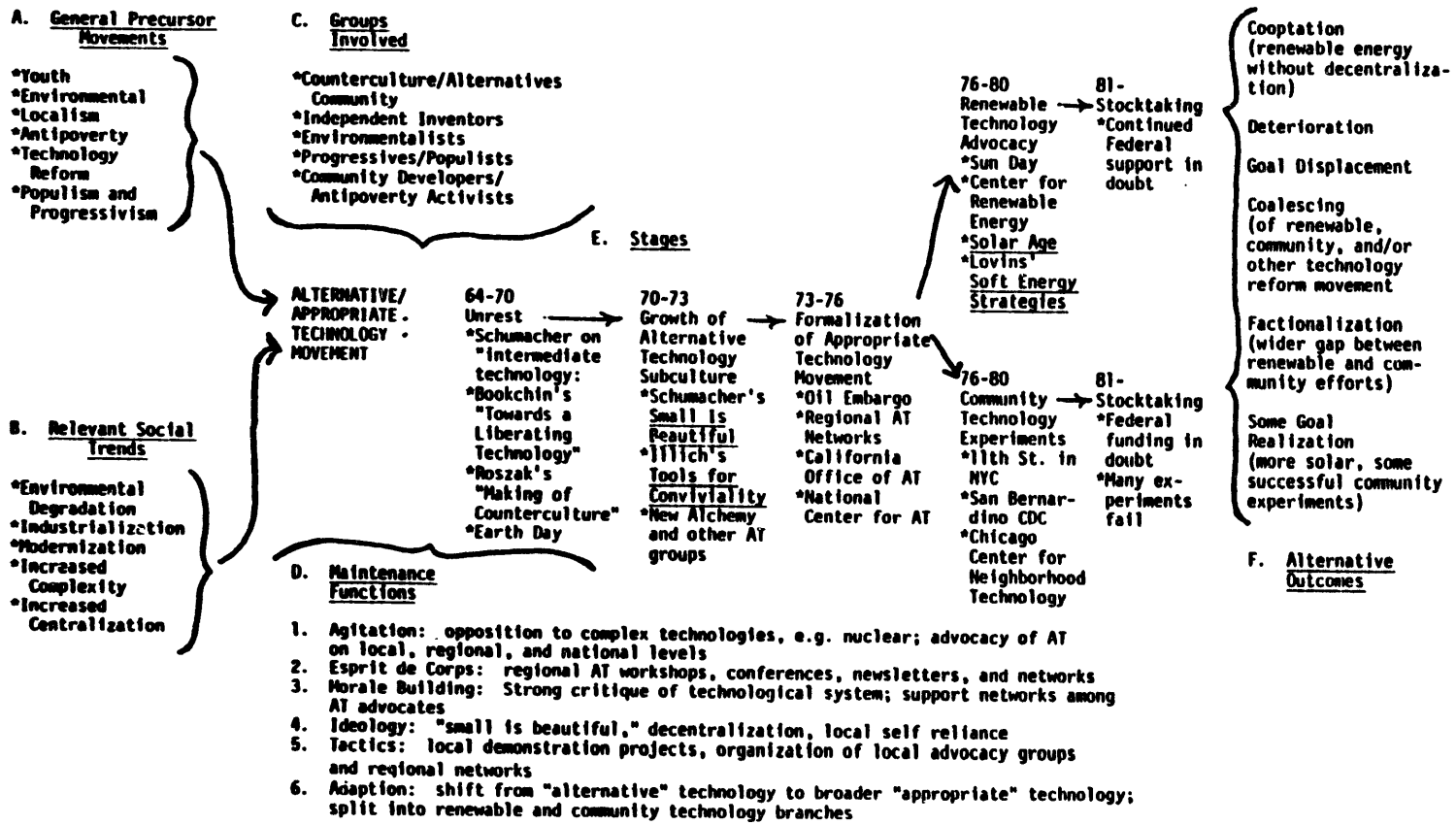
AT as one type of "technology reform" and this has helped in relating it to the other technology and social reform movement that emerged out of the 60's.

Stage II: AT as Social Movement

At the beginning of 1977, after completing my initial course work at MIT and Harvard and my work on the NSF summer AT study, I moved back to Washington, D.C. to begin my field research on the AT movement and consult for the National Center for Appropriate Technology (NCAT), which had just be funded by CSA after a stormy planning process which I'd been following. My ideas about the nature of "technology reform" and how to go about studying the AT movement were still pretty vague at this time[13] and like most graduate students in the social sciences, I felt the need to find and adapt an already proven conceptual framework which I could then use to study, analyze and interpret the movement. Eventually, I found a pretty good initial framework in the literature on social movements, especially Herbert Blumer's seminal article (Blumer, 1951; also important were Ash, 1972; McLaughlin, 1969; Dawson and Gettys, 1935; Roberts and Kloss, 1974; and Toch, 1965).

"Social movements", as defined by the literature on them, are "conscious, collective, organized attempts to bring about or resist large-scale change in the social order by noninstitutionalized means"[14]. Exemplary American social movements include the movement to abolish slavery, the movement for women's suffrage, labor's movement for better working conditions and the right to unionize, the prohibition movement and the civil right's movement in the 60's. In the spring of 1978 I completed an initial study (Decker, 1978) which treated the AT movement as a social movement. Figure 3 shows the preliminary framework and catagories that I developed in that study.

Figure 3 : ROOTS AND EVOLUTION OF ALTERNATIVE/APPROPRIATE TECHNOLOGY MOVEMENT USING SOCIAL MOVEMENT FRAMEWORK



First, following Blumer (1951) and Roberts and Kloss (1974), I looked at the roots and precusors of the AT movement in older more general movements (A in figure) and relevant social trends (B in figure). Then, following Dawson and Gettys (1935), I traced the movement through the typical stages that social movements go through: social unrest, popular excitement, formalization and institutionalization (E in figure). I also, following Ash (1972), analyzed the groups involved in the movement (C in figure) and used Blumer's catagories in analyzing how the movement organized and sustained itself (D in figure). Finally, following Ash, I speculated on the possible outcomes or results of the movement (F in figure)[15].

This first framework fit the AT movement reasonably well. The evolution of the AT movement did resemble the evolution of previous social movements in America and treating it as one did yield some useful insights about how the movement was organized. Problems arose, however, which eventually led me to search for another framework and approach. First, the AT movement didn't quite fit the mold of the social movement. Social movements are aimed at directly changing the "social order", but the AT movement, while it sought "social change", sought it indirectly through the changes it advocated in peoples values, "dreams", life styles and the technologies they used. Also, most social movements have explicitly stated goals (to abolish slavery, to give women the vote, etc.), while the goals of the AT movement were always rather vague and exploratory. It did advocate certain technologies, but as I've noted these technologies were just the "tip" of the AT "iceberg" and the definition of what was "appropriate" in terms of hardware or values or life styles seemed to evolve along with the movement.

Besides the fact that my social movement framework didn't quite fit the AT movement, it more importantly didn't generate the kind of ideas and insights about the movement I was most interested in pursuing. While I was interested in how the movement functioned and was organized, I was more interested in its underlying

themes, values and meanings. That is, I was as interested in revealing what it "meant", to the people in it and the surrounding American culture, as I was in showing how it "worked", that is, how it was organized and functioned to promote its goals, and I eventually decided that to do both I would require a broader conceptual framework and approach[16].

The main relevance that this stage in my thinking has to the present study is in the insights it provided about the social organization of and the factions within the AT movement, insights I've incorporated into my approach to my key questions on social organization and political conflict.

Stage III: AT as Organizational and Community Innovation

For the next three years, 1979-1981, I set the problem of characterizing the AT movement as a whole to one side and concentrated on studying one portion of it, the part of it having to do with local community technology development projects in low income urban neighborhood, which I began to think of and refer to as the "small war on poverty" ("small" because it was inspired by Schumacher's Small Is Beautiful and emphasized small-scale solutions to neighborhood problems). Early in this period, I thought I might do my whole dissertation on the evolution of NCAT, which had been created by the Community Services Administration (CSA), the remanent agency of President Johnson's War on Poverty, to promote and support community technology projects and whose evolution I'd been following since its early planning stages in the spring of 1976 (I'd also consulted for NCAT twice, once in the fall of 1976 to develop its funding proposal to CSA and once in early 1977 to help with its start-up). I soon realized, however, that to do a complete analysis of the community technology development portion of the AT movement I would have to study not only NCAT but also a number of the pioneering community technology development projects around the country.

I decided to limit my study to urban community projects and to focus on the pioneering community technology projects in five cities: New York, Chicago, San Bernardino

Eugene, Oregon and Seattle. These pioneering community technology projects and their characteristics are listed in Figure 4, taken from my disertation proposal (Decker, 1979a). Starting in late 1977 I began gathering case material on these projects as well as continuing to follow the evolution of NCAT.

In late 1977, for example, I took another trip across the country, this time by bus, to gather data on NCAT and on local AT and community technology projects in the Midwest and along the Pacific Coast. In the summer of 1978, I became a consultant to CSA, working on community technology options as part of the Carter Administration's interagency policy review and formulation of a new national solar energy policy, and in the fall I did an evaluative study for CSA of the pioneering community technology projects it had helped to fund on New York's Lower Eastside and in the South Bronx (Decker, 1981). Then, in early 1979 I returned to Cambridge and helped to form the MIT-ATG (MIT AT Group) within MIT's Energy Lab. During the summer of 1979, I worked with other members of MIT-ATG on a study of local AT innovations for the National Park Service (see Decker, 1979). As part of this effort I did another series of site visits to NCAT and local AT and community technology projects on the West Coast (including projects in Sacremento, San Bernardino, Davis (Calf.), Eugene and Seattle).

Through these various research and consulting projects, I developed a model of local AT innovation adapted from the literature on organizational and community innovation and social program implementation and evaluation[17]. This model, which I now refer to as my "transformer" model, focused on the nature of the AT innovation process and who initiated it (i.e. whether it was initiated by community people, AT people and/or sponsoring agencies) and on the role and effectiveness of the person or persons in the process I refered to as "AT transformers", because they functioned to "transform" or translate the ideas of the AT movement into designs and projects tailored to a particular organization or community, in explaining the relative success of the local AT projects I was studying (see Decker, 1979 and discussion later in this

Figure 4: COMMUNITY A.T. DEMONSTRATION PROJECTS

Locality	* CD Group	** TS Group	Technology	*** Process	**** Support
NY Lower East Side	*CHARAS	Bucky Fuller	Domes	Mutual/Bottom	<25k, private
	*519 E. 11th St.	Energy Task Force	Housing/Solar/ Wind	AT/Bottom	<100k, CSA/NYC
	*Adopt-A-Building		Urban Homesteading	Com/Mixed	>1M, HUD/CETA
	*LEAC/11th St.	UHAB, ETF	Aquaculture & others	Mutual/Bottom	<100k, NCAT/CSA
	*LEAC/CHARAS	Goddard College	Recycling Center	Mutual/Bottom	<50k, NCAT
	*LEAC/CUANDO	Energy Task Force	Solar Wall, etc.	AT/Bottom	<50k, NCAT
South Bronx	*Bronx Frontier Corp.	ETF	Composting	AT/Bottom	<500k, CSA/Found.
	*Peoples Development Corp.	UHAB	Housing	Com/Mixed	>1M, HUD/CETA
	*PDC/BESS	Self	Recycling/ Bioshelters	Com/Bottom	<25k, Found.
	*PDC/Energy Team	ETF/Self	Energy conservation	Com/Bottom	<100k, HUD/State
	*Open Space Task Force	ILSR	Gardening, Open Space Planning	Mutual/Mixed	>1M, Interior
Chicago	*CAM	CUA/CNT	Rooftop greenhouse	Com/Bottom	<25k, Private/Found.
	*Operation Brotherhood	Center for Neighborhood Technology	Solar greenhouse	Mutual/Bottom	<25k, City
	*18th St. Corp.	CNT	Solar greenhouse	AT/Bottom	<25k, City
	*1st Presbyterian	CNT	Solar greenhouse	Com/Bottom	<50k
San Bernardino Westside	*Westside CDC	Earth/Life Systems Research	Neighborhood Solar System	Com/Bottom	<250k, HUD/CSA
	*Westside CDC	Self	Solar Collector Manufacture	Com/Bottom	<250k, State/CSA
	*Westside CDC	Solarex/Calif. Poly.	Solar Drying/ Industrial Park	Com/Bottom	>1M, CSA/EDA
Eugene, Oregon	*Whiteaker Community Council	Oregon AT, etc.	Integrated Urban Plan	Mutual/Mixed	<100k, NCAT
Seattle	*South Park Committee	CNT/Ecotope	Solar greenhouse	Mutual/Mixed	<25k, City CBG
	*Madison/Jackson Council	CNT/Ecotope	Solar Collector Workshops	Mutual/Mixed	<25k, City CBG
	*Active Mexicanos	CNT/Ecotope	Thermal Shutters, Window Greenhouse	Mutual/Mixed	<25k, City CBG

* The Community Development (CD) Involved in the Project
** The Technical Support (TS) Group Involved in the Project
*** The Process involved in implementing the technology: AT-initiation by TS Group; Com-initiation by community;Mutual-initiation by TS Group and community. Bottom-planed by grassroots;Mixed- planned by sponsor and grassroots.
**** Amount of support in dollars and the Sponsoring Agency

chapter on the role of this model in the present study).

The main products of this stage of my work on the AT movement were: (i) a series of brief case studies on innovative local AT projects and programs (including the San Bernardino's Westside CDC's solar projects, the City of Davis' energy conservation code and solar development, the California State Office of Appropriate Technology, the Chicago Center for Neighborhood Technology, the Eugene Integral Urban AT Demostration and the Seattle Neighborhood Technology Coalition) which used my transformer model and were done for the National Park Service study (Decker, 1979); (ii) a preliminary report on NCAT's first year of operations done for the NCAT Board; and (iii) my evaluative study of the community technology projects on New York's Lower Eastside and in the South Bronx, done for CSA (Decker, 1981).

These studies provided some useful insights about local AT innovations and the potential and limitations of community technology development and the "small war on poverty" as a community development and enpowerment strategy, but I now had the sense that I was dealing only with one portion of the movement, that part having to do with community technology development efforts, and that I was in danger of missing the "forest" for the "trees". I realized that I still needed a broader framework and approach with which I could analyze the movement as a whole and incorporate my more micro-level analysis of the evolution of NCAT and local AT innovation and community technology projects into. And, if my initial social movement framework was not adequate for this task, I would have to find or create another one.

The main relevance of this stage for the present study is the data and insights it provided on the local AT innovation process (my "transformer" model) and on the evolution of NCAT and the pioneering community technology development projects listed in Figure 4, insights which have been incorporated into the present study (particularly Chapter 5 on NCAT and the "small war on poverty").

Stage IV: AT as New Technical Discipline and Counter-Movement

In the fall of 1980 I returned to Washington, D.C. and spent the next year and a half doing a variety of things including writing proposals for further studies on AT and community technology projects, working as a science reporter and trying to start a science and values program at the Institute for Policy Studies in D.C. In early 1981, however, I returned to Cambridge and took additional courses in the social studies of science and technology through MIT's new Program in Science, Technology and Society and Harvard. Through courses taught by my future advisors cultural historian Leo Marx, sociologist Sherry Turkle and anthropologist Sharon Traweek and historian of science Everett Mendelsohn, I was introduced to the recent work treating science and technology as "culture" and "cultural products"[18]. Through these courses and my subsequent work with Marx, Traweek and Turkle, I came to see how technologies could be viewed as "cultural artifacts" and how communities of scientists and engineers could be viewed as distinctive subcultures with their own cosmologies, social organization and development cycles[19]. This notion of technology as "culture" eventually became the new nucleus around which my present framework and approach crystalized.

In the mean time, however, these courses also introduced me to the recent literature on the way new disciplines and specialities emerge in science and engineering (Ben-David and Collins, 1966; Mullins, 1972, 1973; Edge and Mulkay, 1976; Lemaine, et. al., 1976), and, as a result, I briefly considered treating AT as a new emerging technical discipline. This caused me to shift my focus from the community technology projects I'd been concentrating on in my third stage to the pioneering AT research and development groups, such as, the ones listed in Figure 5 (from Decker, 1983), and the young scientists, engineers and outlaw designers involved in these groups (see middle column of Figure 5 for some AT pioneers and their professional training). I sought to show how these AT R&D groups and the larger AT research network they were part of could be viewed as a new emerging technical discipline evolving through the same

Figure 5 : SOME AMERICAN A.T. RESEARCH GROUPS

GROUP	LEADER	RESEARCH AREAS
New Alchemy Institute Falmouth, Mass.	John Todd, biologist William McLarney, marine biologist	biotechnology, aquaculture, bioshelters, wind power, organic farming, fruit & nut trees
Total Environmental Action Harrisville, N.H.	Bruce Anderson, solar architect	passive solar, solar architecture
Domestic Technical Institute Evergreen, Colo.	Malcolm Lillywhite, ex-NASA scientist	solar collectors, solar greenhouses, methane digestors
Zomeworks Albuquerque, N.M.	Steve Baer, independent inventor	passive heating and cooling, solar architecture, zomes & domes
Integrated Living Systems Tigeras, N.M.	Robert Reines, engineer, inventor	solar collectors, wind power, domes, integrated systems
Living Systems Davis, Calf.	Jon Hammond, ecologist	energy conservation codes, passive solar, solar architecture
*Maximum Potential Building Systems Austin, Texas	Pliny and Daria Fisk, architects	solar, methane digestors, wood stoves, wind power
Ecotope Group Seattle, Wash.	Ken Smith	methane digestors, solar collectors, solar greenhouses, organic farming
*Farallones Institute Point Reyes, Calf.	Sim VanderRyn, architect Bill & Helga Olkowski, biologists	organic gardening, composting, waste recycling, solar, autonomous housing, integrated pest management
*Ourobourous Minneapolis, Minn.	Dennis Holloway, architect	solar architecture, energy conservation, wind power
Montana Energy Research Institute Butte, Mont.	Jerry Plunkett, engineer	low cost energy conservation, passive solar, solar greenhouses
*Social Ecology Institute Plainsfield, Vermont	Murray Bookchin, anarchist philosopher & social critic	organic gardening, bioshelters, aquaculture, wind power

*Groups affiliated with a University or Educational Institutions

stages of organization as other new scientific and technical disciplines[20].

While these pioneering AT researchers and research groups did resemble a new technical discipline in certain respects, the AT movement as a whole didn't fit the technical discipline framework, so I soon abandoned this approach for the same reason I'd found my earlier social movement and local innovation frameworks wanting- they each helped in analyzing certain aspects of the movement but failed to get at its overall dynamics and significance.

Also, during this stage, I briefly considered treating the AT movement as what Nowotny and Rose refered to as a "counter-movement" in the sciences. In the collection of essays they edited on "counter-movements in the sciences"(1979), Nowotny described "counter-movements" as "social forms of protest, contemporary as well as historical, which are critical of scientific rationality and at times hostile to specific technological developments...(p 1)." This notion seemed to fit the AT movement as a whole better than the technical discipline one, but like my original notion of "technology reform", which it was quite similar to, it was too vague to be of much use to me.

The main importance of this stage for the present work is that it familiarized me with the literature on the sociology of science and the social construction of scientific knowledge and products and introduced me to what has become a central premise of my present approach, namely, that science and technology can be treated as "cultures" and "cultural products". The main product of this stage was a research paper I wrote for Harvard sociologist Daniel Bell, in which I tried to integrate my four previous views of AT, as "social movement", "local innovation", "technical discipline", and "counter-movement"(or "technology reform"), into one conceptual framework (Decker, 1983). The attempt failed, and I recall Professor Bell commenting on my paper, "This is a curiously bloodless account of the movement." I had to agree. In trying to "fit" various aspects of the movement into neat, predetermined social science "boxes" and frameworks, I was in danger of losing sight of its vital and unique wholeness, which had

attracted me to it in the first place.

Stage V: AT as Cultural Quest

Fortunately, during the summer of 1983, after completing my unsuccessful effort at synthesis for Bell, some of my vague previous ideas about the "questlike" and "pastoral" nature of the AT movement began to coalesce into a new unifying framework that was uniquely my own and which would eventually evolve into my present coevolutionary approach.

In the fall of 1982 I had participated in a seminar taught by American cultural historian Leo Marx and psychologist Kenneth Keniston on American technological society and its critics in the mid-nineteenth century and the 1960's. Through this seminar I was introduced to Marx' work on the "pastoral ideal" and the "pastoral retreat" as literary and cultural themes and formulas which were responses to concerns about the rapid industrialization of America (see Marx' The Machine in the Garden, 1964). The cultural theme of the "pastoral ideal" was, and is, the belief that men and women are somehow at their best when they are living in touch and in harmony with Nature. The "pastoral retreat" is a cultural/literary formula for striving for the pastoral ideal which often appeared in American literature and was often emulated in real life. Typically, in a pastoral retreat, a hero (1) leaves his community and (2) spends time in a natural or pastoral setting in which he has a series of experiences and adventures culminating in some important insight or revelation, following which he (3) returns to civilization often with some useful insights for his fellow men. Henry David Thoreau's retreat to Walden Pond is the archetypal example of the pastoral retreat in American literature, but it also appears in the works of many other well known American writers, including Cooper, Melville, Hawthorne, Faulkner, Twain, Fitzgerald, Hemingway, Kerouac and Kesey (Marx, 1964).

On being introduced to these notions and their role as American cultural themes by Marx and Keniston, I began to think about how the pastoral ideal and retreat might relate to the AT movement. Certainly, the pastoral ideal, with its emphasis on harmony with Nature, was a central underlying theme in the movement. Also, some of the actions and activities of the pioneers of the movement resembled pastoral retreats. For example, Schumacher's journey to Burma, where he began to formulate his ideas about AT and "Buddhist Economics" (Schumacher, 1973, chapter 4); or Pirsig's journey West in search of meaning in Zen and the Art of Motorcycle Maintenance; or the efforts of "outlaw" designers like Steve Baer and Robert Reines to build and live on isolated, self-sufficient homesteads in the Southwest, all resembled the pattern of the pastoral retreat.

These activities also, however, resembled another literary and cultural formula- that of the "quest", and it had indeed always seemed to me as I studied and participated in the movement that there was indeed something "quixotic" and "questlike" about it. The people in the movement themselves seemed to sense this and play upon it, often portraying themselves as modern day Don Quixotes, who "tilted" with windmills rather than at them. When Schumacher died, for example, Nancy Todd of the New Alchemists wrote in their journal, comparing him to the wizard Gandalf and the movement itself to the fellowship of the Ring in Tolkien's epic quest tale, The Lord of the Rings:

> We share with everyone in our small but beautiful movement a sense of personal and collective loss. It has sometimes seemed to me that in our struggle we are not unlike Tolkien's ragged and assorted fellowship and, if that is so, then Fritz was our wise and gentle wizard. His leadership and guidance, the directness of his thinking will not easily be replaced...(Todd, 1977).

Similar allusions appeared often in the movement's literature and the mainstream media's stories about the movement.

Accordingly, in the summer of 1983, when I found myself without a unifying framework, I began to actively explore the similarities between actions and activities within the AT movement and those typical of literary and real life quests and pastoral retreats. I eventually decided to focus this effort on the new key metaphor of the AT movement as "cultural quest", treating the pastoral retreat as a particular kind of quest- a quest into Nature [21].

In the fall of 1983, I took a pastoral quest or retreat of my own, spending the next year on my grandmother's wheat farm in eastern Washington State. Here, during long walks over the gentle, rolling hills of my grandmother's farm, I began to formulate a new framework based on my new key metaphor of the AT movement as "quest".

Early in this stage of my thinking, Auden's essay on the typical elements of quest stories (Auden, 1968) and Campbell's classical work The Hero with a Thousand Faces (1949) on the typical processual structure or cycle involved in literary quest, helped to clarify my conception of the nature and structure of literary quests [22]. Then, I discovered the work that the anthropologist Victor Turner and his students had done in analyzing and interpreting real life religious and cultural questlike rituals and pilgrimages (Turner, 1957, 1967, 1969, 1974, 1979; Myerhoff, 1974, 1975), and I able to use this work and the way it had evolved as a model or exemplar for my own evolving ideas about the AT movement as "cultural quest".

Early in his own study of the culture of the Ndembu tribes of Zambia, Africa, Turner adopted as his own key metaphor the notion that certain social actions and processes resembled staged dramas [23]. He noticed that in times of crisis, a cycle of events would often occur that bore a striking resemblance to a staged or public play in which the parties involved would clash in dramatic fashion and then seek to somehow resolve their differences. He called these cycles of events, "social dramas", and proceeded to study and analyze them using concepts and implications drawn from the field of drama (Turner, 1957). Later he and his students went on to de-

velop a general approach for analyzing social dramas and other "processual units", such as, rituals and pilgrimages, which focuses on interpreting the symbols embedded in these processes (Turner, 1967, 1969, 1974). This approach or method has since come to be known as "processual symbolic analysis" (Turner, 1979, Appendix).

The evolution of Turner's thinking from his root metaphor of "social action as drama", to his initial "social drama" framework, and on to his general method of "processual symbolic analysis" has served as a model for my own evolving thinking about the AT movement's questlike nature. Like Turner, I first explored the implications of my own root metaphor, the AT movement as quest. This soon led me to develop the notion of a social unit or process I called the "cultural quest". I conceived cultural quests to be actual social processes or "processual units", like Turner's social dramas and rituals, but ones which particularly resembled quest tales in their actions, structure and themes. I then proceeded to develop a framework around this notion and use it in analyzing actions and activities in the AT movement and the movement as a whole as cultural quests.

This cultural quest framework focused on interpreting the questlike actions, stories and themes of the movement and it eventually evolved into my present coevolutionary approach. The main products of this stage in my thinking were the first three drafts of the first chapter of my dissertation, each of which further developed and refined my quest framework. The third of these represented a transitional product between my quest stage and my sixth and final stage and much of it, particularly its description of my cultural quest model, has been incorporated into this chapter.

The chief importance of my quest stage for the present work is that it generated my cultural quest model, which I will use here along with other processual models in analyzing the questlike actions and transitional processes within the AT movement. Also, it generated a number of the other new seed ideas around which my present approach eventually crystalized.

Stage VI: AT as Coevolving Cultural Movement

When I returned to Cambridge from my grandmother's farm in the fall of 1984, I sat in on one final series of seminars at Harvard and MIT over the next four semesters, this time ones dealing with cognitive, creative and design studies. These seminars, particularly Robert Kegan's research seminar on the structural stages in personal meaning-making and Howard Gardner's course on the structure and evolution of creative lives at Harvard and my advisor Hayward Alker's seminar on cognitive models in the social sciences and Donald Schon's design research seminars at MIT[24], showed me how creative lives, personal meaning systems and creative designs, like cultures and cultural systems, evolve through a series of stages and cycles. Moreover, they taught me that during periods of cultural and personal crisis, people's personal meaning systems and the culture around them and their creative themes and designs all tend to change or evolve together in a process I've come to refer to as "coevolution" of meanings and meaning systems.

Initially, I sought to incorporate these new insights into my embryonic quest framework, using them to show how the personal themes and the designs of the AT prophets and pioneers "coevolved" during their cultural quests. Eventually, however, in something like the foreground-background shift that Gestalt psychologist talk about (where what was foreground in ones thinking becomes background and what was background becomes foreground), I realized that my cultural quest model should be incorporated into my emerging coevolutionary perspective and approach rather than the other way around.

The chief catalysis for this gestalt shift was my discovery of the recent studies in the sociology and politics of culture which sought to utilize cultural construction and production as a unifying theme for studying cultural movements in both the arts and the sciences (particularly, Peterson, 1976; Crane, 1972; Griswold, 1987 and Balfe and Wyszomirski, 1985). These studies made me realize that the AT movement could best

be analyzed as a "coevolving" cultural movement which had characteristics of new movements in both the arts and sciences as well as more general social and cultural movement, and which contained within its evolving activities and processes a number of cultural quests and related processes. This, then, is the culminating perspective and approach around which the present study has been organized.

The diagram in Figure 6 summarizes how this coevolutionary approach emerged from and is informed by the five prior stages in my thinking and how key ideas from these earlier stages have been integrated into the specific elements of this new approach aimed at addressing each of my six key questions, shown along the bottom of the figure (numbers in the figure indicate stages and key metaphors; letters indicate the studies and literature that inspired and informed each stage; and small roman numerals indicate elements of my coevolving approach which address my corresponding key questions).

The Elements of My Coevolutionary Approach.

I call the approach I've evolved for analyzing the AT and other emerging cultural movements a "coevolutionary" approach, because it focuses on the coevolution of new themes, designs and systems of meaning within such movements. In this section I will enumerate, very briefly, the component elements that make up this approach; then, in the sections which follow, I'll elaborate upon each and show how they relate to and were informed by the studies in the six areas of the social studies of culture discussed above.

The coevolutionary approach emphasizes, first and foremost, the role of themes and meaning systems in the social construction, transmission and production of culture:

> 1. Themes are rules and heuristics for living and related concepts which are the key components of the larger cultural and personal systems of meaning that guide our personal and collective lives.

Thus, themes are the most important unit of analysis in this approach. They are

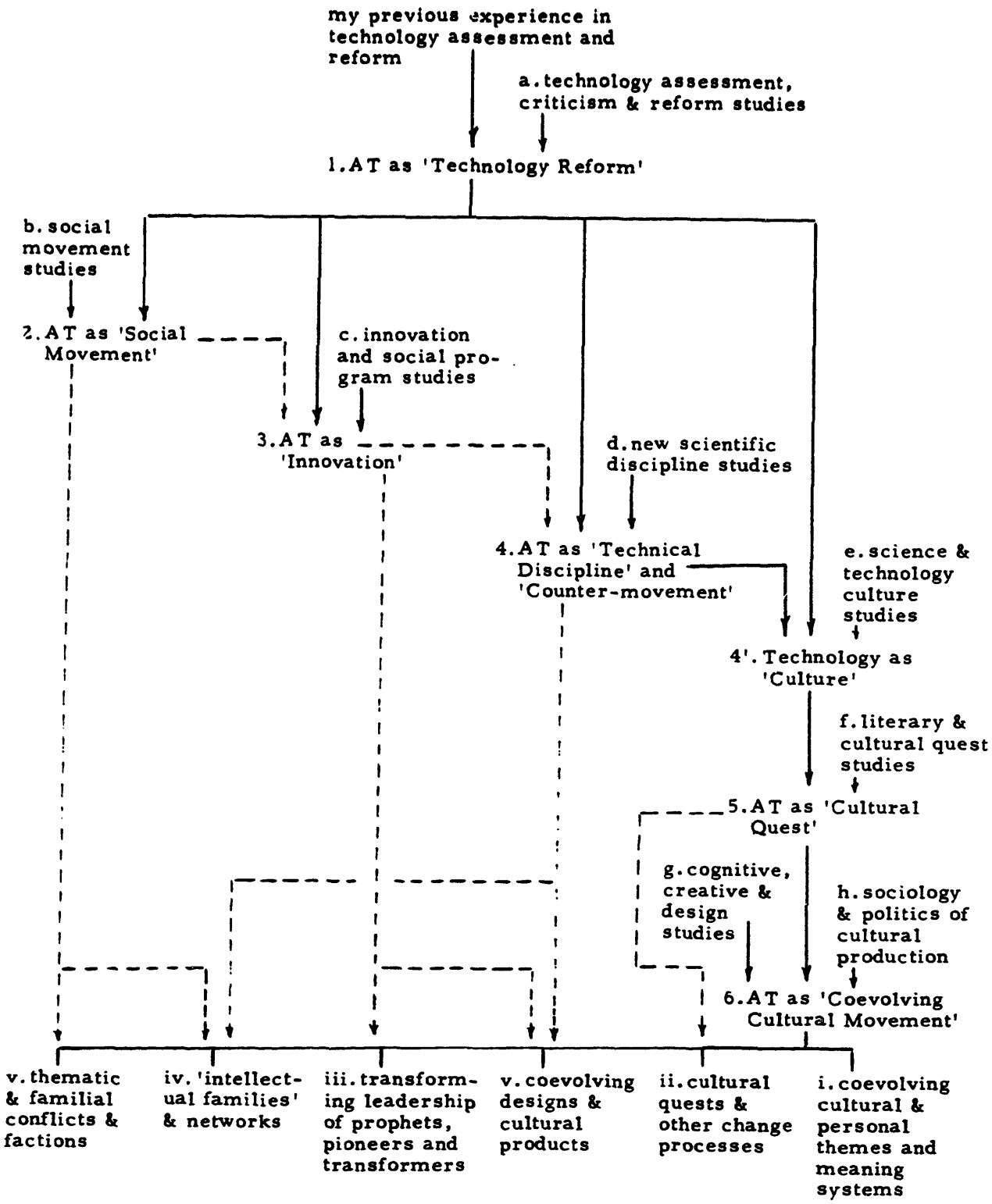


Figure 6: Diagram of How My Previous Stages Evolved into My Present Approach

viewed as the basic building blocks out of which larger units and systems of meaning are personally and socially constructed. Four different types of themes and corresponding meaning systems are important in this approach:

> 2. Four important types of themes and meaning systems are: i)general cultural themes and systems, ii)personal themes and systems, iii)the themes and systems in and among stories, and iv)the themes and systems in and among designs.

All of these types of meaning systems change over time. During periods of cultural crisis and within new cultural movements, these types of systems tend to change together and transforming themes, leaders and designs play an important role in these transitions:

> 3. Within cultural movements, new transforming themes, leaders and designs emerge to trigger and guide changes in meaning systems and the creation of new meanings.

Transforming themes are new core ideas and rules for living which serve as nuclei for creating new thematic and meaning systems around. Transforming leaders are the leaders of cultural movement who discover (or rediscover), articulate and promote new transforming themes for a group or culture. Transforming designs are the new patterns or designs for living created by transforming leaders from a new transforming theme.

During the cultural movements and change process triggered by new transforming themes, leaders and designs, the four types of themes and meaning systems tend to change in mutually complementary ways or "coevolve" together:

> 4. During cultural movements and change, cultural, personal, design and story themes and systems of meaning coevolve, that is, mutually change in complementary ways, together.

Out of this mutual coevolution, new embryonic thematic systems of meaning emerge:

5. As themes and meaning systems coevolve within cultural movement, new themes become linked together around transforming themes to form larger thematic systems.

These new thematic systems may eventually be incorporated into and thus transform older, established systems of meaning or they may evolve into whole new meaning systems themselves. Related meaning systems and embryonic thematic systems make up larger ecologies of meaning:

6. Related established meaning systems and new thematic systems make up larger cultural or meaning ecologies which also evolve and coevolve over time.

Thus, in this approach meanings are seen as being organized into hiearchies of meaning structures and systems in which five different levels can be distinguished. At the most basic level are the rules for living and related concepts called themes. Above these are the various cultural forms through which themes are conveyed, including stories, myths, rituals and cultural artifacts and products. Next, come the relatively new structures of interrelated themes called thematic systems. Then, come the more complex and established cultural and personal meaning systems that guide peoples lives in a culture. And, finally, at the highest level are the complex ensembles of related thematic and established meaning systems called cultural or meaning ecologies.

In order to abstract and interpret the new themes of a cultural movement from its cultural forms and products and from these reconstruct and interpret its central thematic systems, a method called coevolving thematic analysis is employed:

7. The coevolving cultural, personal and design themes and thematic systems of cultural movements may be abstracted and reconstructed from the cultural forms and products of the movement through a process called coevolving thematic analysis.

Coevolving thematic analysis involves the following steps: (i) abstract the important

life themes of the leaders of the movement from the stories they tell about themselves and the movement; (ii) reconstruct the personal thematic systems of the leaders by analyzing how these themes fit together into a coherent worldview; (iii) abstract the transforming and formative themes of the movement from stories about it; (iv) show how the thematic systems of the leaders and the transforming and formative themes of the movement coevolved to form the new thematic system(s) of the movement; and (v) show how this new thematic system(s) then guided and coevolved with the cultural designs, social organization and products of the movement and how its themes are embodied in the designs and products of the movement.

In abtracting and interpreting themes from a movement's stories, designs and products, coevolving thematic analysis makes use of a number of heuristics and strategies suggested by other methods of literary and cultural interpretation:

> 8. In abstracting and interpreting the personal, cultural and design themes of movements, coevolving thematic analysis draws upon numerous heuristics suggested by other formal, structural and contextual methods of interpretation.

The next three elements deal with general cultural change and transitional processes related to cultural movements:

> 9. General cultures and cultural systems evolve through stages and cycles, during which periodic efforts are made to resolve or mediate the inherent tensions among certain polar themes of the culture.

No one has created a perfectly structured culture yet. In all cultures there are certain tensions and conflicts among some of their central polar themes. Most cultures, thus, go through a series of evolving stages and cycles aimed in part at resolving or at least mediating these underlying conflicts. One of the roles that new cultural movements play within a wider culture is to seek and promote new ways for mediating these tensions and thus better integrating the cultures central themes and meanings.

In seeking to mediate polar themes and create new unifying ones, cultural movements may exhibit a variety of transitional processes and patterns:

> 10. In seeking to transform their parent culture and its meanings, cultural movements exhibit a variety of transitional processes and patterns, including social dramas, revitalization cycles and counterculture formations.

A fourth important type of transitional process often exhibited in cultural movements is the cultural quest pattern:

> 11. Cultural movements frequently exhibit and contain transitional processes called cultural quests, so called, because they resemble the pattern of actions characteristic of quest stories and myths.

The cultural quest process is one important way that the leaders of a new movement are able to separate themselves and their followers from the themes and meanings of their parent culture in order to discover and develop new ones. This approach emphasizes the identification and analysis of these questlike patterns and the role they play within cultural movements.

This approach is also grounded in the realization that, like cultures, the lives and meaning systems of creative people and cultural leaders also evolve through stages and cycles:

> 12. The lives and personal meaning systems of creative people and cultural leaders, like cultures, evolve through a series of stages, transitions and cycles.

In cultural movements the new thematic systems of the movement and the personal meaning systems of it leaders mutually transform and coevolve with each other. Three types of leaders are important in this process:

> 13. In cultural movements three types of transforming leaders are important in creating and implementing new cultural themes and designs: the prophets, the pioneers, and the transformers of the movement.

The prophets of a movement discover or invent the central transforming themes and designs of the movement. The pioneers refine and translate these transforming themes and designs into more specific design themes, designs and cultural products. The transformers, so named, because they transform the ideas of the movement for use in particular contexts, translate the themes and designs of the movement into designs and projects for particular communities or organizations.

Like the leaders of movements, the social organization of movements also coevolves with the new themes, thematic systems and designs of the movement. This occurs through the emergence of new intellectual marriages, families and networks around the new themes and designs of the movement:

> 14. The social organization of cultural movements evolves out of new intellectual marriages, families and networks formed by leaders to develop and promote the the themes, designs and products of the movement.

Like cultures and creative lives, the designs and products of a cultural movement evolve through a series of stages and cycles:

> 15. The cultural designs and products of a movement and the system of design themes that guide their production evolve through a series of stages and cycles during the evolution of the movement.

Thus, this approach emphasizes that three of the important types of meaning systems, general cultural systems, personal meaning systems and design systems and their products all evolve through stages, transitions and cycles. Moreover, it focuses on analyzing how these three types of systems mutually evolve or coevolve through their respective stages and cycles during the course of cultural movements.

Lastly, the final two elements of the approach deal with the analysis of political and ideological conflicts related to cultural movements:

> 16. Political and ideological conflicts between cultural movements and their parent cultures result from and may be analyzed in terms of the conflicting

themes and meaning systems that each seeks to promote or uphold.

Similarly, clashes and conflicts within and between cultural movements may be analyzed in terms of the competing themes and meanings that different factions and intellectual families seek to promote:

> 17. Conflicts within and between cultural movements result from and may be analyzed in terms of the conflicting themes, thematic systems and designs that alternative factions and intellectual families seek to develop and promote.

These, then, are the seventeen component elements of my coevolutionary approach for the analysis of the evolution and products of cultural movements. In the sections which follow I'll elaborate on each element and show how they build on one another to form a unified approach for addressing my six key questions in a systematic and comprehensive way.

Four Types of Themes and Meaning Systems

Figure 7 illustrates the overlapping nature of the four realms or types of meanings and meaning systems important in my approach for analyzing the coevolution of new meanings and designs in cultural movements. In this section, I'll briefly describe the nature of themes and systems of meaning in each of these overlapping realms.

My ideas about the nature and structure of cultural meaning systems have been taken mainly from the pioneering work of the symbolic anthropologists Clifford Geertz and Victor Turner and the structural anthropologist Claude Levi-Strauss. In his influencial collection of essays, The Interpretation of Culture, Geertz succinctly makes the case for treating "culture" as the "systems of meanings" by which a group of people live, stating that:

> The concept of culture I espouse... is essentially a semiotic one. Believing... that man is an animal suspended in webs of significance he himself has

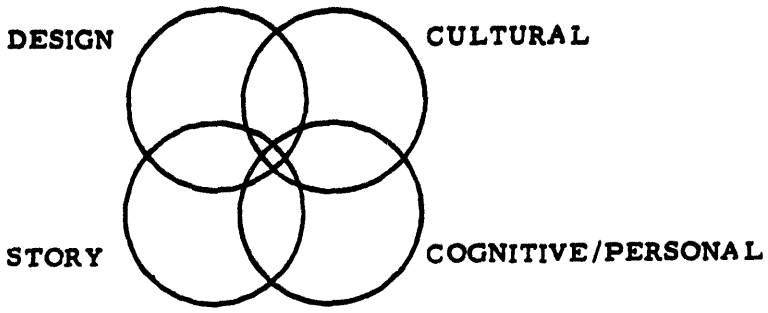


Figure 7: Four Overlapping Realms or Systems of Meaning

> spun, I take culture to be those webs, and the analysis of it to be therefore not an experimental science in search of law but an interpretive one in search of meaning (1973, p 5).

Later on in this collection, he defines a cultural meaning system more specifically as "an historically transmitted pattern of meanings embodied in symbols, a system of inherited conceptions expressed in symbolic forms by means of which men communicate, perpetuate, and develop their knowledge about and attitudes toward life (1973, p 89)." This, with some minor variations, is the view of culture and cultural meaning systems that I will take in this study.

The scholar of culture, wishing to analyze and interpret certain cultural meaning systems, is faced with two immediate methodological choices, namely, what basic unit or building block of meaning should he adopt as his primary unit of analysis and what cultural forms or carriers of meaning should he focus on. Basic units or building blocks of meaning are the simple units of meaning out of which more complex meaning structures and systems are constructed. Cultural forms, such as, myths, rituals and cultural artifacts, are the cultural vehicles or carriers which contain and convey the cultural meanings of a group. To use a loose analogy to the way biological information is organized in the body, general cultural meaning systems may be likened to the DNA,

which contains the general rules which guide the biochemical life of the body, as these cultural systems contain the rules which guide the collective life of a culture; cultural forms are then analogous to the bodies in the cells which contain messenger RNA and function to transmit the codes and rules from the DNA to other parts of the body where they are needed; and basic units of cultural meaning are analogous to the basic codes for different types of proteins which the DNA and messenger RNA chains of such codes are made up of.

In his work on African tribal cultures, for example, Victor Turner chose to use cultural "symbols" as his basic unit of meaning and analysis and to focus on rituals and related processual forms (such as "social dramas" and pilgrimages) as the main cultural forms which he would seek to abstract and interpret meanings from. These choices, as noted earlier, eventually evolved into a method of cultural interpretation and a related body of studies and analyses now refered to as "processual symbolic analysis" (Turner, 1967, 1969, 1974, 1979, appendix; Myerhoff, 1974).

Early in the evolution of my own approach, I also intended to use symbols as my primary unit of meaning and to utilize Turner's "processual symbolic analysis" and other methods of symbolic analysis to interpret the symbols of the AT movement and their meanings. I eventually concluded, however, that while cultural symbols were indeed important in the AT and other cultural movements, it was more appropriate for my purposes to focus on cultural "themes" as my primary unit of meaning.

There were two main reasons for this choice. First, I decided that cultural symbols were best viewed as pointers to one or more basic units of meaning or "themes", and, thus, while symbols played an important role as pointers to and unifiers of themes and meanings in cultural meaning systems, they were not themselves the most basic building blocks of meaning. I, therefore, decided to treat the analysis of cultural symbols as an aspect of cultural thematic analysis, rather than the other way around.

The second reason for adopting "themes" as my primary unit of meaning was that

the notion of "themes" and their role in meaning-making was discussed in the literature on all four of the realms or types of meaning and meaning systems which I felt were important in the analysis of cultural movements. The notion of themes, thus, was a concept that cut across these four realms and could, therefore, hopefully serve to help unify my study and analysis of them.

In the realm of culture and cultural systems, in particular, "cultural themes" have been frequently discussed and analy zed in the literature on cultural history, cultural studies, and American studies. My own thinking on cultural themes was most influenced by my advisor Langdon Winner and his book Autonomous Technology (1977), in which he analyzed "technics-out-of-control" as a cultural theme in political thought, and by my advisor Leo Marx and his book The Machine in the Garden (1964), in which he analyzed the cultural themes of the "pastoral ideal" and the "machine" (that is American Technology and Yankee Ingenuity) and their juxtaposition (to create another more global theme) in American literature and culture [25].

On the question of which cultural forms to focus on, I decided in analyzing the AT movement not to focus exclusively on one type of form, but rather to study the various types of forms which were important in conveying the movement's meanings and how these forms interacted to reenforce one another. The AT cultural forms which I have analyzed the most thoroughly in this study are: (1) the stories told about the movement and its leaders, (2) the cultural and technological designs produced by the movement, (3) the journals and other literature of the movement, and (4) the physical artifacts, devices, products and projects produced by the movement.

Turning now to the second realm of meaning, the cognitive/personal realm, my ideas about the nature of cognitive/personal meaning systems and themes were most shaped by the Harvard psychologists Robert Kegan and Howard Gardner and the Yale cognitive scientists Schank, Abelson, Lehnert and Dyer. Through Kegan's book The Evolving

Self and his research seminar at Harvard on the structural-developmental stages of of meaning-making in people's lives, I was introduced to the notion of personal meaning systems or structures and the way in which these systems typically evolve over a person's life. Then, in Gardner's seminar on creative lives, also at Harvard, I was introduced to the current research on creative people's lives (such as Gruber, 1974; Feldman, 1980; Csikzentmihalyi and Robinson, 1984), which indicates that the thinking of creative people and their creative systems of ideas and meanings also go through a series of structural stages and transformations (although these creative meaning systems are more specific and content-based and the stages they evolve through less regular and predictable than the general stages of meaning-making and structures which most people typically evolve through).

Then, through my advisor Hayward Alker, I was made familiar with the recent work of Yale cognitive scientists Roger Schank and Robert Abelson and their students on the role of personal "themes" and "scripts" in cognition and story understanding and the relevance of this work to social and cultural analysis[26]. In their pioneering work on cognitive scripts, plans and themes (1977), Schank and Abelson argued that individuals typically used a hiearchy of different meaning or knowledge structure to guide their actions and to make sense of the stories they were told. At a low level in this hiearchy, they argued, were specific "scripts" which the individual used to guide her action in stereotypical situations, such as, ordering food in a restaurant. At an intermediate level were more general "plans" which the individual employed to guide her actions towards fulfilling personal goals. Then, higher up in this hiearchy were general life "themes" which served to guide the individual's plans and actions in general ways for extended periods of time. In later work, Schank and Abelson's students Lehnert and Dyer (Dyer, 1983) postulated a fourth type of cognitive/personal meaning structure, falling in between specific plans and general life themes in Schank and Abelson's hiearchy, which they called "thematic abstract units" or "TAUs" for short. These TAUs, they argued, were general heuristics

for planning and living which often corresponded to popular sayings or adages, such as, "the early bird catches the worm", "it's no use closing the barn door after the horse is gone" and "a stitch in time saves nine". This work on cognitive themes and TAUs made me realize that most themes, including not only personal but also cultural, story and design themes, like the TAUs corresponding to popular adages, involved a rule or heuristic (that is, a rule of thumb) for living or a related concept (such as a symbol or definition of something that is good, beautiful and/or true and hence worth striving or "living" for).

I also found the Yale cognitive scientists' notion of personal themes and TAUs similar to and compatible with other psychological conceptions of personal meaning structures, including Jung and his students work on personal stories and myths (Jung, 1964; Whitmont, 1969; Hillman, 1983), Berne's work on life "scripts" and "script systems" (1972), Turner's work on "root paradigms" (1974, chapters 2 and 3), and Fowler's work on "master stories" and their role in the evolution of personal meaning and faith (1981).

Turning now to story themes and systems, the well documented fact that stories and myths and the themes embedded in them convey both personal and cultural themes and meanings, made it easy to relate story themes to themes in the first two realms, cultural themes and personal themes. I also came to realize, however, particularly through Levi-Strauss' work on the structure of myths and myth systems (1955) and Wright (1975) and Cawelti's (1976) more recent work on the structure and evolution of formula stories (i.e. the American western story formula), that stories and the subcultures and communities that produce them, like general cultures and individuals, have their own distinctive systems of meanings.

There are two important types of structures and systems of meanings relevant to stories, their themes and their production and evolution. The first type of structures are the internal meaning structures of the stories themselves. Various analysts and

schools of myth and literary interpretation have focused their attention on one or another of these internal meaning structures. In his pioneering work on plot units and structure, for example, the Russian formalist Propp focused on the narrative structure of Russian folk tales and their typical component elements. Whereas, Jung and his students and other symbolic analysts have focused on interpreting the meaning of symbols and symbolic actions in stories and myths (Jung, 1964). And, Levi-Strauss and the other structural analysts inspired by him have focused on what he called the "deep structure" of stories and myths, that is, the way key polar elements and symbols are juxtaposed and mediated by other element within stories (Levi-Strauss, 1955). Wright (1975) and Cawelti's (1976) more recent work on story formulas and the American western formula in particular, however, made me realize how all three of these internal story structures, its narrative structure, its symbols and characters and its "deep" structure, work together to convey the central messages or themes of the story. And this in turn made me realize that not only story themes but also general cultural, personal and design themes are often conveyed through and associated with storylike combinations of narrative, symbolic and deep structures. Thus, for example, popular sayings and adages which convey cultural and personal themes, such as, "the early bird catches the worm", while not being stories per se, nevertheless have narrative, symbolic and deep aspects and associations.

The other meaning systems relevant to stories are the external meaning structures and systems that guide and govern their production and evolution. These include the cultural meaning systems of the literary and publishing subcultures which produce and disseminate stories, the design meaning systems of the authors who create new stories and the personal meaning systems of the readers and critics who are the audience for the stories. Wright (1975) and Cawelti (1976), in their work on story formulas, for example, showed how popular stories, like westerns, mysteries and romances, were

not isolated creative products but the related products of a larger system of themes, meanings and conventions, which they called the story "formula". Moreover, in their analyses of the American western formula and its evolution, they showed how these general story systems or formula relate to and serve to convey the themes of the general cultures they are found within and how they change or coevolve with these general cultures.

Viewed in this way story systems and formula may also be seem as a particular type of cultural design and design systems. Thus, not only do stories overlap with the cultural and cognitive realms of meaning through their role as cultural and personal forms or carriers of meaning, but also with my fourth important realm of meaning, that of designs, design systems and design products, by virtue of the fact that they are a particular type of design and design product. As this characterization of stories as designs suggests, I intend to use the term "design" broadly to include any creative design and the product(s) produced from it, be it a story, a painting, a building, a plan for a social program or a new scientific theory. I was introduced to the notion that creative designs and their products are guided by design themes and systems through Don Schon's design research seminar and N J Habraken's work on design themes and thematic systems in architecture at MIT and also Howard Gardner's course on creative lives, designs and meaning systems at Harvard.

Here, I will adopt Habraken's conception of "design themes" as the rules and heuristics which guide and are reflected in cultural designs and products (thus design themes are the rules by which designs and designer "live" and evolve) and of design "thematic systems" as the larger ensembles or meaning systems of themes which guide the evolution of design projects and the creative and collective work of designers (Habraken, 1983, 1985). I also was guided by Schon's work on the role of what he called "generative metaphors" (1979, 1983), which I view as a particular type of transforming design theme, in the design process.

I also found very useful and complementary the recent work on themes, design and theory building in science and engineering, including Gerald Holton's work on the role of themes or "themata" in guiding scientist's work (1973), Howard Gruber's study of the role of themes or "schemas" in the evolution of Darwin's thinking on evolution (1974), my advisor Sharon Traweek's work on the design of experiments in high energy physics "cultures" (1988), my advisor Sherry Turkle's work on styles in the design of personal computer programs (1984), and Larry Bucciarelli's work on engineering design as a social process (1986). These studies were important in illustrating how design themes and systems in science and engineering interact with the other important types on themes and systems, including general cultural, personal and story systems in science and engineering.

This concluded my brief introduction to the four types of themes and meaning systems which my coevolutionary approach emphasizes. I've tried to show that while these types or realms of meaning are distinctive, in any given culture or movement they heavily overlap with one another.

Transforming Leaders, Stories, Themes and Designs

Having briefly described the nature and structure of the four important types of themes and meaning systems, I can now begin to discuss how these four types of themes and systems change or evolve over time. I'll start by giving four examples in this section of how the emergence of new stories and themes, what I call "transforming" stories and themes, during periods of crisis in the lives of creative/cultural leaders have triggered personal/cultural change and the generation of new "transforming" cultural designs.

My first example of meaning transformation comes from Robert Kegan's book, The Evolving Self. Here Kegan tells of a New York State assemblyman who faced an acute moral dilemma over how to vote on a pro-abortion bill. The assemblyman's children were strongly for the bill, but his county party committee wanted him to vote against it. Moreover, the Speaker of the Assembly, whose party was planning to name the assemblyman to an important commission seat, warned him not to change his vote, as this might look suspicious later.

The assemblyman, when called, voted against the bill, figuring it would still pass by three votes, but when these three votes collapsed, "when life imitated art and the assembly was exactly divided, no escape from the contradiction of his world design was possible" and he later recalled to Kegan:

> I think at that point I just about cracked. I didn't know what to do. I-didn't-know-what-to-do. And my options were fading fast because there wasn't too much time left...finally-it-it was almost by impulse. And the next thing I remember there I was. It was like a wild dream. There I was, saying things that, uh, just off the top of my head...I remember saying, "Mr. Speaker, I once read a book called Profiles in Courage." I don't know why I said that. I think what I was intending to say was that up until this point I was showing far more profile than courage (Kegan, 1982, p61).

This passage suggests to me that in his time of crisis, when his standard modes of operation couldn't help him, the assemblyman desperately searched his mind for a new theme or model that might offer him a way out and as a result hit on the theme of the "courageous statesman", who sacrifices his own personal ambitions for a greater public interest- the theme embedded in the stories of statesmanship told by John Kennedy in Profiles in Courage (Kennedy himself also being a cultural symbol or pointer to the theme of the courageous statesman). This interpretation is supported by the remarks that the assemblyman then made to the Speaker from the floor of the Assembly, changing his vote:

> Mr Speaker, less than a week ago, I learned that I was being seriously considered by you, sir, for a very important post in state government. Mr. Speaker...I release you from any commitment which you have made to me, sir. I am also fully aware of the fact that many people in my district may not only condemn me for what I am about to do, but, in many respects, perhaps, my law firm will suffer as a result of this. But Mr. Speaker, I say to you in all candor, and I say this feelingly to all of you: "What's the use of getting elected and reelected if you don't stand for something?"...I cannot go back to my family on the first Passover seder and tell them that I defeated this bill. I fully appreciate that this is the termination of my political career, but I cannot in good conscience, stand here and thwart the obvious majority of this house...(Kegan, 1982, p61)

Notice the dramatic quality of this speech. It is the kind of speech that might have been made by one of the legislators praised by Kennedy in his book, suggesting that the assemblyman's recall of the book and its theme of the courageous statesman did indeed inspire him to change his vote and make this speech from the floor.

After this speech the assemblyman slumpted in his seat, wept, and said over and over, "What have I done?" As Kegan concluded, after subsequent interviews with the assemblyman, "there was more changing here than a vote, more being passed than a bill"- the assemblyman's whole "world design" or way of making sense of his world and his moral responsibilities was changing and his new transforming theme of the courageous statesman was helping to guide that change.

My second example of a transformation of meaning comes from the life of J.R.R. Tolkien. In this case rather than recalling a book or story with an appropriate transforming theme, Tolkien wrote his own.

In 1938 Tolkien was completing the first few chapters of his epic fanasy, The Lord of the Rings, having gotten Frodo and his hobbit friends as far as the inn at Bree, when his imagination failed him for a time. He later recalled that, "I had then no more notion than they (the hobbits) of what had become of Gandalf or who Strider was; and I had begun to despair of surviving to find out." As Paul Kocher notes in his study of Tolkien, Master of Middle-Earth, this was because, "having barely survived the First World War, Tolkien feared that he would not survive the Second, which then loomed more and more ominously. He felt a sense of urgency and despair at the prospect of not living to complete not only The Lord of the Rings but the still vaster history of the early Ages of Middle-Earth, which lay in fragments in his workshop (1972, p163)."

During this personal crisis, Tolkien put aside his major work to write an allegorical short story, "Leaf by Niggle", which tells of a painter named Niggle who is racing against time to complete his great work, a painting of a large tree with forest and mountains in the background. Due to distractions and his own weaknesses, he dies before completing his work. But then in afterlife, after a period in Puragatory, he finds himself inside the landscape of his painting and he is now able to complete his "tree" and move on toward the mountains, which, according to Kocher, "represent the next highest stage in his spiritual growth (1972, p162)."

Like all good stories, "Leaf by Niggle", is meaningful on a number of levels, but as Kocher concluded, "the story may well be looked at as an effort on Tolkien's part to find some underlying meaning for all his labors, if not in this life then in the next (1972, p164)." Through writing the story, Tolkien seems to have been constructing for himself a new transforming theme- one dealing with the works of an artist being part of a larger pattern which goes on even after the death of the individual artist- in order to give himself the courage necessary to go on with his major work. A similar theme was also sounded in an essay Tolkien wrote during this same period and later published together with the story under the title Tree and Leaf :

> It is easy for the student to feel that with all his labour he is collecting only a few leaves, many of them now torn or decayed, from the countless foliage of the Tree of Tales, with which the Forest of Days is carpeted. It seems vain to add to the litter...But that is not true...Each leaf, of oak, and ash and thorn, is a unique embodiment of the pattern, and for some this very year may be the embodiment, the first ever seen and recognized, though oaks have put forth leaves for countless generations of men (Kocher, 1972, p161).

My third example comes from the autobiography of Gandhi (1929). In a chapter entitled "The Magic Spell of a Book", Gandhi tells of reading social critic John Ruskin's book, Unto This Last, on a train and how it changed his life:

> The book was impossible to lay aside, once I had begun it. It gripped me. Johannesburg to Durban was a twentyfour hours' journey. The train reached there in the evening. I could not get any sleep that night. I determined to change my life in accordance with the ideals of the book...I believe that I discovered some of my deepest convictions reflected in this great book of Ruskin, and that is why it so captured me and made me transform my life (1929, p298-9).

Specifically, Gandhi felt that he received the following three transforming themes or principles from Ruskin's book:

1. That the good of the individual is contained in the good of all.
2. That a lawyer's work has the same value as the barber's inasmuch as all have the same right of earning their livelihood from their work.

3. That a life of labour, i.e., the life of the tiller of the soil and the handicraftsman is the life worth living.

On reading the book, he concluded that, "The first of these I knew. The second I had dimly realized. The third had never occured to me. Unto This Last made it as clear as daylight for me that the second and the third were contained in the first (1929, p299)."

Gandhi quickly translated these new themes into concrete designs and actions. He arose the next day, "ready to reduce these principles to practice", and within weeks had organized the Phoenix Settlement, a rural cooperative community of his friends, which sought to promote and test these principles. Besides experimenting with farming, handicrafts and equal ownership, the Phoenix Settlement also printed Gandhi's radical newspaper Indian Opinion. The settlement, thus, became the testing ground for many of Gandhi's ideas about equality and self reliance, which he would later successfully promote in India (1929, p300-306).

My fourth initial example of meaning transformation comes from the autobiography of the American architect Frank Lloyd Wright (1932). Here Wright tells of suffering in 1909 what would today be called a mid-life crisis: "I had almost reached my fortieth year. Weary, I was losing grip on my work and even my interest in it... I could see no way out. Because I did not know what I wanted I wanted to go away... Everything, personal and otherwise, bore down heavily upon me (1932, p162-3)." He asked for a divorce and when this was refused, he fled to Europe.

Returning from his "voluntary exile" two years later, Wright resolved to, as he put it, "get my back against the wall and fight for all I saw I had to fight", by building a new homestead on a hill his mother had purchased for him near his childhood home in Wisconsin. He decided to name the hill and the house he built on it Taliesin, after the Welsh pastoral poet:

> Taliesin! Name of a Welsh poet, druid-bard who sang to Wales the glories of fine art. Many legends cling to that beloved reverend name in Wales...Since all my relatives had Welsh names for their places,

> why not Taliesin for mine?...Literally the Welsh word means "shining brow" (1932, p191).

Thus Taliesin, the romantic "druid-bard", became a personal transforming theme for Wright in his time of crisis. Later, in fact, his last wife Olgivanna Lloyd Wright wrote a biography of Wright entitled The Shining Brow: Frank Lloyd Wright (1960), which equated the architect with the poet:

> Taliesin- The Shining Brow- was the name of a Welsh bard who sang songs to beauty. Mr. Wright liked the poet; he liked the melodious sound of the name, and he liked its meaning- The Shining Brow- the symbol of dignity, purity, nobility, all of the finest human attributes.
>
> To me Frank Lloyd Wright is synonymous with Taliesin. It is he who is The Shining Brow- the epitome of creative force in a life devoted to beauty.

Having chosen this general romantic theme, Wright then had to translate it into a specific design theme, which he did by envisioning Taliesin as a "natural house" which would be part of the hill it was on:

> This hill on which Taliesin now stands as "brow" was one of my favorite places (as a boy)...I turned to this hill in the Valley as my Grandfather before me had turned to America- as a hope and haven ...(It was) unthinkable to me, at least unbearable, that any house should be put on that beloved hill.
>
> I knew well that no house should never be on a hill or on anything. It should be of the hill. Belonging to it. Hill and house should live together each the happier for the other...
>
> There must be a natural house, not natural as caves and log-cabins were natural, but native in spirit and in the making, having itself all that architecture had meant whenever it was alive in times past...
>
> Yes, Taliesin should be a garden and a farm behind a real workshop and a good home.
>
> I saw it all; planted it all: laid the foundation of the herd, flocks, stable and fowl as I laid the foundation of the house...
>
> So began a "shining brow" for the hill; the hill rising unbroken above it to crown the exuberance of life in all these rural riches...(so that) finally it was not so easy to tell where pavements and walls left off and ground began (Wright, 1932, p191-4) .

Here- in his emphasis on blending architecture and nature and his use of natural materials, in his personification of nature and architecture, and in his stress on

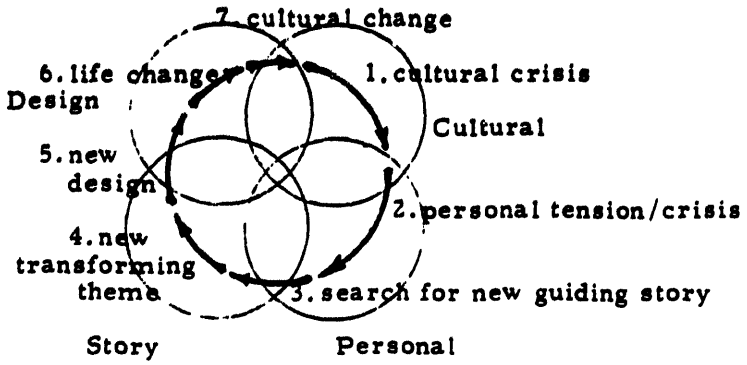


Figure 8: The Transforming Cycle Involved in Discovering and Applying a New Transforming Theme (Superimposed on Four Realms of Meaning It Cuts Across)

family roots and his glorification of the past- Wright articulated a number of the key design themes that would characterize his "organic" style of architecture. Moreover, Wright would draw on his Taliesin theme again later on, as Norris Smith has noted (1966, p119-26), when he established the Taliesin Fellowship, which he envisioned as a latter day "roundtable" of architects, artists and craftsmen, stressing the fact that "Taliesin, a Druid, was a member of King Arthur's Roundtable."

In these four brief examples, drawn from the lives of a politician, a writer, a religious/political leader and an architect, we begin to see a common pattern of elements surrounding the discovery and application of a new transforming theme. In each of these cases there was a cultural and/or personal crisis which caused a creative individual to be under considerable stress. When the individual's standard problem solving strategies failed to work (i.e. solve the crisis), he seemed to consciously or subconsciously search for a new guiding story that would offer him a way out of his predicament. Eventually, he hit on a story or book or image that seemed appropriate and abstracted or constructed from it a new transforming theme which he used to guide his future actions. He uses this theme to create a new design (for a story, a home, a community and/or his life itself) and through the implementation

leaders of transformations in the lives and meanings of cultural

General Stages in Cycle	Their Manifestation in Four Specific Examples of Transformation			
	Assemblyman	Tolkien	Gandhi	Wright
1. Cultural Crisis	Abortion	World War II	Inequality in South Africa	Dull, lifeless Architecture
2. Personal Crisis	How to vote	Time to finish work	Role as reformer	Weary of family, career
3. Guiding Story	Profiles in Courage	Christian myths of afterlife	Unto This Last	Taliesin legend
4. Transforming Theme	Courageous Statesmanship	One's work as part of larger pattern	Equality and simplicity of labor	The harmony of Nature and Architecture
5. New Design	Being a courageous politician himself	Leaf by Niggle story	Phoenix communal settlement	Taliesin home and later Taliesin Fellowship
6. Personal Change	Change in vote and meaning-making	Courage to complete Lord of the Rings	A simpler, more spiritual life	A new "organic" style of architecture
6. Cultural Change	Pro-abortion law passes	Tolkien attracts literary and cultural following	Political and cultural reform in S. Africa & India	A new school of "organic" architecture

Figure 9: The Corresponding Stages of Transformation in Four Illustrative Examples

of this design, makes changes in his own life and, ultimately, in the culture he lives in; thus, completing a cycle of transformation which originally began with a cultural/personal crisis.

This general transformational pattern or cycle is depicted in Figure 8, where I've shown it superimposed on the four realms of meaning identified in Figure 7, which it seems to cut across. The chart in Figure 9 shows the specifics of how each example exhibits this same pattern.

This transformational cycle is similar to and was partially inspired by a number of other models of personal and/or cultural transformation, including Loder's model of the steps in "transformational knowing" (1981), Turner's conception of "root paradigms" and the role they play in personal and cultural transformation (1974, chapters 2 and 3), Wallace's model of "mazeway" or worldview reformulation during "revitalization movements" (1956), Havelock's conception of the "problem solving cycle" involved in technological innovation (1969), and Schon's notion of "generative metaphors" and their role in inspiring innovative designs (1979, 1983). All of these models and their relevance to my coevolutionary approach will be described briefly later in this chapter.

As I reflected on these various models and their relevance to the simple meaning transformation cycle depicted in Figure 8, I began to realize that more than one type of meaning transformation was actually occuring in my four examples of transforming stories, themes and designs. I eventually concluded that in these examples of personal and cultural transitions, there were, in fact, three types of meaning transformations or transitions occuring simultaneously with one another, namely: (i) a transition in cultural themes and meanings, (ii) a transition in personal themes and meanings and (iii) a transition in design themes and meanings. Thus, instead of the single cycle of meaning transformation depicted in Figure 8, what was actually occuring in my examples was a more complex and multi-level process in which these three types or levels of meaning transitions occured in conjunction with each other, and this, in turn, led me to the insight that during such cultural/personal transitions, cultural, personal and design themes and meaning systems tend to mutually adapt or "coevolve" with one another.

The Coevolution of Meaning Systems

This insight that cultural, personal and design themes and meaning systems tend

to mutually adapt or "coevolve" during personal/cultural crises and transitions and over the course of cultural movements was partially inspired and reenforced by a number of sources. The term "coevolution" itself was inspired by the way Stewart Brand used it in his successor publication to The Whole Earth Catalog, which he called The CoEvolution Quarterly.

The term "coevolution" had first been coined in 1965 by biologists Paul Ehrlich (one of Brand's professors in biology/ecology at the University of California) and Peter Raven in their study of the mutual adaption of caterpillars and the plants they ate to one another (1965). Here, they coined the term "coevolution" to refer to the progressive mutual adaption or evolution of species with one another such as they had found exhibited by the caterpillars and the plants they ate. Brand, in adopting the term as the title for his quarterly companion to The Whole Earth Catalog, expanded the sense of the term to include not only the coevolution of species, but also the coevolution or mutual adaption of ideas, communities and cultures (in this Brand was inspired in part by another of his mentors Gregory Bateson and his ideas about the ecology of ideas and "mind";see Bateson, 1972;Brand, 1974). As Brand put it in an early issue of CoEvolution Quarterly:"the beauty of the term is what it adds to the concepts of ecology...Ecology is whole system all right, but coevolution is whole system in TIME...Ecology maintains. Coevolution learns (Brand, 1975, p 193)." Like Brand, I intend to use the term "coevolution" in this general sense, using it in particular to refer to the mutual, complementary change in meaning systems and related social and cultural forms and products during cultural transitions and within cultural movements.

My ideas about the way meaning systems coevolve during cultural movements were informed by the work of a number of scholars, particularly Erik Erikson's work on how cultural leaders and the cultures they lead go through analogous crises/transitions simultaneously (1958, 1968, 1969), James Burns' work on the role of "transforming leaders" and "transforming leadership" in envisioning and achieving cultural change

(1978), and Robert Kegan's work on the role of "cultures of embeddedness" in facilitating personal meaning transitions (1982). Also important were Gardner (1986) and Csikszentmihalyi's (1984) work on the mutual role of personal creative evolution and the evolution of creative cultural domains and social fields in the production of creative cultural products and Habraken's work on the role of social "powers" or parties of interest and their cultural values in the evolution of designs and building sites (1983, 1985).

The chart in Figure 10 lists six different dimensions or types of meaning change which these works identified as being important in the analysis of the coevolution of cultural, personal and design meanings and meaning systems. The top four of these dimensions of change were adapted from a paper by Erikson (1968), in which he distinguished these four dimensions in the psychohistorical analysis of mutual personal/cultural change, resulting from the 2 x 2 matrix formed by two types of changing entities and meaning systems (the community/culture and cultural leader) and the two types of change and impact (the short term or transitional change and impact and the longer term or sequential change and impact). To this 2 x 2 matrix of change types, I've added another row, inspired by the work of Habraken, Gardner and Csikszentmihalyi on the evolution of design and creative systems, which expands the matrix to include short and longer term change and impact of creative and cultural designs and design systems. Then, having identified these six dimensions of change as being important, I sought to expand the simple meaning transformation cycle or model in Figure 8 to include these multiple dimensions of change. Figure 11 shows a diagram of the resulting multi-level "coevolutionary" model of mutual cultural/personal/design meaning transformation.

As this diagram illustrates, this multi-level coevolutionary model depicts change in meaning as occuring on three levels and within three corresponding entities or meaning systems simultaneously: (i) general cultural meaning systems, depicted by the line of transitional "cycles" at the top of the figure, (ii) the more particular personal mean-

Figure 10: Matrix of the Six Dimensions of Change Important in the Analysis of The Coevolution of Meaning Systems During Cultural Transitions and Movements

CHANGING MEANING SYSTEM	TYPE OR DURATION OF CHANGE: I. TRANSITIONAL (SHORT TERM)	II. SEQUENTIAL (LONGER TERM)
A. CULTURE/ COMMUNITY	1. Transitional changes and their impact on the culture/community and its meaning system(s)	2. Longer term changes and impacts on the culture/ community's evolution and history
B. LEADERS' PERSONAL SYSTEMS	3. Transitional changes and impacts on cultural leader(s) life and personal meaning system(s)	4. Longer term changes and impacts on leader's life history and evolution of his meaning systems
C. CREATIVE/ CULTURAL DESIGN	5. Transitional changes and impact in leader and movement's creative/ cultural designs and design systems	6. Longer term changes and impacts in the evolution of the leader(s) and movement's designs, design systems & products

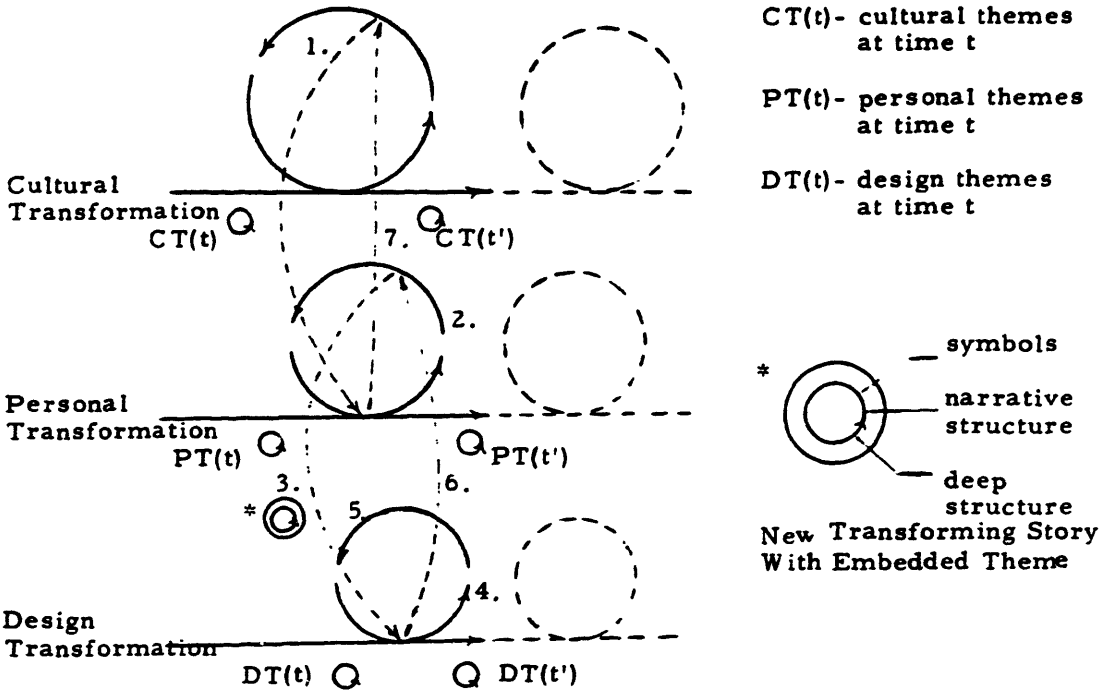


Figure 11: The Coevolution of Cultural, Personal and Design Meaning Systems (Numbers correspond to stages in transforming cycle in Figure 8: 1- cultural crisis triggers personal crisis; 2- personal crisis triggers search for new guiding story; 3- new story triggers design transformation; 4- new transforming theme; 5- new design development; 6- new design promotes personal change; 7- personal change promotes cultural change.)

ing systems of the cultural leader(s), depicted by the middle line of transitional cycles and (iii) the even more specific creative and cultural design systems of the cultural leaders and movements they initiate, depicted by the bottom line of transitional cycles. Furthermore, the distinction between short term transitional changes and longer term sequential ones at each level are depicted by an initial solid circle or transitional cycle followed by a dotted circle or cycle, which stands for one or more subsequent sequential or longer term transitions at each level. The fact that these three levels mutually change or coevolve together is indicated by the dotted arrows which interconnect the three evolving levels. These numbered dotted arrows correspond to the seven transformational steps/processes identified in my initial, simpler version of the meaning transformation process depicted in Figure 8. Now, in this expanded coevolutionary model, in the typical case of meaning transformation, such as, illustrated in my four examples from cultural leaders lives, these seven steps correspond to the following stages or processes in coevolution: (1) typically, a cultural crisis and resulting cultural transition(top solid transitional cycle) triggers personal crises and transformations in one or more cultural leaders (middle solid transitional cycle); (2) during this personal transition, the leader searches for a new transforming/guiding story and theme(s); (3) the discovery of such a transforming story and its embedded transforming theme(s) (depicted by the small circle within a circle), in turn, triggers a transition in the creative design system, which guided the design process of the leader(s) and the cultural movement he founds (bottom solid transitional cycle); (4) during this transition at the design level, new design themes and thematic systems are developed, which led to (5) the creation of a new transforming creative/cultural design(s); (6) this new transforming design(s) then serves to further stimulate and reenforce the leader(s) personal transition and (7) this, in turn, further stimulates and reenforces the cultural transition which started this coevolutionary process in the first place. Not infrequently, one such cycle of coevolution triggers another one, with the seventh step of one cycle

triggering a whole new cultural transition cycle (step 7a in figure), which in turn triggers a new cycle of coevolution. Thus, the coevolution of meanings frequently involves a coevolving sequence of the coevolving cycles depicted in Figure 11 and this is indeed usually the case with the coevolution of meanings within new cultural movements.

This multi-level model illustrates more of the complexity of the coevolution of new meanings than did the simple transforming cycle in Figure 8, but the actual process of new meaning coevolution in cultural movements is even more complicated than depicted in Figure 11. The emerge of a new transforming story, theme(s) and design, as depicted in the figure, is only the beginning of the coevolution of new meanings and meaning systems. The new transforming theme(s) and design forms the nucleus around which a new embryonic meaning system, which I will call a thematic system, grows. Like mature meaning systems, these new thematic systems are made up of structured hiearchies of themes and other meaning forms/units (e.g. cultural symbols). They are, however, more malleable and susceptible to change than more mature meaning systems. These thematic systems become the focal point for the coevolution of new themes and meanings in cultural movements and they also guide the evolution of designs and cultural products in the movement. Eventually, these new thematic systems either (i) become incorporated into and thus transform existing meaning systems or (ii) grow into mature meaning systems in their own right or (iii) die out or become dormant.

The emergence of a new thematic system can be illustrated by extending one my examples of transforming leaders, stories and designs. I'll use the example from the life of Frank Lloyd Wright, since his evolving thematic design system is probably the most similar to those of the AT movement which I'll be analysing in this study. In Wright's case, the evolution of his ideas about "natural" and "organic" architecture only began to take shape with the conception of his transforming theme and design of "Taliesin" and his Taliesin homestead. Figure 12 depicts what some of the components

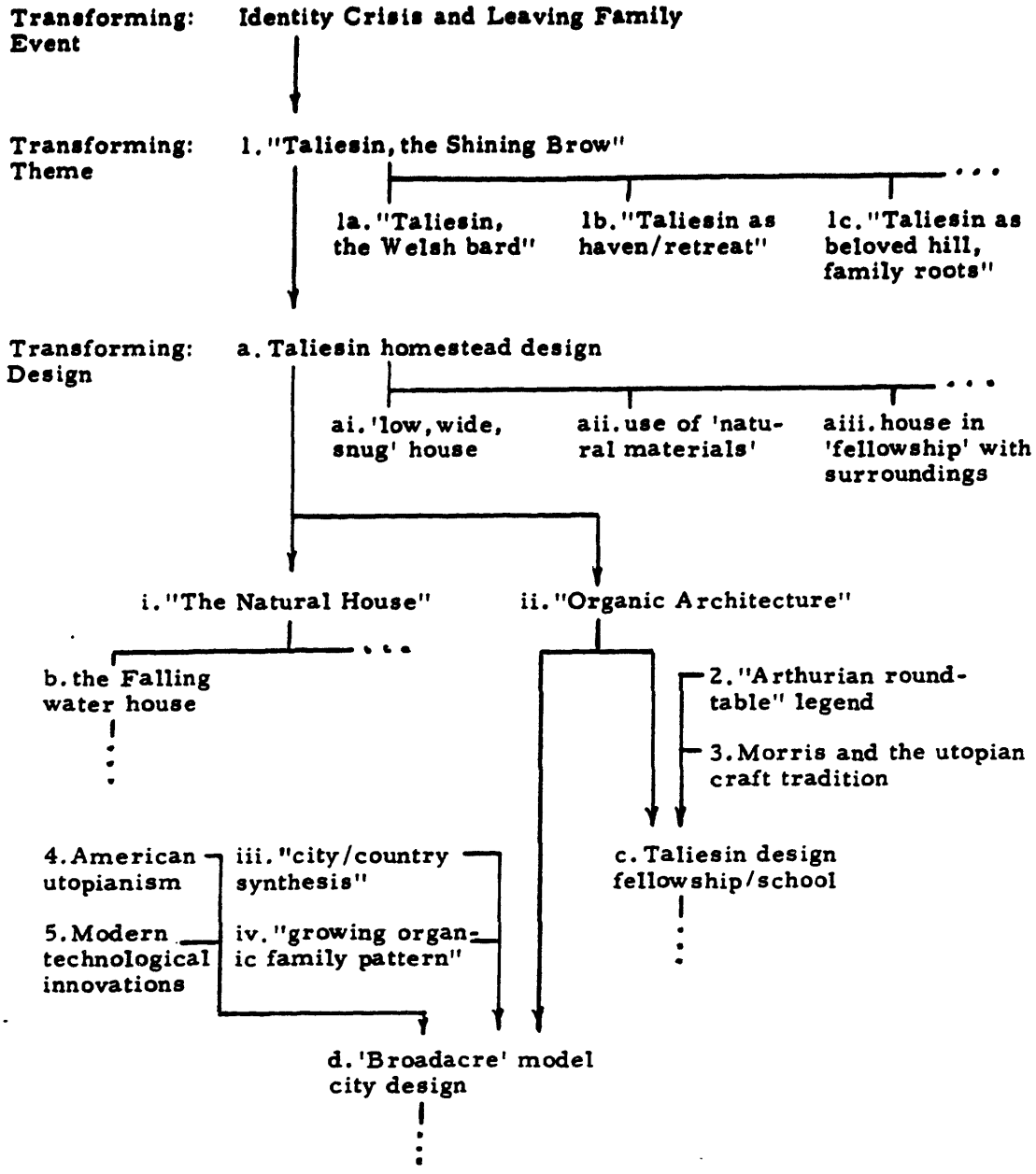


Figure 12: A Simple Example of an Evolving Thematic Design System Based On the Evolving Designs and Design Themes of Frank Lloyd Wright

of Wright's evolving thematic design system might have looked like, which I developed from Norris Smith's account of the evolution of his life and designs[27].

This simple example diagram of a thematic system, based on Wright's creative design system, like the other evolving thematic systems I will endeavor to reconstruct in this study, is made up of a number of types of themes and designs organized in a hiearchical fashion. This particular thematic structure contains five different types of meaning units: (i) general themes, including its initial transforming theme, "Taliesin, the Shining Brow", which begin with numbers; (ii) subordinate or supportive general themes, which begin with numbers followed by letters; (iii) general design themes, which begin with numerals; (iv) actual designs, which begin with letters and (v) subordinate or supporting designs, which begin with letters followed by numerals. It starts with Wright's transforming theme of "Taliesin, the Shining Brow"(1) at its top, which was discussed in my previous example of transformation in Wright's life. Directly below this are three subordinate themes (1a, 1b, 1c), which elaborate upon and support this transforming theme. Also below the transforming theme is the Taliesin homestead design (a) it inspired and the subdesigns or components of this design (ai, aii, aiii). It was only after building Taliesin, as Smith pointed out, that Wright was able to articulate the general design themes embodied in Taliesin, namely, the themes of "the natural house" (i) and "organic architecture" (ii), which, in turn, guided much of Wright's later work. In particular, in this partial thematic system, the Falling water house (b) is shown as growing out of the "natural house" theme and Wright's later design fellowship/school (c) which he also called "Taliesin" is shown as evolving from his "organic architecture" theme, as well as the general themes embodied in the Arthurian "roundtable" legend (2) and the utopian craft tradition in Europe (3). And finally, at the bottom of the diagram, Wright's 'Broadacre' model city design (d) is also shown as growing out of his "organic architecture" theme as well as the general themes of American utopianism (4) and modern American technology (5) and Wright's more specific design themes of a

"synthesis of the virtues of city and country" (iii) and of a town design "growing organically like a family tree" (iv).

In the next section, I'll describe some "heuristics" or tentative "rules of thumb" for "reconstructing" and diagramming evolving (and coevolving) thematic systems like this one and in later chapters I'll use these heuristics to reconstruct a number of coevolving thematic systems for the AT movement.

There is one final additional level of complexity which needs to be added to the basic model of the coevolution of meanings which I've been evolving over the last several pages. Thus far, the most complex meaning structure we've discussed has been the mature cultural meaning system. Such meaning systems, however, are usually part of still larger systems of meaning which I will call "meaning" or "cultural" "ecologies". "Cultural ecologies" are systems or ensembles of related cultural, creative, story and design meaning and thematic systems which interact and mutually support one another and coevolve together over time. The notion of these evolving meaning or cultural ecologies was first suggested to me in a general way by Gregory Bateson's notion of "ecologies" of ideas or "mind" (1972) and William Irwin Thompson's more recent work on the four broad "cultural ecologies" which have made up Western civilization to date (1985), which will be briefly discussed later in this chapter. Then, the work of architectual historian Charles Jencks on the evolution of modern schools or ecologies of design (1971, 1973) made the notion more concrete and usable [28].

Figure 13a shows Jencks' "evolutionary tree" diagram of the six modern evolving schools or ecologies of design which he identified and analyzed through a structural analysis inspired by the work of Claude Levi-Strass (Jencks, 1971; see also Levi-Strauss, 1955). Figure 13b enumerates the main cultural and design themes guiding each of these design schools/ecologies and shows how they constitute three pairings of polar themes for and approaches to design. I will use a similar structural technique

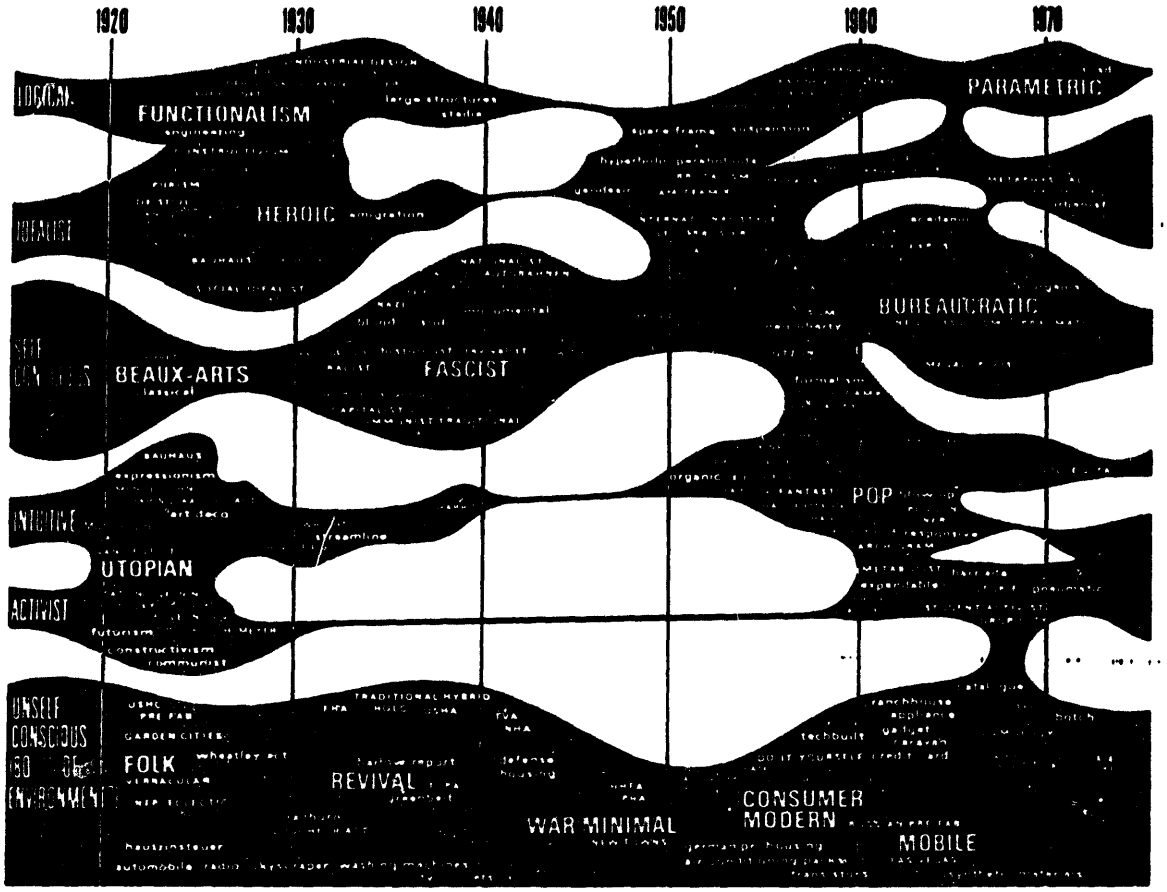
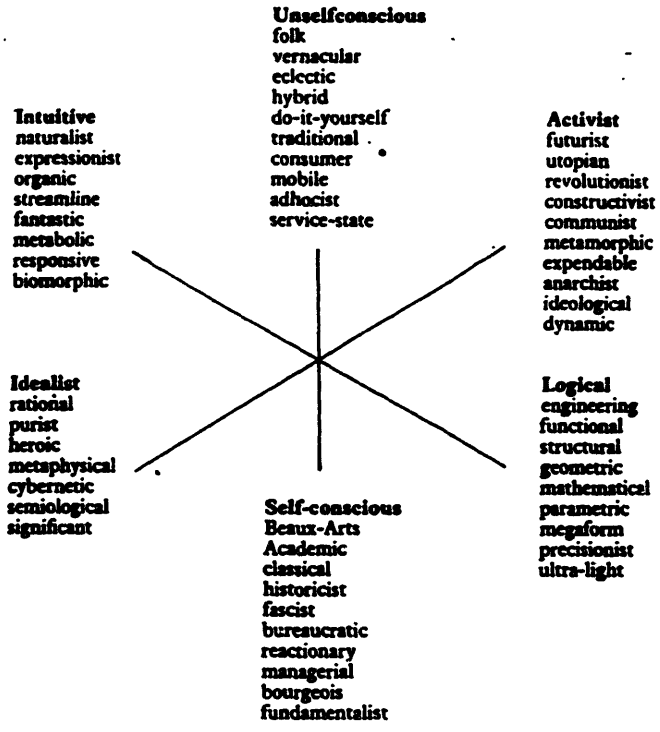


Figure 13: The Polar Themes and Evolution of Jencks' Six Schools or Ecologies of Modern Design:
A. Jencks' 'Evolutionary Tree' Diagram of the Evolution of the Six Ecologies (from Jencks, '1973)
B. Jencks' Structural Diagram of the Three Pairings of Polar Themes and Approaches Among These Six Design Ecologies (from Jencks, 1970)



in to analyze the AT movement's emergence out of and relationship to the various meaning/cultural ecologies of social and technological reform of the 60's.

Thus, in this and the previous two sections, I've developed a hiearchy of five types and levels of meaning structures relevant to the analysis of the coevolution of meanings in cultural movements: (i) first, at the most micro level, the various types of themes, the building blocks out of which more complex meanings and meaning structures are built; (ii) followed by the various types of cultural forms, such as, stories, designs, rituals and artifacts, in which themes art embedded and through which they are conveyed and communicated; (iii) followed next by the new embryonic creative/cultural thematic systems which emerge in cultural movements to convey their new meanings and guide the design and production of new cultural products; (iv) then come the mature, relatively stable meaning systems, including the cultural, personal and design systems, which guide the lives of cultures and individuals over relatively long periods of time; and finally, at the most macro level, are the ensembles of related cultural and personal meaning and thematic systems and related cultural forms, which I've called meaning or cultural ecologies.

Steps and Heuristics for Coevolving Thematic Analysis

Having outlined the nature of the various types of themes and more global meaning structures and systems relevant to my approach and how these themes and meaning systems coevolve during cultural transitions and movements, I will now turn to a discussion of how the new themes of a movement may be identified and articulated and its coevolving thematic systems "reconstructed" and diagramed, through a method I call "coevolving thematic analysis". Just as Victor Turner's method or technique of "processual symbolic analysis" (1967, 1974, 1979, appendix) became the methodological heart of his general symbolic anthropological approach for studying cultures and cultural processes, this method of "coevolving thematic analysis" is the central methodo-

logical component of my coevolutionary approach for studying cultural movements.

Like other methods of cultural interpretation, coevolving thematic analysis is best viewed as a creative craft rather than a rigorous algorithm which can crank out results in an entirely objective manner. It does, however, involve a series of steps and useful heuristics or "rules of thumbs" which can help guide the scholar in his effort to identify and describe the key themes of a cultural movement and to reconstruct the important coevolving thematic systems of the movement. In this section I'll briefly describe the basic steps and supporting heuristics utilized in coevolving thematic analysis.

Rather than modeling my analytical method on one or two of the existing schools or traditions of cultural/thematic interpretation, I've been very eclectic and have borrowed ideas from many methods of cultural/thematic analysis, believing that no one method is the ultimate "correct" approach, but that they each have some useful insights or heuristics to contribute. Accordingly, I've drawn up a tentative list of heuristics or "rules of thumbs" inspired by these various methods, which I've sought to keep in mind as I've endeavored to abstract the themes and reconstruct and diagram the thematic systems of the AT movement. These tentative heuristics are enumerated in Figure 14.

I've divided these heuristics into four catagories. First are listed heuristics intended to be useful in abstracting and articulating the general cultural themes of a movement. Next are listed heuristics for abstracting and articulating the personal/creative life themes of the leaders of the movement. This is followed by heuristics for abstracting and articulating the design themes which guided and are embodied in the cultural designs and products of the movement. And finally are listed systemic or integrative heuristics for combining the various cultural, personal and design themes of a movement into a "reconstructed" diagram of its coevolving thematic system or systems. For each of these numerous heuristics, I've listed the type of analysis and exemplary studies which inspired it.

Figure 14: Some Initial Heuristics for the Coevolving Thematic Analysis of Cultural Movements

Heuristic	Source	Exemplary Study
I- Heuristics for Abstracting General Cultural Themes		
c1.a cultural theme typically contains a rule or heuristic for living in a culture/movement.	design/cognitive thematic analysis	(Dyer,'83) (Habraken,'85)
c2.a cultural theme may express a cultural ideal or vision.	American symbol-myth analysis	(Smith,'50) (Marx,'64)
c3.a cultural theme may express epistemological, ethical or aethetic values, i.e., what is true, good and beautiful and how one knows.	countercultural analysis	(Yinger,'82)
c3a.a cultural theme may express what is false, bad or ugly in the parental culture.	countercultural analysis	(Yinger,'82)
c4.a cultural theme may express the social/political ideology of a culture/movement.	social/semiotic analysis	(Barthes,'72) (Wright,'75)
c5.a cultural theme may express the inversion or counter-theme to a parental cultural theme.	countercultural analysis, symbolic inversion	(Yinger,'82) (Babcock,'78)
c6.a cultural theme may fuse or unite distinctive meanings/values.	symbolic analysis structural analysis	(Turner,'67) (Levi-Strauss,'55)
c6a.a cultural theme may mediate polar parental themes.	structural analysis symbolic analysis	(Levi-Strauss,'55) (Turner,'67)
c7.a cultural theme may express mankind's oneness or "communitas"	structure/communitas symbolic analysis	(Turner,'69)
c8.a cultural theme may express the nature of life or the ideal life or life cycle.	psycho- analysis quest analysis	(Jung,'64) (Campbell,'49)
c8a.a cultural theme may express collective "archetypes" which symbolicly guide self-development in a culture.	archetypal analysis	(Jung,'64)
c9.a cultural theme may be linked to one or more cultural symbols.	symbolic analysis	(Turner,'67)
c10.a cultural theme may be embodied in and conveyed through a cultural form.	various types of cultural analysis	(Turner,'67) (Marx,'64) (Barthes,'72)

Figure 14: Heuristics for Coevolving Themeatic Analysis (Con't)

Heuristic	Source	Exemplary Study
I- Heuristics for Abstracting General Cultural Themes (con't)		
c10a.a cultural theme may be conveyed through a cultural ritual,drama or performance.	processual symbolic analysis	(Turner,'67,'74)
c10b.a cultural theme may be embodied in a cultural artifact or product.	cultural artifact analysis	(Malinowski,'22) (Willis,'78) (Traweek,'86)
c10c.a cultural theme may be conveyed through a "style" of behavior.	subculture analysis	(Hebdige,'79)
c11.a cultural theme may be embodied in and conveyed through a cultural story or myth.	various types of cultural/literary analysis	(Marx,'64) (Levi-Strauss,'55) (Cawelti,'76)
c11a.a cultural theme may be conveyed through the plot or narrative structure of a story.	narrative analysis plot unit analysis	(Propp,'27) (Alker,Lehnert,'84) (Campbell,'49)
c11b.a cultural theme may be the "kernel" out of which a story grows.	formal thematic analysis	(O'Toole,'75)
c11c.a cultural theme may be embodied in the "deep" structure of a story.	structural analysis	(Levi-Strauss,'55)
c11d.a cultural theme may be conveyed through a series of formula stories.	formula story analysis	(Wright,'75) (Cawelti,'76)
c11e.a cultural theme may be conveyed by the symbolic,narrative and deep structure of a story or story formula all working together.	multiple structural analysis formula analysis	(Petty,'79) (Wright,'75) (Cawelti,'76)
II- Heuristics for Abstracting Personal/Creative Life Themes		
p1.a personal theme is typically a rule or heuristic which guided a person's life.	cognitive thematic analysis	(Dyer,'83) (Schank,Abelson,77)
p2.a personal theme may express part of a person's "worldview" or guiding "paradigm".	root paradigm analysis	(Turner,'74)
p3.a personal theme may express a person's "root" or guiding metaphor(s).	root metaphor analysis	(Turner,'74)
p4.a personal theme may express a personal value on what is true,good and/or beautiful.	countercultural analysis	(Yinger,'82)

Figure 14: Heuristics for Coevolving Thematic Analysis (Con't)

Heuristic	Source	Exemplary Study
II- Heuristics for Abstracting Personal/Creative Themes (con't)		
p5.a personal theme may express a life goal or a plan or strategy for achieving a goal.	cognitive thematic analysis	(Schank,Abelson,77)
p6.a personal theme may express a life script myth or motto.	cognitive analysis life script/myth analysis	(Dyer,'83) (Berne,'72) (Jung,'64)
p7.a personal theme may be linked to a personal symbol or archetype.	archetypal analysis	(Jung,'64)
p8.a personal theme may be expressed in the stories a person tells about himself and his life.	personal story analysis	(Fowler,'81) (Hillman,'83)
p9.a personal theme may be embodied in a person's favorite story,myth or movie.	literary psychoanalysis	(Jung,'64) (Berne,'72)
p10.a personal theme may be expressed through a person's activities and creative products.	various types of psychological analysis	
p10a.a personal theme may be expressed in a person's way or "style" of behaving and making meaning.	cognitive style/stage analysis,personality types	(Kegan,'82) (Gilligan,'82) (Jung,')
p10b.a personal theme may be expressed in the way a person responds to crisis and changes over time.	cognitive stage analysis, personal transformation	(Kegan,'82) (Fowler,'81) (Loder,'81)
p10c. a personal theme may be expressed in the way a person relates to others.	self-other cognitive/ structural stage analysis	(Kegan,'82)
p10d.a personal theme may be expressed in the way a person relates to and cultivates meanings in things.	household object analysis,subculture object analysis	(Csikzentmihalyi, Rochberg-Halton, '81)(Willis,'78)
p10e.a personal theme may be expressed in a person's creative designs and products.	creative life/product analysis	(Gruber,'74) (Smith,'66)
III- Heuristics for Abstracting Design Themes from Cultural Designs/Products		
d1.a design theme is typically a rule or heuristic which guided the design and production of a cultural product and is reflected in it.	design thematic analysis	(Habraken,'83,'85)

Figure 14: Heuristics for Coevolving Thematic Analysis (Con't)

Heuristic	Source	Exemplary Study
III- Heuristics for Abstracting Themes from Designs/Products (con't)		
d2.a design theme may express part of the "grammar" or "pattern language" which a design obeys.	design pattern language analysis	(Alexander, '77)
d3.a design theme may express a "generative metaphor" for an innovative design.	generative metaphor analysis	(Schon, '79)
d4.a design theme may be reflected in the resemblences between a design and another meaningful object.	design thematic analysis	(Habraken, '85)
d5.a design theme may express symbolic meanings linked to a design or product.	symbolic analysis household object analysis	(Turner, '67) (Csikzentmihalyi, Rochberg-Halton, 81)
d6.a design theme may be reflected in the way the components of the design relate to each other.	design thematic analysis	(Habraken, '85)
d7.a design theme may be reflected in how a design evolves over time.	evolving design analysis, creative life/product analysis	(Habraken, '85) (Gruber, '74) (Arnheim, '62)
d8.a design theme may reflect general cultural and social themes.	cultural/subcultural artifact analysis	(Malinowski, '22) (Willis, '78) (Traweek, '86)
d8a.a design theme may be reflected in the way a design/product is used in a culture/movement.	functional artifact analysis	(Malinowski, '22) (Willis, '78)
d8b.a design theme may be reflected in the way a design/product is described or used in cultural stories, rituals and performances.	processual symbolic analysis, functional artifact analysis	(Turner, '67) (Malinowski, '22) (Willis, '78)
d9.a design theme may express and reflect personal themes of the designer and/or user.	cognitive design analysis, household object analysis	(Schon, '83) (Csikzentmihalyi, Rochberg-Halton, 81)
d9a.a design theme may be expressed in stories a designer tells about her designs.	design discourse analysis, creative life analysis	(Schon, '83) (Gruber, '74)
d9b.a design theme may be reflected in the evolution of a designer's designs and life.	evolving design analysis, creative life/product analysis	(Habraken, '85, '83) (Gruber, '74) (Arnheim, '62)

Figure 14: Heuristics for Coevolving Thematic Analysis (Con't)

Heuristic	Source	Exemplary Study
d9c.a design theme may be reflected in the way users use products and the stories they tell about them and their significance.	household object analysis, artifact analysis	(Csikzentmihalyi, Rochberg-Halton, 81) (Willis, '78)
IV- Heuristics for Reconstructing Coevolving Thematic Systems		
s1.coevolving thematic systems/diagrams contain four major types of components: general cultural themes, life themes, design themes and specific designs.	coevolving thematic analysis	present study
s2.each of the major components in thematic systems may have related subordinate or supporting components.	design thematic analysis	(Habraken, '85)
s3.coevolving thematic systems/diagrams are organized hiearchically going from broad to more specific components.	design thematic analysis	(Habraken, '85)
s4.coevolving thematic systems/diagrams are also organized temporally going from initial transforming themes and designs to subsequent ones.	coevolving thematic analysis	present study
s5.thematic systems should include the life themes of its leaders which influenced the movement and indicate their interrelationship.	personal/creative thematic analysis	(Dyer, '83) (Berne, '72) (Turner, '74)
s5a.thematic systems should show how the life themes of different leaders interrelated and coevolved together.	coevolving thematic analysis	present study
s5b.thematic systems should indicate how the leaders' life themes influenced the general transforming and related themes/designs of the movement.	psychohistorical analysis, creative life analysis	(Erikson, '69) (Csikzentmihalyi, Robinson, '84) (Gardner, '86)
s6.thematic systems should indicate how relevant themes of parental cultures and cultural ecologies influenced the transforming and related/designs of the movement.	contextual cultural analysis, cultural ecology/counterculture analysis	(Marx, '64) (Yinger, '82) (Jencks, '70)
s7.thematic systems should indicate how transforming themes/designs inspired more specific movement themes, design themes and designs.	design thematic analysis, generative metaphor analysis	(Habraken, '85) (Schon, '79)

Figure 14: Heuristics for Coevolving Thematic Analysis (Con't)

Heuristic	Source	Exemplary Study
IV- Heuristics for Reconstructing Coevolving Thematic Systems (con't)		
s8. thematic systems should indicate how general design themes influenced and guided the specific designs/products of the movement.	design thematic analysis	(Habraken, '83, '85)
s9. thematic systems should indicate how the design themes and designs of a movement relate back to the creative life themes of its leaders.	creative life analysis design thematic analysis	(Gruber, '74) (Smith, '66) (Habraken, '83)
s10. thematic systems should indicate how the movement themes and designs and the creative themes of its leaders changed and coevolved over the course of the movement.	evolving design/ design ecology analysis, creative life analysis	(Habraken, '85) (Jencks, '70, '73) (Gruber, '74) (Arnheim, '62)

In analyzing the themes of the AT movement, I didn't consciously and explicitly try to apply each and every one of these heuristics in a systematic fashion, but instead used these heuristics subconsciously as my basic creative forms or constructs as I carried out the "re-creative" process of abstracting themes and reconstructing thematic systems. The basic steps I used in this process of coevolving thematic analysis are described below. The first step involved articulating some of the general cultural themes of the movement:

> Step 1- Abstract, in a preliminary and tentative way, the general cultural themes of the movement.

This is intended as a first and tentative cut at identifying and articulating some of the key new cultural themes that the movement developed and promoted, drawing on the cultural heuristics listed in Figure 14. For the AT movement, I sought to abstract these key themes from the stories and writings of AT prophets and pioneers, the promotional literature and publications of the movement and from the AT designs and products producted by the movement. Another aspect of this first step is to:

> Step 1a- Begin to analyze how these themes fit together to complement and reenforce one another.

In the next step, the focus shifts to the leaders of the movement and their personal/creative themes:

> Step 2- Abstract the relevant personal life and creative themes of the movement's leaders.

By "relevant", here, I mean themes which influenced and helped to guide the movement which they led. For the AT movement, I was able to abstract these from the stories, interviews, essays and designs of AT leaders, drawing upon the personal/creative heuristics enumerated in Figure 14. Another aspect of this step is to:

Step 2a- Analyze how these personal/creative themes fit together to form coherent personal/creative meaning systems.

Having abstracted some of the relevant general and creative themes of the movement, the analyst then focuses in on the transforming themes and designs of the movement and the historical/cultural context out of which they emerged:

Step 3- Identify and analyze the central transforming events, themes, stories and designs which inspired and guided the movement.

This is done by identifying transitional events and cycles in the life of the movement and its leaders and analyzing them as I did with my four examples of meaning transitions earlier in this chapter. Another important part of this step is to identify the cultural roots, traditions and ecologies out of which the movement grew:

Step 3a- Identify and analyze the historical/cultural roots of the movement, relating and contrasting its themes to those of its parent culture and the meaning ecology(s) it evolved out of.

The next and most important step is to analyze how the themes, designs and products of the movement coevolved together over its course and from this reconstruct and diagram its coevolving thematic systems:

Step 4- Analyze how the new transforming, cultural, creative and design themes of the movement coevolved over time and guided the creation of the designs and products of the movement.

Central to this analysis is the reconstruction and diagraming of the important coevolving thematic systems of the movement, drawing on the thematic system heuristics in Figure 14:

Step 4a- Reconstruct, diagram and analyze the important coevolving thematic systems of the movement.

The fifth and final formal step of the method itself involves abstracting and analyz-

ing the design themes embodied in the designs and products of the movement:

> Step 5- Abtract and analyze the meanings and design themes embodied in the cultural designs and products of the movement.

This may be done either in conjunction with or after step 4, drawing on the design heuristics listed in Figure 14. These themes abstracted from the designs and products of the movement are then related back to the general coevolving themes and thematic systems of the movement:

> Step 5a- Analyze how the design themes embodied in the designs and products of the movement reflect and reenforce the general coevolving themes and thematic systems of the movement.

These five steps, then, make up the "re-creative" process of coevolving thematic analysis itself. Besides these, I've added a sixth step which involves integrating the results of this analysis with the other types of analyses encompassed within my coevolutionary approach:

> Step 6-Integrate the results of this coevolving thematic analysis with the complementary analyses of other aspects of the movement including its social/cultural change dynamics and transitional processes, its social organization and its internal and extenal conflicts and their mediation.

These complementary aspects and types of analyses will be elaborated on in subsequent sections. The method of coevolving thematic analysis, which I've described here, will be applied to the AT movement as a whole in Chapter 2 and to one of its exemplary pioneering groups, the New Alchemists, and their designs in Chapter 3.

American Cultural Stages, Cycles and Polar Themes

For most of the remainder of this chapter, I will elaborate on the six different types of change and change processes listed in Figure 10 and on how they relate

II. Direction of Cultural Change:	I. Character of Cultural Change and Continuity: 1. Cultures are inherently stable	2. Cultures change slowly and smoothly	3. Cultures evolve through stable stages & unstable transitns	4. Cultures are inherently unstable
a. Change is Progressive or Unidirectional	i. equilibrium theory (Parsons, Ogburn)	ii. evolutionary theory (Comte, Morgan, Sahlins, White)	iii. stage theory (Mumford, Lenskis, Habermas) vii. helical theory (Thompson, Williams Toynbee)	iv. conflict theory (Marx-Engels, Dahrendorf)
b. Change is Nonprogressive or Nondirectional		v. cyclic theory (Spengler, Sorokin Schlesinger)		vi. revolution & routinization theory (Weber)

Figure 15: Different Types of Theories and Models of Broad, Sequential Cultural Change and Continuity (Expanded from Appelbaum, 1970)

to cultural movements and how they can be studied and analyzed for cultural movements. In this section and the next, in particular, I will discuss the two types of cultural change, focusing on broad, long-term, sequential cultural change in this section and short term transitional processes in the next. As these latter processes are considerably more important in the study of cultural movements than broad macro models of cultural change, I will only briefly describe these broad macro models here and spend more time in the next section discussing my own transitional model of the cultural quest and related transitional process models.

The chief relevance of broad macro models of sequential cultural change for the study of cultural movements is that they can help to place movements in their historical cultural context and to explain why movements emerge at certain times in a parent culture's evolutionary history. Figure 15, which was expanded from Appelbaum's catagorization of different theories of sociocultural change (1970; I added the stage (iii) and helical (vii) catagories), lists seven different types of such macro theories of cultural change and continuity, arranged according to two dimensions: (I) first, hor i-

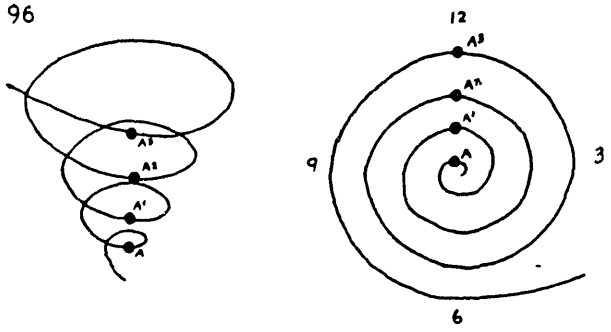
zontally, according to whether they emphasize cultural stability or change and (II) second, vertically, according to whether they view change as progressive and unidirectional or cyclic and nondirectional.

Thus, in the first row of progressive theories, going from those emphasizing stability to those emphasizing change are: (i) equilibrium theory, such as, those of sociologists Parsons and Ogburn, which stress the inherent stability and tendancy of cultures and social systems to seek and stay in equilibrium; followed by (ii) evolutionary theory, such as, those pioneered by Comte and Morgan and the more recent theories of Sahlins and White , which view change as occuring slowly from the cumulative effect of very small changes which occur continuously; followed next by (iii) cultural stage theory, such as, Mumford and the Lenskis' models of the sociotechnical stages and Habermas' recent model of the communicative stages in cultures, which view cultures as evolving through a series of relatively stable, progressive structural stages, in between which unstable transitional periods occur; and ending on the right with (iv) conflict theory, such as, pioneered by Marx and Engels and more recently refined by Dahrendorf , which view cultures as inherently unstable and hence prone to cultural revolutions.

Below these in the nonprogressive row are: (v) the cyclic theory of the rise and decline of civilizations and cultures, such as, those of Spengler (1962) and Sorokin (1937), and (vi) the cultural revolution and routinization theory growing out of the work of Max Weber[29].

Finally, in between these two rows is the more recent (vii) helical or spiral theory, such as, those of Thompson, Williams and Toynbee, are hybrids of and hence combine aspects of both stage (iii) and cyclic (v) theories[30]. Figure 16, for example, illustrates the cultural historian William Irwin Thompson's helical or spiral view of the evolution of Western civilization, in which each stage in the evolution is a cycle which character-

A. Thompson's diagram of the spiral or helical nature of cultural evolution



B. Thompson's listing of the defining characteristics of the four cycles or "cultural ecologies" which have made up the spiral of Western civilization thus far

THE FOURFOLD PATTERN

Cultural Ecology	*Form of Pollution*	*Archetypal Religious Leader*	*Religious Mode of Experience*
I. Riverine	I. Soil Loss	I. Dumuzi	I. Momentary possession
II. Mediterranean	II. Deforestation	II. Moses	II. Surrender to authority
III. Atlantic	III. Atmospheric pollution	III. Luther	III. Commitment to belief
IV. Pacific-Aerospace	IV. Noise, Paranoia	IV. Group as an ecology of consciousness	IV. Symbiotic consciousness
Economy (Marx)	*Communication System (McLuhan)*	*Characteristic Good*	*Characteristic Evil*
I. Asiatic	I. Script	I. Humble piety	I. Pride, arrogant assertion of self
II. Feudal	II. Alphabetic	II. Obedience to law	II. Revolt against authority
III. Capitalistic	III. Print	III. Understanding of doctrine	III. Ecstatic escape or transcendence
IV. Socialistic	IV. Electronic	IV. Universal compassion	IV. Collectivization through terror
Polity	*Mathematical Mode*	*Climactic Literary Masterpiece*	*Characteristic Cosmogonies**
I. City-state	I. Enumeration	I. *Gilamesh Epic*	I. *Enuma Elish*
II. Empire	II. Geometrizing	II. Dante's *Divine Comedy*	II. Hesiod's *Theogony*
III. Industrial nation-state	III. Equations of motion, dynamics	III. Joyce's *Finnegans Wake*	III. Darwin's *On the Origin of Species*
IV. Enantiomorphic ?	IV. Catastrophe theory leading to processual, multidimensional morphologies and return of mythic hieroglyphics	IV ?	IV. Disney's *Fantasia*

Figure 16: William Irwin Thompson's Helical View and Model of Western Culture and the Characteristics of Its Four Composite Cycles or Cultural Ecologies (1981, 1985)

izes the evolution of a particular cultural ecology and on which subsequent cultural ecologies build so that the composite evolution of the four cultural ecologies which have made up Western civilization so far resembles the upward spiral or helix shown in Figure 16a. I found these helical theories and the closely related stage and cyclic theories the most useful in helping to place the AT movement in its American historical and cultural context and relate it to longer term cultural changes and dynamics in

America.

More specifically, I've been most influenced by helical, stage and cyclic theories which focus specifically on the evolution of American culture, particularly American literary historian Robert Spiller's two cycle model of American literature (1955), American historian William A Williams' three stage helical model of America's politico-economic culture (1966), historian and activist Harvey Wasserman's six cycle spiral of American history and culture (1983), and American political historian Arthur Schlesinger, Jr.'s thirty year cyclic model of American politics (1986). Each of these models is briefly described below.

In his book, The Cycle of American Literature, Spiller describes a two cycle model of the evolution of American literature based on an organic/cyclic view of how literature and culture evolves:

> ...the American literary historian can do no better than to adopt for his study an organic view of history. The individual organism follows the circular pattern of life; it has a beginning, a life cycle, and a end. This simple principle may be discovered in the structure of a poem, in the biography of an author, in the rise and fall of a local or particular cultural movement, or in the over-all evolution of a national literature...American literature (also) ...reveals such a cyclic rhythm (1955, xi).

Moreover, he argued that the central "theme" of the two cycles in American literature which he analyzed had to do with Western expansion, first from Europe to the New World (in the first 'frontier' cycle) and then Westward across the continent (in the second 'frontier' cycle):

> ...The basic theme for this rhythm is also the central historical fact of the American experiment: the removal of a mature and sophisticated civilization - that of Western Europe- to a primitive continent ideally suited to its needs and virtually unexploited of its apparently infinite natural resources...When applied to the story of American literature as a whole, this cyclic theory discloses not only a single organic movement, but at least two...cycles...the literary movement which developed from the Eastern seaboard as a center, and culminated with the great romanic writers of the mid-nineteenth century (the 'first frontier' cycle); and that which grew out of the conquest of the continent and is now rounding its full cycle (the 'second frontier' cycle) in the twentieth century (1955, p xi).

Whereas Spiller focused on literary cycles in American, Williams, in his book The Contours of American History, developed a three stage or level helical model of the evolution of America's politico-economic culture. Williams characterized these three politico-economic stages or "ages" as: The Age of Mercantilism, 1740-1828; The Age of Laissez Nous Faire, 1819-1896; and The Age of Corporation Capitalism, 1882-1960s. For each of these stages or ages, Williams described a five phase transitional cycle in which the new politico-economic Weltanschauung or worldview (i.e. 'mercantilism', 'laissez nous faire', and finally 'corporation capitalism') came to dominate its age and replace the previous dominant worldview:

> (My description of) each of the three broad (ages) opens with a section on the Triumph of the Rising Order, in which an effort is made to characterize the essential reality, assumptions, theories, and policies of the (new emerging) conception of the world... these (new) dominant ideas are confronted almost immediately with a reality different from the one used as data in their own construction. This confrontation, discussed as A New Reality for Existing Ideas, eventuates in a modus vivendi through a third (phase), The Adaption of of the Accepted Order. So adjusted and estabished, the (new) accepted outlook next lierally transforms reality and in doing so gives birth to (still newer) assumptions and ideas (The Transformation of Reality and the Inception of New Ideas phase). As this challenge (the emergence of the next dominant worldview out of these newer assumptions and ideas) moves towards its own ultimate triumph (in the next age), however, the (now dominant) existing outlook ripens and fulfills itself in practical and intellectual affairs (in The Fulfillment of the Passing Order phase, the last phase of each age's transitional cycle) (1966, p 22; emphasis added by underlining the five phases in each age's transitional cycle).

This passage and Williams' model reminds one of Kuhn's model of revolutions and paradigm-shifts in science (1962), with Williams' transitional cycles and "worldview-shifts" operating in the general culture analogously to the way Kuhn saw paradigm-shifts occuring in scientific cultures.

Recently, in his book America, Born and Reborn, historian and social activist Harvey Wasserman developed a newcyclic or spiral model of American history and culture, inspired in part by Williams earlier model, but having six cycles instead of Williams' three. Figure 17 illustrates this model and its six progressively shortening cycles.

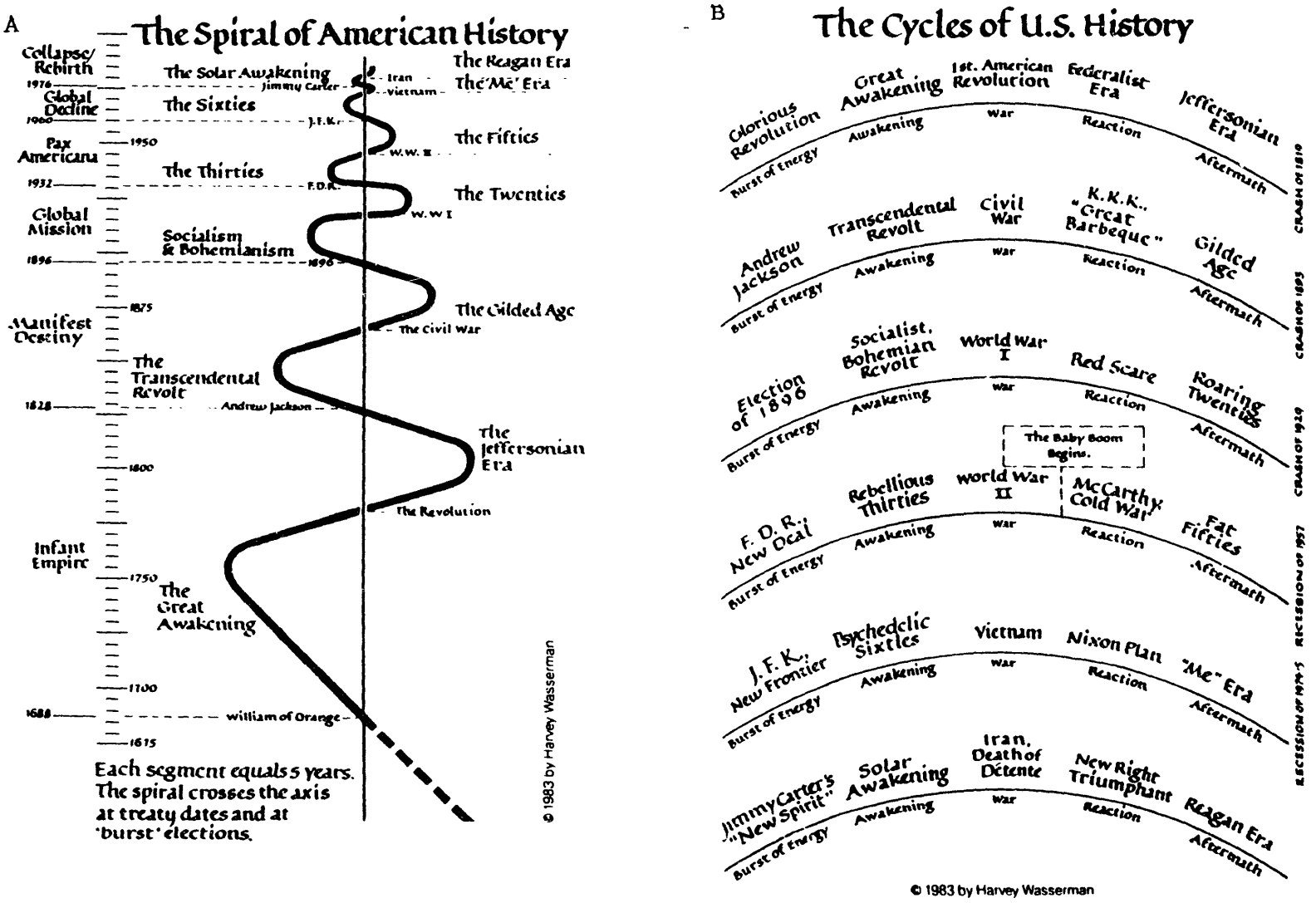


Figure 17: Wasserman's Six Cycle Spiral Model of American History and Culture: A- the Spiral of American History Diagram showing the six progressively shortening cycles B-A diagram showing the five phases in each cycle (1983

In this model each of its six cycles is characterized as a dialectical conflict between a "thesis" of "softer" values and themes (e.g. harmony with nature, community and feminism) which Wasserman associates with the native American Indians and an "antithesis" of "harder" values and themes (e.g. technology, capitalism, progress and colonization) which Wasserman associates with the European Puritans:

> Throughout the cycles of U.S. history, the belief (Indian 'thesis') in the indivisibility of human and natural spirits, the faith in community, toleration, open sexuality, and the rights of women have surfaced repeatedly in the awakened springtimes (of each cycle) of our national story...
> ...(Conversely) the disciplined, austere ways (of the European Puritan 'antithesis') laid the groundwork for American corporate capitalism, and the "trickle-down" theories that have dominated conservative economic thought. Their ceaseless search for confirmation of grace powered the conquest of a contient and a world empire... The Puritans' back-and-forth war with the softer ethos of native America has (thus) provided the motivating force behind the ever-shortening cycles of United States history. As those cycles spiral toward their peak... some sort of synthesis merging the cult of God the Father with the ancient societies of Mother Earth becomes a matter of pure survival (1983, p 18, 23).

As shown in Figure 17b, Wasserman views each of these six dialectical cycles as having five phases which roughly correspond to the seasons in the annual cycle: each of Wasserman's cycles starts with a "springtime" in which there is (i) a burst of progressive/Indian energy followed by (ii) an awakening of progressive/utopian idealism and activism; this is followed by a "summertime" in which the progressive Indian thesis and the conservative Puritan antithesis hotly conflict with one another and there is usually (iii) war; which is followed by a "fall" in which (iv) a conservative reaction sets in and a long "winter" of (v) aftermath in which the conservative Puritan antithesis dominates until a new burst of energy triggers the next cycle.

I found this model useful in tracing and analyzing the AT movements' roots in previous utopian periods or "awakenings" in America, and I'll refer to it again when I discuss these roots in Chapter 2[31].

The last and most recent of these helical/cyclical models of American culture, is

Arthur Schlesinger, Jr.'s model of the thirty years generational cycle in American politics described in the second chapter of his book The Cycles of American History (1986). Here, Schlesinger argued that there was a roughly thirty year cycle in American politics which involved an emphasis on progressive "public purpose" in its first half and then shifts to an emphssis on conservative "private interest" in its second half, as typlified in the twentieth century, for example, by the progressive period starting with Theodore Roosevelt in 1901, Franklin D. Roosevelt in 1933 and John F Kennedy in 1961 and the intervening conservative periods of the 1920s , the 1950s and the 1980s. Moreover, Schlesinger argued that the source of this political rhythm is generational in nature:

> ...it is the generational experience that serves as the mainspring of the political cycle...a generation's political life lasts about thirty years. Each generation spends its first fifteen years after coming of political age in challenging the generation already entrenched in power. Then the new generation comes to power itself for another fifteen, after which its policies pall and the generation coming up behind claims the succession...
> ...There is a feedback from the generation in power to the generation coming of political age, while in between an antagonistic generation clamors for change. Each new generation, when it attains power, tends to repudiate the work of the generation it has displaced and to reenact the ideals of its own formative days thirty years before (1986, p 29, 30).

Schlesinger also, however, adds a reservation about the limitations of this generational model, which is an appropriate caveat for all four of these American helical or cyclic models:

> ...There is no arithmetical inevitability in the generational sequence. A generation is a rough, not an exact, unit; almost a metaphor. Nor are the cycles involved the grandiose and immutable cycles beloved by Toynbee or Spengler. They are only fluctuations, rhythms, in the short-run politics of a single country. They may foreshadow but do not control the shape of things to come. Because the cycle is not a pendulum swinging between fixed points but a spiral, it admits novelties and therefore escapes determinism (and confounds prophecy)(1986, p 30-1).

As I reflected on the relevance of these four models to the present study, I began

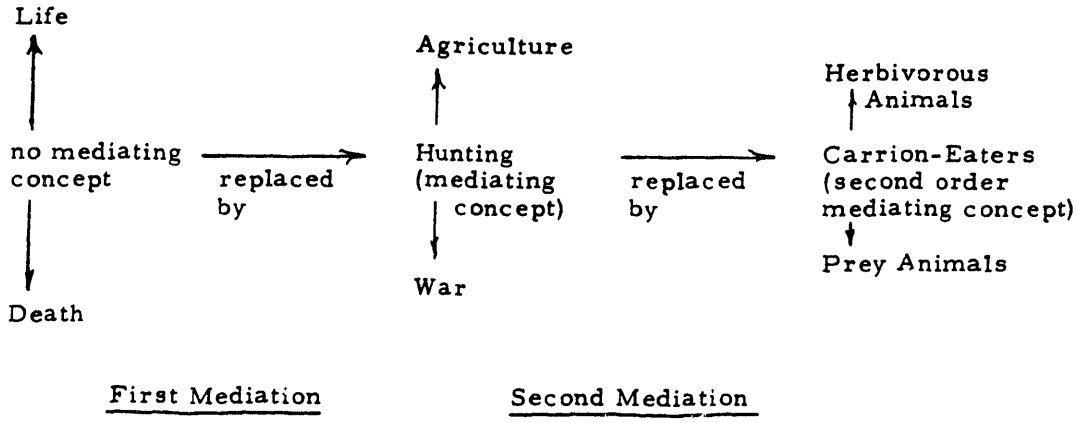


Figure 18: Levi-Strauss' Example of the Progressive Opposition and Mediation of Polar Themes (Life/Death, Agriculture/War) in the Myths and Culture of the Pueblo Indians (1955)

to think about how they might be related to Levi-Strauss' ideas about the opposition and progressive mediation of "polar themes and symbols" within cultures and their myths and rituals[32].

In his seminal essay, "The Structural Study of Myth" (1955), Levi-Strauss argued that the "mythic thought" of so-called 'primitive' cultures, "always works from the awareness of oppositions towards their progressive mediation (1955, p 99)." Figure 18 illustrates an example of such successive opposition and mediation from that essay, which Levi-Strauss drew from his "structural analysis" of the myths of the American Pueblo Indians. In this illustrative example of his ideas about progressive opposition and mediation of polar themes, he argued that on a "deep structural" level a sequence of these myths could be interpreted as a way of mediating between the polar opposites of "life" and "death" and hence lessening the fear of death. In this case, as frequently occurs in myths, the mediation was accomplished by first symbolically replace the polar opposites of life/death, for which there was no mediating theme or concept, with a similar pair of opposites, agriculture/war, for which a mediating concept, hunting, did

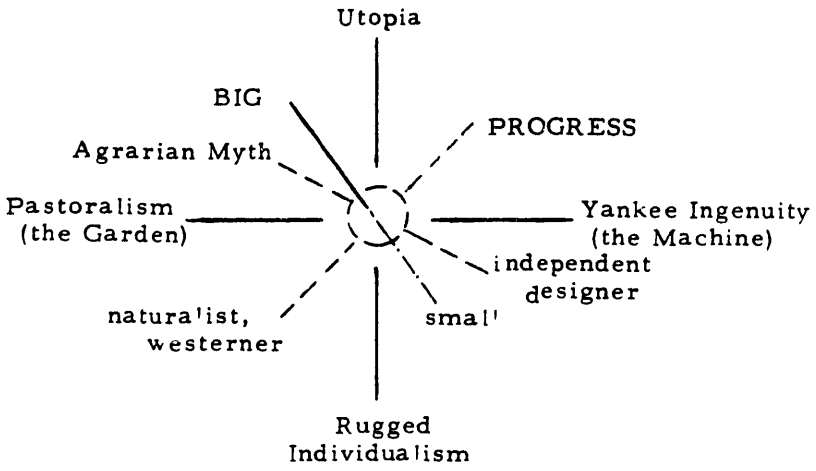


Fig.19:Traditional Polar and Mediating Themes and Values in America Diagramed Along Three Axes: (i) A Horizontal Nature-Science-Technology Axis Running From Pastoralism to Yankee Ingenuity; (ii) A Vertical Society-Individual Axis Running From Utopia to Rugged Individualism and (iii) An Axis Perpendicular To Page Showing Scale From BIG to small. Dotted Lines Connect Themes Which Mediate Polar Themes.

exist. Then, later in the myth sequence, the concepts of agriculture and hunting were themselves mediated by replacing them with the similar opposites of herbivorous animals/prey animals, which could then be mediated by the mediating category of carrion-eating animals, such as, the raven and coyote which are central characters in these myths. As Mary Douglas (1975) has pointed out, this model of polar opposition and mediation is essentially a dialectical one, with the polar themes or concepts being the "thesis" and "antithesis" and the mediating concept being the dialectical "synthesis". In resent years Levi-Strauss and others have sought to apply this model not only in the analysis of primitive myths and cultures but in the analysis of modern Western ones as well (see, for example, Leach, 1961; Petty, 1979; Wright, 1975).

Reflecting on how this notion of polar cultural themes and their opposition and mediation might relate to American culture and its historical evolution led me to develop the three dimensional diagram of polar and mediating Ameican themes shown in Figure 19.

In this diagram two pairings of important American polar cultural themes are shown on the horizonal and vertical axes. The vertical axis, inspired partly by Schlesinger's dialectic of "public purpose" vrs. "private interest" and by de Tocqueville's much earlier analysis of the tension between American democracy and individualism (1835), runs from the polar theme of social Utopia (e.g. the Republican ideal, democracy, utopian communities and movements) to the polar theme of Rugged Individualism . The horizonal axis, inspired partly by Wasserman's dialectic of softer Indian values and harder Puritan ones and by Marx' analysis of "pastoralism" and "the Machine" as American cultural ideals, runs from the polar theme of Pastoralism (e.g. America as New World Garden) to the polar theme of Yankee Ingenuity (e.g. American technology and the ideal of "the Machine"). Then, to these basic thematic axes, I added a third axis, coming out of the page to indicate scale (from BIG to small), because for each of the four polar themes there have existed large-scale and small-scale exemplars of the theme (e.g. for the Utopia pole there was the large scale vision of America as New World Republic or Utopia and the much smaller scale utopian communities and movements; in this and subsequent thematic diagrams, BIG themes will be shown in all capitals, Moderate themes with initial capitals, and small themes in all small letters).

As de Tocqueville (1835) and Marx (1964) have shown all four of these polar themes have been important aspects of the American character, but there has always been a certain amount of tension among them, particularly the Utopia/Rugged Individualism pair and the Pastoralism/Yankee Ingenuity pair which Wasserman's and Schlesinger's models suggest is a least partially responsible for the dialectical cycles and swings in American culture. In Levi-Strauss' terms, then, these periodic cycles can be view in part as efforts to mediate among these polar opposites. Out of these dialectical cycles, from time to time, new mediating cultural concepts, themes and symbols have emerged which have been able to mediate between two or more of these . A few of the more

important of these, such as, the theme of social PROGRESS, which mediated among Utopia, Yankee Ingenuity and Individualism; the Agrarian Myth, which mediated between Pastoralism and Utopia; and the naturalist (such as Johnny Appleseed or Henry David Thoreau or the American Indian), which mediated between Pastoralism and Individualism.

On a lesser scale I believe that certain cultural movements (e.g. transcendentalism, utopian community experiments, social Darwinism and utopian literature at the turn of the century) have also sought to find new themes and ways for mediating these polar themes. In this regard the AT movement can be seen as a recent effort to mediate among these four themes, especially the themes of Pastoralism and Yankee Ingenuity, which are the ones most out of balance in the present American culture. Accordingly, I will utilize the three dimensional polar thematic 'space' scheme and diagram depicted in Figure 19, in analyzing the themes of the AT movement and how they sought to mediate these polar American themes in Chapter 2.

Cultural Quests and Other Related Cultural Transitional Processes

Having briefly discussed theories and models of broad sequential cultural change in America (i.e. the type of change corresponding to the whole upper or cultural line of evolution in Figure 11) and how they might relate to the coevolution of meanings in cultural movements, I will now turn to a more detailed discussion of shorter term (i.e. the upper solid transitional cycle in Figure 11) cultural change and transitions, focusing particularly on my notion of "cultural quests" and other related cultural transitional processes/models and their role in the social evolution of cultural movements. As mentioned earlier, my metaphor of the AT movement as quest and my resulting cultural quest transitional process model played a crucial role in inspiring and ultimately leading to my whole coevolutionary approach for studying cultural movements.

When I first hit upon the insight that certain aspects, actions and processes within

the AT movement were "questlike," I didn't really know that much about the nature & characteristics of quests- I had only a vague sense of what it might mean for a phenomina to be "questlike"- so my first step was to read some of the literature on quest tales and myths in order to increase my understanding of the nature of quests. Particularly useful, in this regard, were W.H. Auden's essay, "The Quest Hero" (1968), and Joseph Campbell's classic work, The Hero with a Thousand Faces (1949)[33].

In his essay Auden stressed the exploratory nature of the quest, noting that:

> TO LOOK FOR A LOST COLLAR BUTTON IS NOT A TRUE QUEST: to go in quest means to look for something of which one has, as yet, no experience; one can imagine what it will be like but whether one's picture is true or false will be known only when one has found it (1968, p40).

He goes on to enumerate the following typical elements of a quest story:

> 1) A precious Object and/or Person to be found and possessed or married.
>
> 2) A long journey journey to find it, for its whereabouts are not originally known to the seekers.
>
> 3) A hero. The precious Object cannot be found by anyone, only the person who possesses the right qualities.
>
> 4) A test or series of Tests by which the unworthy are screened out, and the hero revealed.
>
> 5) The Guardians of the Object who must be overcome before it can be won.
>
> 6) The Helpers who with their knowledge and magical powers assist the hero (1968, p44).

Campbell in The Hero with a Thousand Faces showed how these typical elements and other typical events fit together into a three stage narrative structure or cycle, in which each stage was analogous to the stages found by anthropologist Van Gennep (1909) in tribal rites of passage. Campbell called this archetypal structure, "the monomyth", but I refer to it hereafter as the "quest cycle" (see my illustration in Figure 20):

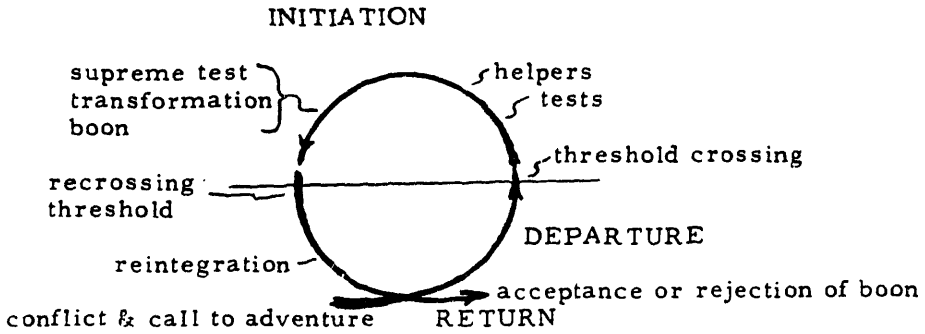


Figure 20: Diagram of Campbell's Quest Cycle

> The standard path of the mythological adventure of the hero is a magnification of the formula represented in the rites of passage: separation-initiation-return...A hero ventures forth from the world of common day into a region of supernatural wonder - fabulous forces are there encountered and a decisive victory is won - the hero comes back from this mysterious adventure with the power to bestow boons on his fellow man (1949, p30).

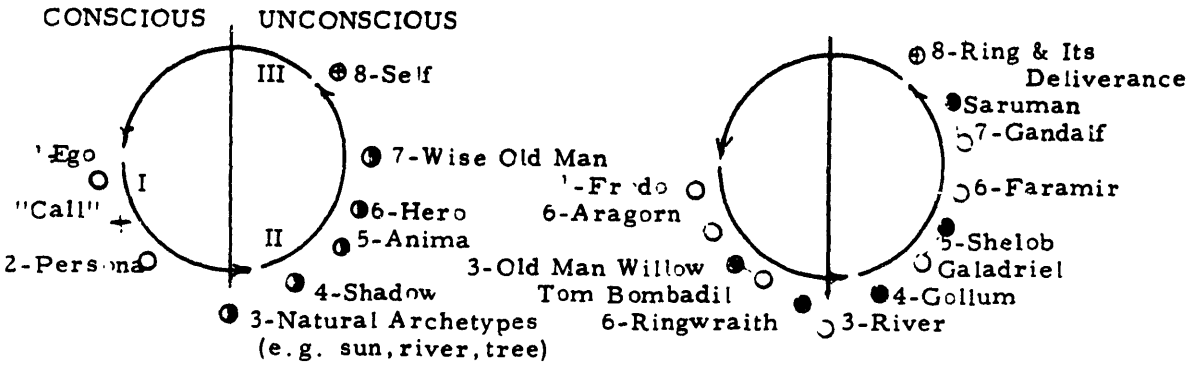
Campbell found that in each of these stages certain events typically occured. In the first stage of separation or departure, some conflict or problem usually arises in the hero's life or community and as a result he receives a "call to adventure" and leaves his home community and "crosses a threshold", a physical or symbolic barrier, such as, a river or mountain range, into a strange, often supernatural region. For example, he may enter a dark, mysterious forest or journey to a magical kingdom or cross over into the Land of the Dead.

In the second stage, initiation, the hero faces a series of "trials or tests" on his journey in the stange region- he may, for example, have to fight villians or a dragon or endure hardships like poverty and hunger. Often he is aided in these tests by mortal or supernatural "helpers" he meets along the way. Ultimately, he encounters a powerful "father and/or mother figure", such as a goddess, witch or king, and faces a "supreme test or ordeal", through which he is somehow "trans-

formed" and secures the "boon or precious object" he has been seeking. This boon or objective of the quest may be material (e.g. the Grail or a damsel's hand in marriage) or not, but in either case it usually symbolizes the acquisition of new individual and/or cultural wisdom or enlightenment on the part of the hero.

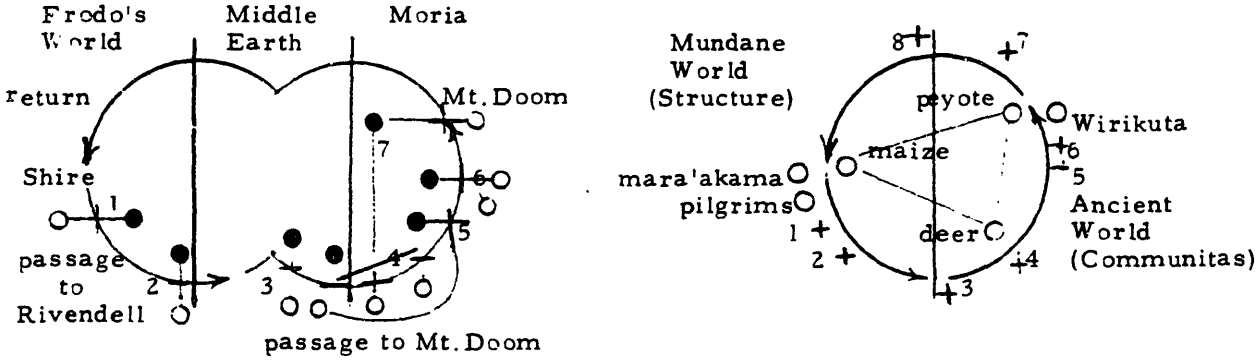
Finally, in the third stage of return, the quest cycle is completed with the hero "crossing back over the threshold" from the strange land and returning to his home community with his boon. Here, he undergoes an easy or difficult "reintegration" into his community, in which his boon is either accepted and he is praised and his community renewed or it is rejected and he distained.

I also found useful in clarifying the nature and structure of mythic and literary quests Jung and his students work on personal or psychological quests and the psychological meaning of quest tales (Jung, 1964; Whitmont, 1969; Hillman, 1983), Propp's pioneering work on the narrative structure and units of folk tales (1927) and Levi-Strauss' work on the deep stucture of myths (1955). Figure 21a depicts Jung's model or theory of "individuation" or self development as a personal quest in which various powerful collective symbols or "archetypes" are encountered and dealt with. Jung believed that myths and quest tales expressed and modeled in a symbolic fashion this personal journey of self discovery and development, and that the characters and symbols in these tales corresponded to and symbolized his collective "archetypes". Figure 21b, for example, depicts a Jungian or Archetypal interpertation of the character pairs in Tolkien's Lord of the Rings (developed from Grant, 1981; according to Jung each archetype had a 'light' and 'dark' side as indicated by the light/dark character pairings in the figure). Subsequently, through reading Propp and Levi-Strauss and related work on narrative and structural analysis (Petty, 1979; T. Turner, 1970; Wright, 1975; Alker, Lehnert and Schneider, 1984), I came to realize that not only are symbols and characters important in conveying the meaning of quests but also their narrative structure (which Campbell and Propp had analyzed) and their 'deep' or relational structure(which



A. Jung's Notion of Individuation or Self Development as an Inner Journey or Quest Facilitated by Universal Archetypes (circles): I-Departure from Consciousness, II-Self Discovery, and III-Reintegration of Ego and Self.

B. A Jungian or Archetypal Interpertation of Tolkien's Lord of the Rings (from Grant, 1981). Numbers are the archetypes in A which the Tolkien characters correspond to.



1 ● Old Man Willow	○ Tom Bombadil	+ rescue	1. knotting of rope symbolizing unity
2 ● Ringwraith	○ River	+ drowning	2. adoption of names and behavior of Ancient Ones
3 ● Balrog	○ Gandalf	+ fusion	3. inversion of meanings and actions
4 ● Boromir	○ Faramir	+ treachery, aid	4. hardships of journey
5 ● Shelob	○ Galadriel	+ killing	5. arrival at Wirikuta
6 ● Saruman	○ Treebeard, Gandalf	+ battle	6. gathering and eating of peyote
7 ● Gollum	○ Frodo	+ sparing, sacrifice	7. removal of all traces, new names
			8. unknoting of rope

C. Example From Petty's Analysis of Lord of the Ring, Which Combines Campbell's Quest Cycle with Levi-Strauss' Structural Analysis: Examples of Events Mediating Polar Symbols

D. Example of The Quest Cycle in a Social Quest: Myerhoff's Study of the Elements of the Peyote Hunt of the Huichol Indians

Figure 21: Illustrations of Psychological (A), Literary (B & C) and Ritualistic(D) Quests and Their Analysis: A- Jung's Quest of Self Development, B- Grant's Jungian Analysis of Tolkien's Quest Epic, C-Petty's Narrative/Structural Analysis of Tolkien, D-Myerhoff's Processual Symbolic Analysis of the Peyote Hunt Ritual.

Levi-Strauss had analyzed). This is illustrated, for example, in Petty's analysis of The Lord of the Rings, depicted in Figure 21, in which she went beyond analyzing symbols, by drawing on Levi-Strauss' and Propp's methods, to show how symbols/characters were placed in opposition to one another and then mediated through symbolic mediating events.

Having clarified the nature and structure of literary quests, I concluded that there were indeed a number of similarities between quests in literature and the AT movement, including the following ones:

* Both the movement and quests had a romantic quality or spirit.

* The prophets and pioneers of AT resembled quest heros in their character and action.

* The movement, like quests, involved a search for new meaning and values. Moreover, the values and meaning sought were both personal and cultural in nature.

* The movement, like quests, was exploratory: the nature and objectives of AT were vague at the outset and evolved over the course of the movement.

* The movement and quests were also both symbolic: the technologies and actions of the movement, like the actions and objects in quests, represented and symbolized deeper meanings, themes and values.

* Many activities in the movement and the movement as whole followed the quest cycle of departure-initiation-return: AT pioneers typically withdrew from mainstream American culture, experimented with and tested their ATs and then returned to the mainstream to promote AT and the values underlying it.

This led me to conclude that certain transitional processes within the AT movement and/or the movement as a whole resembled literary quests and I began to think of such transitional processes as social or cultural quests. I then began to explore how this notion of cultural quests compared with transitional processes which other scholars had identified and analyzed in cultures and cultural movements.

The first examples of other questlike processes in the real world, were certain cultural rituals, studied by anthropologists, which resembled quests, such as the rites of

passage studied
by van Gennep (1909); the Kula or ocean trading rituals of the Trobriand tribes of the Western Pacific, first studied by Malinowski (1922) and more recently treated as quests with psychological significance by Lorna McDougall (1975); the religious pilgrimages studied by Victor Turner (1974, Chapter 6; 1979); and the Peyote Hunt of the Huichol Indians of North Central Mexico studied by Barbara Myerhoff (1974, 1975), one of Victor Turner's students. These "quest rituals" were interesting, but they didn't seem that relevant to the AT movement, because the movement sought to change its culture rather than to reenforce it through ritual.

More relevant were Turner's analyses of social dramas in Western cultures (1974, Chapters 1-3), anthropologist Anthony Wallace's work on "revitalization movements" (1956) and Myerhoff's study of questlike behavior in the "counter-culture" (1972, 1975), because these were all movements or processes aimed at cultural change like the AT movement. Accordingly, I looked at how the notions of "social dramas", "revitalization movements" and "countercultures" might be related to my emerging notion of cultural quests as cultural transitional processes.

As already mentioned, Turner developed the notion of "social dramas" to describe "aharmonic" or nonroutine public clashes or conflicts among the Ndembu tribes he was studying which resembled plays or staged dramas (1957). In later work he showed that his social drama model could be useful in analyzing public conflicts and cultural change in Western cultures as well (1971; 1974, Chapters 2, 3).

Turner found that social dramas typically had four stages or acts: first there was a public breach, followed by period of mounting crisis, followed by efforts at redressive action to limit and resolve the crisis, followed by a final stage in which there is either a reintegration of the conflicting groups or the recognition of a irreparable schism. In the first stage, a dramatic public breach of some crucial norm regulating social relationships in some social system signals the start of a social drama. This breach reflects and comes to symbolize an underlying tension

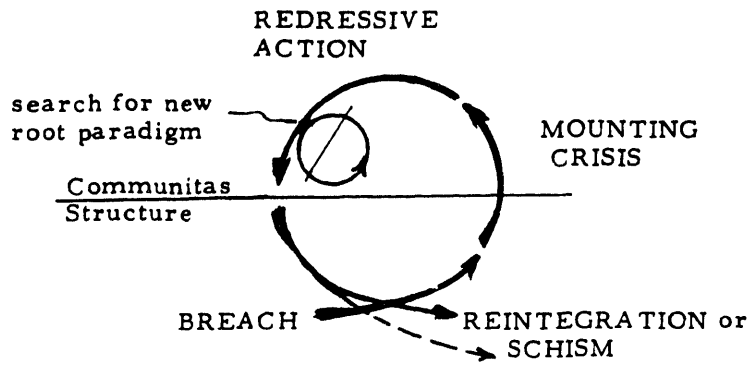


Figure 22: Diagram of Turner's Social Drama Model

or conflict among groups in the system and their beliefs.

Following the public breach, there is a stage of mounting crisis, during which, the public conflict tends to expand to include more issues and parties and to escalate into a struggle over fundamental cultural values. This struggle usually results from and is fought over some "fault line" or weak point in the cultural system of the parties in conflict. Following this escalation of the crisis, there is a stage in which various redressive actions are taken in an attempt to limit and/or resolve the conflict. Initially, these efforts focus on using the existing redressive mechanisms of the system, such as, personal mediation between the conflicting parties, legal action by authorities or ajudication of the dispute. If the conflict is over very fundamental values, however, these existing mechanisms may not resolve it, and in this case parties in the conflict may begin to search for new cultural models or what Turner calls "root paradigms" which might heal or lessen the cultural rift underlying the conflict:

> (These) cultural models in the heads of the main actors... have reference not only to the current state of social relationships existing or developing between actors, but also to the cultural goals, means, ideas, outlooks, currents of thought, patterns of belief, and so on, which enter into those relationships, interpret them, and incline them to alliance or divisiveness... Paradigms of this fundamental sort reach

> down to irreducible life stances of individuals, passing beneath conscious prehension to a fiduciary hold on what they sense to be axiomatic values, matters literally of life and death (1974, 64).

Turner also noted that both the crisis and redressive stages of drama had a "liminal" quality, like van Gennep found in the initiation phase of rites of passage (van Gennep 1909). That is, during these phases, participants have the sense of being "betwixt and between" and hence outside of the social structures and roles that normally govern their lives. This means that interactions are less governed by social structure and norms and there's more opportunity for people to related in a more organic, less structured way, where there's a sense of community and oneness. This way of relating, which is more direct, undifferentiated, and equalitarian than when behavior is governed by social structure and roles, Turner calls "communitas" (1969, 1974). Communitas occurs often in the liminal phases of rituals, such as, the initiation phase of rites of passage and on religious pilgrimages, and may occur in some social dramas, although it's less likely here because of the existence of conflict and the fact that behavior is still bracketed by social structure and norms, even though these may be weakened.

If the redressive mechanisms employed succeed in resolving the crisis or a new root paradigm is found and adopted which mediates or heals the underlying cultural rift, then in the final stage the conflicting parties are <u>reintegrated</u> back into their social system and the wounds caused by the conflict are gradually healed. Otherwise, if the crisis can't be resolved, a permanent <u>schism</u> occurs in which one or more of the warring parties may leave the social system (be it village, community, organization, or nation) and form one of their own or may form a new sub- or counter- culture within the system (Turner, 1957; 1974, p37-41).

I was immediately struck by how much this pattern of social dramas found by Turner resembled the quest cycle found by Campbell in myths (compare Figures

2 and 3); with the breach stage of the former roughly corresponding to the departure stage of the quest, its crisis and redressive stages corresponding to the quest's initiation stage, and its reintegration stage corresponding to the return in the quest. A significant different, however, between the social drama and the quest is that in a drama the actors stay in their community, whereas in the quest the hero leaves his community (physically and symbolically) and then later returns. I reasoned that there were probably actual "processual units" or social processes like social dramas, but in which one or more of the actors, physically or symbolically, left the community to search for new ideas or a new root paradigm and later returned like the quest hero. Moreover, I thought such "questlike" units would be likely to occur between the redressive and reintegrative phases of social dramas, when the failure of existing redressive mechanisms and the lack of an immediately apparent new mediating paradigm would "trigger" a deeper and longer search or quest for new personal and/or cultural paradigms. I had, in fact, already observed such patterns in the AT movement, which was what had led me to my AT as quest metaphor in the first place, so I began refering to such processes or processual units as "cultural quests" to empasize the fact that they involved searches for new cultural meanings and paradigms.

In cases where social dramas and cultural quests intermesh, which I expected to frequently occur, the cultural quest could be view as part of an ongoing social drama or, alternatively, the cultural quest might be seen as having a social drama as part of its departure stage and another drama as part of its return phase.

Furthermore, I decided that even the cases described by Turner in which individuals or groups found a new root metaphor without leaving their community involved a departure (from their old paradigm) and quest of sorts, though not a fulfledged cultural quest, and, therefore, I began thinking of these short duration

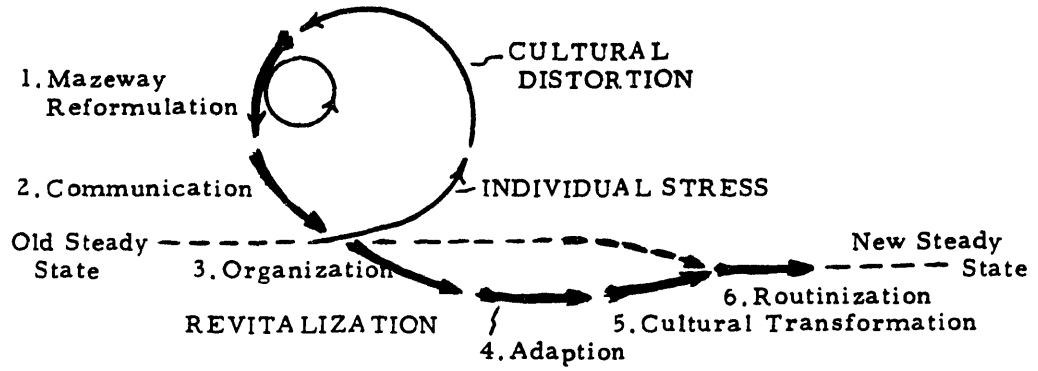


Figure23: Wallace's Model of Revitalization Movements

individual cognitive searches as "microquests". A number of such microquests, I believed, might occur prior to and during a cultural quest.

My notion of "cultural quests" was also inspired by and complementary to Anthony Wallace's notion of "revitalization movements". Wallace developed this notion to refer to a range of "deliberate, organized, conscious efforts by members of a society to construct a more satisfying culture":

> Revitalization is thus, from a cultural standpoint, a special kind of culture change phenomina: the persons involved in the process of revitalization must perceive their culture, or some major areas of it, as a system... they must feel that this cultural system is unsatisfactory; and they must innovate not merely discrete items, but a new cultural system, specifying new relatioships as well as, in some cases, new traits (1956, p265).

He included under this rubric cultural phenomina, such as, nativistic movements, cargo cults, religious sect formation, religious revivals, messianic movements, charismatic movements, utopian community formation and cultural revolutions.

Wallace argued that all such movements are characterized by a five stage revitalization process: Before revitalization begins, there exists a cultural Steady State, in which the culture does reasonably well in satisfying individual needs and

stress is minimized; this equilibrium is periodically disruted, however, by a Period of Individual Stress, during which members of the culture experience increasingly severe stress, which the cultures stress reduction mechanisms fail to relieve; this, in turn, triggers a Period of Cultural Distortion, in which social norms and relationships are stressed and warped to the breaking point; this brings on the Period of Revitalization, itself, during which a movement emerges which conceives and promotes new cultural codes or paradigms, what Wallace calls "mazeways"; and, finally, if the revitalization movement is sucessful, its new codes and paradigms replace or are incorporated into the old cultural system and a New Steady State emerges.

Wallace further divides the Period of Revitalization into six major tasks or substages: 1. mazeway reformulation, 2. communication, 3. organization, 4. adaptation, 5. cultural transformation and 6. routinization.

He defines "mazeways" as the models or mental images that members of a culture have of their culture and society and their place within it:

> The mazeway is nature, society, culture, personality, and body image, as seen by one person... Changing the mazeway involves changing the total Gestalt of his image of self, society, and culture, of nature and body, and of ways of action. It may also be necessary to make changes in the "real" system in order to bring mazeway and "reality" into congruence. The effort to work a change in mazeway and "real" system together so as to permit more effective stress reduction is the effort at revitalization; and the collaboration of a number of persons in such an effort is called a revitalization movement (1956, p266-7).

This notion is similar to Turner's concept of root paradigms.

Wallace found that mazeway reformulation usually involved the "restructuring of elements and subsystems which have already attained currency in the society", but that their combination into a coherent structure, which could then act as a model or guide for action, typically occured in abrupt and dramatic fashion in the mind of one individual, the prophet of the movement, through a flash of inspiration or one or more

dreams or hallucinatory visions. In many cases, for example, "a supernatural being appears to the prophet-to-be (in a dream or vision), explains his own and his society's troubles as being entirely or partly a result of the violation of certain rules, and promises individual and social revitalization if the injunctions are followed and (certain) rituals practiced" (1956, p270).

I noticed that this process of mazeway formulation was similar to the search for new root paradigms in social dramas, which Turner had described and which I had begun to think of as a "microquest".

Following mazeway reformulation, the prophet endeavors to preach or communicate his new vision to potential followers. If this is successful, converts are made and the prophet and his followers begin to organize a movement, with its own system of rules, relationships and institutions, to promote their vision. As the movement grows and comes into conflict with the present social order, it may adapt its original vision and its strategies and organization somewhat to become more effective in promoting its message. If the movement is successful, then the dominant culture is eventually, either wholly or partially, transformed by the movement, accepting all or part of its new codes and mazeway. This newly transformed cultural system is then assimilated or routinized into the day to day life of the society and a new cultural equillibrium or steady state emerges.

I found Wallace's model of cultural change through revitalization movements very appealing. Certainly, the AT movement could be viewed as a revitalization movement aimed at revitalizing American science and technology. Unlike the "social movement" framework, which I'd previously tried out, Wallace's model focused on broad cultural changes rather than specific changes in social institutions; and, I also liked the way Wallace stressed the role of the individual in cultural movements. I felt, however, that the AT movement, particularly in its early stages, like other intellectual movements, such as, the evolution of new "schools" of art

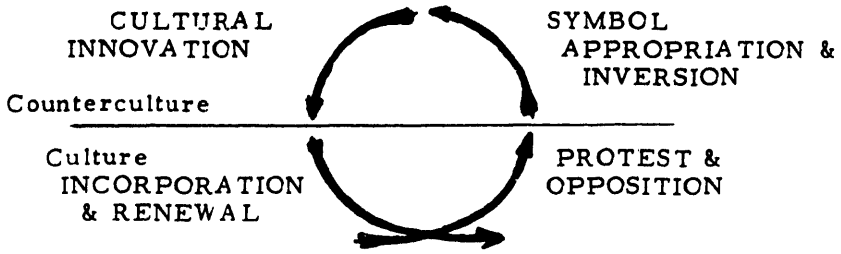


Figure 24: The Cycle of Cultural Change Through Counter-Culture Formation and Assimilation

and new disciplines of study, was more exploratory than the way Wallace had characterized revitalization movements. There was not one prophet of AT but many, and their ideas and "mazeways" or paradigms evolved and coevolved with one another slowly over time rather than in a single flash of inspiration. As with Turner's social drama model, I decided that revitalization movements were related to, but not the same as, my notion of cultural quests. I felt, in fact, that all three of these processual units-dramas, quests, and movements- were likely to occur together in periods of cultural change and within cultural movements. Typically, for example, a serious social drama or series of dramas, which couldn't be resolved by existing means, might trigger one or more cultural quests in search of new paradigms or mazeways, which, if successful, might, in turn, inspire one or more revitalization movements to promote the new paradigms or mazeways discovered through the quest or quests. And, finally, this movement or movements, as it clashed with the established culture, might trigger new social dramas which either lead to assimilation and cultural transformation or a new round of quests and movements.

The third major model of cultural change I looked at while developing my notion of cultural quests was the concept of "countercultures" and their role in cultural change. The historian Theodore Roszak coined the term "counter culture" to refer to the youthful opposition to America's increasingly "technocratic" society, which

emerged in the 60's (Roszak, 1968). Subsequently, social scientists found the notion of "countercultures" useful in examining a number of cultural phenomina. The sociologist J Milton Yinger , in his seminal book Countercultures : The Promise and the Peril of a World Turned Upside Down (1982), defined a counterculture as an alternative blueprint for living or system of guidelines and values, developed in opposition to the blueprint and guidelines of the dominant culture:

> Counterculture is all those situationally created designs for living formed in contexts of high anomie and intrasocietal conflict, the designs being inversions of, in sharp opposition to, the historically crested designs (of the dominant culture)(1982).

Note that, defined in this way, countercultures fit nicely with Greetz' notion of cultures as systems of meanings, countercultures simply being alternative systems of meanings or designs, in which the meanings and designs of the dominant culture are inverted or opposed. Yinger argued that the best way to characterize countercultures was in terms of how they opposed traditional views of what was true, what was good and what was beautiful, that is, in terms of their counter- epistemologies, ethics, and aesthetics. "No sets of values and norms better characterize a culture, no more clearly distinguish it from other cultures", he wrote, "than those which affirm: This is the truth, and this is the way we know the truth; this is good, which has been shown to us in these ways; and this is beautiful, made evident by the application of these basic standards (1982)."

Yinger also characterized countercultures by the pattern of actions typical of their members, finding that countercultures typically exhibited one or a mix of the following three patterns:

1. a mystical or bohemian search for insight and new experience.
2. a withdrawal into a protected community, where values are purified.
3. an active attack on the dominant culture, its values and its institutions.

Note how these patterns resemble those in a quest, with the first two coresponding to the departure and initiation stages and the third to the return stage.

Yinger stressed the role of countercultures as "engines" or vehicles for social and cultural change (1982, Chapter 14). His work along with that of other social scientists, including Willis' work on the appropriation of cultural symbols and artifacts by subcultures in England (1978), O'Keefe's work on the cultural dialectic between religion and magic (1982), Berger, et.al., work on modernity and demodernization movements (1974) and Turner and his students' work on communitas and symbolic invertion in the Counter Culture of the 60's (Turner, 1974, p261-270, 1969, p 112-3; Myerhoff, 1972, 1975; Moore and Myerhoff, 1975; Babcock, 1978), suggest there is a typical pattern or dialectic, through which the periodic formation, evolution and assimilation of countercultures results in cultural change and renewal within an ongoing society. This pattern, which I'll call the "culture/counterculture dialectic or cycle", typically has four stages (see Figure24): (1) first, a group emerges to protest and oppose certain actions of a society and the values on which those actions are based; (2) that group, then, appropriates for its own use some of the symbols and artifacts of the dominant culture but alters or inverts their meanings to reflect their own alternative values, thus, creating an embryonic counterculture or alternative system of meanings; (3) over time, as its embryonic system evolves, the group goes beyond simply appropriating and inverting symbols and meanings from the dominant culture to create its own innovative symbols, designs, and cultural artifacts; and (4) eventually some of these new meanings, designs and artifacts may be incorporated or assimilated by the dominant culture, transforming and/or revitalizing it .

Again, as with social dramas and revitalization movements, I found the notion of countercultures and their role in cultural change useful in clarifying my thinking about cultural quests and the AT movement. Here, I decided, was a fourth cultural

unit or entity which might be expected to occur in conjunction with dramas, quests and movements during periods of cultural conflict and change. Embryonic countercultures or alternative systems of meanings, for example, might evolve during cultural quests or within revitalization movements and then become established as temporary or longlived countercultures within the society. Or, alternately, an already existing counterculture might give birth to a number of quests in search of new meanings and one or more revitalization movements promoting its alternative meanings and values. In any case, the culture/counterculture dialectic or cycle seemed to fit the overall process of change, whatever particular combination of dramas, quests, movements and countercultures might be involved.

The AT movement or quest, in particular, seemed to grow out of and be inspired by the countercultural impulses and groups of the 60's (what Roszak called the Counter Culture, but was really a loose collection of a variety of countercultural ideas and activities), and over its course it began to evolve its own countercultural or alternative system of meanings around new and dormant cultural themes, but the movement waned before it was able to fully complete this task.

From this examination of the transitional cultural processes/models of social dramas, revitalization movements and counterculture formation and their relevance to my emerging concept of cultural quests, I concluded that all four of these were related but distinctive cultural transitional processes, which might be expected to appear and work in conjunction with one another during periods of cultural change and within new cultural movements.

I also concluded that cultual quests, like other cultural forms and processes, such as, myths, rituals, dramas and revitalization processes, were likely to be part of larger systems of related quests and other relevance cultural processes and forms. I, accordingly, began to think of these larger ensembles of quests and related cultural

processes and forms as "quest systems". Quest systems were thus viewed as providing the overall context or framework within which similar individual and collective cultural quests and related activities took place.

Figure 25 shows the model of cultural quests and quest systems as cultural transitional processes that eventually congealed out of my ideas about cultural quests and their relationship to other cultural transitional processes. It depicts the typical stages and transitional processes involved in the evolution of cultural quests and quest systems. The solid line of transitional loops across the top of the figure shows the simplist type of cultural quest, in which a single social drama/cultural crisis triggers a single cultural quest. The additional dotted lines and transitional loops depict the more typical case, in which a number of related social dramas and quests evolve together within the context of a larger quest system.

In either the simple or complex case, the flow of action is from left to right, following stages analogous to those found by Campbell in quest tales, i.e., departure (A), followed by initiation (B), followed by return (C and D). In the simple single quest case, a cultural quest is triggered by a serious social drama or cultural crisis (A), in which existing redressive mechanisms fail to resolve the cultural conflict and a new mediating paradigm or mazeway cannot be quickly identified. This sets the stage for the cultural quest proper (B). The failure to resolve the conflict eventually causes one or more actors to physically and/or symbolically "depart" from the conflicting community and begin a quest or search for a new cultural paradigm or mazeway which will resolve the conflict and heal the community. Such a quest will usually begin with an initial microquest, in which the actor (or actors) receives a "call" to undertake the quest and/or some premonition of what an alternative paradigm or mazeway might look like. This is followed by a series of exploratory, intellectual "adventures" or microquests, during which the quester (or questers) gradually forges a new

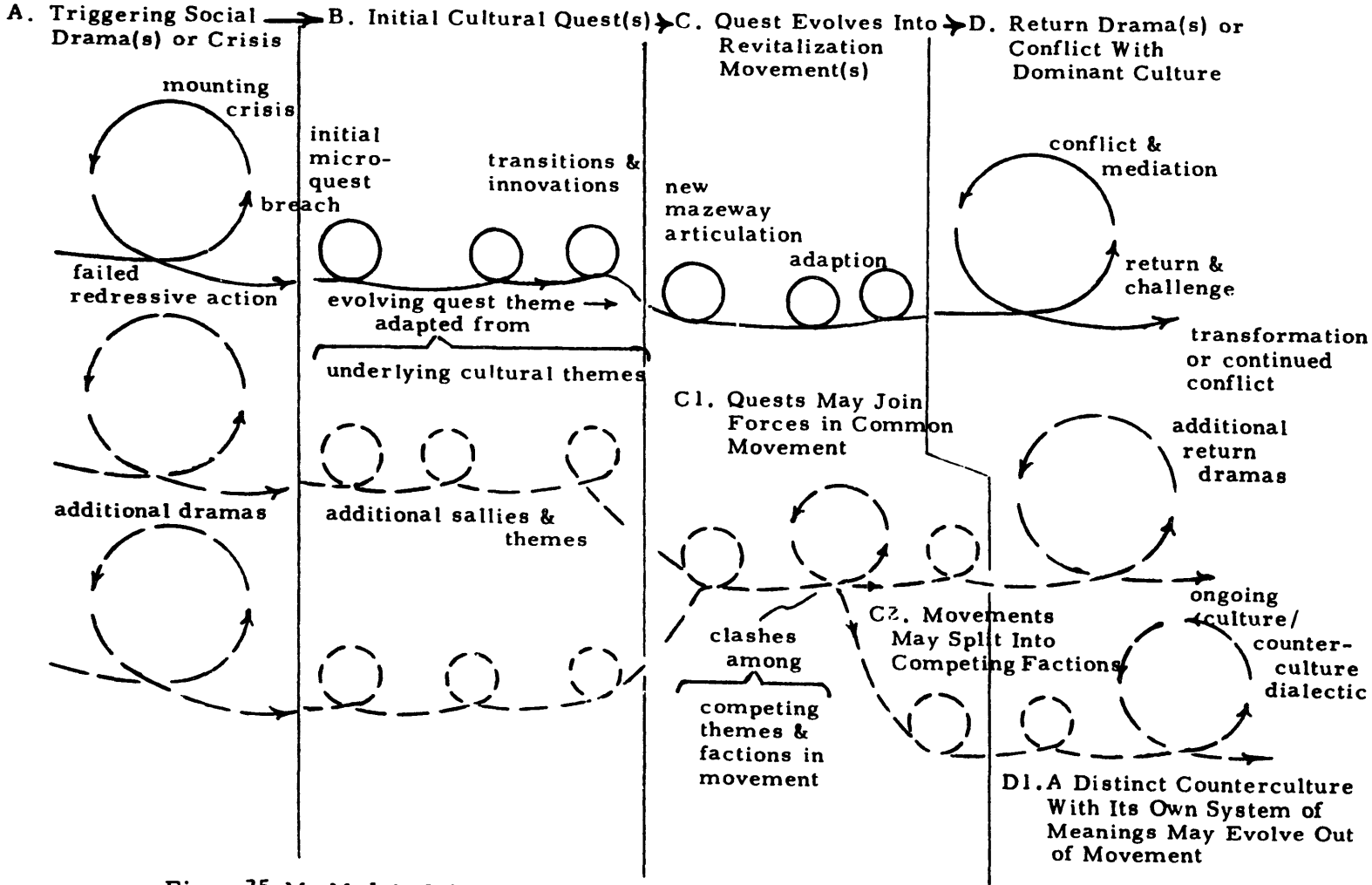
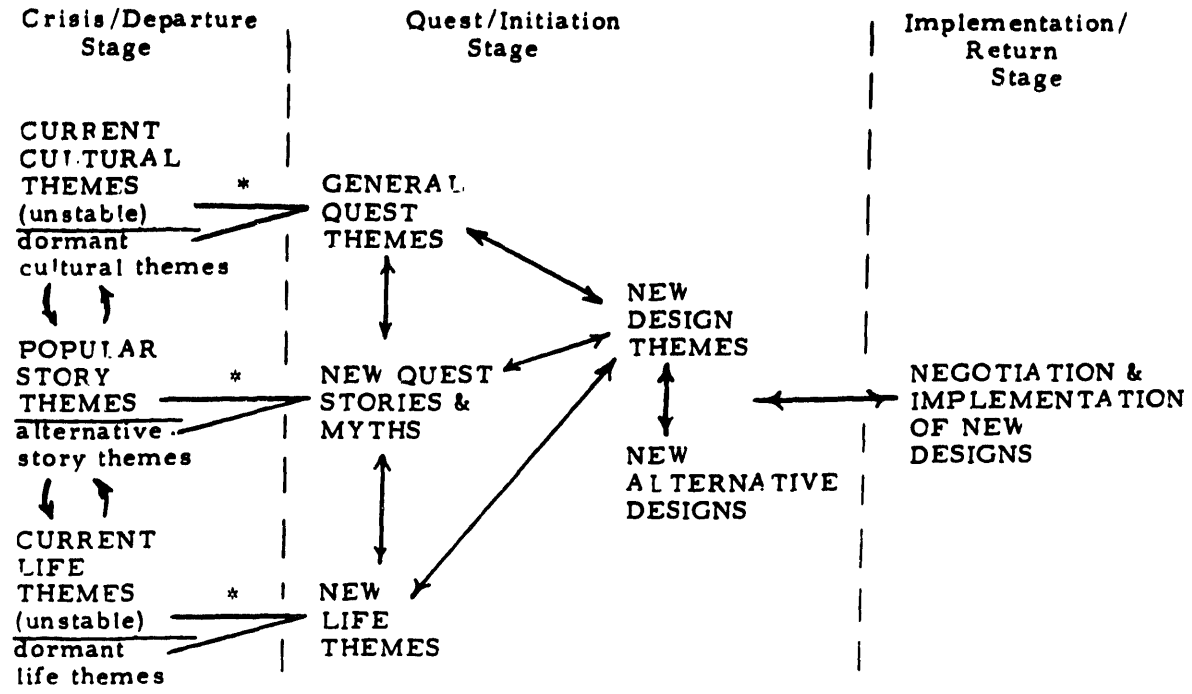


Figure25: My Model of the Evolution of Cultural Quests and Quest Systems

tentative paradigm or mazeway out of pieces adapted from older underlying or dormant cultural themes. The quest itself and what occurs during it often becomes part of the new mazeway, as in the case of the founding myths of new religions, such as, Prince Sakyamuni's quest to become the Buddha (Campbell, 1949, p31-4). Once a tentative new paradigm or mazeway is formulated and articulated, it is brought back to the conflicting community by the quester and may be organized to promote it (C). At first, this movement will likely be rather tentative and exploratory and its mazeway may undergo additional innovations and adaptions, but over time it will become more firmly structured and organized. When this new movement grows large enough to actively promote its new mazeway as the solution to the community's conflict, it will clash with the established social order and a new social drama of return will ensue, in which the values and meanings of the community's existing cultural system are challenged by those in the new mazeway (D). This drama or clash may result in the mazeway successfully challenging and replacing portions of the existing cultural system, thus causing a dramatic cultural transformation; or some parts of the mazeway may be integrated into the existing cultural system, causing some less drastic cultural transformation; or the conflicting parties may again fail to resolve the conflict, triggering a new round of dramas, quests and movements.

In the more typical case (whole of figure), several related lines of development or quests are involved rather than just one. In this case, a number of serious social dramas in different parts or at different levels of a society (A) trigger an ensemble or quest system of quests and related structures and processes. These unresolved dramas cause a number of actors or groups to undertake a series of distinctive but similar quests or sallies, either in parallel or serially (B). Over time, these quests evolve a number of new themes, which serve to guide further quests and from which new paradigms or mazeways may evolve. Two or more of these quests may come to-



*search for new themes; inversion and adaption of existing themes

Figure26: The Coevolution of New Cultural, Story, Life and Design Themes During Cultural Quests

gether, integrating their themes into a common mazeway and forming a joint revitalization movement (C1). Such movements may have conflicting factions which emphasize alternative themes, and as a result of these competing factions the movement may eventually split into different revitalization movements (C2). Finally, if one or more of the resulting movements fail to transform the parent culture, one or more counter-cultures may form out of the movement(s) and seek to transform its parent culture through an ongoing culture/counterculture dialectical change process (D1).

Just as my notion of coevolving meaning systems and the method of coevolving thematic analysis which grew out of it together constitute my approach for analyzing the meanings and meaning systems of coevolving cultural movements, this cultural quest model and the method of cultural transitional process analysis suggested by it,

which I'll refer to as "cultural quest analysis", make up my approach for analyzing the social/cultural processes and transitions out of which cultural movements emerge and the processes and transitions within cultural movements themselves, both of which typically resemble the evolution of cultural quests as depicted in Figure 25.

These two approaches and methods of analysis are complementary components of my larger coevolutionary approach, with coevolving thematic analysis providing answers to my first, third and fifth key questions and cultural quest analysis mainly addressing my second key question (cultural continuity and change). Figure 26 illustrates how these models and corresponding methods of analysis are viewed as being related and complementary to one another. In my coevolutionary approach, cultural quests and quest systems and related transitional processes (i.e. social dramas, revitalization, microquests and counterculture formation) are viewed as the main socio-cultural vehicles or processes through which the coevolution of new meanings is carried out within cultural movements. Cultural quests and quest systems, with their pattern of departure-initiation-return, thus, provide the social or processual context or script within which new cultural and personal themes and new stories and designs emerge and coevolve together as depicted in Figure 26. Here the coevolution of new themes and meanings (as depicted in Figure 11) is related to the stages of cultural quests (as depicted in Figure 25). In the crisis/departure stage of the quest process, the current cultural themes, story themes and predominate life themes in the parent culture, which have reenfored each other in the past, become unstable and no longer able to satisfactorily guide and structure life in that culture. This triggers one or more cultural quests for new themes and meanings, which in the cases we're interested in quickly evolves into a new cultural movement with its own quest system. In the initiation stage of the quests, which are now part of a larger quest system and cultural movement, new general quest/movement themes, quest/movement stories, and life/creative themes emerge and coevolve together and, in turn, inspire new design

themes and alternative designs and cultural products. Finally, during the stage of return, the new designs and products and the themes embodied in them are promoted and advocated by the questers/movement to their parent culture and a process of initial conflict, usually followed by negotiation and some incorporation and implementation of the new designs and themes into the parent culture ensues.

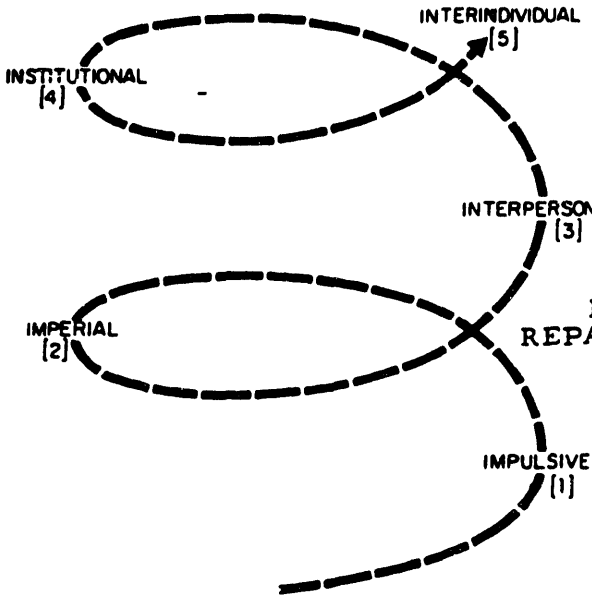
In Chapter 2 I'll analyze the transitional processes and evolution of the AT movement as an emerging quest system and I'll show how this system of quest processes and related activities was the processual vehicle for triggering and promoting the new coevolving themes, meanings and designs of the movement.

The Coevolution of Creative Lives, Designs and Cultural Movements

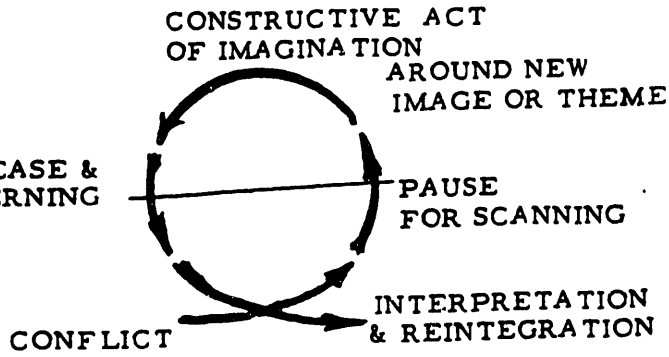
In the previous two sections, I have focused mainly on the top two types of meaning change in Figure 10- those having to do with transitional and longer term changes in cultural system. This concentration is appropriate, in that, in my subsequent analysis of the AT movement in America, I will also focus on the cultural dynamics of the movement and its relationship to longer term cultural changes in America. In the last few pages of this chapter, however, I want to touch on the other four types of meaning change in Figure 10 and how they coevolve with cultural system changes.

Figure 27 shows some recent models of personal/creative transformation analogous to the models of cultural transformation described in the previous two sections. Figure 27a shows Robert Kegan's helical model of the five structural stages of meaning-making and self organization that he found in typical lives (Kegan, 1982). This and similar models of stage and helical self development (see also Fowler, 1981) are analogous, on the personal level, to the cyclic, stage, and helical theories of cultural change and development

Fig 27 Relevant Models of Personal/Creative Change

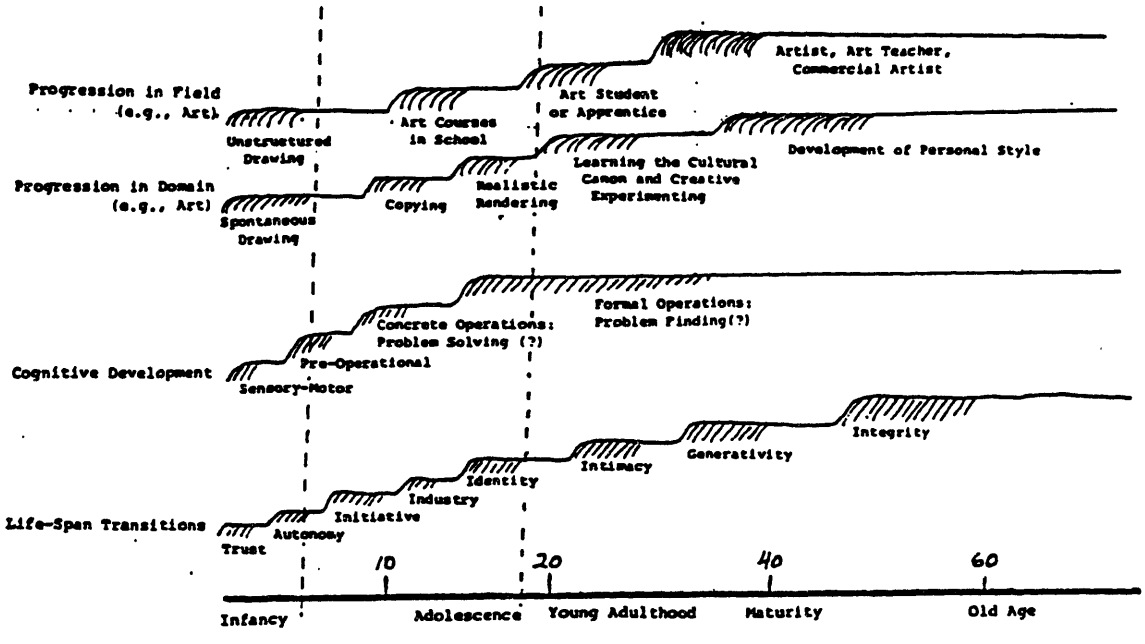


A- Kegan's Helix Diagram of His Macro Model of the Five Structural Stages in Self Evolution



B- Loder's Micro Model of the Steps in Personal Knowledge Transformation ('Knowing Events')

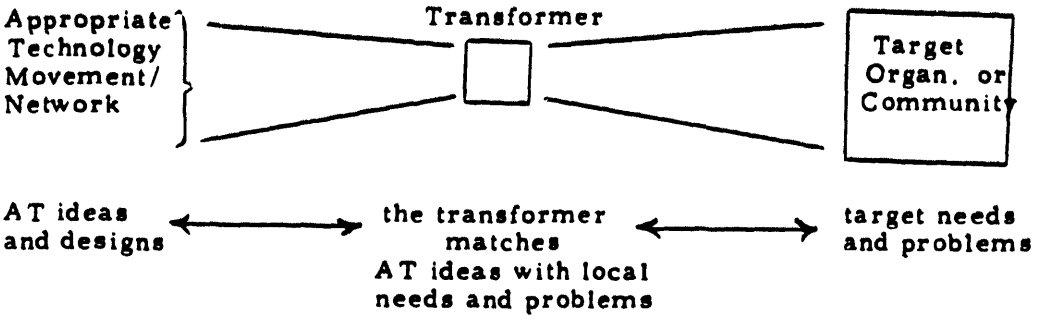
C- Csikszentmihalyi's Macro Multi-level Model of Different Stages and Levels in the Evolution of Creative Lives (e.g. Artists)



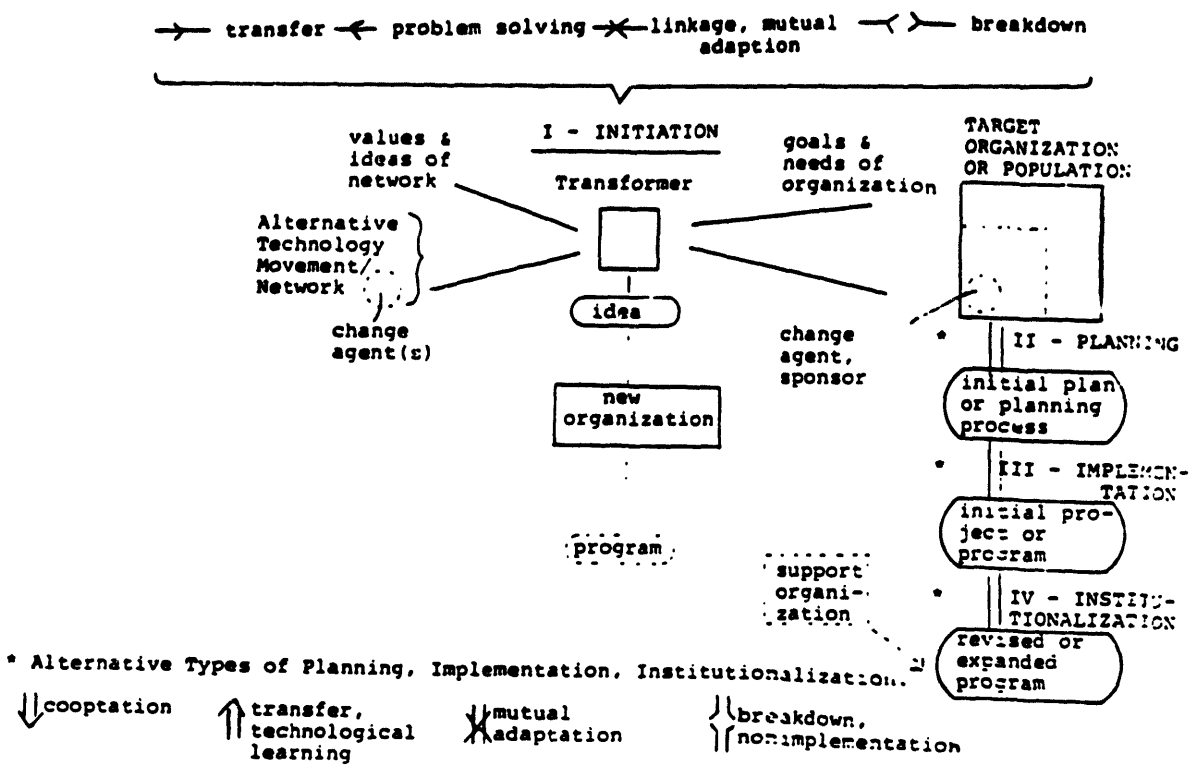
previously discussed. Similarly,Figure 27b shows a shorter term, transitional model of personal transformation- Loder's model of the steps or stages in personal knowledge transformation (1981)- analogous to the transitional cultural models discussed in the previous section. Lastly,Figure 27c shows Csikszentmihalyi and Robinson's multi-level model(1984) of the different stages in the evolution of creative lives,which begins to suggest the interaction and coevolution between creative personal change (lower levels in Figure) and cultural change (higher levels). In the future I hope further explore and clarify the relationship among these analogous models of transitional and sequential change on the personal and cultural levels. This,however,is become the scope of this present study.

Turning lastly to the lowest level of change categories in Figure 10,that of transitional and sequential changes in personal and cultural designs,Figure 28 illustrates a model of AT design/ innovation,which I adapted from the literature on innovation (particularly Havelock's linkage model of innovation (1969) and Berman and McLaughlin's model of the stages in the implementation of innovations) and design research (particularly Habraken (1985) and Schon's (1979,1983) work on the evolution of designs). Central to this model is the notion of an AT 'transformer',that is,a person who acts as a link between the AT movement/community and its innovative ideas and designs and a specific organization or community in which some of these ideas/designs might be implemented.

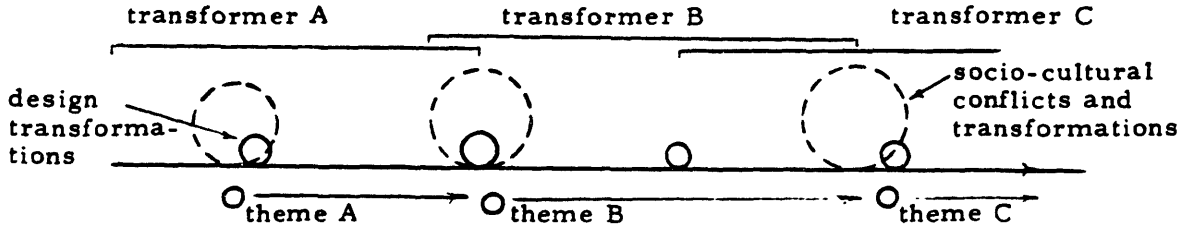
Figure 28a depicts this basic concept of the role of the AT transformer in linking or mediating between the AT community/culture and a potential new target group (adapted from Havelock,1969).



A. The Concept of a Transformer Adapted From Havelock



B. Structural Diagram of the Four Stages in AT Innovation



C. Transformational Diagram of AT Innovation

Figure 28: Elements of A Model of the Process of AT Innovation

Figure 28b,then,depicts the typical stages in the evolution of AT innovations-i.initiation,ii.planning,iii.implementation,and iv.institutionalization- and the alternative types of process that can characterize each of these stages (e.g.transfer,problem solving, linkage,cooptation,adaption) (adapted from Berman and McLaughlin, 1978). Lastly,Figure 28c depicts the sequential series of design and larger sociocultural transformations that characterize the AT innovation process (adapted from Habraken,1982,1985). In Chapter 4 I'll utilize this AT transformer model in analyzing the evolution of the National Center for Appropriate Technology (NCAT) and four local pioneering community technology development efforts in San Bernardino,Chicago,Eugene and Seattle.

The last four elements of my coevolutionary approach enumerated at the beginning of this chapter- on the role of intellectual marriages and families in cultural movements,the interaction of design themes/systems and the products of movements,and the nature of political and ideological conflicts within movements and between movements and their parent cultures- will be illustrated through the case study of the coevolution of the New Alchemists and their bioshelter designs in Chapter 3. In the future I hope to be able to develop these elements in more detail and apply them,along with the rest of my approach,to other contemporary cultural movements.

Chapter 2. Planting Some Trees:

The Roots and Emergence of the AT Movement in America

All my life has been a journey of discovery of the generosity of nature... Traveling through India, I came to the conclusion that there was no salvation for India except through trees... By means of trees, wild life could be conserved, pollution deceased, and the beauty of many landscapes enhanced. This is the way, or at least one of the ways, to spiritual, moral and cultural regeneration.

-E.F. Schumacher

To bring the sun, wind, earth, indeed the world of life, back into technology, into the means of human survival, would represent a revolutionary renewal of man's ties to nature.

-Murray Bookchin, "Towards a Liberatory Technology"

I have chosen "convivial"... to designate a modern society of responsibly limited tools... Such a society, in which modern technology serve politically interrelated individuals rather than managers, I will call "convivial".

-Ivan Illich, Tools for Conviviality

(The Coming) Planetary culture is neither world-denying mysticism nor world-destroying materialism; it is a Pythagorean synthesis of science, art, and religion; it is economics and ecstasy, preindustrial magic and postindustrial technology, myth and history: in short, it is an embodiment of transcendence.

-William Irwin Thompson,
Passages About Earth

(I) propose a new way of thinking about ideas and about those aggregates of ideas which I call "minds." This way of thinking I call the "ecology of mind", or the ecology of ideas.

-Gregory Bateson,
Steps To An Ecology of Mind

The real cycle you're working on is a cycle called "yourself."

-Robert Pirsig,
Zen and the Art of Motorcycle Maintainance

In early 1977, at a time when interest in AT was really mushrooming in America, Fritz Schumacher made an exhausive 42-day lecture tour of the U.S., crisscrossing

the country from New York to California to spread his gospel of small technology and home coming to audiences totaling over 60,000 people (Schumacher, 1979). This journey culminated in a private meeting with President Jimmy Carter, in which the president, an enthusiastic supporter of the notion of AT, ask Schumacher what else his administration could do to promote the notion. Fritz replied, enigmatically, "Plant a tree."

In so doing, Schumacher seemed to be suggesting in a playful way that Carter should "plant" or help foster the kind of root intellectual ideas or "trees" which Schumacher and the other prophets of AT, including Bookchin, Illich, Thompson, Pirsig, and Bateson, had planted in the early 70's and which had subsequently grown into the "forest" or ecology of intellectual ideas, themes and designs known as the AT movement.

In this chapter, I'll briefly discuss the roots of these "trees" of the AT movement in earlier transformational themes and periods in America and how they re-emerged out of the reformational cultural ecology of the '60's' and grew into the AT movement. Then I'll describe how these themes and impulses of the '60's' inspired four related, but distinctive, cultural quests in America-the quest for renewable/alternative energy, the quest for ecological shelters and homesteads, the quest for an ecological or convivial culture, and the quest for community technology development- which collectively coevolved into the ATmovement.

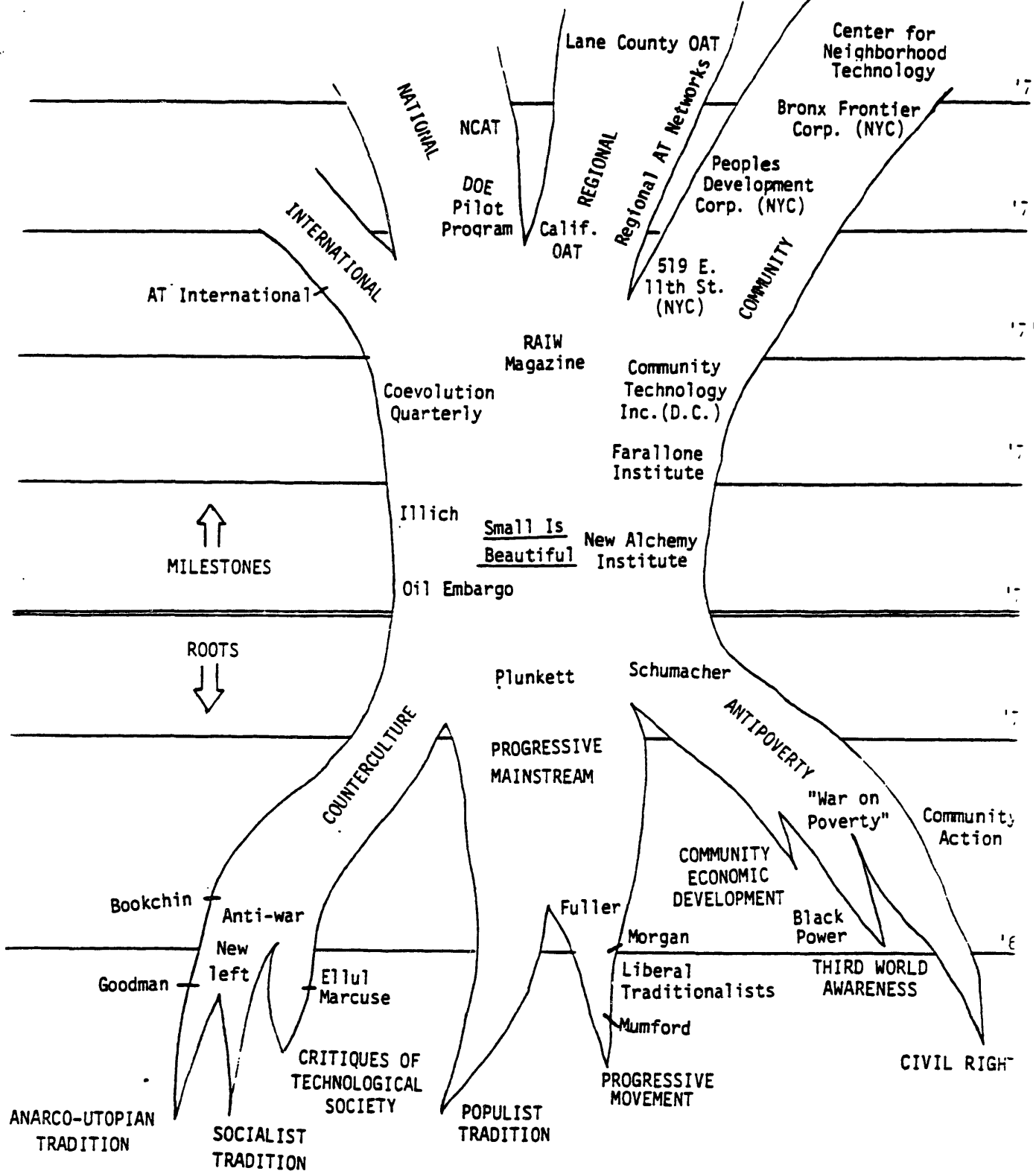
Roots of the AT Movement in Earlier Transformational Periods in America

Figure 1 shows my own early effort to use a tree metaphor to depict aspects of the AT movement, in this case its "growth" from earlier "roots" in America and subsequent "branching" into distinctive areas and levels of activity. In this figure, taken from my initial treatment of AT as a social movement (Decker, 1978), I depicted the evolutionary "tree" of the AT movement as having three main roots in America: (i) in the counterculture (and its earlier roots), (ii) in the progressive and populist undercurrents of the American mainstream, and (iii) in the civil rights and anti-poverty movements. I also showed the movement branching into four main branches in the 70's: (1) international intermediate and AT activities and support, (2) national AT activities and programs in this country, (3) regional AT activities around the country, and (4) local community AT activities in urban and rural communities.

This initial metaphor for depicting the roots and growth of the AT movement soon became too limited and simplistic for my purposes and I subsequently developed a more sophisticated metaphor for characterizing the roots and evolution of the AT movement in America, which is illustrated in Figure 2. This metaphor and evolutionary model, partially inspired by Jencks' 'evolutionary tree' model of the evolution of modern design ecologies (Jencks, 1970, 1973) and Wasserman's cyclic/spiral model of American culture and history (Wasserman, 1983), both of which were discussed in Chapter 1 (see figures 13 and 17 in Chapter 1), views the AT movement as emerging from and becoming part of a complex cultural ecology of pastoral/utopian ideas, which have periodically waxed and waned over the course of America's cultural history[1].

Figure 2 depicts the helical growth of this pastoral/utopian cultural ecology, within and between five of the cyclical periods of cultural disequilibrium, revitalization and innovation, what Wasserman called periods of cultural "energy" and "awakening", that Wasserman identified in his spiral model of American cultural history(Wasser-

Figure 1. ROOTS AND MILESTONES IN THE ALTERNATIVE/APPROPRIATE TECHNOLOGY MOVEMENT AS TREE (Decker, 1978)



Periods of Cultural Disequilibrium	Utopian Quests and Revitalization Movements	Spectrum of Utopian Visionaries and Designers: Naturalists/Writers - Activists - Scholar/Designers - TECHNOLOGISTS
The "60's" 1962-1978 (Kennedy)	Counterculture Environmentalism, AT Localism	Carson - Kesey - Twin Oaks - Hayden - Roszak - Baer - BUSH Bateson Abbey Drop City Brand Illich Lovins Fuller Pirsig the Farm, Brown Thompson Todds etc. Schumacher*/
The "30's" 1930-1944 (F.D.R.)	Independent Liberalism Cooperativism Regionalism	Leopold - Bromfield - Borsodi - Mumford - WRIGHT - TECH- Huxley* Sinclair Odum MORGAN NOCRATS VEBLEN
Populist-Progressive Era, 1888-1912 (T. Roosevelt)	Populism Utopian Socialism Conservation	Muir - Howell - Donnelly - Olmsted - BELLAMY Twain Morris* Howard* GILLETTE Adams Kropotkin* TAYLOR Sinclair
Jacksonian Era, 1828-1848 (Jackson)	Transcendentalism Communitarianism	Emerson - Owen, Noyes - EVERETT Thoreau Ripley, Alcott, LOWELL Hawthorne etc.
Revolutionary Period 1770-1790 (Washington)	Republicanism Revivalism Pastoralism	Jefferson - Mother Ann, - HAMILTON etc.

* Influencial Non-Americans

Figure 2: The Roots of the AT Movement in Previous Periods of Utopian Quest and Revitalization in America: These periods may be viewed as periodic phases in the cycles or spiral of American culture and politics. Dotted lines link similar perspectives in different periods.

man, 1983, see Figure 17 in Chapter 1;I haven't included Wasserman's sixth such period in the 70's because I see this as just an extension of the '60's' period), namely, the Revolutionary Period, the Jacksonian Era, the Populist-Progressive Era, the "30's" and the "60's". Each of these periods saw the reemergence of a variety of cultural quests and revitalization movements and of a wide spectrum of utopian vistionaries, designers and activitists. The cultural roots of the AT movement in America can be traced successively back through the utopian movements and spectrums of visionary cultural designers listed in the figure. Or alternately, starting at the bottom of the figure and moving forward in time through the five periods of cultural revitalization, one sees how the cultural spectrum or ecology of utopian ideas and designs, out of which the AT movement eventually grew, like natural ecologies, evolved and became more culturally complex with more niches, during each of its "springs" or period of growth in the five successive periods of American cultural revitalization. Hence, this visionary spectrum or ecology, which I've organized as going from small pastoral thinkers (e.g. Jefferson in the Revolutionary Period)(the pastoral American polar theme;see Figure 19 in Chapter 1) to BIG TECHNOLOGICAL ones (e.g. HAMILTON in the Revolutionary Period) (the YANKEE INGENUITY or TECHNOLOGICAL American polar theme), can be seen as becoming increasingly differentiated during each of its periods of revitalization and growth, until in the uppermost visionary period, the'60's", I show seven distinctive groups or niches of intellectual/cultural leaders that provided ideas and inspiration for the AT movement in the 70's, including ecologists (such as Carson), writers (such as Kesey and Pirsig), commune/counterculture designers, New Age activists (such as Brand and Jerry Brown), New Age thinkers and intellectuals (such as Illich, Thompson and Schumacher), New Age/outlaw designers (such as Lovins and Baer), and visionary TECHNOLOGISTS (such as Bucky Fuller).

As Figure 2 suggests, one could trace the roots of the AT movement in America all the way back to the pastoral and democratic ideals articulated by Jefferson during

the Revolutionary Period and to the ideas of the Transcendental thinkers Emerson and Thoreau and the utopian community designers, such as, Owen, Noyes, Ripley and Alcott, in the Jacksonian Era[2]. Here, however, I won't attempt to go back that far and will focus instead on the AT movement's more recent roots in the Populist-Progressive impulses of the turn of the century and the cultural and social experimentation of the 1930's and 40's and on its more direct emergence out of the reformational cultural ecology of the "60's".

Roots of the AT Movement in the Populist-Progressive Turn of the Century[3]

The predominant trends in America since its inception - industrialization, urbanization, conglomeration - have resulted in an ongoing shift of economic and political power from the country to the city and from the individual to the large organization. There has been a long-standing tradition of resistance to this trend, seen most clearly in the populist movement at the turn of the century and the progressive movement in the early 1900's, which, while never approaching a numerical majority of the populace, has been able to achieve significant social reforms and exert considerable influence upon (within) the American mainstream. While the A.T. movement has its most direct roots in the counterculture and the reform efforts of the 60's, it also appear to grow out of and draw support from these long-standing populist and progressive undercurrents in the American mainstream. In this regard, A.T. can be seen as the latest in a series of "progressive" efforts to "reform" technology.

Following Hofstadter, I will use the terms "populism" and "progressivism" in a broad sense. By "populism", I mean the general impulse to return economic

and political power to the "grassroots", rather than its particular manifestation in the agrarian movement of the 1890's. As Hofstadter writes:

> ... the Populist Party (was) merely a heightened expression, at a particular moment of time, of a kind of popular impulse that is endemic in American political culture ... Populist thinking has survived in our own time, partly as an undercurrent of provincial resentments, popular and "democratic" rebelliousness and suspiciousness, and nativism. (Hofstadter, p 4-5).

Likewise by "progressivism" I mean the general impulse to curb the power of large organizations and the people that run them and return power to the individual citizens. As Hofstadter writes of progressivism in the early 1900's:

> Its general theme was (is) the effort to restore a type of economic individualism and political democracy that was widely believed to have existed earlier in America and to have been destroyed by the great corporation and the corrupt political machine; and with that restoration to bring back a kind of morality and civic purity that was also believed to have been lost (Hofstadter, p 5).

Hofstadter argues the main ideological rationale for the populist impulse in America is in what he calls the "agrarian myth", that is the belief in the nobility of the farmer because of his self sufficiency and close ties with nature:

> The yeoman, who owned a small farm and worked it with the aid of his family, was the incarnation of the simple, honest, independent, healthy, happy human being. Because he lived in close communion with beneficent nature, his life was believed to have a wholesomeness and integrity impossible for the depraved populations of cities ... (Hofstadter, p 25).

Accordingly, the Populists at the turn of the Century sought to "restore the conditions prevailing before the development of industrialism and the commercialization of agriculture" (Hofstadter, p 62). The A.T. movement, with its emphasis on small scale organic farming, self-sufficiency, simple living, and harmony with nature, reflected many of the key themes of the populist impulse.

Like "populism", "progressivism" attacked centralization and big organizations; however, progressivism, while including some agrarian elements, was promoted mainly by dissatisfied members of the urban middle class, especially professionals. Also it was more sympathetic towards modern technology and big government than "populism". As Hofstadter states:

> The Progressives, object though they might to the many sacrifices of traditional values that the new society demanded, did not seriously propose to dismantle this society, forsake its material advantages, and return to a more primitive technology. (Hofstadter, p. 215).

In fact, technology and big government were seen as vehicles for controlling private corporations and political machines. The Progressives believed that by "professionalizing" government based on scientific principles and by separating "administration" from "politics" they could reduce or do away with political corruption. Also on a local level, the Progressives saw urban planning, zoning and building codes as tools which communities could use to systematically design better environments.

Thus, of the populist and progressive movements at the turn of the century, some roots of the AT movement can be most clearly seen in the populist impulse and movement. Later, however, in the subsequent progressive impulses and activities in the 30's and 40's, in what historian Layton calls "the revolt of the engineers" (1971) and historian Lawson calls "independent liberalism" (1971), the link between the progressive tradition and the AT movement becomes clearer.

Roots of the AT Movement in the Progressive/Independent Liberalism of the 30's and 40's

Whereas, the influence of the Progressive party/movement peaked before World War II, the most important links between progressivism and the subsequent AT movement evolved later in the 30's and 40's as engineers, like other professions had earlier, be-

gan to resist what they perceived as a growing plutocracy in America. In the Revolt of the Engineers, Layton (1971) documents how professional engineering societies, alarmed by the extent to which their profession was controlled by large coporations, began to become politically active in the 1930's, pressing for progressive reforms and more power for engineers. This "revolt" of the engineers can be seen as part of a larger progressive impulse between the World Wars which Lawson refers to as "independent liberalism" because it attempted to chart an independent course "between organized Marxism on the left and the New Deal on the right" (Lawson, 1971, p 13) Lawson argues that this impulse had two branches, a "pragmatic rationalist" branch"influenced by John Dewey's instrumentalism and Thorstein Veblen's concept of an engineered society designed to end arrogant wastefulness", and a "liberal traditionalist" branch which "argued for social cohesion through a humane regard for tradition and environment". (Lawson, 1971, p 13). Engineers and scientists played important roles in both branches.

Scientists and engineers in the "pragmatic rationalist" school sought to enhance the rationalist of decision making and increase their influence over the process by promoting scientific management techniques such as those used in Taylor's time-motion studies. An extreme manifestation of this impulse was the short-lived Technocracy Party, the brainchild of Howard Scott, a Columbia economist and disciple of Veblen.

While the A.T. movement must be viewed mainly as a reaction against this kind of scientific elitism and rationality, it does share with the "pragmatic rationalist" impulse the belief that technology can be a vehicle for positive social change. This is illustrated by the fact that Buckminster ("Bucky") Fuller who's writings

exhibit many aspects of "pragmatic rationalism" (Fuller, 1970) is also viewed as a hero and pioneer by many in the A.T. movement (Houriet, 1971).

The relationship of the "liberal traditionalist" branch to the A.T. movement is more obvious and less ambivalent. The liberal traditionalists stressed "regionalism" and "cultural pluralism". "Regionalism" called for the "organization of the country into cohesive units as an antidote to the rootlessness of mass society":

> The regionalists emphasized tradition and cooperation as the basis of a new society that would place high value on esthetic and spiritual ends. Their belief in shared wisdom and a sense of communal responsibility sought to replace the social vision of Horatio Alger with the older lessons of Emerson. (Lawson, 1971, p 13)

In this they can be seen as being closely related to the populist impulse. "Cultural pluralism" added the belief that "the most valuable of the ties binding men together were not regional but ethnic" and, therefore, emphasis should be placed on "preserving harmony between distinct ethnic cultures, rather than subjecting all to assimilation within a single national standard" (Lawson, p 14]

Nowhere is the link between the populist/progressive tradition in America and the A.T. seen more clearly than in the writings of two of the leading liberal traditionalists, Lewis Mumford and Arthur Morgan. The writings of these men, along with Bookchin and Goodman, first articulated many of the key themes of the A.T. movement and, indeed, influenced many of the later activisits in the movement.

Lawson describes Mumford as "the most complete exemplar of the liberal traditionalist position" in the 1930's:

> To his basic commitment to regionalism Mumford joined a plea for basic communism that enabled parts of Rochdale cooperatism, Utopian socialism - in the Edward Bellamy and Henry George mold- and a deepending respect for American moral and esthetic tradition ... Mumford advised turning from Marx to a native genius, Henry David Thoreau, as a guide for reformist action movements. He agreed with Waldo Frank that individual regeneration must precede social regeneration and found Thoreau's translation of that premise into a program of civil disobedience to have proven its worth in Gandhi's social revolution in India. (Lawson, 1971, p 210).

In Technics and Civilization (1934), Mumford emphasized the importance of energy sources in shaping culture, a key theme in the later AT movement, by defining three historical ages based on the predominant energy source utilized: the eotechnic phase (1000 to 1750) "powered by wind and water, continous resources whose use tends to conserve rather than corrupt the natural environment (note the correspondencé of A.T. to eotechnics); the paleotechnic phse (after 1750) powered by coal and the steam engine, and the neotechnic phase (1900 on) dominated by electricity.

In his later writings, especially The Myth of the Machine (1966), Mumford is highly critical of modern industrial society and suggests the need for the reemphasizing of "tools", which were characteristic of the eotechnic phase and which men can control and manipulate, over "machines" which tend to be used to control and manipulate man.

Thus, in his emphasis on regionalism and cooperativism, Thoreauian (or Gandhian) means of social reform, the impact of energy on culture, the dangers of large scale technology and "mega-machines" and the merits of smaller scale (eotechnic) tools, Mumford brought together for the first time the central elements of the A.T. movement. He can be seen as an important link between the earlier progressive efforts and A.T. proponents in the counter culture, many of whom read and were influenced by his works.

Arthur E. Morgan, who was President of Antioch College and the first Chairman of the Tennessee Valley Authority in the 1930's, attempted to incorporate both "progressivism" and "humanism" into engineering. In books, such as, The Small Community-Foundation of Democratic Life (1942) and The Community of the Future (1957), he stressed the importance of the small community and cooperatism in American life. Moreover, he established Community Services, Inc., which acted as an early clearinghouse and technical advisor for cooperative and communal efforts. His relevance to the A.T. movement is seen most clearly in his book Industries for Small Communities (1953) in which he argued the desirability and feasibility of small scale industries and technologies as a vehicle for preserving community life. Here Morgan stressed the danger centralization implied for community life:

> A major count against centralization of industry is one which it shares with modern life in general -- the destruction of our indigenous small communities. Our country has a large stake in these small, primary groups ... (which have) been the chief means of transmitting such basic cultural traits as good will, neighborliness, and mutual confidence ... (Morgan, 1953)

He, more over, strongly attacked the notion that "big" technology and industry were necessarily better:

> One of thegreatest hinderances to the increase of American small business in many fields is not so much any inherent technical superiority of bigness as it is the mental climate of industrial America. Bigness, whether in industries, in government or in universities, is uncritically worshipped. (Morgan, 1953).

On the contrary, Morgan concluded that "as the field for small industry closes in some directions through the advancement of technology, it opens in others through that same technology" (Morgan, 1953).

Hence, both the cultural historian and critic Mumford and the progressive engineer and administrator Morgan were important intellectual precursors and predecessors of the AT prophets and pioneers in the 70's.

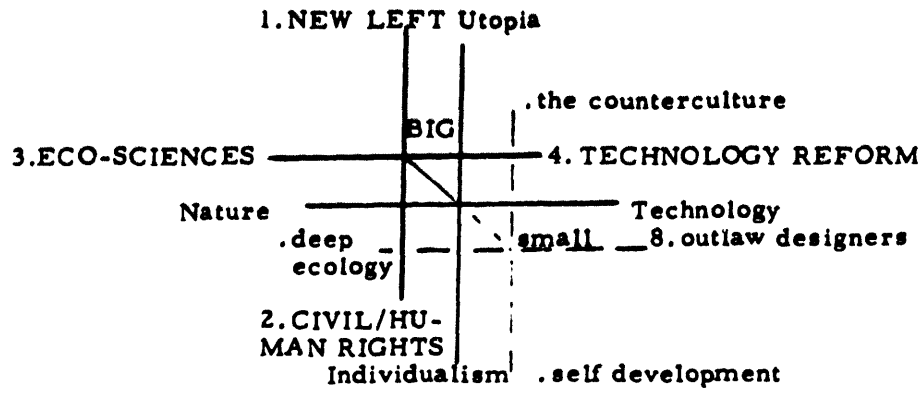


Figure 3: Diagram of Eight Types of Polar Cultural Reform Movements Making Up the Cultural Ecology of the '60's', based on BIG and small Reform Approaches Related to My Four Polar American Themes (Utopia, Individualism, Nature & Technology)

The Emergence of the AT Movement from the Cultural Reform Ecology and Movements of the '60's'

While the roots of the AT movement can thus be traced to earlier reform thinkers (e.g. Jefferson, Emerson, Thoreau, Mumford and Morgan), movements (e.g. transcendentalism, utopian communitarianism, populism, conservationism and independent liberalism), and periods (e.g. the Jacksonian Era, the Populist/Progressive turn of the century, and the '30's'), it grew most directly out of the various movements for cultural and social reform in the '60's'.

These various movements, such as, the New Left, civil rights, environmental, anti-war, counterculture and human potential movements, made up the larger reformational cultural ecology of the '60's' which sought to drastically transform American culture. In order to clarify how the AT movement emerged from and related to these various movements and the larger cultural ecology they formed, I have adapted the structural approach that Jencks used to analyze and depict the coevolution of modern design schools and ecologies (see Figure 13 in Chapter 1). Accordingly, in Figure 3, I have

listed and diagramed the relationship among eight polar types of reform movements which appeared during the 60's. These eight polar types were generated by relating the important movements of the 60's to the four polar Ameican cultural themes identified in Chapter 1 (see my polar theme diagram, Figure 19 in Chapter 1) and whether the movements took aim on central American institutions (BIG approach) or a decentralized, grassroots (small) approach to cultural reform. This resulted in two sets of polar movement types: those which emphasized BIG or centralized reforms related to the four polar Ameican themes of Utopia, Individualism, Nature (e.g. pastoralism), and Technology (e.g. Yankee Ingenuity), namely, 1. the New Left, 2. the CIVIL/HUMAN RIGHTS movements, 3. the new ECO-SCIENCES (e.g. ecology), and 4. the TECHNOLOGY REFORM movements (e.g. public interest science and technology assessment), respectively; and those which emphasized small or decentralized approaches to these themes, namely, 5. the counterculture of the 60's, 6. the self relization and development movements (e.g. the human potential and holistic health movements), 7. the ecological and 'deep' ecology movements and 8. the radical architects and 'outlaw' designers (e.g. Baer, Brand, Baldwin, Fuller, Soleri), respectively.

Then, in Figure 4, I've depicted the coevolution of these eight polar movements and the larger reformational cultural ecology they made up and the AT movement's subsequent emergence out of this ecology. This coevolutionary diagram, inspired by Jencks' "evolutionary tree" diagram of modern design schools/movements (Figure 13 in Chapter 1), shows the major thinkers, events and milestones in the evolution of each of these eight types of reform movements/traditions in the 60's and 70's.

At the right side of this diagram, in the mid-70's, we can see four distinctive parts of the AT movement beginning to emerge and differentiate themselves from already established 60's movements. I've labeled these distinctive parts or aspects of the emerging AT movement as "AT I" through "AT IV". They included the promo-

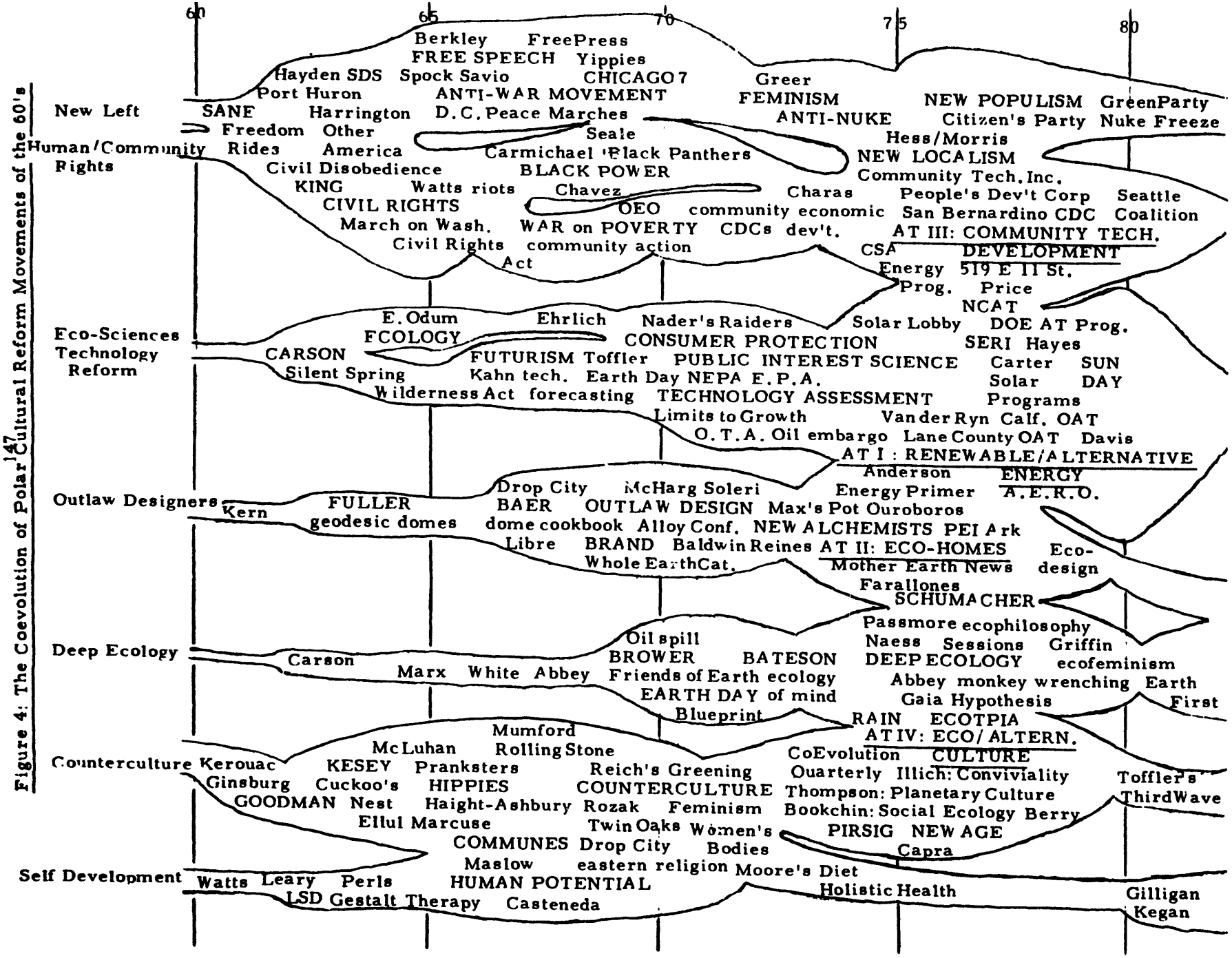


Figure 4: The Coevolution of Polar Cultural Reform Movements of the 60's

tion of "renewable or alternative energy" (AT I), which mainly grew out of the technology reform, eco-science and outlaw design movements; the design and development of "ecological homes and homesteads" (AT II), which mainly grew out of the outlaw design, ecological and countercultural/communal movements; the envisioning and design of "alternative, more ecological communities and cultures" (AT III), which mainly grew out of the countercultural and deep ecology movements; and the creation of "community technology development" projects and programs (AT IV), which mainly grew out of the human rights, community development and New Left movements.

Later, I will show how each of these parts or aspects of the AT movement may be viewed as distinctive, though related, cultural quests, which together made up the larger AT movement. First, however, I will briefly discuss its emergence from and relationship to the countercultural activities and movements of the 60's, which of the eight types of reform efforts the AT most directly grew out of. Also, I will briefly discuss its relationship to the civil rights/community development movements of the 60's, which particularly influenced its community technology development branch.

The AT Movement's Emergence From and Relationship To the Counterculture of the 60's [4]

Roszak in The Making of a Counter Culture (1968) stressed the important role concern about technology played in the evolution of what he and others refered to as the counterculture. The youthful opposition to the "technocratic society" (Roszak's term for modern America) of the 60's were motivated both by a conviction that modern technology was oppressive and alienating and by a hope that more humane alternatives could be developed. As Houriet wrote in Getting Back Together:

> Technology at once attracted and repelled the young, who looked on themselves as the first mass-produced generation... (Technology) gave them the hope, articulated by one of their mentors, Buckminister Fuller, that a humanized science could ultimately save the world's life-support system... but they (also) had a victim's knowledge of the harm a dehumanized technology could cause ... (Houriet, 1971, pp 225-6)

They read and were influenced by the major critics of modern technology, especially Marcuse (One Dimensional Man), Mumford (The Myth of the Machine) , Roszak (The Making of the Counterculture), and Ellul (The Technological Society). Equally influential were writings in the anarchist-utopian tradition in America (Borsodi, 1928; Goodman and Goodman, 1947; Nearing and Nearing, 1954; Bookchin, 1971; Stavrianos, 1976; Satin, 1977; Callenbach, 1975) which suggested the possibility of alternative more decentralized societies, life styles, and technologies. Especially important in conveying this potential were the essays "Towards a Liberating Technology" by Bookchin (1967) and "Can Technology be Humane?" by Goodman (1969). Bookchin argued that:

> There is a very real danger, today, that we will lose our perspective toward technology, neglect its liberatory tendencies, and worse, fatalistically submit to its use for destructive ends... A liberated society, I believe, will not want to negate technology - precisely because it is liberated and can strike a balance. It may well be that it will want to assimilate the machine to artistic craftsmanship.

Bookchin's influential essay, which emphasize renewable sources of energy and local self-reliance, laid a theoretical foundation for the A.T. movement in America:

> To bring the sun, wind, earth, indeed the world of life, back into technology, into the means of human survival, would represent a revolutionary renewal of man's ties to nature. To bring it back in a way that evokes a sense of regional uniqueness in the community, a sense of... dependence on a specific region with distinct qualities of its own, would give this renewal a truly ecological context ... A technology must be based on the community; it must be tailored to the community and regional level ... (Bookchin, 1967)

In a similar vein, Goodman (1969) argued for a "new reformation" which would make science and technology more prudent, ecological, and decentralized:

> ... for science and technolgoy to become prudent, ecological, and decentralized requires ... a kind of religious transformation. Yet there is nothing untraditional in what I have proposed: prudence, ecology, and decentralization are indeed the high tradition of science and technology. Thus, the closest analogy I can think of is the Protestant Reformation, a change of moral allegiance, liberation from the Whore of Babylon, return to the pure faith.

Early efforts to develop A.T.s often occured in countercultural communes and/or by persons sympathetic to the communal ideal. For example, in 1969, Steve Baer, one of the pioneers in the A.T. field, helped build a solar heated zome (similar to a geodesic dome) at the Drop City communie in Arizona. (Houriet, 1971; Rabbit, 1971). In a sense communes were the first "market" for A.T.s, pragmatically because they were often in remote areas, and ideologically because they wished to decouple themselves as much as possible from modern society. As Houriet points out, communards at first rejected all modern technologies, but in the early seventies:

> communes (were) moving toward greater trust and use of technology through a process of sorting out priorities ... The rationale that emerged was to adopt only those limited segments of modern technology that fit in with a number of other communal ideals, such as self-sufficiency and craftsmanship ...
>
> All over the country communes talked enthusiastically of finding new pollution-free sources of energy (such as solar, windmills, waterwheels, and methane digestors) ... (Houriet, 1971, pp 229,231)

Most of the early pioneers in the A.T. field, such as John Todd, the director of the New Alchemy Institute (one of the oldest A.T. groups, founded in 1970), Sym Van der Ryn, founder of the Farallones Institute in California, Tom Bender of RAIN Magazine, Pliny Fisk, founder of Max's Pot in Texas, Peter Van Dresser in New Mexico, David Morris, co-director of the Institute for Local Self Reliance in Washington, D.C., and Murray Bookchin, who directed the Social Ecology Institute in Vermont, either identified themselves with or were sympathetic to the counter culture and its search for more cooperative life styles. The early pioneers also identified strongly with the environmental movement and the anti-growth movement which emerged in the early 70's. They were motivated both by a fear that modern society was "sick" and on the verge of collapse and by the hope that an alternative more humanistic society could be created. (Rivers, 1975)

On the pessimistic side, they saw alternative technologies as "life boats" for the inevitable day when modern industrial society would collapse. This is illustrated by the fact that the New Alchemists call their integrated biological shelters "arks". On the optimistic side, they saw alternative technology as a modern equivalent of the "might for right" concept in Arthurian legend, that is, as an instrument for liberating individuals, making communities more self reliant, and ultimately helping to create an alternative, more humanistic society. They saw glimpses of this alternative society, which would be more decentralized, cooperative, and egalitarian than the present one, in Schumacher's writings on Buddhist economics, Illich's concept of a "convivial" society and Callenbach's utopian novel, Ecotopia (Schumacher, 1973; Illich, 1973; Callenbach, 1975). The romance and quest-like quality of the early A.T. movement is illustrated by the parallel Nancy Todd of the New Alchemy Institute drew between the movement and Tolkien's Fellowship of the Rings (previously cited in Chapter 1):

> It has sometimes seemed to me that in our struggle we are not unlike Tolkien's ragged and assorted fellowship and if that is so, then Fritz (Schumacher) was our wise and gentle wizard ... (Todd, 1977)

Much has been written about the "turning inward" of the counter culture in the early 70's, that is, its shift from protest and activism to an emphasis on inner growth and personal development. The A.T. movement in the mid 70's seemed to reflect a re-emergence of interest in the material world and of a more activist posture within the counter culture. Nevertheless, considerable emphasis was still placed on personal growth and consciousness. Illustrative of this emerging two-fold interest in the "material" and "spiritual" world was Pirsig's Zen and the Art of Motorcycle Maintenance, which was read widely in the counter culture and AT movement. On the one hand, Pirsig argued it was self-defeating to attempt to disassociate one's self from technology:

> ... (the) flight from and hatred of technology is self-defeating. The Buddha, the Godhead, resides quite as comfortably in the circuits of a digital computer or the gears of a cycle transmission as he does at the top of a mountain or in the petals of a flower (Pirsig, 1974, p 18)

On the other hand, Pirsig emphasized the individual and personal growth and an eastern world view ("zen"). The counterculture in the 1970's seemed to be engaged in a simultaneous search for both "liberation" and for "roots", a search for what might be called "homefreeness". Or as Satin wrote in New Age Politics (1976):

> Marxism stresses community at the expense of autonomy, and liberalism does just the reverse; but each of these values requires the other, and is the logical extension of the other, like the light and dark sides of the moon. By stressing the one and repressing the other, we don't come to know either ... autonomy becomes isolation and community becomes conformity. (Satin, 1976, p 48)

Much of the appeal of A.T. in the counterculture, I believe, was that it appeared to be a way of achieving both "roots" and "liberty" at the same time. It was thus seen as a way of reconnecting and re-establishing "roots" with nature and the community, but in a way that is non-oppressive and non-manipulative because A.T.s were small and under the control of the individual. Thus, Alternative technologies like solar energy, wind and water power and organic farming took on special psychological significance and symbolic value because of their perceived linkage to and harmony with nature.

The AT Movement's Later Relationship to Anti-poverty/Community Development Efforts

While the AT movement had its main roots in the counterculture and related movements in the 60's (e.g. outlaw design, technology reform, deep ecology), as it evolved in the 70's, it began to stimulate some interest and develop some ties with the human and community rights movements, including the antipoverty and community development movements. The interest in A.T. in the antipoverty movement arose out of its struggle for community control of poor and minority neighborhoods in the 60's and early 70's (see Altshuler, 1970; Kolter, 1969; Alinsky, 1971) and out of attempts to mitigate the impact of the energy crisis upon the poor.

A forerunner to the community technology development projects inspired by the AT movement was the Black Panthers' community 'survival' programs in the late 60's:

> The programs ... are meant to meet the needs of the community until we all can move to change social conditions that make it impossible for the people to afford the things they need and desire ... we not only have a breakfast program for school children, we have clothing programs, we have health clinics which provide free medical and dental services, ... and we are opening clothing and shoe factories to provide for more of the needs of the community. More recently we have begun a testing and research program on sickle-cell anemia ... (Black Panther Party, 1974)

The goal of these programs were very similar to those of the A.T. movement, namely to make communities more self reliant by generating resources and services internally. In fact the Panther's Platform in 1972 called for "people's community control of modern technology" (Black Panther Party, 1974, p 49), however, the numbers and influence of the Black Panthers dwindled before they were able to become actively involved in community technology development.

An outgrowth of the antipoverty movement that did become somewhat involved in promoting A.T.s were the community development corporations (CDCs), which have sprung up in low income communities across the country to promote the economic development and self reliance of these communities. As described by the Center for Community Economic Development (CCED) in Cambridge:

> A CDC is organized and controlled by local residents to develop the economy of their own community. The CDC is, in fact, a new community tool created by people in low-income areas to gain influence over the economic conditions of their lives ...
> CDCs:
> *identify and develop local skills and talents
> *own and control land and other resources
> *start new businesses and industries
> *create job opportunities
> * sponsor new community facilities and services
> *improve the physical environment (CCED, 1976)

Since CDCs are intrinsically small scale operations (although some operate large

plants) and since AT products, such as, wood stoves, solar collectors, cellulose insulation, and greenhouses, are relatively simple to manufacture, and their manufacture is labor rather than capital intensive, they appeared to offer attractive possibilities for CDCs and consequently a number of CDCs started getting into the A.T. area in the mid 70's.

For example in 1972, the Central Coast Counties Development Corporation started developing an agriculturally-based micro-community called an agri-park, an agricultural/housing cooperative in the Salinas Valley of California which is utilizing hydroponic techniques and solar greenhouses (an innovative prototype design which uses focusing collectors is now being tested) to grow crops (CCDC, 1976). In the mid seventies, the Southeast Vermont CDC started manufacturing the SEVCO wood stove which now has a considerable market in New England. Since 1976 a number of A.T. efforts have been initiated through CDCs, such as, the manufacture of simple solar collectors and greenhouses designed by Malcolm Lillywhite, a pioneer in the A.T. field, by CDCs in Wyoming and Colorado; the creation of a CDC (Solar Heat in New England) to install solar hot water units in inner city homes in Cranston, R.I.; the installation of solar collectors in ten homes in San Bernadino by the West Side CDC; and the initiation of a community cellulose insulation plant by the Fresno County community action program (Decker, 1978; Morris, 1977; Bossong and Okagaki, 1978).

Unlike the pioneers in the counterculture who saw A.T.s as alternatives to the existing system, these CDC's seem to see A.T. mainly as a way of getting a "piece of the action" within the existing system. As Valerie Pope, a former black welfare mother and the director of the San Bernadino West Side CDC, state ,for exampl i:

> My concern from the very beginning was to get black people and low-income people involved from the ground floor of what I see as a new technology. Too often in the past we were the last to know and by the time we found out ... the technology was assimilated by a very select group and we were out in the cold ... (Decker, 1978)

The 'energy crisis' in the early 70's and the need to provide low income families with energy at a reasonable cost also was a major stimulus for CDC and antipoverty interest in AT. Shortly after the Oil Embargo in 1973, many local community action programs, the remnants of the War on Poverty in the 60s, began insulating and weatherizing low income homes under the guidance of the Community Services Administration (CSA), the successor agency to the Office of Economic Opportunity. As part of these efforts, a few CAPs got interested in the solar energy field, for instance, Chris Ahrens who worked for the New York regional CSA offices started constructing passive solar window boxes with students at Friends World College on Long Island (NCAT, 1976) and Jim Parker of the Montana State Office of Economic Opportunity was working with Malcolm Lillywhite, an A.T. pioneer, to train CAP employees in the Rocky Mountain region to build solar collectors and greenhouses. In a similar vein, although not CAP affiliated, Karl Hess, David Morris, and others created Community Technology, Inc. in 1973 to develop alternative technologies for the racially mixed Adams Morgan neighborhood of Washington, D.C. The goals of Community Technology, Inc. were to "demystify" technology, "challenge all the claimed economies of scale", and develop practical demonstrations of technology in the direct service of human needs in the community:

> Specific projects immediately planned (were) a complete information system ... trout raising in basement-sized areas, vegetable farming in roof-sized areas; use of solar energy on a community scale; use of wind mills as an urban energy source; effects of machine tools upon community self-reliance; and re-design of community facilities, including transportation. (Hess, 1974; see also Morris and Hess, 1975; Hess, 1975; Morris, 1976)

In fact Community Technology, Inc. failed to stimulate the interest and involvement

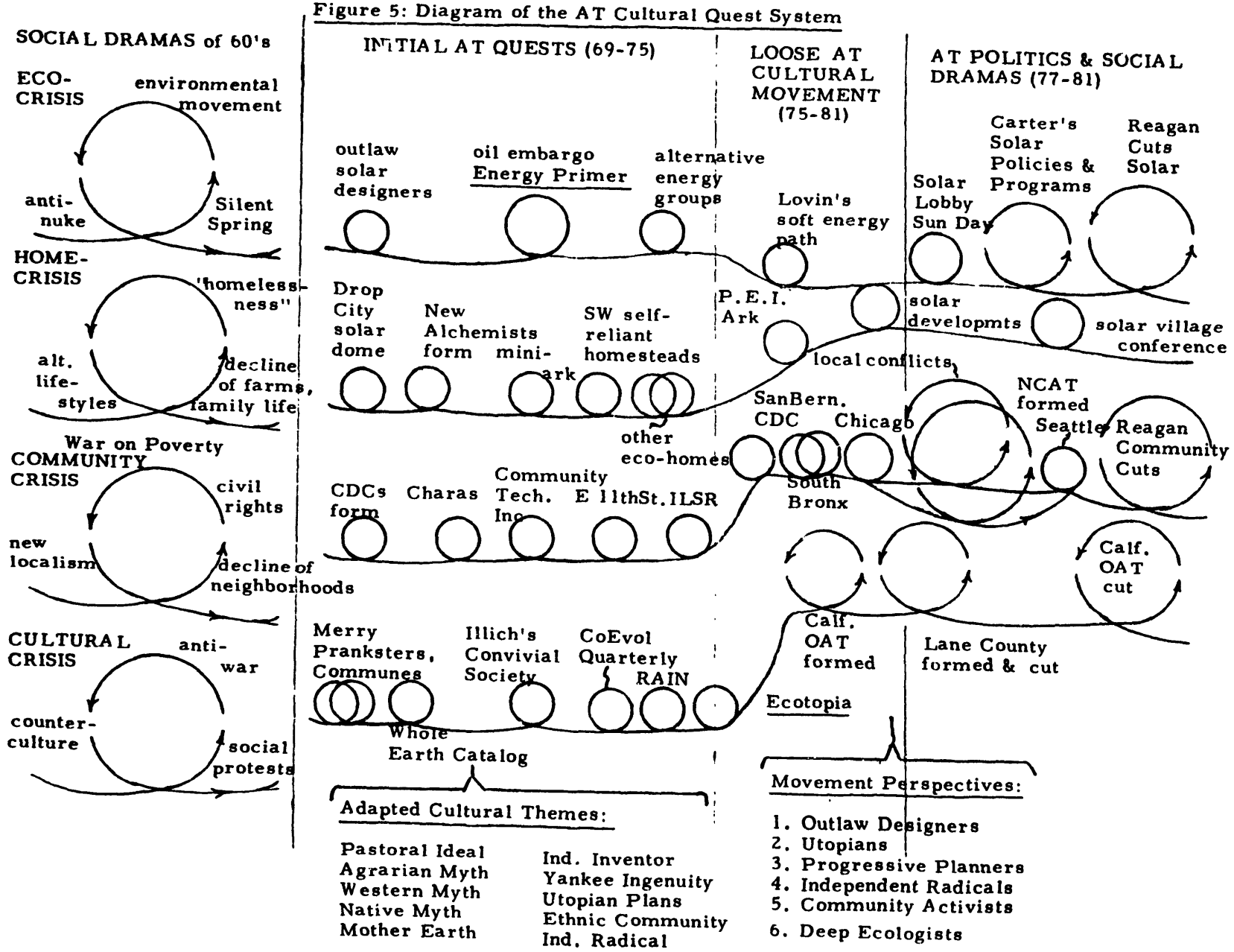
of the blacks and the poor in the neighborhood (Hess, 1977) and is, therefore, more properly viewed as a manifestation of the countercultural rather than the antipoverty strand of the movement, although it was important in that it is one of the first attempts to try to bridge these two strands and it became an important "myth" for popularizing the movement (the writings of Hess tended to embellish the accomplishments of Community Technology and suggest it played a more important role in the community than it actually did).

The Four Cultural Quests Out of Which the AT Movement Evolved

Having briefly described some of the cultural roots and precursors of the AT movement in the cultural reform movements of the 60's and in earlier transformational movements and period in America, I will now use the notions of "cultural quests" and "cultural quest analysis" that I developed in Chapter 1 to describe and analyze the transitional process that characterized the movement's actual emergence and early evolution in the 70's. As shown in Figure 4, four related but distinctive parts or aspects of the AT movement grew out of different portions of the ecology of cultural reform movements in the 60's (AT I- AT IV in figure). These four parts or components of the AT movement each grew from its own distinctive cultural quest process in the early 70's. Then, in the mid- and late-70's these formative quests converged to form the loose coalition that became the AT movement. In Figure 5, I've depicted the emergence and evolution of these four quest through the four typical quest stages I identified in Chapter 1 (see Figure 25 in Chapter 1): a) the triggering social dramas of the 60's, b) the initial AT quests, c) the emergence of a loose movement, and d) the dramas and conflict of 'return'.

On the left side of the diagram in Figure 5, I've shown four distinctive social dramas or cultural crises within America's complex cultural ecology in the 60's, which I believe helped to trigger the quests for appropriate technologies and con-

Figure 5: Diagram of the AT Cultural Quest System



vivial designs in the early 70's. First, there was the ecological/technological drama or crisis triggered by concerns about the negative impacts of modern science and technology on the natural and social environment. Second, there was the general cultural/countercultural drama or crisis triggered by the opposition of American youth to the Vietnam War and their efforts to create alternative or countercultures. Third, there was the human/community rights drama or crisis triggered by the deterioration of urban neighborhoods and the civil rights movement in the early 60's. Fourth, there was what I will call the home/family/self drama or crisis triggered by the decline of traditional family life and the growing sense of "rootlessness" and "homelessness" among Americans and the resultant search for alternative "families" and "life styles". While there was considerable overlap among these dramas, each triggered a distinctive initial quest or approach to AT in the early 70's.

These four resulting quests- i) the quest for renewable or alternative energy (AT I), ii) the quest for ecological homes and homesteads (AT II), iii) the quest for community technology (AT III) and iv) the quest for an ecological and convivial culture (AT IV) - are depicted by parallel horizontal lines of development in the figure. Below I briefly describe each of these distinctive quest paths which later converged to form the AT movement.

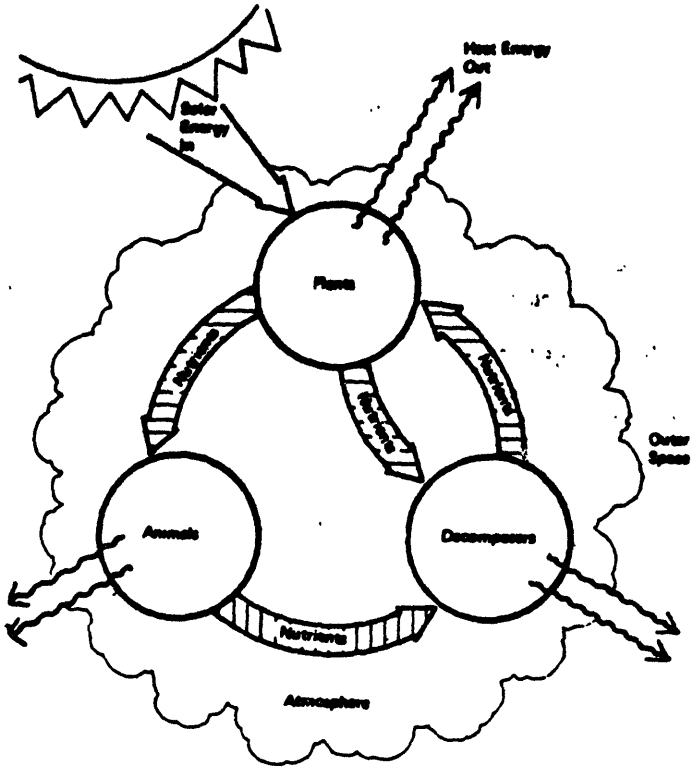
AT I: The Quest for Renewable/Alternative Energy

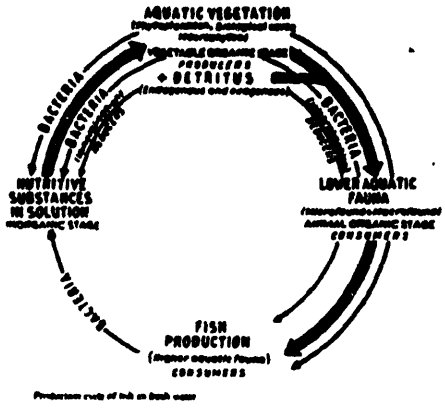
The uppermost horizontal quest path in Figure 5 illustrates some of the milestones and what I've called "microquests" or small transitions in the quest for renewable/alternative eneergy, that was triggered by the ecological/technological crisis in the 60's and was initiated by young "outlaw" designers and scientists, mainly in the Southwest and along the Pacific Coast. This quest was given much added impetus by the Arab oil embargo in 1973 and, starting with the Energy Primer in 1974, a series of how-to guides and catalogs of renewable/alternative energy and related technologies came out in the mid-70's. Also in the mid-70's, a number of solar and alternative energy

groups were formed across the country to develop and promote renewable sources of energy and Amory Lovins articulated the themes and values of this quest path in his noti on of the "soft energy path" (Lovins, 1975;1977). This quest reached its peak during its return phase in the late 70's, when a national Sun Day was held on May4, 1978 and a number of renewable energy programs and policies were implemented by the Carter Administration.

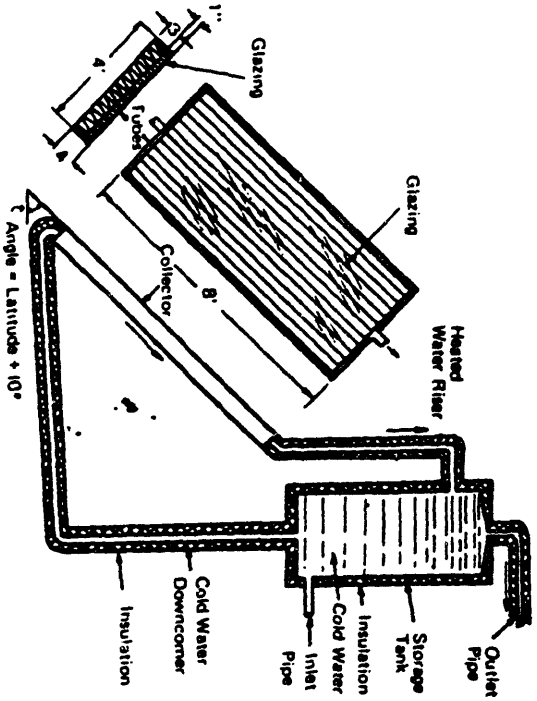
In this quest to develop renewable or alternative energy technologies, these technologies, such as, windmills, solar collectors, passive solar homes and methane gas digestors, came to have symbolic as well as practical value for their advocates. These "renewable" sources of energy, for example, were seen as duplicating or re-creating the renewable energy cycles in nature. This is illustrated by the drawings in Figure 6, which were taken from the Energy Primer . The top two drawings (Figure 6a & 6b), which were typical of several in the Primer, depict the cyclical nature of nutrient and energy recycling in nature, and the bottom two drawings show how similar cycles are utilized in two alternative energy devices, a simple solar water heater that utilizes natural convection currents to circulate water (Figure 6c) and a methane digestor that recycles organic wastes into methane gas and fertilizer (Figure 6d). As this juxtaposition of drawings suggests, these renewable energy technologies thus symbolized for their advocates the renewing power of nature and the potential for learning from and living in harmony with nature.

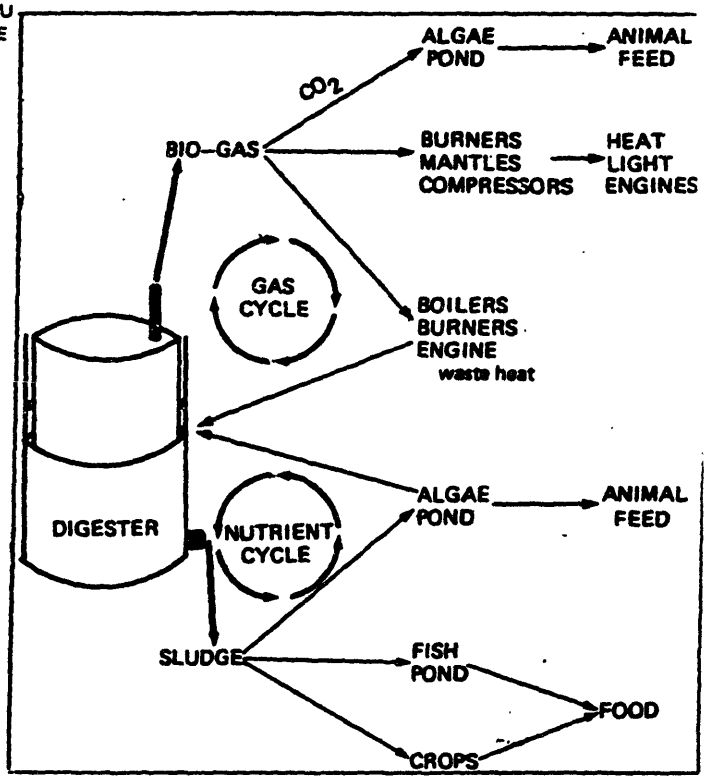
Moreover, these "renewable" energy technologies also came to symbolize the potential for cultural change and "renewal". In this context, they were often refered to as "alternative" energy technologies to emphasize their relationship and symbolic connection to the "alternative" value, life styles and cultures of the 60's. This symbolic connection of "alternative" energy to other "alternative" cultural and political movements is well illustrated by the sampling of drawings in Figure 7 taken from Radical Technology, a British catalog of alternative technologies similar to the Energy



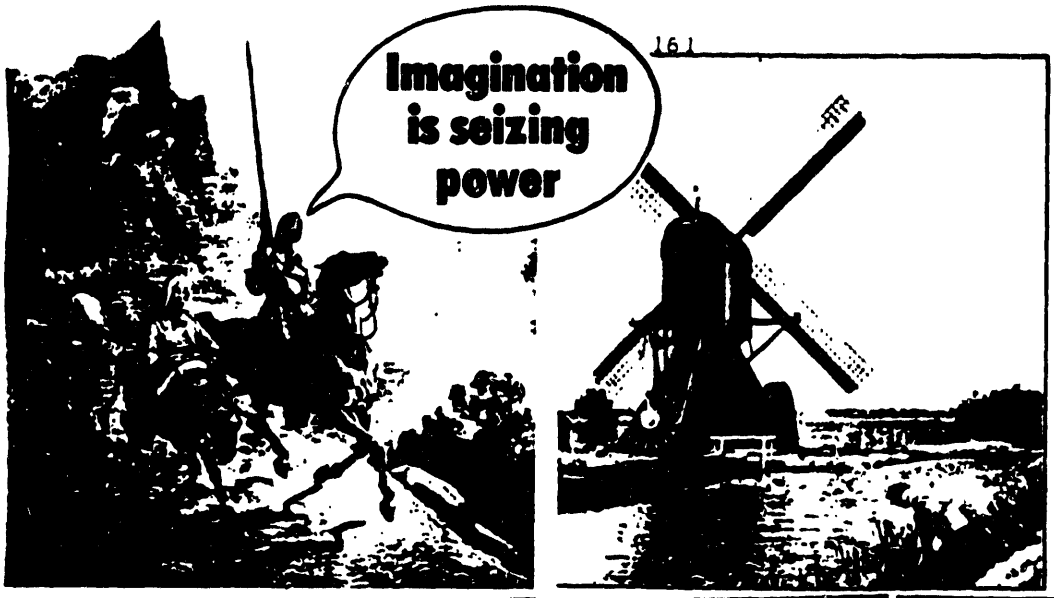


RECYCLING OF NUTRIENTS AND FLOW OF ENERGY IN THE BIOSPHERE. VIRTUALLY ALL MATERIALS ARE RECYCLED IN THE BIOSPHERE, BUT ONLY A SMALL PORTION OF INCOMING SOLAR ENERGY IS STORED AT ANY ONE TIME. EVENTU ALL BIOMASS ENERGY DISSIPATES INTO OUTER SPACE





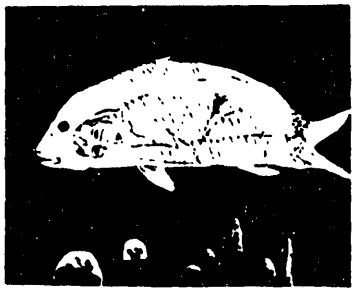
THE POTENTIALS OF A DIGESTER SYSTEM.



There is pollution at the point of production,
No litter in a forest,
And no sunshine
On the assembly line.
Production and pollution in the home too
Where the only muscles you let me develop
Are in my uterus
And forced labour makes us
Producers of producers.

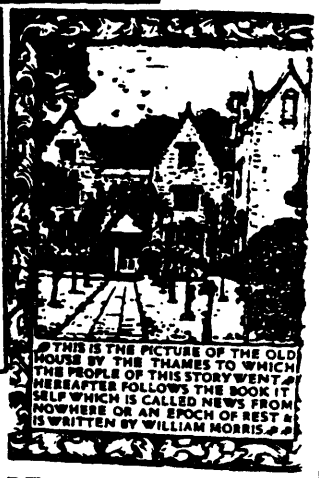
I am the mercury[1] in the belly of a deepsea fish
Where once I was the world.

©Lyn Gambles, 1974



Spellbound in the fish—a symbol of the living contents of the unconscious—Mercury is the god of magicians, representing the epitome of all dualities, the winged and the wingless, fire and water, spirit and matter. Also a trickster the alchemists sought to tame, a god of healing. "They call him the Spirit of the Lord which fills the whole world and in the beginning swam upon the waters. They call him also the Spirit of Truth which is hidden from the world," according to a 17th century alchemical source. He is also designated as anima, hence a feminine being. Carl Jung summarises the rich alchemical symbolism of Mercury in *The Spirit Mercurius* in vol 13 of his collected works published by Routledge and Kegan Paul in 1968 as "*1. Mercurius consists of all conceivable opposites. He is thus quite obviously a duality, but is named a unity in spite of the fact that his innumerable inner contradictions can dramatically fly apart into an equal number of disparate and apparently independent figures. 2. He is both material and spiritual. 3. He is the process by which the lower and material is transformed into the higher and spiritual, and vice versa. 4. He is the devil, a redeeming psychopomp, an evasive trickster, and God's reflection in physical nature. 5. He is also the reflection of a mystical experience of the artifex that coincides with the* opus alchymicum. *6. As such, he represents on the one hand the self and on the other the individuation process, and, because of the limitless number of his names, also the collective unconscious.*"

TILAPIA



NEWS FROM NOWHERE

OUROBOUROS

Sulphur as sun and Mercurius as moon bridging the river of 'eternal water'. (Barchusen, *Elementa Chemiae*, 1718)

Figure 7: Drawings from 'Radical Technology' Symbolically Connecting "Alternative" Energy Technologies with Other Alternative Political and Cultural Themes

Primer but more explicitly political in tone. As this sampling illustrates, the juxtaposition of alternative energy descriptions and drawings with other types of alternative political and cultural themes (for example, the drawings in Figure 7 contain symbols or allusions to radical or quixotic politics ("imagination is seizing power"), the utopian socialism and crafts movement in England (front piece from Morris' News From Nowhere), feminism (poem and drawing of woman in fish), alchemy and humanistic psychology (reference to Jung)) in this catalog served to symbolically link "alternative" energy and technology with these other alternative political and cultural themes.

Thus, the quest for renewable and alternative energy was seen by its advocates as not just a technological quest but a cultural and political one as well.

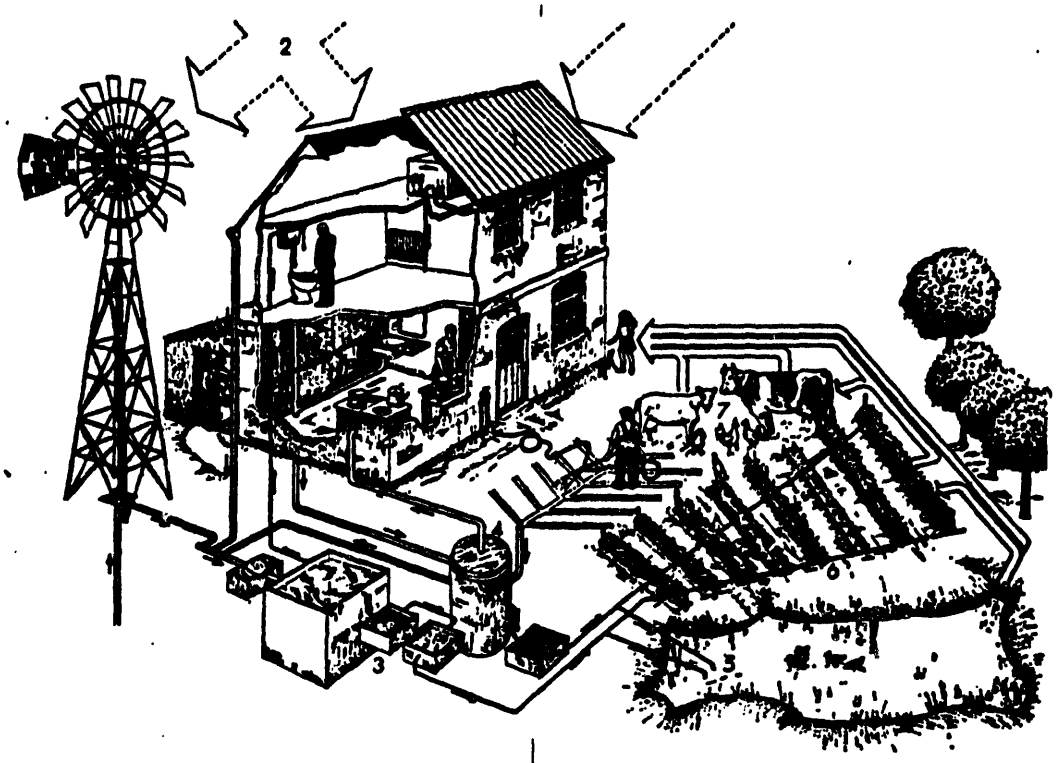
AT II: The Quest for Ecological Homes and Homesteads

Just below the renewable/alternative energy quest path in Figure 5 is depicted the closely related quest to design and build ecological homes and homesteads (e.g. Steve Baer), which started in the late 60's when "outlaw designers" and countercultural communes like Drop City in the Southwest collaborated to build innovative structures which combined unusual architectual designs, such as, domes and zomes with alternative energy technologies, such as, solar collectors. In the early and mid- 70's a number of ecological or autonomous homes and homesteads were created across the country, including Baer's zomehome and Robert Reines' autonomous living system dome in New Mexico, the New Alchemy Institute's mini-ark and Ark bioshelters in Massachusetts, the Farallones Institute's Integral Urban House in California, the Ouroboros House in Minnesota, and the Walden Institute homestead in New Mexico. These innovative homes and homestead generally sought to combine a number of ATs, including solar and wind, aquaculture, hydroponic or organic gardening, water and waste recycling and alternative structures (e.g. domes and greenhouses), into an integrated life support system. This quest path seemed to culminate with the development and testing of the Prince Edwards Island Ark by the New Alchemy Insti-

tute for the Canadian government in 1976-7 (described in Chapter 3). After this, some of the innovations pioneered in these ecological homes were incorporated into new homes in innovative communities like Davis, California, but no major governmental programs were lauched to build such ecological homes.

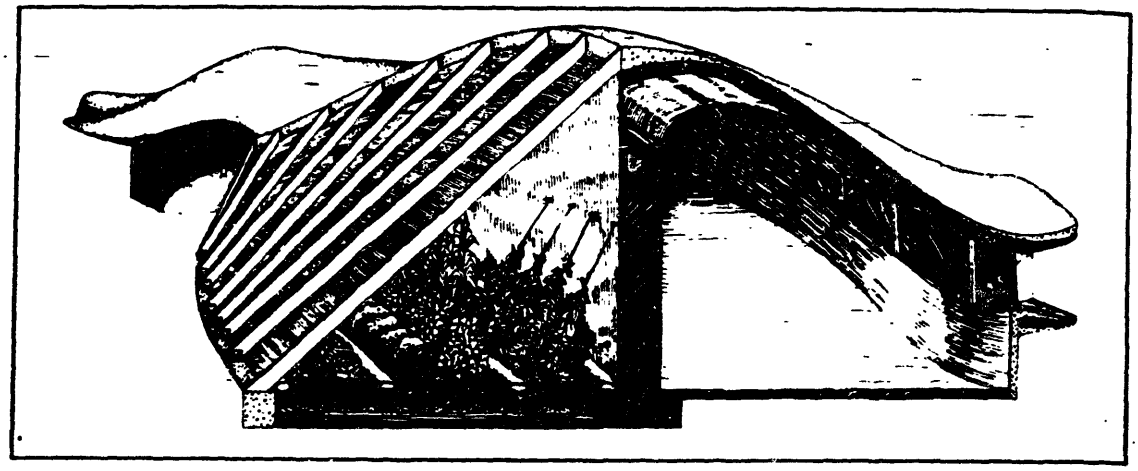
As with renewable/alternative energy technologies, the designers of ecological homes and homesteads saw them both as a way of connecting with and living in closer harmony with nature and as a way of disconnecting themselves from modern technology and society so as to live more independent and self-reliant lives. Figure 8, for example, shows two prototypical ecological home designs that illustrate these dual goals. The first design (Figure 8a), taken from the Radical Technology catalog, depicts a vision or prototype for a self-reliant ecological homestead in the country, which would incorporate numerous ATs, including solar energy, a windmill, a waste water recycling system, a methane digestor and an organic garden (note that this prototype design is refered to as an "archetype", Jung's term for generic collective symbols, again, suggesting that these designs had a symbolic/psychological dimension in addition to their material/practical rationale). The second design (Figure 8b) depicts solar architect Day Chahroudi's "bio-shelter" concept, which sought to integrate "nature" with the "home" by bringing "nature" into the home through the creation of a miniature bioshpere/ecosystem within the shelter (in Chapter 3, we'll see one of the ways this "bio-shelter" concept was actually implemented in the "Ark" bio-shelters of the New Alchemists).

The designers of these ecological homes/homesteads, drawing on what they saw as the holistic and inte grated character of natural ecosystems, also emphasized the blending of various complimentary ATs and subsystems into holistic, ecological life support systems. Figure 9, for example, shows schematic diagrams for three such integrated eco-home designs, taken from the Energy Primer: i) the "Mini-Ark" bioshelter of



A - An archetype: A miniature ecosystem in the country, sustained by sun, wind, rain, muck and muscle.

1 Solar roof captures sunlight to heat water
2 Rain water collected for home use. Wind powers windmill
3 Water purified and stored
4 Decomposition of wastes produces methane gas for stove in house
5 Water from treatment systems flows to fish pond and vegetable garden
6 Vegetable garden
7 Animals provide nourishment



B - The biosphere concept as conceived by Day Chahroudi.

Figure 8: Two Prototype Designs for Ecological Homes: A Rural Ecological Homestead and Chahroudi's Bio-shelter Concept (from Radical Technology and Leckie, et.al.)

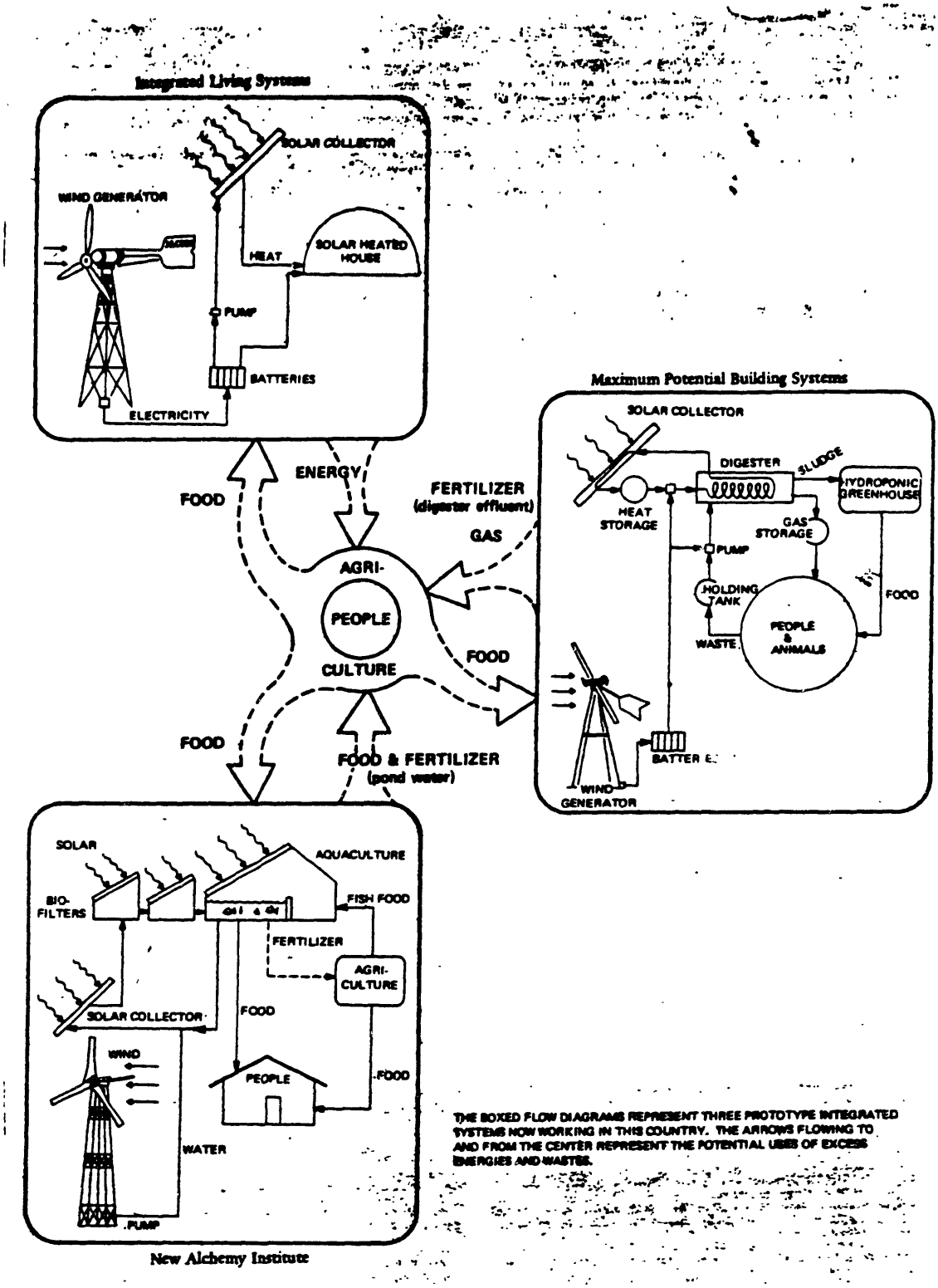


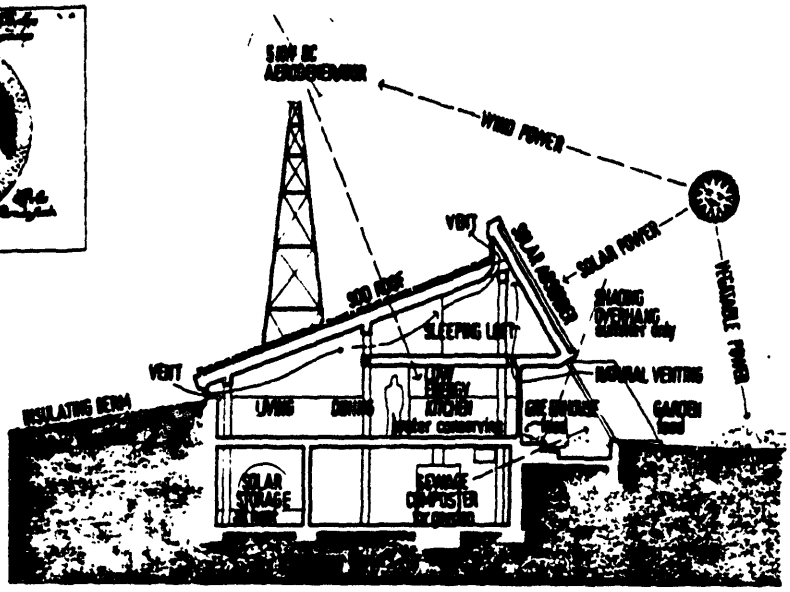
Figure 9: Schematic Diagrams for Three Integrated Eco-Home Designs from the "Energy Primer": Reines' Integrated Living Systems, Max's Pot's Methane/Greenhouse System and the New Alchemist's Mini-Ark

the New Alchemists (discussed in Chapter 3), which combined aquaculture, solar and wind systems; ii) the dome Integrated Living System designed by SW outlaw designer Robert Reines, which combined a geodesic dome shelter with solar and wind energy systems; and iii) the integrated digester/greenhouse of the Center for Maximum Potential Building Systems (Max's Pot), which combined a methane digester, hydroponic greenhouse, solar collector and windmill. Also, Figure 10 shows the designs for two more of these highly integrated or "autonomous", as they were sometimes refered to, eco-homes. Figure 10a illustrates the AT components and the operation of the Ouroborous House, designed by architect Dennis Holloway and his students at the University of Minneasota and named after the mythical snake swarrowing its own tail (see insert), which was an alcher. ical symbol for wholeness and unity (and thus symbolized the inte rated and recycling nature of the Ouroborous House). This House combined the following AT devices and components: a solar heating system, a wind generator for electricity, a greenhouse for food production, a sewage composter for recycling organic wastes and underground construction for conserving energy. Figure 10b shows the layout and a schematic diagram of the integrated components of the Berkley Integral Urban House, an existing house to which the Farallones Institute added a number of AT components, including solar collectors, a composting toilet and methane digestor, a greenhouse and organic garden, and aquaculture tanks and rabbit and chicken pens, in order to make it as energy and food self-reliant as possible.

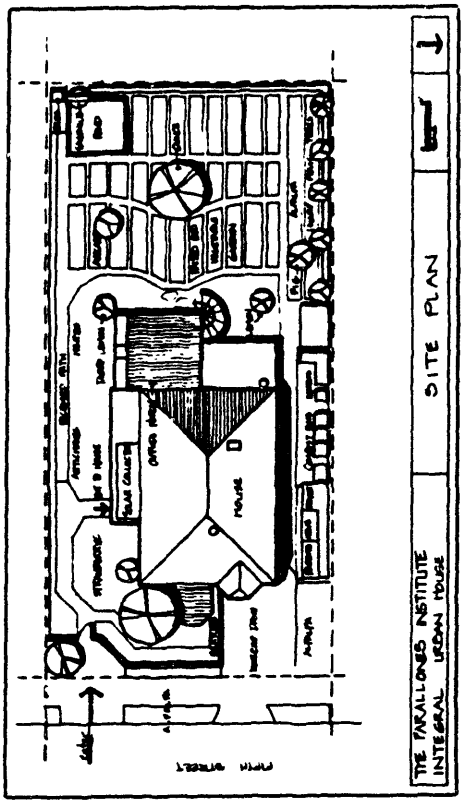
In Chapter 3 I will describe in considerable detail the evolution and coevolution of an exemplary series of these eco-home designs, the mini-Ark and fullscale Ark bioshelters of the New Alchemists, and of how the New Alchemists themselves co-evolved along with their designs.

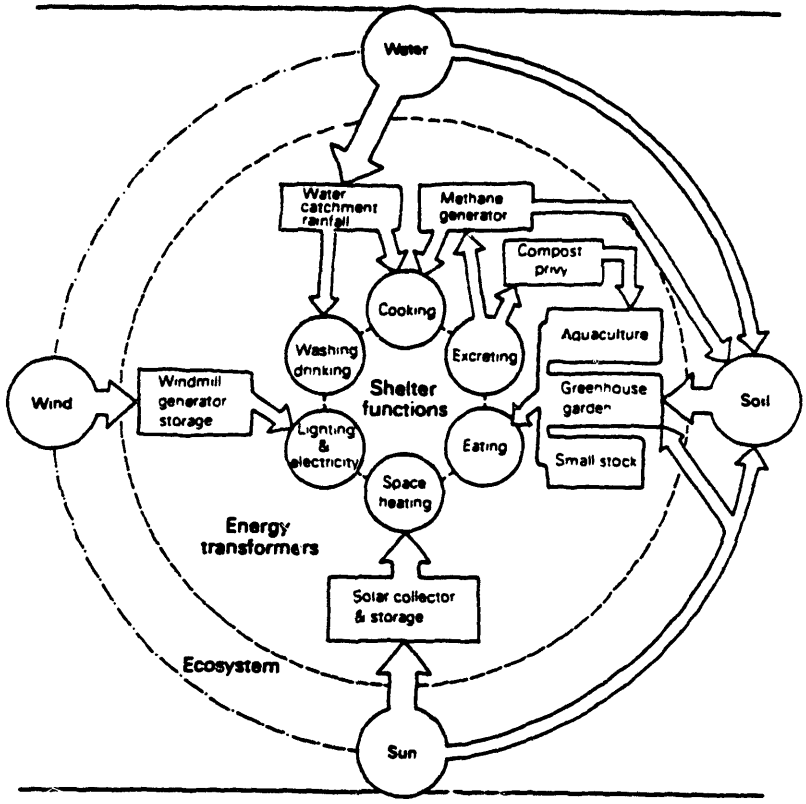
AT III: The Quest for Community/Neighborhood Technology Development

The next lower quest path in Figure 5 depicts the evolution of the community/neighbor-



A. Diagram of the AT Components of the Ouroborous Eco-House with Insert of the Ouroborous Alchemical Symbol for which it was named.





B. Schematic Diagram and Layout of the Farallones Institute's Integral Urban House

Figure 10: The Components of Two Autonomous Eco-Homes: The Ouroborous House and the Farallones' Integral Urban House

hood technology quest ,which emerged mainly from the human/ community rights crisis and resultant civil rights and community development movements of the 60's. This quest was initiated in the early 70's when a number of community organizations and ad hoc community groups began experimenting with energy saving devices and alternative technologies. These included CHARAS, a group of former gang members who built geodesic domes on New York's Lower East Side and Community Technology, Inc., a group experimenting with fish tanks, solar cookers and rooftop greenhouse in Washington, D.C. In the mid-70's more ambitious solar and gardening projects were launched at 519 E 11th Street on New York's Lower East Side and by the People's Development Corporation and Bronx Frontier Corporation in the South Bronx, the Westside Community Development Corporation in San Bernardino and the Center for Neighborhood Technology in Chicago. These pioneering community efforts became the inspiration for what I call the "Small War on Poverty" in the late 70's, the effort by the Community Services Administration and other government agencies to support neighborhood technology demonstration projects in low income communities, which culminated in the creation of the National Center for Appropriate Technology in Butte, Montana to promote and facilitate such projects.

Figure 11 depicts one of the earliest and most famous of these pioneering community technology development projects, the rehab and installation of a solar system in a fire gutted tenement building at 519 E 11th Street on New York's Lower East Side.

In Chapter 4 I'll descibe in detail the evolution of this quest for community/neighborhood technology and the resulting "Small War on Poverty" that grew out of it in the late 70's, focusing particularly on the stormy evolution of the National Center for Appropriate Technology (NCAT) and on pioneering local neighborhood technology development projects in San Bernardino (Calf.), Chicago, Eugene (Oregon) and Seattle.

AT IV: The Quest for Ecological/Convivial Culture

Finally, the lowest quest path in Figure 5 depicts the milestones in the evolution

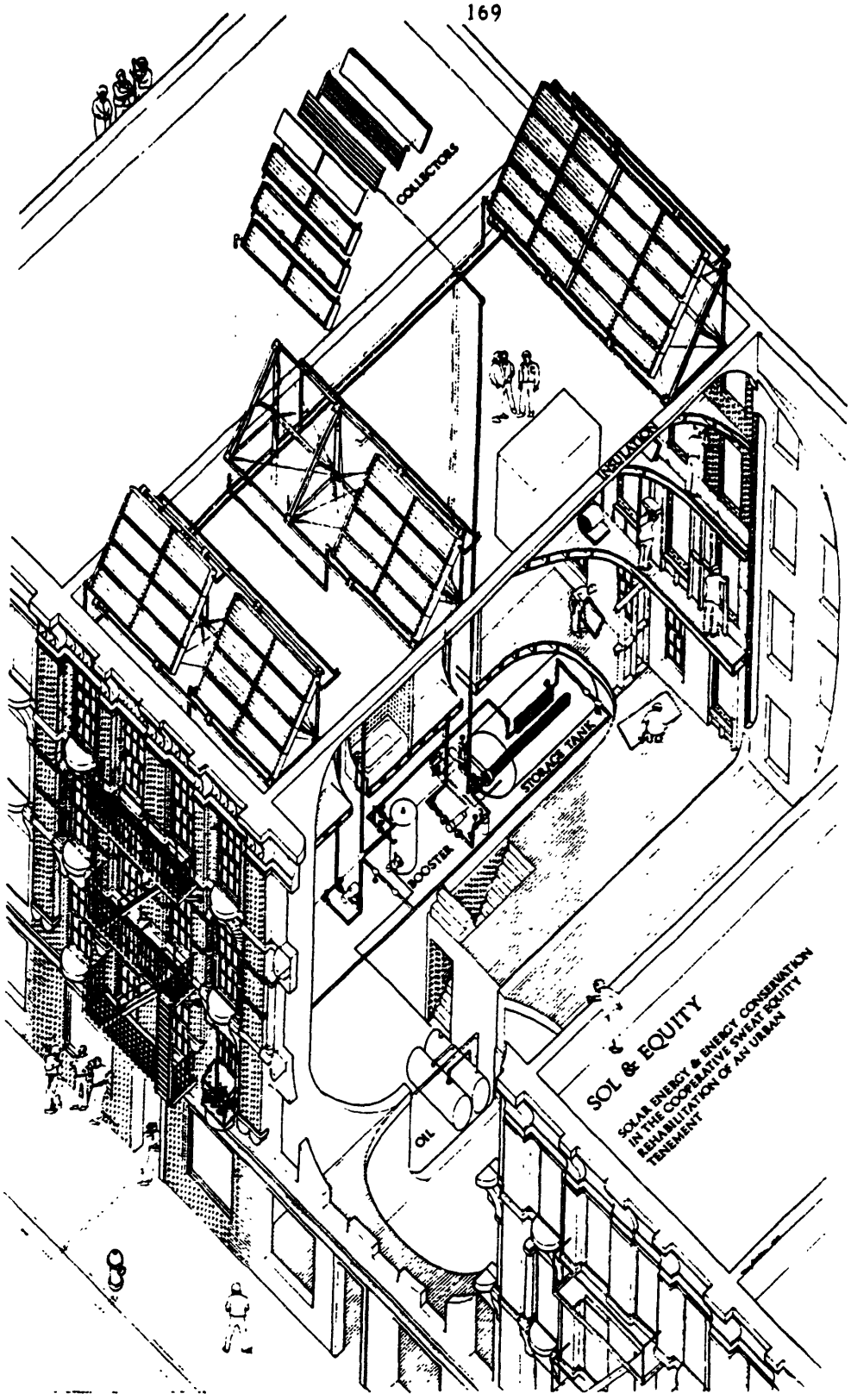


Figure 11: One of the Earliest and Best Known Community Technology Development Projects, the Rehab and Solarization of the Tenement at 519 E 11th Street

of the quest for ecological or convivial culture, which emerged from the cultural crisis and countercultural impulses in the 60's and sought to design and live by an alternative culture or system of meanings around a combination of countercultural, ecological and AT ideas. This quest was initiated by Stewart Brand, one of Kesey's Merry Pranksters, who created the Whole Earth Catalogs in the late 60's and later the CoEvolution Quarterly to serve as guides to alternative tools, ideas and designs. In the early 70's a number of preliminary and partial visions of ecological cultures were articulated, including Illich's notion of a convivial society (Illich, 1973), Thompson's vision of an emerging planetary culture (Thompson, 1971, 1974), Bookchin's notion of social ecology (Bookchin, 1971, 1982) and Bateson's ideas about an ecology of mind (Bateson, 1972). Then, in the mid-70's Callenbach developed a more complete vision of an ecological utopia in his novel, Ecotopia (1975) and RAIN magazine joined the CoEvolution Quarterly in promoting ecological and ecotopian ideas. In the late 70's groups and governmental agencies in Northern California, Oregon and Washington, the setting of Callenbach's utopian vision, began trying to implement some of the ecotopian ideas advocated by Callenbach and others. Governor Jerry Brown and his state architect Sym Van der Ryn established a state Office of Appropriate Technology in California and Stewart Brand became one of Brown's advisors. Lane County, Oregon and Santa Clara County, California established local Offices of Appropriate Technology, Davis, California passed innovative energy conservation ordiances and in Seattle, Washington a Neighborhood Technology Coalition was was formed among the city's community development agency, its AT groups and its community groups. When more conservative people gained control in Lane County and California in the late 70's and early 80's, however, the Lane County and California OATs were dismantled and the energy for creating an ecological culture in the Pacific Northwest seemed to wane for a time.

The illustration in Figure 12, taken from the cover of the Rainbook (a collection of AT and ecotopian ideas and designs from RAIN magazine), which was entitled "Vision

BY THE EDITORS OF "RAIN"

RAINBOOK

RESOURCES FOR APPROPRIATE TECHNOLOGY

with Hundreds of Illustrations

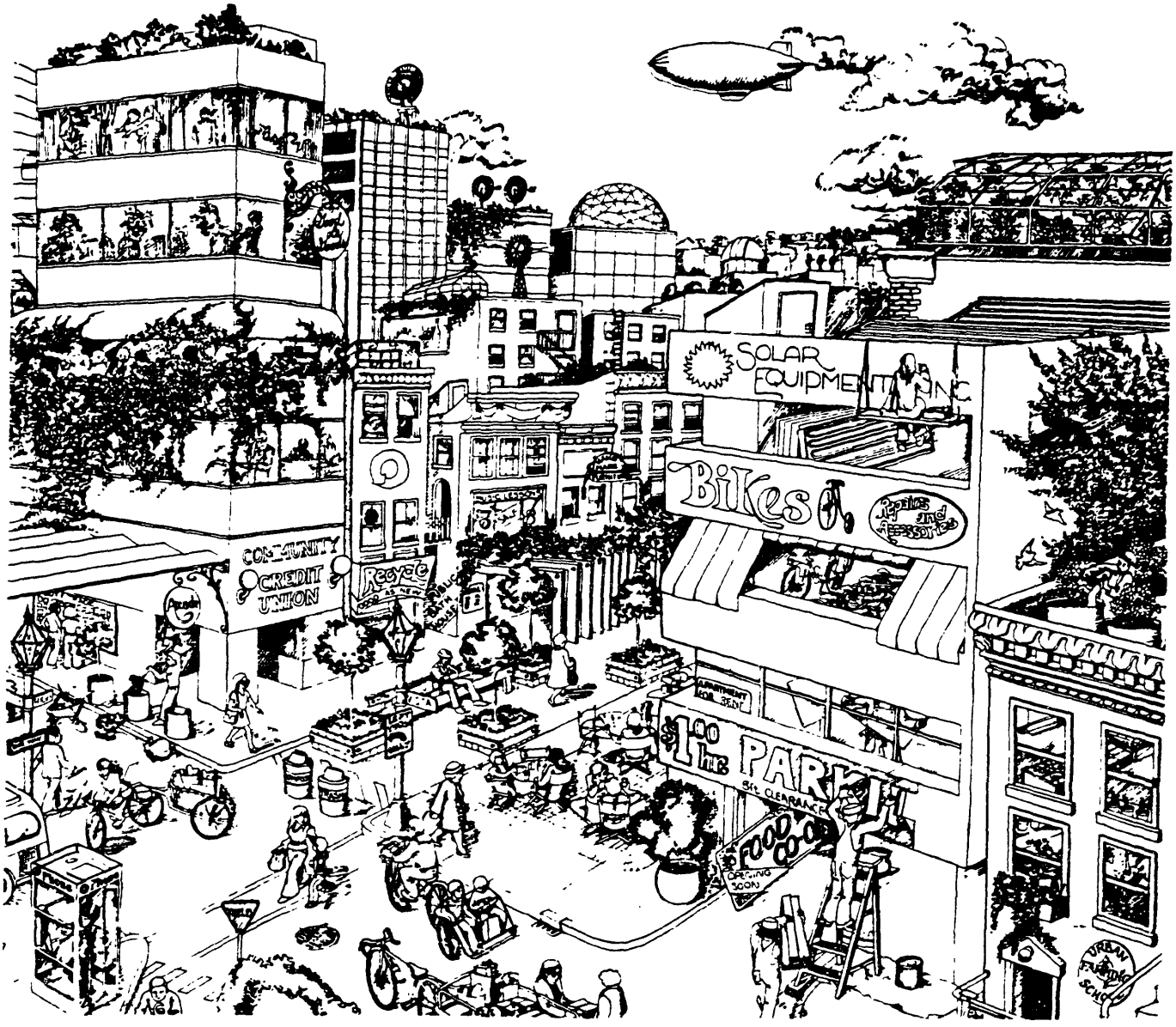


Figure 12: Cover of Rainbook Catalog with Illustration Entitled 'Vision of Ecotopia'

of Ecotopia", depicts a number of desirable features these cultural designers thought a more ecological/convivial community or culture should have, including the replacement of automobiles with "people-powered"vehicles, the use of renewable energy, the recycling of waste materials, urban gardening and farming and food and other types of cooperative enterprises. In a similar vein, the collage of ideas and illustrations taken from RAIN magazine in Figure 13, suggest a number of the alternative cultural themes that these cultural visionaries and designers sought to promote, including the theme of living by alternative ecological values (as illustrated by Bender's piece on "Sharing Smaller Pies" which advocated "stewardship, not progress", "people, not professions", etc.), the theme of living in harmony with nature (illustrated by the exerpt "In Ecotopia's Big Woods" from Callenbach's utopian novel and Schumacher's essay, "Plant a Tree), the theme of self and spiritual renewal and wholeness (illustrated by the alchemical symbols in the lower right corner), the theme of alternative cultural and mental "maps" and ecologies (suggested by the quotes from Bateson), and the theme of bioregional cooperation and networking around AT and related concepts (illustrated by the photo of the RAIN/Ecotope "hands-on" solar workshops and the map of alternative energy resources in the Northwest bioregion).

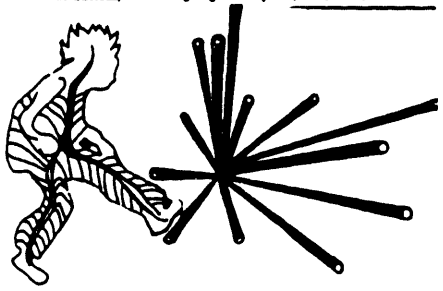
Not only did the four AT quests described above have different origins in the 60's and stress different design themes, they also had different geographical origins and distributions as the map in Figure 14 showing the locality of major American AT activities and projects illustrates. The renewable/alternative energy quest (A pointers in figure) had its origins and growth in a number of regions including the Southwest, California/Oregon, New England and the Southeast. The ecological home/homestead quest (B pointers in figure) and the ecological/alternative culture quest (D pointers in figure) had their origins and greatest concentration in the South-

The Map Is Not The Territory

The very meaning of "survival" becomes different when we stop talking about the survival of something bounded by the skin and start to think of the survival of the system of ideas in circuit. The contents of the skin are randomized at death and the pathways within the skin are randomized. But the ideas, under further transformation, may go on out in the world in books or works of art. Socrates as a bio-energetic individual is dead. But much of him still lives a complex set in the contemporary ecology of ideas.

Gregory Bateson

☰ Earth (sign not very well drawn — left lower stroke should be at bottom) + the foregoing = level plain, wide horizon.

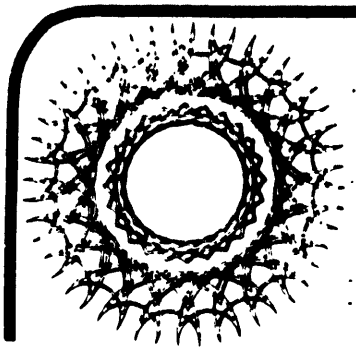


II. MODELS—THE ECO-CONNECTION

If Lake Erie is driven insane, its insanity is incorporated into the larger system of your thought and experience

Gregory Bateson
Steps to an Ecology of the Mind

Solar Workshops



Spawning Adhocracies

SHARING SMALLER PIES

STEWARDSHIP, not progress. We have valued progress highly during our period of growth, as we have known that changes were unavoidable, and have needed an orientation that would help us adjust to and assist these

PEOPLE, not professions. Our wealth has made it possible for us to institutionalize and professionalize many of our individual responsibilities—a process which is inherently ineffective and more costly, which has proven

AUSTERITY, not affluence. Austerity is a principle which does not exclude all enjoyments, only those which are distracting from or destructive of personal relatedness. It is part of a more embracing virtue—friendship

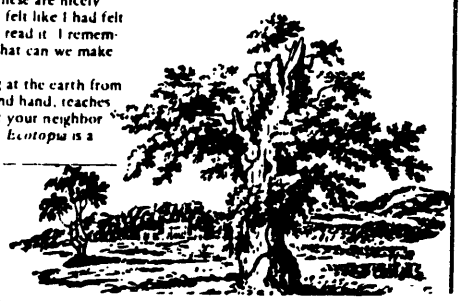
In Ecotopia's Big Woods

Ecotopia, by Ernest Callenbach, Banyon Tree Books, 1517 Francisco St., Berkeley, CA 94703

Ecotopia is a singular work, like the wheel it looks obvious.

A steady state, spiritual rather than economic conscious society. It's more like a kit than any Utopia I've read or like a ten-year plan. Yes, flawed, of course, but even these are nicely angled odd things. It felt like I had felt a new feeling when I read it. I remembered how to ask (What can we make the world into?)

Somehow looking at the earth from the moon, even second hand, teaches you something about your neighbor. We need big pictures. *Ecotopia* is a unique one.

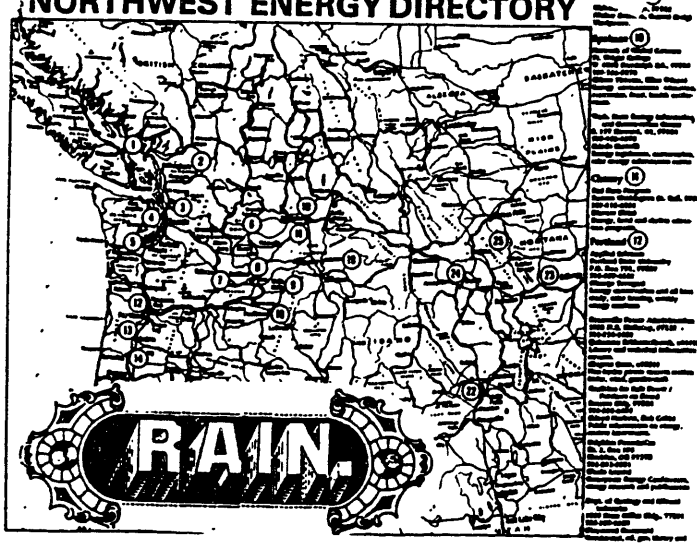


Healdsburg, May 17. Wood is a major factor in the topsy turvy Ecotopian economy, as the source not only of lumber and paper but also of some of the remarkable plastics that Ecotopian scientists have developed. Ecotopians in the city and country alike take a deep and lasting interest in wood. They love to smell it, feel it, carve it, polish it. Inquiries about why they persist in using such an outdated material

PLANT A TREE

E.F. Schumacher

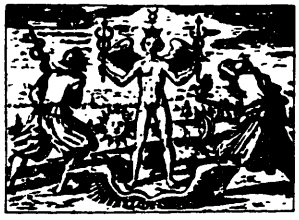
NORTHWEST ENERGY DIRECTORY



RAIN

st unexpectly, a letter from
t. It couldn't be *the* Richard

ty of nature. I started out thinking that we had to do everything ourselves and, of course, we couldn't. But then I dis-



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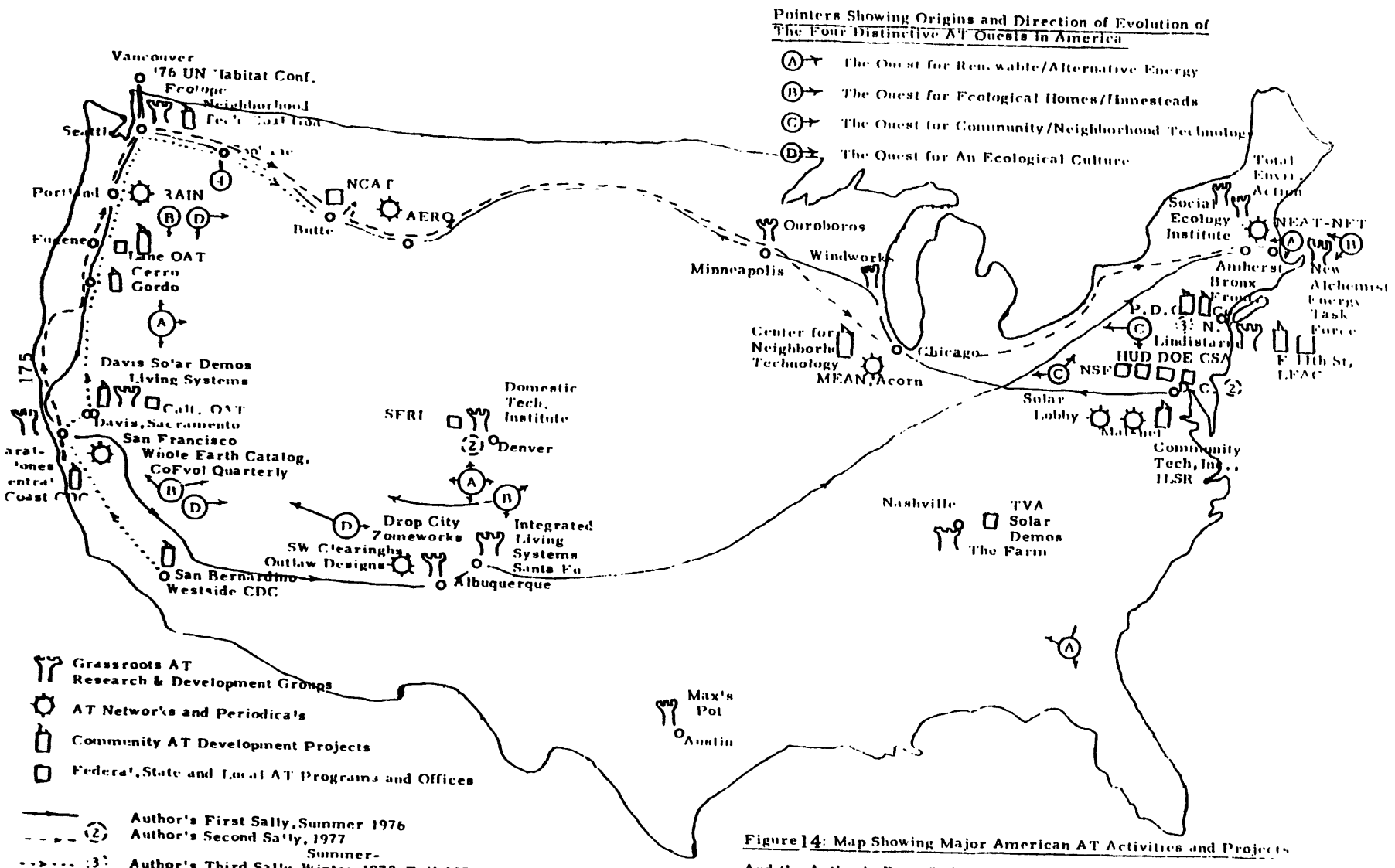


Figure 14: Map Showing Major American AT Activities and Projects And the Author's Data Gathering Trips or Sallies

west and Pacific Northwest (Ecotopian) regions. The neighborhood/community technology quest and the small war on poverty which followed, however, had its origins in the East in New York City and Washington, D.C. and then moved westward to places like Chicago, Denver, San Bernardino, Eugene and Seattle(C pointers in figure).

Figure 14 also shows my own "sallies" or research trips to gather the data on these four quests and their convergence into the AT movement on which this dissertation is based, including: 1) my initial trip across the country to visit AT groups and attend the UN Conference on Human Habitation in Vancouver, Canada during the summer of 1976; 2) my trip in the winter of 1977 to gather data on NCAT and grassroots AT groups; 3) my research trips to New York, Chicago, San Bernardino, Eugene and Seattle in 1978 and 1979 to study and gather data on the pioneering neighborhood technology development projects in those cities; and 4) my pastoral/intellectual retreat to my grandmother's farm for a year in 1983-84, where I developed in a preliminary way a number of the intellectual/theoretical concepts on which this dissertation is based.

Although, for the sake of clarity, I've depicted and described these four cultural quests, out of which the AT movement emerged, as separate lines of development, there was, in fact, considerable intermingling and coevolution among these four quests, as my subsequent chapters on the coevolution of one exemplary group of alternative energy, eco-home, and alternative cultural designers, the New Alchemists, and on the the national and local evolution of community technology development and the "Small War on Poverty" will show.

Chapter 3. The Arks of the New Alchemists

...The question we finally came to one night in San Diego was: Is it too late?... As none of us had reached a point of utter hopelessness, we gradually began to formulate a few ideas of what might be done. From this somewhat contradictory construct of intellectual pessimism and glandular optimism, we formed a group and called our quixotic gesture New Alchemy...'

- Nancy Todd
The Book of the New Alchemists

...The New Alchemists are builders of 'lifeboats' and 'arks'. It is our contention that they will be needed desperately, if humanity is to avoid famine and hardship, and manage to shift to modes of living which restore or rekindle our bonds with nature...

- John Todd and Bill McLarney
"Walton Two: A Compleat Guide to Backyard Fish Farming"

...It has sometimes seemed to me that in our struggle we are not unlike Tolkien's ragged and assorted fellowship and, if that is so, then Fritz (Schumacher) was our wise and gentle wizard...

- Nancy Todd
Journal of the New Alchemists, Four

...We are a mirror image, a tiny reflection of the earth itself and our collective psyche is a superimposition of images of humanity's experience on earth over time. The same forces which have shaped us have shaped the world. There can be no real separation. The continuities in nature between the design of cells and ecosystems extend from organelles outward to the smallest freshwater pools with their myriad living entities to the oceans and ultimately to the whole planet...

- John Todd
"The World in Miniature"

The New Alchemists were one of the earliest and most innovative of the grassroots AT research and development families which sprung up across the country in the early 70's. They were organized by marine biologists John Todd and Bill McLarney and John's wife, Nancy, in San Diego in 1970 and soon thereafter moved east and rented a farm on Cape Cod which became the permanent home for the New Alchemy Institute.

During the 70's they conducted research and developed innovative designs in the areas of renewable energy, ecological agriculture and ecological aquaculture. Their chief focus was the design, contruction and testing of a series of "bioshelters", that is, structures which contained ecosystems of plants, animals and fish. The first of these were what they called "backyard fish farms". From these simple original structures, their more sophisticated "ark" bioshelters evolved- first their Mini-ark, followed by their Six Pack prototype solar greenhouse/bioshelter, and, finally, their fullscale Cape Cod and Prince Edward Arks, which were the culmination and zenith of their research and design.

In this chapter, I'll trace the coevolution of the ideas, themes and designs which ultimately led to the creation of these Arks. I'll start by looking at the lives and life themes of New Alchemy founders John and Nancy Todd and showing how their life themes foreshadowed and formed the basis for what became the formative ideas and themes of the New Alchemist community. Then, I'll describe the more immediate transforming events and themes that led them, along with Bill McLarney, to form the New Alchemists, and how these "coevolved" out of the Todds' complementary life themes, skills, and experiences. Next, I'll describe the social design and organization of the New Alchemists which was guided by their transforming themes of becoming a "fellowship" or extended family involved in a quest to transform themselves and their culture so as to once again be able to live in harmony with nature. Then, I'll describe the progression and coevolution of bioshelter designs which grew out of and came to symbolize their general transforming themes of cultural transformation and being in harmony with nature, starting with their backyard fish farms and proceeding, step by step, through their Mini-ark, Six Pack, and, finally, their Cape Cod and Prince Edward Island Arks. Lastly, I'll turn to the Journals of the New Alchemists, which came out each year and told of the New Alchemists' activities and progress in the previous year, analyzing their thematic structure and showing how they contained symbols and myths which both reflected and reenforced the general themes of the New Alchemists.

John Todd's Life Themes

In an interview published in 1976 (my, 1976), John Todd told several stories about his early life from which I was able to abstract a number of tentative life themes.

The interview began with Todd telling of his childhood in Hamilton, Canada:

> There was no science background in the family, but there was always an interest in nature. I was brought up on the edge of a rural area, and I spent a lot of time as a child alone in a deep climax forest. My father was interested in woods lore, and the house was filled with all kinds of books on the woods. And we lived right on the water, so I was very much involved in aquatic things. He built me a punt, and I fantasized it was a raft on the high seas and the little bay was the South Pacific. . . All these things are sort of wound together like a tapestry (p68).

In this story piece we see two of Todd's early ideals, a love of nature and a longing for adventure, coupled together, suggesting the following life theme:

1) adventure in nature: Seek adventure in nature.

In high school Todd sought adventure through skiing, eventually skiing on Canada's national team. He also dreamed of becoming a farmer and practicing "good land stewardship" like he had read about the American writer Louis Bromfield doing in the 40's (Bromfield, 1943, 1947). But when he enrolled in agriculture at McGill University, he soon received a rude awakening:

> I was sort of weaned by Louis Bromfield's dreams of restoring valleys and making hamlets and peoples thrive on the basis of really good land stewardship; and then all of a sudden I was studying agriculture, and it was reduced to potassium, nitrogen, and phosphorus, or it was dealt with in cold economic terms. I remember an economist who got us all in a class and asked how many had parents with a completely operational farm. There were some. Then he said how many of the rest of you have a hundred and fifty thousand dollars ^ and there were a couple. Then he said, The rest of you just won't farm; forget it. So here was the world of Bromfield, and here was another world in which I was being taught by a narrow-minded agricultural economist (p 69).

The references in this passage to Bromfield's "dreams" and "world" refer to

Bromfield's book Pleasant Valley (1943) and its sequel Malabar Farm (1947), which describe how Bromfield and his family created and ran a model cooperative organic farm in the 40's in the Ohio valley where he had grown up. This passage led me to read Pleasant Valley and I found layed out there a whole thematic system quite similar to the one later evolved by the New Alchemists. This suggested to me that Todd not only got a life theme from Bromfield's books but a whole system of themes and designs- a system which he later used and adapted in the development of the New Alchemists' farm on Cape Cod. I, therefore, attempted to abstract the general themes, design themes and designs from Pleasant Valley and show how they fit together into an interlocking thematic system. This effort is summarized in Figures 1 and 2. In Figure 1 I've listed important passages from the book and the themes or designs I abstracted from them. Then, in Figure 2, I show how these abstracted themes and designs fit together into an interlocking thematic system or hiearchy (the reader may wish to skip the details in Figure 1 and focus on the summary structure in Figure 2 for now).

The overall theme of Bromfield's book is what I call "the romance of farming", that is, the ideal that farming is a noble and romantic adventure on which the future of our society depends (see Smith, 1950; Hofstadter, 1955 and Marx, 1964 for discussions of the evolution and role of this "agrarian myth" in American culture). In the first part of the book, Bromfield develops some general themes about his life (note the similarity between passage (3) in Figure 1 and the above passage on Todd's childhood, from both of which I abstracted the same theme, "adventure in nature") and about man's relationship to nature (shown at the top of Figure 2). These led into his key transforming theme- the need for a breed of "new pioneers" who will be conservers and stewards of nature rather than exploiters. From here, Bromfield goes on to develop three sets of themes: personal themes about the qualities that make good farmers and stewards (left side of Figure 2), global themes about the "sickness of American agriculture" and possible remedies (right side of Figure 2), and design themes for his own model farm/world,

Figure 1: Themes and Designs in Bromfield's Pleasant Valley World

Story Passages	Abstracted Themes/Designs*
1) In his Preface, Bromfield suggests his overall theme:	
...farming is the most honorable of professions and unquestionably a romantic and inspiring one. ...agriculture is the keystone of our economic structure and the wealth, welfare, prosperity and even the future freedom of this nation are based upon the soil (p vii).	1)the romance of farming: Farming is a noble and romantic adventure on which the future of our society depends.
2) In his first chapter, "Return of the Native", he develops that theme, talking of his return from Europe to the valley he grew up in at the beginning of WWII:	
...I was coming home to a country which I had never really left, for in all those years away from the Valley it had kept returning to me...I dreamed constantly of my home country, of my grandfather's farm...And those dreams were associated with a sensation of warmth and security and satisfaction that was almost physical. It may have been because in all my waking hours, during most of those years, I was aware of insecurity and peril, conscious always that in the world outside my own country, a doom lay ahead (p3-4). ...(but now) after years of excitement and wandering and adventure (my valley) had reclaimed me (p 16).	2)return of the native: Seek adventure in the world, but in times of crisis return to your own home and roots.
3) He also mentions one of his childhood fantasies:	
As a boy in these woods I had pretended that they were tropical forests and that I was lost in them, as very often I was. And now I knew I was right...I had seen tropical forests in Malabar and Mascassar which held the same feeling of dampness, of fertility...(p 12).	3)adventure in nature: Seek adventure in nature.
4) In his third chapter, he develops the symbol/theme of Johnny Appleseed:	
The spirit of Johnny Appleseed haunts (our) Valley... (my Great Aunt Mattie told us stories of how) he would arrive and have supper with the family...(and sometimes) preach a kind of sermon upon love of mankind and all Nature...interspersed with wonderful, enchanting stories about the wild things...Aunt Mattie said that, like St. Francis, he had a habit of talking aloud to the birds and animals as he tramped barefooted through the woods (p 28-9).	4)the spirit of Johnny Appleseed: Johnny Appleseed symbolizes our desire to live in harmony with and communicate with Nature.

*numbers indicate general themes, roman numerals indicate design themes and numeral/letters indicate designs

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
5) In his second, fourth and fifth chapters, Bromfield develops three contrasting themes about the relationship of man to nature, using the three pieces of land he bought to create his own farm to symbolize these themes. The high country of the old Ferguson place symbolizes the solitude and wildness of nature:	
On the top of the Ferguson place you have solitude in the midst of beauty and plenty...It is a spot one turns to instinctively when all the world seems collapsing over one's head. You turn to it when fear and depression assail you, with that instinct for returning to the womb which Freud believed was strong in all of us. In the lofty wilderness and solitude of the Ferguson place one goes back to the beginning of time (p 20).	5) the solitude of nature: In times of crisis, seek wisdom and security in the solitude and wildness of nature.
6) He uses the "middle landscape" of the old Anson place to symbolize the warm, nuturing side of Nature:	
The Anson place had a character and a feel about it quite as strong as the Ferguson place but quite different. There was nothing remote or solitary and magnificent about it and certainly nothing fey or haunted. It was human and alive with people coming and going...It was the Anson place we chose as home. It was a good choice. The spot was already warm like the nest of a rabbit...(p 37).	6) the warmth of nature: Live day-to-day in the gentle, nurturing landscape of a family farm.
7) And he uses the "low land" of the old Fleming place to symbolize Man's traditional misuse of Nature:	
(Although the Fleming place) was potentially the best of the three...No one had ever farmed it well...No one had ever cherished or fed that potentially rich soil. The tradition which had guided the farming of the Fleming place for more than a century was the evil tradition which has dominated most farming in America. The men who had owned or rented the Fleming place had not farmed it; they had "mined" it...(and so) its fertility had slipped down and down under the greed and ignorance of the men who worked its gently rolling fields (p 45-6).	7) Man's misuse of nature: Traditionally, Man has misused nature by exploiting rather than conserving it.
8) At the end of his fifth chapter, he brings together the symbol/themes of Johnny Appleseed and his three pieces of land in his vision of a "new race of pioneers":	
I knew in my heart that we as a nation were already much farther along the path to destruction than most people knew. What we needed was a new kind of pioneer, not the sort which	

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
cut down the forests and burned off the prairies and raped the land, but pioneers who created new forests and healed and restored the richness of the country God had given us, that richness which, from the moment the first settler landed on the Atlantic coast we had done our best to destroy...I wanted to be one of that new race of pioneers (p 48).	8)the need for New Pioneers: In order to save nature, agriculture and society, we need a new race of pioneer/stewards who will conserve instead of exploit nature.
9) In his sixth chapter, "The Plan", he lays out some guiding themes/principles for the New Pioneers and shows how these guided the design of Malabar, his model cooperative farm. He starts with the qualities of a good farmer:	
A good farmer in our time has to know more about more things than a man in any other profession...he has to have an open mind, eager and ready to absorb new knowledge and new ideas...(But he must also have) a passionate feeling for the soil he owns and an understanding and sympathy for his animals...(these) are almost mystical qualities, belonging really only to people who are a little "teched" and very close to Nature itself (p 51-2).	9)the mind and soul of good farmers: A good farmer must have both a good mind and a "soul" which empathizes with Nature.
10) He describes the development of the master plan for Malabar Farm (named after the hill overlooking Bombay):	
...there had never been or ever will be a more stimulating experience than the working out of the Plan. We had between us six hundred and forty acres of woods and pasture and farmland and springs and streams, a small kingdom which we sought between us to bring back to life. It was a little like planning the recreation of a world of our own, secure and complete and apart (p 53).	i) Malabar Farm/World: Create a model cooperative farm that is a secure "world" unto itself.
11) ...and the thematic principles guiding the Plan, including the notion of working with Nature to restore the land:	
As the new pioneers bent upon restoring the land, we had to put back by every manner of ingenious means the very elements the first pioneers had recklessly removed... Working with Nature, we would be recompensed by her sympathy...we knew that we could restore the soil...but only if we worked with Nature rather than against her as our predecessors had done (p 56).	ii)work with Nature: Work with Nature rather than against her in restoring and conserving land.
12) which led to the design of animal and "green" manure programs:	
...there was the question of livestock which was vital in the production of manure to bring back the fretility of the	

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
of the wasted fields...And there was to be a whole program of green manures, the clovers and other legumes, rye and rye grass to be plowed under to restore both nitrogen and humus (p 54)	iia)animal manure program iib)"green" manure program
13)...and the thematic principle of self-sufficiency and independence:	
...one of the most important reasons for the breakdown (of agriculture) was the farmer's dependence upon things which he purchased rather than producing these same things off his own land. I had memories of the farm of my grandfather, a farm which in itself was a fortress of security...I wanted to be on my own land, on an island of security which could be a refuge not only for myself and my family but my friends as well (p57, 59)	iii)self-sufficiency: Seek to be as self-sufficient as possible by producing your own food and other resources.
14) which led to the design of a wide range of food and resource production programs:	
I meant to have as nearly everything as possible, not merely chickens and eggs and butter and milk and fruits and the things which many foolish farmers but today: I meant to have guinea fowl and ducks and geese...(and) grapes in abundance and plums and peaches...(and) ponds which would produce a constant supply of fish. And I meant not only to operate the maple sugar bush again but also to have bees (p 59).	iiia)livestock program iiib)crop program iiic)tree program iiid)fish pond program iiie)bee program, etc.
15)...and the thematic principle of economic cooperation:	
(We) had faith in co-operative effort as the solution to many of the illnesses of agriculture...We took as our model the collective as it had worked out in Russia...(we) had faith that some sort of a co-operative farm could be worked out...(so as to raise) the income and living standards of all the families involved...(p 61).	iv)economic cooperation: Form co-operative arrangements to share wealth and raise everyone's standard of living.
16) which led to the design of the Farm's co-operative economic system:	
Under the Plan each family would have a house, rent free, ...all its (food) save only coffee, spices and sugar, as well as a salary above the average...(profits) were to be divided pro rata according to the salaries paid each worker, which varied according to their education, skill and value to the common enterprise (p61).	iva)Farm's co-operative economic system

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
17) Bromfield also develops in this chapter two more global themes about the plight of American agriculture and society:	
...(the farmer) is the source of our stability as a nation, not only in the economic but the social sense as well... (we) knew that agriculture in America was sick, with a wasting illness no amount of subsidies or superficial measures imposed by a highly centralized government could cure. We knew too that when agriculture is sick, the illness in time pervades the whole of the economic structure of the nation (p 51, 57).	10) sickness of American agriculture: American agriculture is sick and this sickness is likely to spread to the rest of the society.
18) and the dangers of mechanization, industrialization and centralization:	
...another reason for the sickness of American agriculture ...was the gradual disappearance over large areas of the family-sized farm and establishment of great mechanized farms which were more like industries than farms...(we did not believe) that the impulse of our times toward regimentation, centralization, mechanization and industrialism necessarily represented progress. It seemed to us and still seems to me a dangerous path...(p 60).	11) the dangers of mechanization and centralization: American agriculture and society has become too mechanized and centralized.
19) In his seventh chapter, "The Big House", Bromfield describes the architectual design themes which guided the design and building of his family home on Malabar Farm, including the notion of organic architecture:	
A house must, like the soil, be a living thing or it is nothing at all but walls and roof and cellar...I wanted a house which after a year or two looked as if it belonged there on that hillside shelf in the middle of the rich Ohio country, a house that looked as if it had been there since the clearing of the wilderness...(p 67, 70).	v) organic architecture: A house should evolve out of and be part of its environment.
20) and the theme of socially appropriate architecture:	
...houses become in time stamped with the character of their owners...(conversely) houses affect the lives and character and happiness of people who live in them...we were a family of big people, big physically and rather big and loose and careless in our living. We had to have room for physique, for personality and for spirit...(p 67-8).	vi) socially appropriate architecture: A house should fit the social needs and personality of the people who live in it.
21) and the theme of continuity and tradition in architecture:	

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
Because the Greek revival style of Thomas Jefferson had left a great imprint on all early houses in Ohio, I wanted that style to dominate both the outside and the inside... I do not believe any style...which breaks clean with the styles and the traditions of the past has any chance of survival. Somewhere there must be the discernible line which connects the present with the past, the new with the old...	vii) tradition and continuity in architecture: A house's style should grow out of and reflect local and cultural traditions.
And so it was desided that the Anson house should remain as the nucleus of the new house and that additions totaling approximately twice the space of the Anson house should be added (p70, 73).	va) the Big House design
22) In his eighth chapter, "On Being 'Teched' ", Bromfield expands on his theme (passage 9) that a good farmer has to be a little 'teched":	
...any good farmer has to be a little "teched"...for it means that he loves his land, his animals and his trees and understands them all. He farms not in order to make money but because of the pleasure and satisfaction there is in it... ...(legendary "teched" characters like Johnny Appleseed have) acquired, like St. Francis, that intimacy with God and with Nature and birds and animals, that lack of all envy or ambition or greed, which is the ultimate "oneness with God" (p 88, 90).	12) being "teched": Being "teched" means living a simple, non-material life in harmony with Nature.
23) In his eleventh and twelveth chapters, he develops the theme of the farmer as grassroots scientist:	
Agriculture is in many ways the most satisfactory and inexhaustible of sciences... With all the research we have made there still remain many mysteries...In this borderland the "live" farmer finds his place-the man who sees and feels what is going on in the soil beneath his feet and on the earth around him, the man whose footsteps are the best fertilizer of his farm (p 148).	viii) the farmer as grassroots scientist: With his combination of good mind and soul, the good farmer makes an ideal grassroots scientist.
24) He goes on to describe some discoveries made at Malabar Farm, including the affinity between corn and weeds and the idea of not plowing manure under:	
Experimentation is the very essence of the "live" farmer... At Malabar we have learned many things...Some discoveries were the result of deliberate experiments. More often they were made by accident... (When some weeds began to grow among the corn), I began to discover a remarkable thing-that where there were weeds in the corn rows, the soil was moist and cool; where the corn was free of weeds, the soil was hot and parched and dry. Where	viiia) the complementary affinity between corn and weeds.

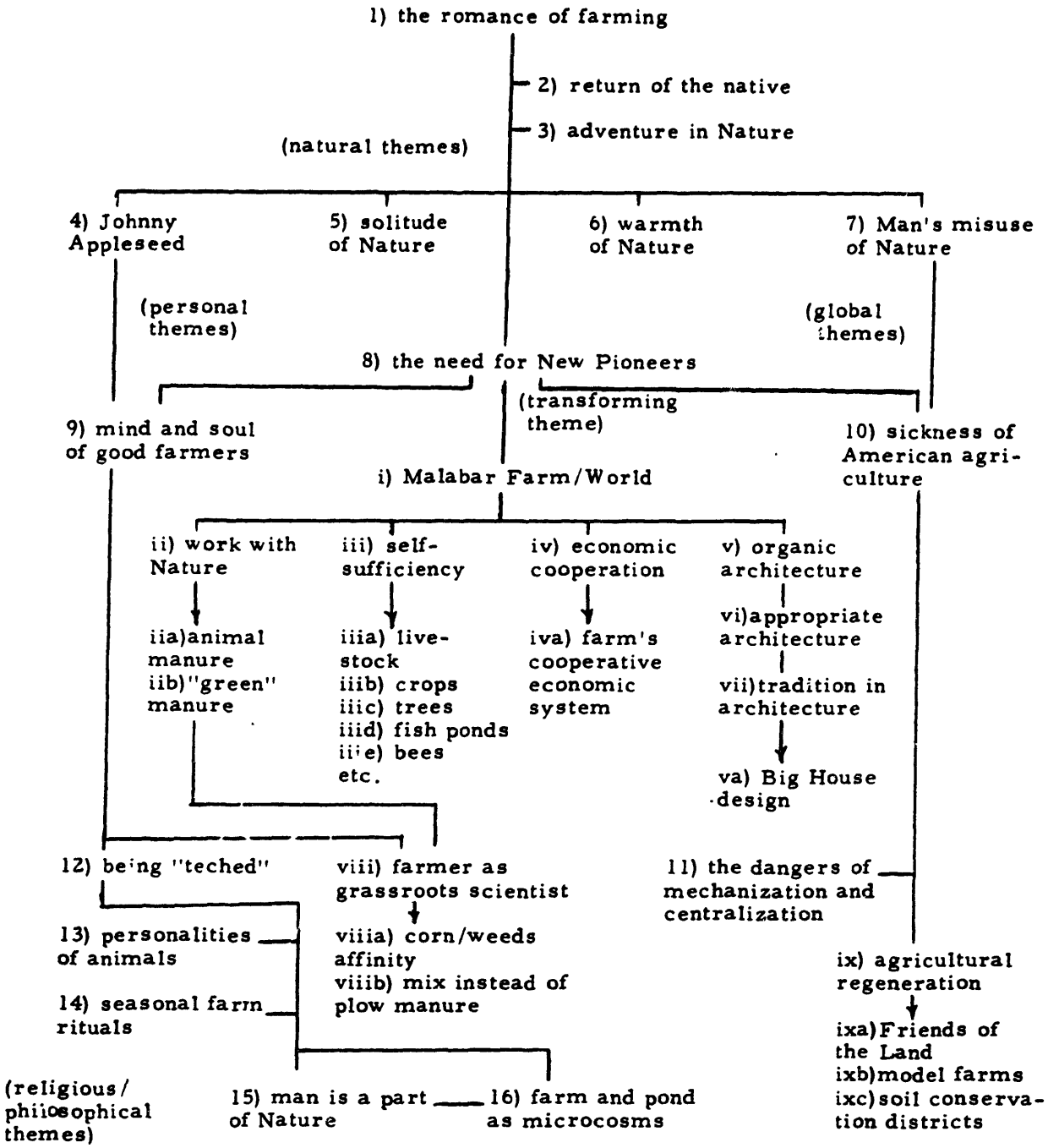
Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
there were weeds, the corn grew stronger and higher... All of this led us then into the whole question of the affinities between plants (p154-5, 158).	
...(Instead of plowing the manure) under to ferment and form destructive acids, it was stirred into the soil along with whatever rubbish, weeds or green manure lay on the surface...(thus) we were growing crops in a living compost heap...(the resulting plants) like it and are healthy and productive (p 198).	viiib)mixing manure with top soil rather than plowing it under
25) In his nineth and fourteenth chapters, he elaborates on his theme of the sickness of American agriculture (passage 17) and advocates a broad movement to regenerate American agriculture:	
...The root of the sickness lies deep. Only unity of the people, statesmanship, understanding leadership and wisdom can cure it...Very likely it requires the regeneration of a whole people, a whole nation...(p 247).	ix)agricultural regeneration: A broad movement is needed to regenerate and revitalize American agriculture.
26) Then, in his sixteenth chapter, he describes the Friends of the Land, a national organization he helped start, and the programs it advocates:	
...The slogan of the organization might well be: "The civilization of this nation is founded upon about eight inches of topsoil. When that goes civilization will go with it."...Its primary purpose is the education of the public regarding the problems of our natural resources...The society urges the adoption of the practices advocated by the US Soil Conservation Service...(and) encourages the establishment of... (model) "pilot" farms...(and) soil conservation district acts in all the states (p268, 270).	ixa) the Friends of the Land organization ixb) model "pilot" farms like Malabar ixc) soil conservation districts
27) In his thirteenth chapter, he tells stories about the farm animals and concludes:	
...It is a friendly place because of the animals who to me and indeed to all of us, each has a personality...There are times in my own relations with the farm animals when I am tempted to accept the beliefs of the Hindu and the Jain concerning reincarnation and the sacredness of all life. In any case, I know how much poorer life would be without the animals and their trust (p 230).	13)the personalities of animals: Animals have personalities and are part of the social fabric of the farm.

Figure 1: Bromfield's Themes and Designs (con't):

Story Passages	Abstracted Themes/Designs
28) In his fifteenth chapter, he tells about seasonal farm rituals:	
Sugar making, the arrival of the morels and of the autumn mushrooms all become seasonal rites, small feast days that are important in the year-long life of a big farm...All these rites are important in the life of a farm and the individuals who live upon it for they are a part of the very life of mankind, going back remotely into the dimness of the ages... They belong to what is deepest and eternal in man (p258-9).	14)seasonal farm rituals: Seasonal farm rituals are important because they connect us to Nature and to our past.
29) Finally, in his last chapter, Bromfield sums up his naturalistic/agrarian philosophy and religion in passages about two farm scenes. The first is about the wild rabbits that feed outside his window:	
...Watching them, living very close to them, gives you a vague and curious sense of participating in the mystery of Nature itself, of yourself being not a specimen of dauntless, clever, all-powerful mankind, but of being only an integral and humble part of something very great and very beautiful. ...for me religion and faith have never come through churches and rarely through men. These things have welled up in me many times in contact with animals and trees and landscape, at moments when I was certain not only of the existence of God but of my own immortality as a part of some gigantic scheme of creation (p 275).	15)man is a part of Nature: Man is a part of Nature, not separate from it, and can only understand himself when he sees this.
30)and the second is about a fish pond and its surroundings, which Bromfield and his new pioneers brought back to life:	
I think I love it best of all the spots on the whole farm... Beside the little pond one is no longer insignificant...in that smaller world one understands everything, with all its tragedies and comedies. One sees that even among geese and ducks there are braggarts and bullies, heroes and knaves, clowns and heroes. It gives one a nice reassuring feeling of belonging to a whole scheme of things, of being a part of the whole plan of Nature. One begins to understand exactly where man fits in. ...The whole field of agriculture represents perhaps the most fascinating of all callings...because it embraces all of science and philosophy and life...Each farm is a tiny world in itself, with each day its small play of tragedy, of comedy, of farce. Each day is in itself a cycle of the history of the earth (p 292, 298).	16)farm and pond as microcosms: The farm and its pond are microcosm which reflect the dynamics of the larger world in miniature. One can better understand the world and his place in it by observing and being part of these microcosms.

Figure 2: The Thematic Structure of Bromfield's Pleasant Valley World



Malabar Farm (middle of Figure 2). Finally, at the end of the book, Bromfield develops some religious or philosophical themes about man being a part of nature and farms being "microcosms" of the larger world (bottom of Figure 2).

I found Bromfield's vision in Pleasant Valley quite appealing, and I believe a lot of this appeal comes from the skillful way in which Bromfield brings together his personal, global, design, naturalistic and religious themes into a complete and compelling "world-view"- a world-view which I believe significantly influenced John Todd, during the design and evolution of the New Alchemy Institute and its projects. In particular, the design themes that Bromfield stressed in the development of his model farm/world- "working with Nature", "self-sufficiency", "economic cooperation", "organic architecture" and "the farmer as grassroots scientist"-all found their way into Todd's work at New Alchemy. I will, therefore, list Bromfield's overall theme "the romance of farming" as a life theme for Todd with an asterisk to indicate that here we are refering to the whole thematic structure or world-view diagramed in Figure 2:

2)* the romance of farming: Farming is a noble and romantic adventure on which the future of our society depends.

Besides this theme or thematic system, the above passage also suggests the theme of the tension between Bromfield's world (or "world-view") and the world of modern science as symbolized by the "narrow-minded" agricultural economist:

3) Bromfield's world/modern science: There is a tension between the world and and world-view represented by Bromfield's farm and the world and world-view of modern science and technology.

This tension and efforts to resolve or mediate it seems to have played a central role in Todd's life.

Having been frustrated temporarily in his effort to become a good farmer/steward like Bromfield, John turned to biology:

> ...So I went into biology. I happened to be around some really exciting biologists at that time. It was my third year. I was on fire for the first time in my life. The first couple of years I just managed to stay inside the wire... And then all of a sudden biology came along...
>
> I ran into a very exceptional person, an ecologist who was studying malaria in New Zealand. The origin of people as scientists in the New Alchemy program is kind of wrapped up in this guy...(p 69).

This passage indicate a transference of focus on Todd's part from nature and farming to science, specifically biology, resulting in the new theme:

> 4) adventure in science-biology: Seek adventure in the biological and ecological sciences.

Todd then goes on to describe his early successes in science during his graduate work in animal behavior at the University of Michigan:

> ...Almost from the moment I began doing scientific research, I started making kind of fundamental discoveries, of a minor nature...
>
> The animals were doing sort of strange things. I was studying catfishes, and one day I said these guys are talking to one another! I went to my major professor, and I said they're communicating, they've a language. He laughed. A year later "The Chemical Communication of Fishes" appeared in Science. Then Scientific American published something with a lot of to-do, and I was awarded the Rackham Post-Doctoral...and I turned it down.
>
> I was just sort of itching to get back into people, especially with Nancy working in the peace movement and everything...(p 71-2).

This seems like a straight-forward success in science story until the end where Todd indicates some reservations. In a similar passage later on he tells of another time he turned down a promotion within science:

> One morning I got a phone call from the dean (of Science of a big university) ...He called up and said, John, would you be associate dean and director of the Center for Biological Studies? Again, not my finest hour, sort of visions of boy-with-multi-million-dollar-budgets, big temptation. So I said yes. For a week. But then I talked to my friends and myself and said you're just simply committing yourself to something that won't be profound and something that will probably do a lot of damage to you and, if it hasn't already, will wreck the fundamental friendships in your life...So I didn't take the job after all (p 75).

These passages together suggest the theme:

5) success in science: Seek success in science, but also realized its limits, and its limits

The first passage, in which Todd describes his research on communication among fish, also suggests another theme, the notion of communication in and with nature:

6) communication in/with nature: Seek to understand how animals communicate and this understanding will allow us to better understand and live in harmony with Nature.

This theme seems to have been a way of mediating between Todd's early dreams of adventure in and stewardship of nature and his later goal of success in science; that is, by studying communication in fish, he was able to both do "good" science and to empathize with nature at the same time.

In the late 60's, motivated by his early themes of stewardship and the environmental and other reform movements of the 60's, Todd moved from his "pure" research on communication in fish into what he called "doomwatch research", that is, research on the negative impacts of modern industry and technology on the environment. Here, as with his earlier research, John was successful but had reservations about the usefulness of what he was doing:

> By this time I was doing the doomwatch research, which was on what effect the impact of man's industrial activities has on the biosphere. Bill McLarney and I began work on the stress on the social behavior of fishes...Working on this doomwatch stuff brought me into kind of a network of ecologists throughout the world. This was sixty-eight, maybe sixty-nine. John Platt set up this Crisis Committee and wrote an article in Science called "What We Must Do," which predicted major dislocations of society...
>
> The next link in the chain is April twenty-second, 1970. Earth Day. Here's Todd in big stadiums, checking to make sure the quality of the rock band is right, and if it's anything less than Santana, I don't wanna speak after it. Bad place to be in your head, right? It didn't last long. I can thank God for that. Society was beginning to realize it had a crisis on its hands. I've never been so radicalized so quickly...
>
> ...(Also) I was being flown to Paris for conferences at UNESCO and meetings with Third World scientists in the Club of Rome and that kind of stuff...(but I began to feel) that's part of the problem rather than the solution...I was fairly convinced that we were part and parcel of a doomed society, and all I was doing was I had a very small slice of the chronicle pie (p 72-6).

This passage seems to echo the passages just quoted on success in science and its limits, suggesting the similar theme:

7) doomswatch research and its limits: Doomswatch research is important in clarifying the problems we face, but it doesn't in itself provide solutions.

Todd's frustration with the seeming inability of doomswatch research to provide workable solutions caused him to move from "mega-" problem assessment towards "micro-" problem solutions:

> (At this time) I'm sort of leading a dual life in the sense that I'm kind of mega and I'm starting to be micro, to get myself together. Nancy's doing quite a bit of dancing at this point, in a small dance group...
> ...Something was lacking in all these (doomswatch) megasolutions. It was all kind of industrial; kind of the same dynamic was extant in all the academic thinking, with no sort of scale- I mean, no consciousness of what scale means, you know, in human terms...
> So I was starting to do very micro sort of thinking. It was kind of Kropotkin and Murray, I mean, to try to make little things whole...In other words, the whole can be no greater than the sum of its parts, and in order for the whole to be healthy, the parts had to be healthy. So why don't we begin in a very tiny way? And a lot of this sort of thinking...wholism, kind of a sacredness of doing, you know, and of being...(p 75-6).

This passage suggests the theme:

8) mega to micro: Move from mega-assessment of social/environmental problems to micro-, wholistic, small-scale solutions.

This theme both echoed Bromfield's belief in his farm as a microcosm and a micro-solution for the sickness of American agriculture and reflected the current emphasis of the countercultural and other 60's reform movements on microcosms and micro-solutions (e.g. communes, organic gardening, "wholistic" health and "getting oneself together"). It also became a central theme in the AT and related movements, as reflected in the late 70's slogan- "think globally, act locally", and, as we'll see shortly, was a central theme in the Todds' conception and design of the New Alchemy Institute and its programs.

Nancy Todd's Life Themes

Having abstracted some tentative life themes for John Todd, I will now do the same for Nancy Todd. I was unable to find a published interview with Nancy, but I was able to abstract some life themes from her essay on "Women and Ecology" in The Book of the New Alchemists (N. Todd, 1977; this essay was originally published in the third Journal of the New Alchemists).

Nancy grew up close to John in Canada and they knew each other as kids. She went to a different university and majored in American history and literature. After she graduated, they were married and she worked in a library to support them while John finished his master's at McGill. They now have three children, Rebecca, Jonathan and Susannah, who were an important part of the New Alchemy "family".

In "Women and Ecology" she tells a story about her childhood that emphasizes the importance of home and family in her life:

> In our family, there was a great deal of laughter shared between the women and the children. We told rambling family tales and talked endlessly as we worked in the kitchen. The men, my father or my uncle, came home from the office, almost always tired, sometimes irritable. Occasionally they joined us in the kitchen. More often they did not. From time to time I thought, but perhaps I was wrong, that there was an aura of wistfulness emanating from behind the newspaper. They would have liked to have joined in our laughter but were not sure how. Whatever they felt, my childhood memories of home are that it was for all of us a refuge, with the kitchen at the heart, cheerful and warm. Women, I understood, stayed and tended this heart and men went off to offices that had ugly desks and chairs and a few interesting machines. This to me was WORK, the OFFICE. It had much the same significance to me as is attached to Mr. Banks' work in Mary Poppins...And my feelings as a child and on through my teens- even now- were that rather than face work that seemed so dull and unrewarding, yet so tiring, I would choose the bright kitchen even if it meant attendant chores of housekeeping and laundry...(p155-6).

From this passage I abstract the theme:

1) home and family: Seek the warmth and security of home and family over a dull office job.

In the 60's this theme came into conflict with feminist ones and Nancy sought explanations for women's subjugation by men and alternatives to it. She found a meaningful explanation in Simone de Beauvoir's notion of male-female duality in The Second Sex:

> ...whereas (historically) it has been the lot of the female to repeat life in order that it may continue, the male in his activities came to experience transcendence and in doing so created values. In de Beauvoir's words, "Man's design is not to repeat himself in time- it is to take hold of the instant and mold the future. It is male activity that in creating values has made of existence itself a value; this activity has prevailed over the confused forces of life; it has subdued Nature and Woman." The essence of the male, then, has come to mean transcendence, while the essence of the female, permanently embedded in the natural world, has come to mean immanence. Here for me are the glimmerings of a comprehensible explanation as to how duality and difference expanded to mean subjugation...(p159).

Nancy then goes on to argue that individuals, couples and groups should seek to bridge this masculine-feminine duality and become more "androgynous". "Our goal for every woman", she concludes, "must be a sense of completion; of destiny as a person, not as wife, mother or mistress, but as herself first...(p161)." And she argues that small communal groups like the New Alchemists were good places to throw off sexist roles and become more androgynous:

> The major advantage to working or living in something akin to a small group is the experience, being shared alike by both sexes, hopefully with minimal antagonism, of outgrowing and casting off sexist conditioning, and of learning that neither sex is bound by the limitations or inhibitions of traditional roles. This offers an unusually free and affectionate environment where immanental feminine qualities and the transcendent aspects of the male can grow toward each other and toward a more androgynous type of mind. Such a possibility, like the alchemists' gold or the holy grail, has long been the object of human longing (p173).

The reference to "alchemists' gold" here is noteworthy, because, as we'll see in the next section, the integration or "marriage" of masculine and feminine qualities was an important theme of the original alchemists from whom the New Alchemists took their name. From these passages I've abstracted the following life theme:

2) bridging male-female duality: Seek to combine and integrate the good aspects of masculine transcendence and feminine immanence in youself, your relationships and the groups you belong to.

The idea of "bridging" dualities also appears in a central metaphor taken by Todd from Virginia Woolf:

> In deliberating along a similar vein, many years ago Virginia Woolf in Three Guineas wrote "We are here on the bridge to ask ourselves certain questions and they are very important questions and we have very little time in which to answer them. The questions we have to ask and answer about that procession during this moment of transition are so important that they may well change the lives of all men and women forever. For we have to ask ourselves here and now, do we wish to join that procession or don't we? On what terms shall we join that procession? Above all where is it taking us, the procession of educated men?" (p163).

Nancy expands this "women on the bridge" metaphor or theme to include the possibility that women because of their immanence or embeddedness might act as a "bridge" between society and Nature and between our current society and a more ecological future one:

> ...This is the point at which the tenuous bridge between the subjects (of women and ecology) begins to suggest itself. Is it possible that the female mind might have less difficulty (affirming that we are part of nature)?...Since time began, our bodies have been rhythmically bonded to the moon. Unlike men, who at times have felt that they have transcended Nature, we are bound in her. Perhaps the time has come when women, by virtue of their immanence or "inness", albeit involuntary, will learn to listen to and trust themselves, and from there accept their responsibility in sharing in the guiding of the course of human history (p164).

Nancy's "women on the bridge" theme thus contains a number of meanings (women at an important turning point, women as independent observers and critics of male dominated modern society, women as a bridge between society and nature, women as a bridge between present society and a more ecological future one, etc.), which I've tried to summarize as follows:

3) women on the bridge: Women because of their embeddedness in nature and their marginality to modern male-dominated society may be able to act as a bridge between society and nature and thus led us towards a more ecological culture.

Towards the end of her essay, Nancy cites another idea or metaphor from Virginia Woolf, the fanasy that Shakespeare had a sister:

> In 1928 Virginia Woolf told a story based on her fanasy of a sister of Shakespeare who died very young and never wrote a word. Virginia Woolf goes on to say, "Now my belief is that this poet who never wrote a word and was buried at the crossroads still lives. She lives in you and in me, and in many other women who are not here tonight, for they are washing up the dishes and putting the children to bed...(and) my belief is that if we live another century or so- I am talking of the common life which is the real life and not of the little separate lives which we live as individuals; if we have the habit of freedom and the courage to write exactly what we think...then the opportunity will come and...drawing her life from the lives of the unknown who were her forerunners, as her brother did before, she will be born...
>
> I find this among the most moving statements of feminism, perhaps the more effective for the fact that it is in the form of a metaphor...(p173-4).

From this and earlier passages I've cited, we can see that Todd makes frequent use of stories, metaphors and ideas drawn from literature in her writing (e.g. the reference to Mary Poppins in the first passage, to the "holy grail" in the third passage, and to Woolf's meatphors in the fourth passage and this one). This is not surprising, given her education in American history and literature and suggests the following life theme:

4) the importance of literary models: Seek explanations of and models for personal and social action in literature.

Another personal theme suggested by this passage, is Nancy's own desire to express herself through art and writing, symbolized here by the sister of Shakespeare, who is in all women, suggesting the life theme:

5) expression through art/writing: Seek to express yourself through art and writing.

As we'll see later, Nancy was able to realize this theme through the creation and editing of the Journals of the New Alchemists, which were more like works of art and literature than research journals.

Transforming Events and Themes

Having identified likely life themes for both John and Nancy, I will now turn to the transforming events and themes that led most directly to their forming (along with William McLarney) the New Alchemy Institute in 1969-70.

Both of the Todds were strongly influenced by the cultural ecology of social reform movements of the 60's, discussed in chapter 2. John was active in the environmental movement and in efforts to reform modern science and technology. Nancy was active in the anti-war, feminist and human potential movements. They both were sympathetic to the countercultural impulses of the time. These activities and sympathies along with their complementary life themes moved them towards the creation of the Institute and its programs.

A key transforming event occured in 1969 when the Todd's and some of John's graduate students at San Diego State made a "pastoral retreat" to a rural communal homestead of some of their friends, where they sought to understand the local ecology and to practice self-sufficiency. This retreat acted as a kind of rehearsal for the creation of the New Alchemy Institute. Interestingly, but not surprisingly given their different life themes, John and Nancy chose to emphasize different themes and lessons in their reporting of this adventure. John stressed the fact that at first they didn't really know what they were doing, didn't know nature in a wholistic way:

> We had reached the point where we were tired of doomwatching, that the only way out seemed to be, can alternatives be created? I taught this course called Cold-Blooded Vertebrates. There were ten or twelve graduate students, and we had been spending time at a commune in the mountains near the Mexican border...We broke it up into subject areas, and each one wrote up what he would do to make the place autonomous. It was pretty uninspired...We didn't know anything. Science hadn't trained us to be able to answer the most fundamental question: How do you make that piece of earth sing, and how do you make it support those that live there?...
>
> Several months later...people were camping out, living in trees, stuff like that...and they grumbled like hell!...But then they started to teach one another and all of a sudden, like the scales falling from our eyes, a piece of land came alive...All of a sudden we had gardens, and the wind guy figured out a source

> of energy. And all of a sudden we were talking for the first time like we knew what we were talking about...It was very heavy for me.
>
> There has never been and doubt for me since that time that the way to go is to be whole. Know the sun, know the plants, know the soil, know the people, know the shelter...have them all interlaced, begin from there (my, 1976, p 77-9).

Nancy, in her description of this adventure, however, stressed the plight of their countercultural friends who lived on the homestead:

> ...The story has an abrupt but pointed conclusion. As excitement began to stir over these newly discovered possibilities, the landlady arrived and, in a variation on one of the themes of classic melodrama, announced to our gentle, long-haired friends that she was raising the rent. The increase was more than they could afford and so they were forced off the land. Even before they departed, the bulldozers had appeared on the crest of the hill to begin the leveling for yet another colony of southern California weekend cottages (N. Todd, 1977, p xi).

These passages suggest the following separate but complementary transforming themes:

1) knowing nature, being whole:	Modern science in itself isn't enough for us to "know" Nature and live in harmony with it. To do this we must reembed ourselves in Nature and deal with it in a wholistic way.
2) the plight of countercultural groups	To survive, countercultural groups and "families" must be self-reliant not only socially but ecologically and economically as well.

These themes were triggered by the immediate transforming event of the communal retreat, but they were also shaped to a considerable degree by John and Nancy's ongoing life themes. Not surprisingly, John's description and the theme embedded in it (1) attempts to deal with and resolve the tension he saw between "science" and "Nature", a tension which we've seen was a central issue and theme in his life, while Nancy, with her life themes related to home, family and relationships, chose to emphasize the human, social and moral aspects of the event (theme (2)). The most important thing to note here, I think, is the complementary nature of the descriptions and themes generated

by John and Nancy. Together they provide a more complete picture of the lessons to be drawn from the event and the possible strategies to be developed from these lessons. We'll see frequent examples of this "complementariness" in the evolution of the New Alchemy family and I believe it's one of the key reasons for their effectiveness, that is, John and Nancy's complementary life themes and skills, with John's emphasis on doing science and "knowing" nature and Nancy's on creating relationships, "families" and art, made them an effective leadership team for the New Alchemy family.

After their retreat experience, John explored the possibility of creating an experimental "bio-technic village" on land owned by San Diego State, but he quickly found that "all the things I wanted to do were not possible within the University of California system. I was asking to create a tiny village, and Reagan was having trouble over a parking lot at Berkeley (my, 1976, p79)." And so John and Nancy and William McLarney and their students began discussing developing their own alternative institutions and out of these discussions the New Alchemists were born. As Nancy put it:

> The question we finally came to one night in San Diego was: Is it too late? Did any one of us, or anyone that we respected, have compelling evidence that there would simply be no use in making some effort, however tenuous, to swim against the main current of modern technological society? As none of us had reached such a point of utter hopelessness, we gradually began to formulate a few ideas of what might be done. From this somewhat contradictory construct of intellectual pessimism and glandular optimism, we formed a group and called our quixotic gesture New Alchemy (emphasis added; N. Todd, 1977, p x).

The New Alchemists group formed in 1969 and the New Alchemy Institute was incorporated as a nonprofit educational research organization in 1970. Just as the New Alchemists were forming, John was offered and accepted a job to set up his own Marine Animal Communications Laboratory at the Woods Hole Oceanographic Institute on Cape Cod, taking his colleague and fellow marine biologist Bill McLarney with him. John, Nancy and Bill took their embryonic New Alchemy Institute with them when they moved east and they soon found a farm to rent on the Cape, which became the site of the Institute.

The transitional period just after they moved east was a difficult one for John. He still had one foot in the scientific establishment at the Oceanographic Institute, where he and Bill worked full time, while in their spare time he and Nancy and Bill were trying to get their own fledgling institute off the ground. He later told an interviewer what amounted to a personal "parable" about this period:

> ...It was a disturbing period in my life- I was trying to level out the whole focus. I looked up and saw a tree- it must have been a nut tree, it had male catkins and they were hanging down. I'm telling this in the form of a story. I'm not trying to imply that the tree was talking, but it said: "You don't know me." I looked at the nature of the leaves and I did know the tree- it was part of my childhood, but something I'd known even as a child I'd forgotten: its name. And then it said: "You don't even know this place where you are; you can't tell me about the plants, the animals and what they mean...the whole." And then it said: "Without a sense of place and a sense of knowing, any claim to expertise is a hollow, cruel fallacy." It was a very humbling experience. I've condensed it greatly, but the essence of it was that to know a place was the beginning and there is no expertise in modern times- there are no experts. The experience was a mockery upon me. It began with, "You don't know me and yet I am part of your life," and then it went from there to, "You don't know the world around you and it is part of your life." And from there to the lesson, which was, "That's where one has to begin." (Rivers, 1975, p 162-3).

This story seems quite similar in tone and function to the examples of transforming stories and themes which I gave in Chapter 1. As with the transforming stories and themes of Tolkien, Gandhi, Wright and the state assemblyman, this transforming story or parable appears to have been a way to reinforce John's resolve to recapture some of his early dormant life themes (e.g. "adventure in nature" and "the romance of farming") and to enact his newer related themes (e.g. "science and its limits", "mega to micro", "knowing nature, being whole"). This story and the transforming theme embedded in it helped to give John the courage to move away from Big Science in the new direction that he and Nancy and the other New Alchemists were now charting. And hence, from this passage I abstract the transforming theme:

3) message of the tree: Scientific expertise, alone, is too limited a way to try to know nature. Seek to know nature in a more direct and wholistic way.

Note that this theme is almost identical to John's earlier transforming theme, "knowing nature, being whole" (1), except that he has added the powerful new integrating symbol of the "talking tree".

The most central transforming theme during the transitional period while the Todd's were organizing the Institute was the notion of "new alchemy" and "the new alchemists" itself. As with other central transforming themes (e.g. Wright's conception of "Taliesin") the notion of "new alchemy" conveyed and symbolized a number of important ideas for its inventors. It was analogous to Bromfield's central transforming theme of "new pioneers", developed a generation earlier, and it played an analogous role in the Todd's evolving thematic system (see Figure 2). Bromfield envisioned the "new pioneers" as a new breed of ecological land stewards who would transform American agriculture and society and, thus, cure their "sickness". Similarly, the Todd's saw the "new alchemists" as a new breed of stewards who would transform modern American science and technology and the cultuure based on them and, thus, cure their sickness. This notion of the "new alchemists" as modern stewards was succinctly captured in the logo which appeared on their letterhead: "THE NEW ALCHEMISTS - To Restore the Lands, Protect the Seas, and Inform the Earth's Stewards." Hence, I've summarized the Todd's central transforming theme as:

4) the New Alchemists: We need a new breed of ecological stewards/alchemists who will transform our science, technology and culture so that we can once again live in harmony with nature and one another.

Besides characterizing the New Alchemist's central transforming theme, we should ask ourselves why the Todd's chose the term "alchemy", in particular, rather than say the "new stewards" or some other descriptive term. Nancy briefly touched on this in her introduction to The Book of the New Alchemists:

> ...At the time that (the name "New Alchemy") first occured to John Todd, we had little conscious knowledge of its full implications. Our understanding then was that in order to change what to us, and to many wiser people, seemed the disastrous course of modern society, there had to be basic changes in its structure, that merely changing the coefficients or substituting one technological fix or large-scale energy source for another was not the answer. The transformation or alchemy had to be more fundamental (emphasis added; N. Todd, 1977, p x).

Hence, one of the initial meanings associated with "alchemy" by the Todd's was the notion of "alchemy as transformation". As we'll see, the Todd's came to include material (i.e. technological), spiritual (i.e. personal) and cultural transformation under this notion. Beyond this, I believe the Todd's saw in the notion of "alchemy" a way of "bridging" or mediating certain dualities in their lives. The original alchemists were a combination or blend of philosopher and magician and of scientist and artist, and I think this blending of "disciplines" appealed to both of the Todd's. For John, "alchemy" seemed to symbolize a way of bridging the gap between the narrow world of modern science and the "magical" and "spiritual" world of nature (i.e. "Bromfield's world"). For Nancy, "alchemy" probably symbolized a way of bridging the gap between technology and science on the one hand and art and magic on the other, and later on, as she read more about alchemy, as a way of bridging the masculine and feminine duality also.

A third type of meaning associated with "alchemy" by the Todd's had to do with its "secret" and "underground" connotations. The original alchemists saw themselves as a secret, "underground" society or fellowship of seekers after profound wisdom. Similarly, the Todd's and other New Alchemist saw themselves as a countercultural band or fellowship of "outlaw" designers and artists who sought new and old wisdom to use in transforming society.

There were thus at least three sub- or supporting themes related to the central transforming theme of "the New Alchemists" (4), having to do with distinctive meanings associated with the term "alchemy", which I've summarized as follows:

5) alchemy as transformation: Alchemy symbolizes the need for fundamental material (technological), spiritual and cultural transformation.

6) alchemy as bridging dualities: Alchemy symbolizes the need to bridge the dualities between science and nature, technology and art, expertise and wholeness, mega and micro, and male and female.

7) alchemy as countercultural fellowship: Alchemy symbolizes the need to organize new grassroots "families" and fellowships to create self-reliant microcosms and transform the larger culture.

When they decided to name themselves the New Alchemists, then, the Todd's and McLarney were using the term "alchemy" in a general metaphoric way. As Nancy said, they had "little conscious knowledge" of the more specific themes and beliefs of the original alchemists (although they probably assimilated a number of these themes through the "counterculture" without being aware of their alchemical origins). As time went on, however, they became more aware of certain traditional alchemical themes and their correspondence to current themes and activities of the New Alchemists. Betty Roszak summarized these correspodences in her forward to The Book of the New Alchemists, in which she enum erated half-a-dozen traditional alchemical themes which are also present in the vision and activities of the New Alchemists. She started with the ancient alchemical notion that the Earth is alive and there are significant correspondences or parallels among every part of it:

> We have come again to consider that life on earth consists of great and small cycles...and that all cycles are interrelated, from the huge to the microscopic...
> This belated scientific recognition of the interrelatedness of earthly patterns and cycles is in fact a reformulation for modern times of an ancient idea: that all things on Earth are organically connected in a vast, pulsating network. Further, the Earth is an organic being, itself in turn reflecting the life of the cosmos. "What is below is above; what is inside is outside." So goes the Hermetic formula ...the small world is the image of the great world...(1)(Todd, 1977, p vii).

Thus, the alchemists saw correspondences between the metals, planets and gods;

between the land and the sea;between heaven and earth;etc. They also saw correspondences between man and the world he lived in,as Roszak illustrated with a quote from the ancient alchemical text Gloria Mundi (1648):

> Man is to be esteemed a little world,and in all respects he is to be compared to a world. The bones under his skin are likened to mountains...the flesh is taken for earth,and the great blood vessals for great rivers,and the little ones for small streams that pour into the great rivers...Whatever else may be discovered inside and outside a man,all according to its kind is compared to the world (Todd, 1977, p viii).

From these two passages,I've drawn the following three alchemical themes which influenced and were reflected in the later work and writings of the New Alchemists:

8a) the Earth is alive: The Earth as a whole functions like a living organism.

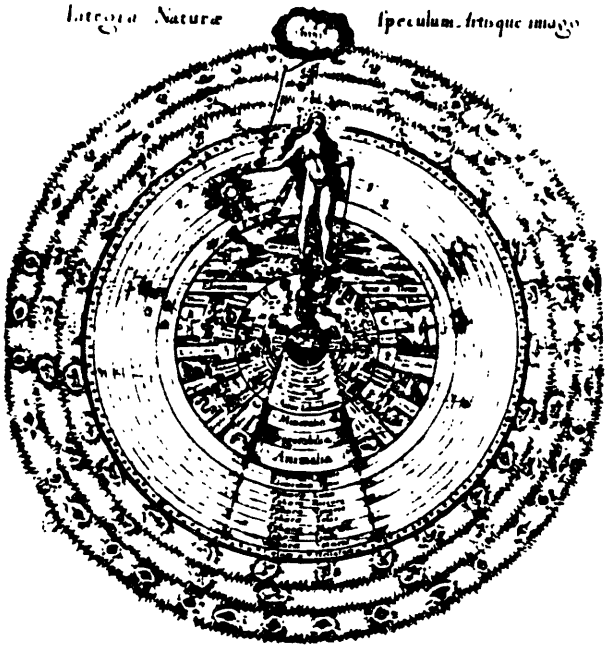
8b) macrocosm-microcosm correspondences: Analogous features,patterns and cycles may be found within every natural system or microcosm from the smallest to the largest.

8c) man as microcosm: Man is a microcosm with correspondences analogous to the world around him/her.

The first theme has recently reemerged as a scientific hypothesis put forth by biologists Lynn Margulis and James Lovelock,called the "Gaia hypothesis",after the Greek earth goddess (Margulis and Lovelock, 1975,Lovelock, 1979).and the Todd's have frequently refered to this hypothesis in their writings (see,for example,N. Todd, 1977, p xii; J. Todd, 1976,p 75; Todd's, 1984,p19-20). They have also made frequent use of the notion of macrocosm-microcosm correspondences in their ecological designs,as we'll see in our discussion of the evolution of their "ark" bioshelter designs,and they also drew heavily on their own life themes and needs (e.g. themselves as microcosms) in developing these designs.

The alchemical images and drawings in Figure 3,taken from Carl Jung's study on the psychological significance of alchemy (1953),illustrate these themes of the living

Figure 3: Alchemical Images and Drawings Illustrating Macrocosm-Microcosm Correspondences Taken From Jung's Psychological Study of Alchemy



a. the alchemical anima mundi or "guide of mankind", taken from a 1617 text, show the p'anets and the animal, vegatable and mineral worlds as a series of concentric spheres with correspondences occuring across spheres (Jung, 1953, p 47).

b. this drawing from a 1702 text, show correspondences across the spheres of the seas, the land, the air and the heavens in more detail (note opposition of figures on left and right sides of each sphere; p259).

c. this drawing from a 1622 text illustrates the correspondences the alchemist saw between the seven key planets, metals and gods. The seven figures represent the seven planets, the seven metals in the earth and the seven gods in Hades (p 65).

d. this drawing of a tree being transformed into a virgin in seven stages, taken from a 1600 text, illustrates the continuum the alchemists saw between man and nature and their view of man as a microcosm with features analogous to the world around him/her (p 41).

Earth and of macrocosm-microcosm correspondences.

Roszak went on in her forward to identify three other relevant alchemical themes, the first of which was the notion of alchemy as a spiritual as well as material quest:

> If we consider alchemy...in the light of the magical correspondences of the great and small worlds, we can understand some of the nature of the serious and ennobling quest it was...Since each natural object, whether animal, vegetable, or mineral, was considered a little image of the divine cosmos, and would therefore contain within it a spark of the divine spirit, the alchemists sought in their labor to liberate the highest in the lowest form of atter. Their work was the recovery of the inner essence or gold, which corresponded to the divine spirit in metals (N. Todd, 1977, p viii).

Hence, the alchemists sought not only to make gold, but also, and perhaps more importantly, to become "golden" themselves (for an extensive discussion of alchemy as a psychological and spiritual quest see Jung, 1953). Moreover, for this spiritual transformation to take place, there had to be a synthesis or "wedding" masculine and feminine polarities, symbolized in the alchemical literature by the hermaphrodite:

> ...before the soul's purity could shine out in its true nature, a new synthesis had to take place. From the violent conflict of contending substances there had to come a grand reconciliation. The great theme of alchemical literature was this wedding of opposites, the "alchemical marriage" of conflicting contraries from whose union would be both the hermaphrodite. This mysterious figure, protrayed in a variety of forms and embellished with richly symbolic images, is the epitome of the alchemical art: the coming together of the masculine/feminine polarities that combine into a higher unity, a powerfully creative unity. Within the hermaphrodite the circle is completed...(N. Todd, 1977, p ix).

Finally, Roszak showed the central place of the sun and solar symbolism in alchemy by quoting from the German alchemist Michael Maier:

> The sun is the image of God, the heart is the sun's image in man...Gold is the sun's image in the Earth...(Thus) God is known in the gold (p viii).

This passage also emphasizes the notion of alchemical correspondences again, with the sun, heart, gold and God each representing the highest level of progression of transformation within its respective microcosm (the universe, man, Earth and heaven).

The three additional alchemical themes identified by Roszak, thus, may be summarized as follows:

8d) alchemy as a spiritual quest: Besides being a material quest for gold, alchemy is also a personal and spiritual quest to become "golden", perfecting oneself by the progression through a series of stages analogous to the ones involved in making gold.

8e) the wedding of masculine and feminine polarities: To evolve spiritually requires the synthesis or "wedding" of masculine and feminine qualities or polarities. The hermaphrodite symbolizes this wedding of opposites.

8f) solar symbolism: The sun, like gold, symbolizes the highest level or stage in the progression towards perfection. It also represents masculine qualities with the moon representing feminine ones.

These themes are illustrated in the alchemical images and drawings in Figures 4 and 5, again taken from Jung's study on the symbolic and psychological nature of alchemy. The drawings in Figure 4 illustrate the theme of alchemy as a spiritual quest involving a series of personal transformations analogous to the steps in making gold. Also, they show that such personal transformations were seen as path to the restoration and renewal of Nature itself, hence man was a part of the natural cycles of progression and renewal (see drawings c and d). The drawings in Figure 5 illustrate the theme of the wedding of masculine and feminine polarities and the use of solar/lunar symbolism to represent this wedding in alchemy (the poem under drawing b, for example, translates as: "O Luna, folded by my embrace, / Be you as strong as I, as fair of face. / O Sol, brightest of all lights known to men, / And yet you need me, as the cock the hen.").

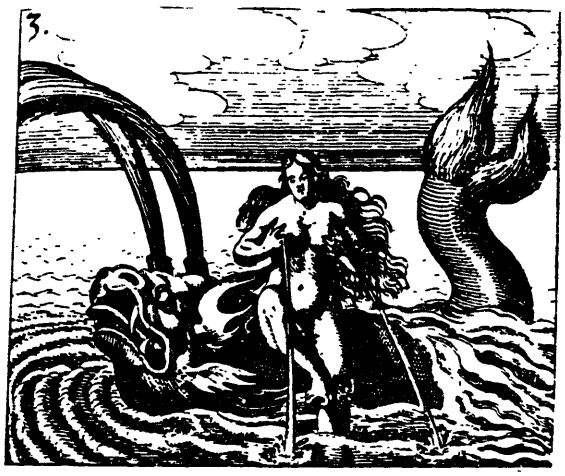
As with the first three alchemical themes Roszak identified, these themes influenced and are reflected in the later work of the New Alchemists. The theme of the wedding of masculine and feminine, in fact, is almost identical with the second life theme I identified for Nancy ("bridging male-female duality"). I'll show in later sections how

Figure 4: Images and Drawings Illustrating the Alchemical Theme of Personal and Spiritual Transformation and Progression From Jung's Study

a. in this drawing from a 1654 text, the seven steps in the process of creating gold also symbolize stages of progression "up the mountain of the adepts", towards perfecting one's own soul (Jung, 1953, p 195).

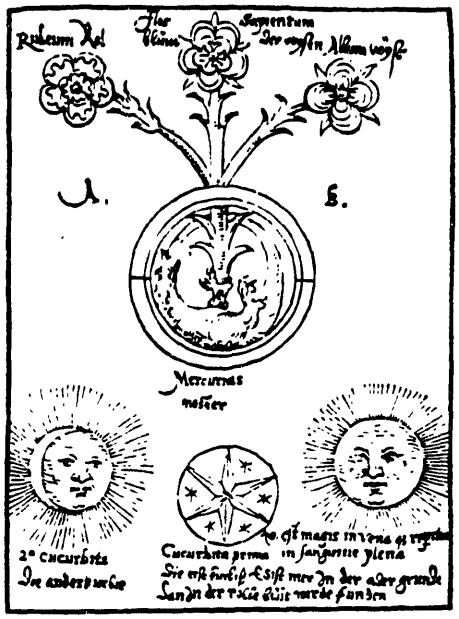
b. in this familial alchemical tree from a 1588 text, the male and the female with the help of various alchemist give birth to the more perfect beings, Mercurius and Sapientia higher in the tree (these also symbolize more perfect ideas; p459).

c. this drawing from a 14th cent. text shows Adam acting as primary material for the philosophical tree, symbolizing man's role as generator of ideas and steward of Nature (p 256).



d. this drawing from a 1624 text shows a virgin renewing the sea with her milk, symbolizing woman's connection with Nature and her role in renewing nature (p 409).

Figure 5: Images and Drawings Illustrating the Alchemical Theme of the "Wedding" of Masculine and Feminine Polarities From Jung's Study



a. this drawing symbolizes the wedding of sun (masculine) and moon (feminine) to create the philosopher's stone and the growth of the alchemical process, symbolized by roses out of the uroboros, the symbol for primal unity (Jung, 1953, p 53).

☽ Luna durch meyn vmbgeben/vnd ſuſſe mynne/
Wirſtu ſchön/ſtarck/vnd gewaltig als ich byn.
☉ Sol/ du biſt vber alle liecht zu erkennen/
So bedarffſtu doch mein als der han der hennen.

b. this drawing from a 1550 text symbolizes the psychic union of masculine and feminine opposites during the alchemical process (p330).

c. this drawing from a 1625 text shows the role of the hermaphrodite as a central unifying symbol of opposites in alchemy (p 372).
d. this drawing from a 1702 text shows a male and female alchemist collaborating in the alchemical process (p432).

e. this 1625 drawing of a stag and unicorn symbolized the coming together of soul and spirit in alchemy. The unicorn was an important unifying symbol in alchemy (p 436).

D.

all six of these alchemical themes were incorporated into the design of the "ark" bio-shelters and the Journals of the New Alchemists.

The formative transforming and design themes of the New Alchemists were first publicly articulated in an essay by John Todd entitled "A Modest Proposal" (J. Todd, 1970), an allusion to the 1729 essay by the same name by British social critic and satirist Jonathan Swift. In this essay Todd warned that we were rapidly losing both biological and social diversity and proposed the notion of a grassroots, decentralized "biotechnology" as a way of combating this dangerous trend. He started by sounding an alarm over the growing homogeneity in both our society and our environment:

> There is a single overview that is increasingly dominating human affairs, while diversity and indigenous approaches are being set aside with the flourishing of modern science and technology...It is my contention that we are in danger of losing an important amount of social variability in the human community at the same time as we are losing the required amount of biological variability in our life-support bases.
> ...Present agricultural methods...are damaging to the environment and a loss of biological variability is rapidly taking place...(moreover, this) environmental (crisis) is mirrored by comparable changes in the human situation. Unnatural selection is causing a loss of diversity in the human sphere and this loss may be leading toward social instability... (p xiii, xv, xvi).

In this passage we see a reworking of Bromfield's theme of the sickness of American agricuture and society (theme #10 and design theme iii in Figures 1 and 2), which also incorporates the 60's countercultural concerns with centralization and the loss of diversity and the alchemical theme (see 8b) of the correspondences between the natural and social realms, resulting in the following theme:

9) loss of natural/social diversity: We are rapidly lossing desirable diversity in both the natural environment and the social sphere.

John then proposes his notion of "biotechnology" as a way of redressing this loss of diversity:

> The first step toward countering homogeneity would be to create a biotechnology based upon an ecological ethic. This biotechnology would function at the lowest levels of society, providing inexpensive life-support bases for individual families, small farmers, or communities who desire more independence and a way of life that restores rather than destroys this fragile planet. It would not be founded upon profit or efficiency considerations but on the philosophical view that all things are interconnected and interdependent (p xvii).

Hence, Todd's notion of "biotechnology" was very similar to the notions of "intermediate technology", "liberatory technology", and "convivial technology" developed by the prophets of AT Schumacher, Bookchin and Illich in the late 60's and early 70's (see discussion of these and similar pioneering notions in Chapter 2), and can be summarized as follows:

10) biotechnology: An alternative, ecologically-based bio-technology and research is needed to promote decentralization and natural/social diversity.

He goes on to propose more specific design themes based on this notion of biotechnology and biotechnical research:

> It is proposed that troughout the country centers of research and education be established and modestly funded. They should not be controlled by the universities...Apart from research funding, these centers should be relatively self-sufficient and the knowledge gained be made available to all through community extension on the part of the centers' residents...
> ...The New Alchemists have begun studies to shape the skills needed to establish modern, relatively self-contained communities that capture their own power, grow their own foods, and utilize their wastes...(such) microcosms may contain within themselves some of the seeds of change for the larger society around them (p xvii, xviii).

Here, in a nutshell, is Todd's initial vision for the New Alchemy Institute. Like Bromfield saw his farm a generation earlier, John saw the Institute as a model "microcosm" which would, through its research and teaching, act as a "beacon" and "seed" for change in the larger society. Note also the alchemical flavor of this passage, with its stress on "microcosms" as "seeds" for change, from which I've abstracted the following general design theme:

ii) microcosmic biotechnical research and education communities: Establish grassroots biotechnical research and education communities to promote decentralized, ecological life support systems & serve as models and seeds for cultural transformation.

More specifically, Todd suggested that these biotechnical communities concentrate on developing innovative designs in the areas of renewable energy, ecological agriculture and ecological aquaculture:

> The first task of (biotechnical research) is to explore the little-used, ancient, nonpolluting forms of energy such as the sun and the wind, and perhaps even the waves and water currents... Research on new uses for the clean energy sources should be closely linked to an ecologically based agriculture and aquaculture... This (research) should focus on the creation of rich soils, and the raising of high quality plants and animals together in sophisticated polyculture schemes. Its goal would be the founding of stable and beautiful agricultural environments (p xvii).

Hence, Todd proposed that the New Alchemists and other biotechnical communities should work on these three specific design themes and areas:

iii) renewable energy: Develop alternative, renewable sources of energy.

iv) ecological agriculture: Develop an organic, ecologically-sound agriculture based on diverse polycultures.

v) ecological aquaculture: Develop an ecologically-sound aquaculture based on polycultures of fish and plants.

These were indeed the initial research themes/areas that the New Alchemists concentrated on.

While John Todd articulated, in "A Modest Proposal", the general intellectual and technical design themes that were to guide the work of the New Alchemists, Nancy Todd was most responsible for envisioning and creating the social and familial atmosphere that characterized the New Alchemists and for handling the day-to-day social issues and tensions that occured during their formative period. She envisioned the New Alchemists as a "quixotic" fellowship or extended family not unlike Tolkien's mythical

quest fellowship in The Lord of the Rings, as indicated by the following passage which she wrote in the Journal of the New Alchemists shortly after Schumacher's sudden death:

> We share with everyone in our small but beautiful movement a sense of personal and collective loss. It has sometimes seemed to me that in our struggle we are not unlike Tolkien's ragged and assorted fellowship and, if that is so, then Fritz was our wise and gentle wizard. His leadership and guidance, the directness of his thinking will not easily be replaced...(N. Todd, 1977b, p1).

This passage, then, suggests the following transforming theme:

11) quixotic quest fellowship: Form a quixotic quest fellowship, like Tolkien's fellowship of the Ring, to promote appropriate technology and cultural transformation and restore harmony with nature.

Which, in turn, suggested the design theme of the New Alchemists as family/fellowship:

vi) New Alchemist family/fellowship: Organize the New Alchemist socially as an extended intellectual family or quest fellowship.

And, as we'll see in the next section, this was indeed the way the New Alchemists were organized socially.

As the New Alchemists organized themselves and began their initial research projects on Cape Cod in the early 70's, they were heavily influenced by the prophets of AT discussed in Chapter 2, whose writings were coming out around that time. Their work was especially influenced by Schumacher's notion of 'intermediate' and 'appropriate technology", Bookchin's notion of "liberatory technology" and "social ecology", Illich's vision of "convivial tools and society", Bateson's notion of the "ecology of ideas and minds", Lovins' notion of the "soft energy path", Brand's notion of "coevolution" and Thompson's vision of the emerging "planetary culture"[2]. They were particularly close to Thompson, and his alternative microcosmic community Lindisfarne, in New York (it

later moved to Colorado), and theirs became like coevolving sister institutions, with the New Alchemists emphasizing technical and environmental transformations and Lindisfarne emphasizing complementary spiritual and cultural ones.

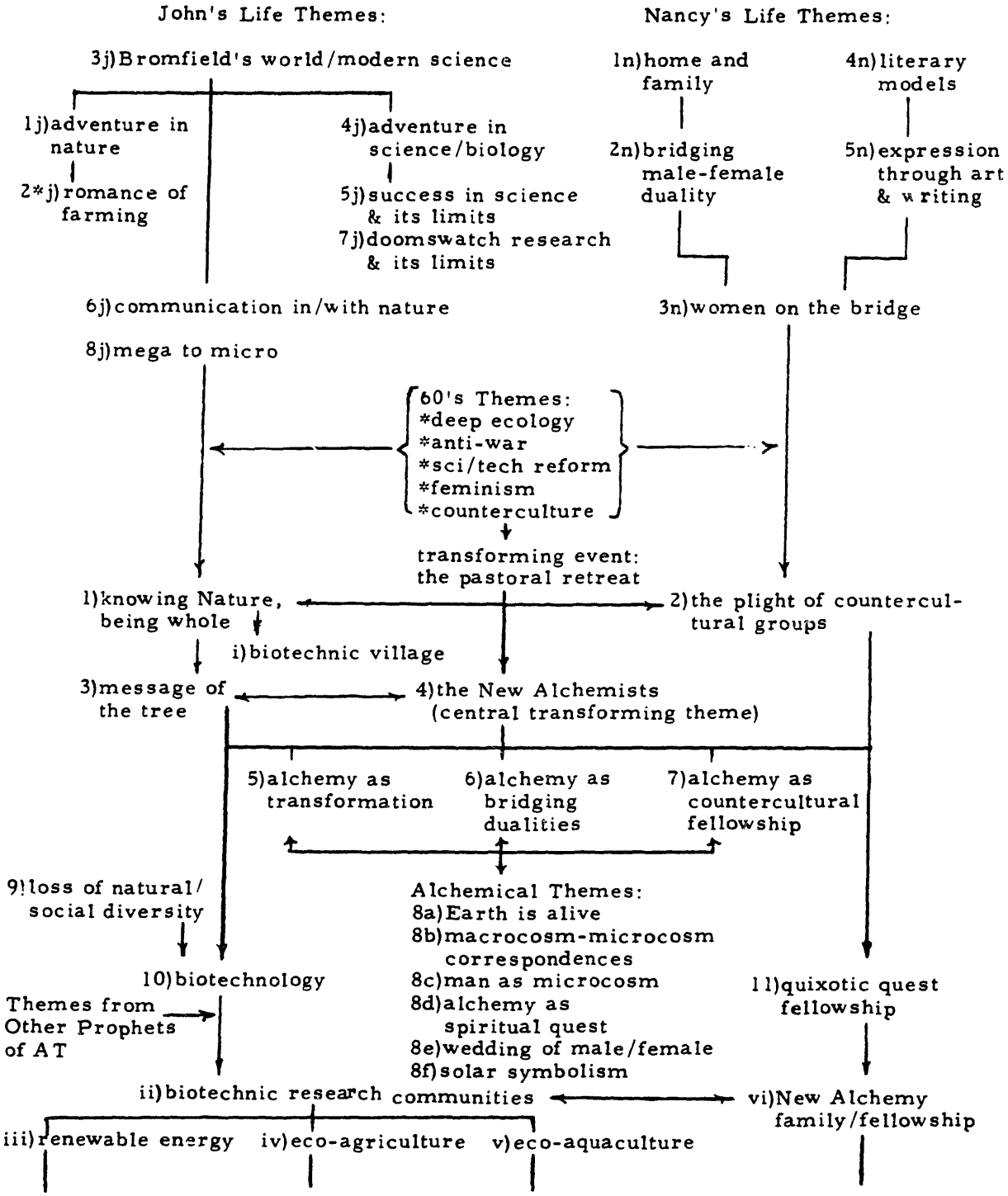
I've now identified the life themes of John and Nancy Todd and the transforming themes and events which together guided the creation of the New Alchemy Institute. Figure 6 summarizes how these themes and influences fit together to form the co-evolving thematic system of the New Alchemists. In the upper left are John's life themes, reflecting the tension between his nature and farming themes (1j, 2*j) and his science themes (4j, 5j, 7j) with his themes of "communcation in/with nature" and "mega to micro" (6j, 8j) mediating this tension. In the upper right are Nancy's life themes, with her family and male-female themes (1n, 2n) and her literary themes (4n, 5n) coming together in her central theme of "women on the bridge" (3n).

These life themes of the Todds were influenced by the themes and movements of the 60's and led John and Nancy to draw somewhat different, but complementary, transforming themes or lessons from the key transforming event of their pastoral retreat on their friends' homestead (middle of figure). John's transforming theme of "knowing Nature, being whole" (1; later reenforced by his parable of the "message of the tree", 3) and Nancy's transforming theme of "the plight of countercultural groups" (2) then came together or coevolved into the Todds' central transforming theme of "the New Alchemists" (4).

The Todds' vision of becoming "New Alchemists" was further defined and fleshed out by the supporting themes of alchemy as "transformation", "bridging dualities", and "countercultural fellowship" (5, 6, 7), which, in turn, were influenced and supported by the traditional alchemical themes (8a-f), shown at the bottom center of the figure.

John, then, drawing on this emerging vision of "new alchemy", articulates the theme of "biotechnology" in his "A Modest Proposal" as a way of dealing with both the loss of natural/social diversity (9) and the tension between nature/stewardship and science

Figure 6: The Coevolving Thematic System of the Todds and the New Alchemists



in his own life,and he goes on to advocate the general design theme of "biotechnic research and education communities" (ii) and the more specific design themes of "renewable energy","eco-agriculture" and "eco-aquaculture" (bottom left of figure). These biotechnical themes were influenced by and coevolved with the similar themes (e.g. intermediate,convivial and soft technology) of other AT prophets and pioneers.

Similarly,Nancy,drawing on her life themes of family,relationships and literature,extended their initial theme of "new alchemy" by envisioning the New Alchemists as a "quixotic quest fellowship" (11) and an extended intellectual family/fellowship (vi) (bottom right of figure).

At the very bottom of the figure,then,we have the two complementary design visions for the New Alchemist,as biotechnic research community (ii) and as quest family/fellowship (vi),which grew out of the interaction and coevolution of the Todds' complementary life themes and experiences and subsequently guided the organization and development of the New Alchemy Institute.

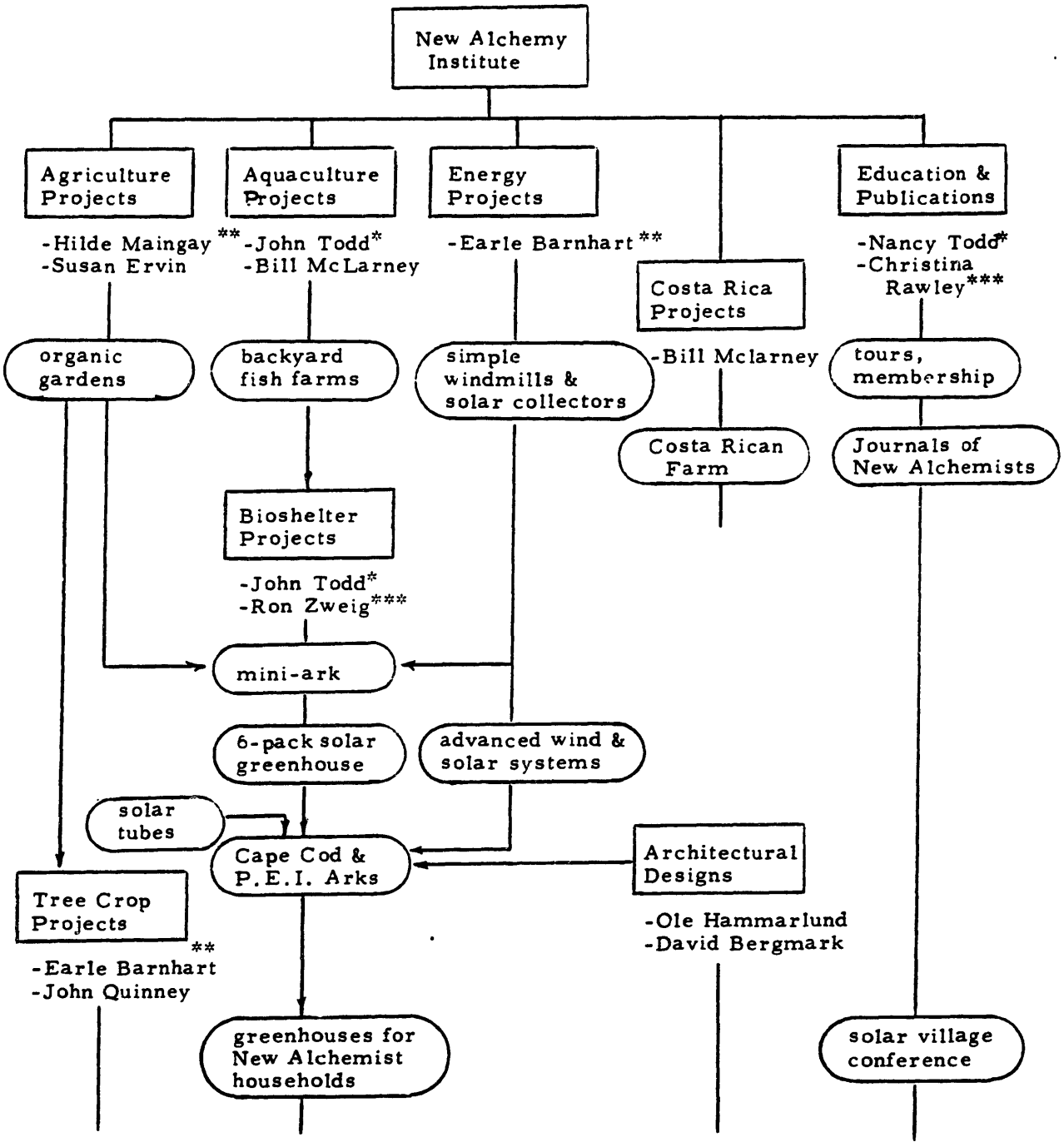
We should also note again the similarities between the New Alchemists' thematic systems and Bromfield's system of a generation earlier by comparing Figure 6 with Figure 2. As has been noted,the Todds' central theme of "the New Alchemists" is analogous to Bromfield's theme of "the need for New Pioneers"; John's themes and parables about nature are analogous to Bromfield's natural and personal themes; the alchemical themes are analogous to Bromfield's religious/philosophical themes;and the Todds' design themes for the Institute are analogous to Bromfield's Malabar Farm plan and its supporting design themes. These striking similaries support my contention that Bromfield's book had a profound influence on John and through him acted a model for the New Alchemy Institute,a model which was adapted and modified according to the Todds' other life themes and experiences.

The Social Organization and Politics of the New Alchemist Family

Figure 7 shows the organization of the major activities of the New Alchemy Institute on Cape Cod during the 70's (besides the main Institute, there was also in the early 70's a small branch, New Alchemy West, headed by Richard Merrill, but this branch died out quickly and will not be discussed here). The New Alchemist's initial research and design activities were organized around the three specific design themes articulated by John Todd in "A Modest Proposal"(J. Todd, 1970): "ecological agriculture", "ecological aquaculture", and "renewable energy". In the Agriculture area they developed a number of organic garden plots in which they experimented with a variety of natural fertilizers and complementary plant and animal combinations. In the Aquaculture area they designed, built and tested two types of "backyard fish farms" (discussed in next section). And, in the Energy area they designed and experimented with simple types of windmills and solar collectors. In addition to these research areas, there was a fourth area, Education and Publications, which involved editing and disseminating Institute reports and handling tours and affiliate members (people who paid a small annual fee to help support the Institute and receive its publications), and later (starting in 1974) editing and publishing the annual Journal of the New Alchemists.

In the mid-70's the prior research by the New Alchemists in the Agriculture, Aquaculture and Energy areas coalesced to create a new major area, that of Bioshelter research and design. The term "bioshelter", originally coined by architects Chahroudi and Wellesley-Miller (1974), refered to buildings which held self-contained eco-systems of plants, fish, animals (and in some cases people), utilized renewable sources of energy and acted themselves like living organisms. Bioshelters were envisioned and designed to be microcosms of Nature. During the mid-70's the New Alchemists designed, built and tested four bioshelters: the Mini-ark, the 6-Pack proto-

Figure 7: Organization of Activities of The New Alchemy Institute
(*, **, and ***'s indicate New Alchemy couples)



type solar greenhouse, the Cape Cod Ark and the Prince Edward Island Ark. The architectual designs for the latter three bioshelters was done by the Solsearch design team of Ole Hammarlund and David Bergmark in collaboration with the New Alchemists.

Also during the mid-70's, the New Alchemists started a branch farm in Costa Rica at which they developed and tested methods of ecological agriculture and aquaculture appropriate to the Costa Rican region and people [3].

In the late 70's the New Alchemists began another major research area involving trees and Tree Crop projects. They also organized a major design conference on "The Village as Solar Ecology", held at their Cape Cod farm in April of 1979, and they incorporated aspects of their ark bioshelter designs into their own homes by adding on greenhouse additions containing solar fish ponds.

The way that the New Alchemists organized themselves socially to carry out these activities appears to have grown out of the combining of John Todd's design theme of "biotechnic research communities" (ii) and Nancy Todd's design theme of the New Alchemists as "family" and "quest fellowship" (vi, see bottom of Figure 6), with the result that the New Alchemists were like an "extended research family" with the Todds as parent figures, cofounder Bill McLarney as uncle, activity area directors like Hilde Maingay and Earle Barnhart as oldest children and the other New Alchemists as younger children. The New Alchemists lived in separate households, but they shared research and household activities on the farm site in a manner similar to that of countercultural communes in the 60's and 70's.

Within this familial or communal arrangement, the New Alchemists sought to achieve three general kinds of social goals. First, they sought to live a pastoral existence in harmony with Nature and each other. Second, they sought to combine their collective scientific and artistic skills in order to design and construct cultural objects (e.g. their "arks" and their journals) that were simultaneously scienti-

fic and artistic. Third, they sought to overcome male-female stereotypes and to encourage one another to realize both "male" and "female" aspects of their personalities.

Hence, the major social goals and designs of the New Alchemists can be summarized in the following four specific design themes (which grew out of and supported the "family/fellowship" theme, vi):

via) extended research family: Form a research community which resembles an extended family in its social organization.

vib) pastoral/convivial living: Live simple yet fulfilling lives in harmony with Nature and with one another.

vic) bridging science and art: Create activities and artifacts which combine and fuse science, technology and art.

vid) combining male and female attributes: Encourage members to develop and realize both their "male" and "female" attributes and strengths.

While the New Alchemists actively sought to achieve these social goals and themes, there inevitably existed a certain amount of "creative" or "ideological" tension between these social ideals and the actual circumstances the New Alchemists found themselves in. Thus, while the New Alchemists sought to live and work together as a family, they were also a research and educational institution and, therefore, had to carry out various institutional functions, such as, raising funds, administrating grants, conducting systematic research and disseminating results, functions which often clashed with their attempt to function as an extended family.

Also, while they sought to live a pastoral existence, they were all products of the modern world and had to live in and deal with the modern world that surrounded their tiny farm on Cape Cod. And, while they sought to fuse their science and art, this was not always easy to do, coming from and still living in a culture that makes such a distinction between the two. And, while they sought to overcome male-female stereotypes, much of the work at New Alchemy, at least initially, was divided alone traditional male-

female lines, with males, for the most part, doing research and design and females doing gardening, editing and taking care of the children.

The New Alchemists dealt with these inevitable ideological tensions and contradictions by adopting an "evolutionary", "bottom-up" approach towards them[4]. That is, rather than seeing themselves as already living a perfected alternative lifestyle, they saw themselves as evolving towards one in small steps in which they tried to perfect small portions or "microcosms" of their lives first and then move progressively (i.e. from the "bottom" upward) towards perfecting larger and larger portions of their lives. They saw themselves as active questers, seeking to find and become a "cultural bridge" between the modern world they lived in and a more ecological and convivial future culture they sought to help bring into being. This approach grew out of and reflected a number of the Todds' life and transforming themes, including the theme of "alchemy as transformation"(5), the alchemical themes of "macrocosm-microcosm correspondences"(8b) and "alchemy as spiritual quest"(8d), John's life theme of "mega to micro"(8j) and Nancy's life theme of "women on the bridge"(3n)(see Figure 6).

Given this evolutionary perspective, the New Alchemists were not surprised to find ideological tensions and contradictions between their ideals and their current situation and they tried to deal with them one by one, in a good-natured spirit of co-operation and comradary.

The New Alchemists' evolutionary, bottom-up approach was strengthened and reenforced by symbols and myths which they collectively constructed[5]. Believing as they did in macrocosm-microcosm correspondences within and between biological worlds and social worlds, they saw their ecological designs and projects as symbols and models for better personal and social lives. Thus, they saw their gardens of complementary plants and animals and their tanks containing balance fish/algae ecosystems and their "ark" bioshelters not only as sensible biological designs, but also, as microcosmic symbols and models for more ecological and convivial social

arrangements. Furthermore, they constructed stories and myths, which incorporated these and other symbols of ecology and conviviality and told of the problems they had overcome and their progress as a group. These stories and myths of progress were then communicated to a wider audience through their journal, The Journal of the New Alchemists, which came out each year and told about their activities, designs and progress the previous year.

A good illustration of the New Alchemists' evolutionary, bottom-up approach to social problems and tensions and their construction of mediating symbols and stories, is provided by Nancy Todd's remarks and stories, in the second and third Journal of the New Alchemists, about the issue of sex roles and the problem of work initially being divided along traditional sexual lines at New Alchemy. In Journal Two, under the heading 'Preservation of Food;Preservation of Self', she brought up the problem of sex roles within a discussion about the canning and preservation of vegatables from their gardens:

> Another major aspect of the summer's work was the preserving of food... The food-processing, and predictably the housekeeping, are the areas where the difficulties of sex roles are most readily apparent, and equally predictably, it is the women who are least pleased with their lot. More than one visitor to the farm has commented that our roles with some exceptions are, in the main, still structured along traditional lines...
>
> There is no simple answer (to this)...I do see a transition, perhaps on the slow side for our taste, coming about in which the jobs, particularly those that we as women find most psychically oppressive, are being shared on an equal basis. It is certainly starting to happen with us. Several of the men cook. A gratifying number crowd the kitchen after Saturday lunch to do the dishes; yet I still have memory of a hot afternoon, a sticky kitchen, stacks of vegatables threatening to molder and an all-female and very resentful crew... transitions are always hard...as long as they keep happening, I guess (emphasis added).

Above this discussion was printed a metaphoric poem by Meredith Fuller-Luyten, entitled "Squash Flowers", which compared women with the fruit of the squash plant in the following lines (reprinted in N. Todd, 1977, p 10):

> Each forest/is proud of its trees but places its trust/in underbrush...

> Here are the tall men/and here the heavy women...
>
> The women wait/twisting their kerchiefs tight./Their short necks stiffen.
>
> But the gold cups of the men incline/their gold thrones teeter/
> generous to the wind, the bees, the final requests./
> By dawn they've even given/their weight in gold to the ground./
>
> ...Down among trunks/the kerchiefs bright as brass locks/
> slide open and in them drop/the favors of the dead./

In the above passage we see the emphasis of Todd and the New Alchemists on an evolutionary or "transitional" approach towards the problem of sex roles at New Alchemy. The accompaning poem symbolizes womens' "low" position, but also their ultimate triumph (it also symbolizes the symbiotic relationship between men and women). The embeding of the passage within a discussion of vegatable preserving underneath the poem neatly connects the symbolic message of the poem to the New Alchemy womens' situation and furthermore shows how the New Alchemists' ecological activities and projects, in this case the growing and preservation of vegatables, also served as occasions and symbols for their social progress.

In Journal Three Nancy Todd reported that sex roles was no longer a problem in the area of housekeeping, as housekeeping tasks were now shared on an equal basis among the New Alchemists, but that the problem of sex roles had arisen and was being dealt with in another microcosm, the conducting of Saturday tours of the farm:

> It is really very nice to be able to say that (sex roles in housekeeping) is not much of a problem for us any more...The goal of balanced sex roles is, however, an elusive one, sometimes laden with unexpected and, for that matter, ill-fated pitfalls...(When we found that men were leading the Saturday tours, while we women prepared lunch), the women's caucus gathered in the kitchen once again. That we, too, should give the tour was self-evident...We announced our intention to the men, who were entirely affable about it...(and) managed to give our first tour without either disgracing ourselves or exasperating our guests...another hurdle has been cleared (Journal Three, p11-2).

This passage futher illustrates the New Alchemists' evolutionary, bottom-up approach to problems, showing how they first dealt with the sex roles problem in a re-

latively simple context or microcosm, housekeeping, and then went on to deal with it in a more difficult context or microcosm, that of conducting tours, and more generally sharing the technical work of the Institute.

Furthermore, at the end of Journal Three, in her essay on "Women and Ecology", Nancy told the following related story about men and women at New Alchemy:

> ...I should like to end with a story about women and ecology that took place around New Alchemy's compost pile, which seems a suitably earthy and symbolic place to close. A while ago, a group of us were turning the compost late one Saturday afternoon, an activity that has acquired the status of near ritual. As we shovelled, someone commented on the smell which was at that moment, as I remember, largely vintage cabbage. "Smell", said Hilde (Maingay), who is our chief gardener and thinks well of compost. "That's the new perfume." To which one of the men...thundered, "If this is the new perfume, then women's liberation has gone far enough."
>
> And Hilde said, "It's just beginning." (p 128, emphasis added)

In this passage we can clearly see all the elements of the New Alchemists' evolutionary approach. Hilde's final remark, "It's just beginning", again underscores the evolutionary and transitional nature of balancing sex roles and liberating women (and men) generally. Also, the New Alchemists' ecological and technical designs and activities, in this case the compost pile and the "ritual" of turning the compost, are connected with and used to symbolize their progress towards their social goals (sexual equality and their new pastoral "perfume"). Finally, in writing and publishing in their Journal this and the previous two passages, Nancy Todd has created an ongoing story or myth about how the New Alchemists' faced and dealt with one of their problems, a story which could then serve as a guide and give the New Alchemists and others the confidence and courage to face other problems and difficulties.

Another important dimension of the social organization of the New Alchemists were the actual family units and households that were part of the larger extended New Alchemy "family" or clan. These family groupings, like the ecological activities and designs of the New Alchemists, were seen as microcosms to be balanced and per-

fected and to be used as models and guides for balancing and perfecting the New Alchemy community as a whole.

In this regard, the Todds themselves represented the prototypical family unit or social microcosm of the larger New Alchemy clan. As was shown by my analysis of their life and transforming themes, their backgrounds and interests complemented one another, with John emphasizing scientific and intellectual skills and Nancy emphasizing artistic and social ones, so that together they formed a relatively balanced entity in terms of what the New Alchemists were striving for (i.e. the fusion of science and art and of male and female strengths). Moreover, they were able to help one another coevolve and become more complete, Nancy helping John to develop and express his artistic and spiritual side and John helping Nancy to develop her scientific side. Also, because of these complementary skills, they were able, together, to function as an effective leadership team for the New Alchemists, with John focusing on intellectual leadership and the development of "big" ideas and Nancy concentrating on nurturing the social and familial ties of the New Alchemist and developing the symbo's and myths which supported and reenforced these ties.

This complementariness is well illustrated by their attitude and approach towards human relation issues and problems. John prefered to concentrate on ideas and designs and avoid human issues and problems as much as possible, remarking once that, "The thing that is hardest on me is the human relations thing. When I'm feeling least whole, I'm very susceptible to criticism, and I'm frustrated by other people, which can last a day or two. Internal conflicts here, of which there are fortunately few, take a tremendous toll on me even if I'm not directly involved (my, 1976, p 85)." This could have been a serious limitation if John had been the sole leader of the New Alchemists, but, fortunately, as we've seen, one of Nancy's chief interests and visions was in the New Alchemists as "family" and she was therefore willing and able to take a leading role in dealing with human and social relations and conflicts at New Alchemy.

Other important intellectual marriages and family units which developed over time among the senior members of the New Alchemists included the pairing up of Hilde Maingay, who was the New Alchemists' chief gardener, and Earle Barnhart, who was the main energy designer and later initiated the Tree Crops program; and the pairing up of Christina Rawley, who ran the Institute's membership program and helped edit the Journal, and Ron Zweig, who helped design and test bioshelters. These additional complementary pairings helped to reenforce the New Alchemists' sense of themselves as an extended family seeking through their designs and social arrangements to bridge the dualities between the pastoral and the modern, the scientific and the artistic and the male and the female. These pairings, along with the Todds, are indicated by asterisk pairs in Figure 7.

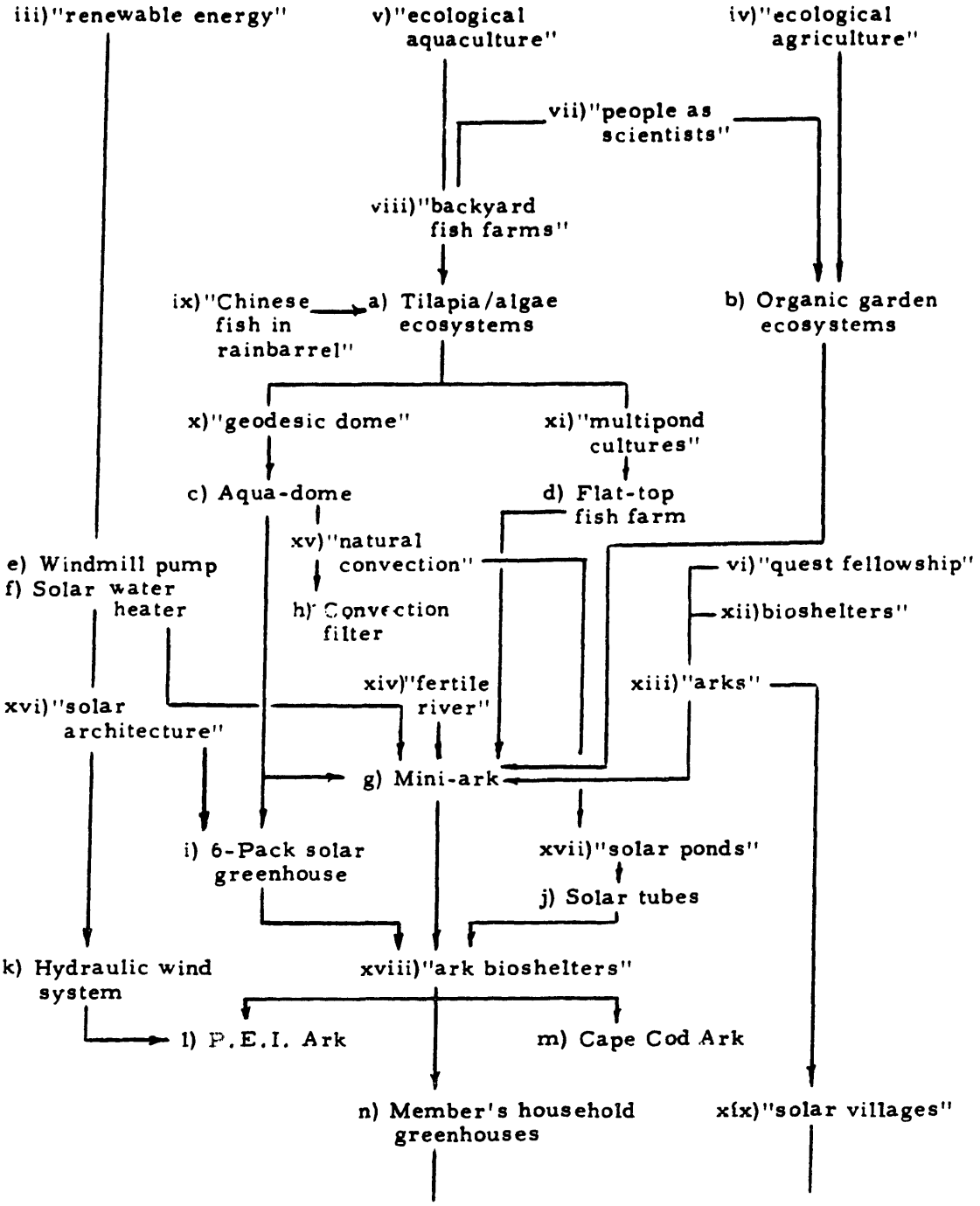
The Evolution and Symbolic Meanings of the Ark Bioshelters

Like their social organization, the major design projects of the New Alchemists, their Ark bioshelters at their farm on Cape Cod and on Prince Edward Island in Canada, emerged in an evolutionary, bottom-up fashion in which their designs for the Arks built on and grew out of their earlier, simpler designs and design projects. Figure 8 shows the coevolution and interweaving of design themes and designs which ultimately led to the creation of the Ark bioshelters. In the subsections below I'll describe, in order, each of the designs which formed a step or stage in this process and the design themes that inspired and guided each design. I'll also discuss the symbolic meanings that each design had for the New Alchemists.

a. Backyard Fish Farms and Ecosystems

At the top of Figure 8 are the three general design themes, "renewable energy"(iii), "ecological agriculture"(iv) and "ecological aquaculture"(v), which grew out of the Todds' transforming themes and were first articulated in John Todd's "A Modest Proposal". The interweaving system of design themes (shown in quotes) and designs shown

Figure 8: The Coevolution of Themes and Designs Leading to the Arks



in Figure 8 is thus a continuation of the coevolving thematic system shown in Figure 6, where these themes appear at the bottom.

Since John Todd and Bill Mclarney, both marine biologists, each had expertise in the ecological aquaculture area, one of their first design projects, the design, construction and testing of what they called "Backyard Fish Farms", was in this area. In their article, "Walton Two: A Compleat Guide to Backyard Fish Farming", which first appeared in Journal Two, they describe the origins of their idea for creating backyard fish farms (their title "Walton Two" has a double meaning: it refers to Izaak Walton, an early expert on fish who wrote The Compleat Angler in 1653, but is also an allusion to Skinner's utopian novel Walden Two):

> During our earliest discussions it was proposed that one approach to food crises, as well as alienation from nature, would be to have everyone to become a farmer. If people could spend part of their time culturing many of their foods in a manner that would be pleasurable and without heavy toil, could new notions of freedom and cooperation evolve?
> ...Psychically, people are drawn to living things...As humans, we want to be involved with life. Perhaps then it's not too great a step for us to transfer this drive to an involvement with creatures that can sustain us, and thereby enhance the living world beyond ourselves. This innate urge perhaps needs only to be cultivated ... Those who come to see the connection between their urge to be closer to life and the need to culture some of their own food would become, in spirit, farmers and stewards of the earth...
> ...We began to see glimmerings of survival possibilities and, beyond these, transformations for society ...In moving from theory to practice, the first step we conceived was the backyard fish farm, a pool where most of the meat protein for a small group of people could be grown (McLarney and Todd, 1977, p 76; emphasis added).

This passage echoes a number of John Todds' life and transforming themes discussed earlier, including his and Bromfield's belief in the romance of farming and the farmer as steward of Nature and his key transforming theme of "knowing Nature and being whole" (see Bromfield's themes in Figure 2 and Todd's themes 1j, 2*j, 3j, 6j, !, and 3 in Figure 6). Note, also, how "culture" and "cultivate" are used here to refer both to biological and agri- "cultures" and to human "cultures", reflecting the New Alchemists' belief in the "correspondences" and connections between biological "microcosms" and

and human social and cultural "macrocosms"(see alchemical theme 8b in Figure 6 and related themes 8a and 8c). The idea for the backyard fish farms, thus, grew out of and reflected a number of Todds' and the New Alchemists' key life and transforming themes.

Besides envisioning people becoming "backyard fish farmers", Todd and McLarney envisioned them becoming backyard "grassroots scientists" (design theme vii) as well, able to maintain and modify when necessary their backyard fish farm. This theme of making people "grassroots scientists" was one of the central goals of the New Alchemists' early work in aquaculture and agriculture and echoed Bromfield's earlier theme of the "farmer as grassroots scientist" (theme viii in Figures 1 and 2).

Todd and Mclarney's idea of creating backyard fish farms was also inspired by a story told to them by an anthropologist friend about how the Chinese in Malaysia grew fish in the rainbarrels under the eaves of their houses, feeding them with scraps from their gardens. Todd and McLarney were intrigued by this, recalling in "Walton Two" having thought at the time: "Fish in a rainbarrel...funny, but ecologically sound, cheap, and perhaps potentially liberating from the company stores...fraught with possibilities (p 76)."

They decided to use algae as the primary food source in their fish farms because it grew naturally in ponds and would thus provide a cheap source of food for the fish. There were not, however, any appropriate North American fish which ate algae, so they decided to use the tilapia or St. Peter's fish:

> (Since) when the great god Pan came to dispensing fish into the lakes and streams of North America, he neglected, for some caprious reason, to give us (good-tasting) vegatarian fish...It was an algae-eating fish with African origins that caught our fancy as a candidate for the backyard fish farms. This fish, called tilapia or St. Peter's fish...was the fish sought by fishermen in the Sea of Galilee in Christ's time and legend has it that this was the fish he fed to the multitudes.
>
> Tilapia have a lot going for them. They are relatively peaceful and, unlike many of the Chinese fishes, very easy to breed and transport. They can be grown in dense associations...(and) feed mainly on algae or aquatic vegetation

and have a reputation for being superb tasting...(p 78).

This passage suggests that the tilapia appealed to the New Alchemists not only for the logical reasons listed, but also because of its symbolic value as the fish that Christ supposedly fed to the mass, which thereby reenforced the symbolic and spiritual meanings that the New Alchemists attached to their work and designs . As we'll see, this was indeed the case with many of the New Alchemists' design choices and components which had both practical and symbolic appeals. The spiritual or religious significance of the tilapia is reenforced by a quote from Walton at the beginning of "Walton Two": "God is said to have spoken to a fish, but never to a beast (p 74)."

In a similar symbolic and religious vein, Todd and McLarney saw the fish farm itself as an organic microcosm like a plant, the workings of which would mimic and reveal the workings of the larger natural world to people:

> The small-scale food farm would be in some respects an image of the plant itself, providing a means of teaching stewardship and an understanding of the workings of the natural world (p 78).

Here, again, we see the New Alchemists' belief in microcosm-macrocosm correspondences exhibited in their designs.

b. Organic Garden Plots

At the same time the New Alchemists' started their fish farm project, they were also planting organic garden plots in which they experimented with a variety of complementary plant (and animal) ecosystems. Like their fish farms, these plots were also seen as microcosms which would help reveal to them, through their observation and systematic measurement of yields, the larger workings of Nature. The results of these experiments and observations, were used by the New Alchemists later to design the internal plant and animal ecosystems for their Mini-ark and Ark bioshelters (for more information on the New Alcemists' gardens, see Hilde Maingay's articles in Journals Three and Four).

c. The Aqua-dome Fish Farm

The New Alchemists designed, constructed and tested two different prototype backyard fish farms, the Aqua-dome Fish Farm and the Flat-top Fish Farm. The details of both of these designs are shown in Figure 9. Figure 9a shows a drawing of a typical Chinese Carp aquacultural ecosystem, which helped inspire the New Alchemists' designs, except they used tilapia instead of carp in their fish farms.

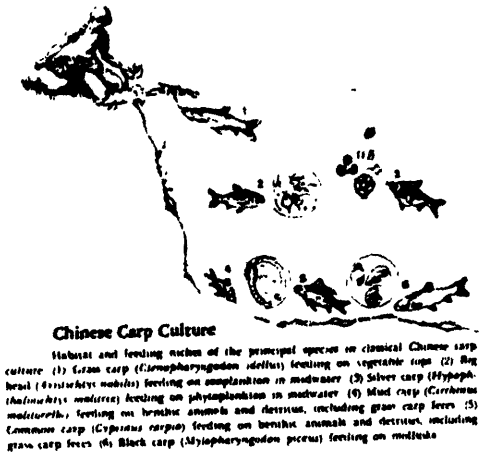
The Aqua-dome Fish Farm, built in 1971, was basically a pond filled with tilapia and algae covered by a transparent eighteen foot geodesic dome, as the diagram, Figure 9b, shows (this diagram also shows compost which wasn't included in the final design).

The geodesic dome, like the tilapia fish, had both a practical and symbolic appeal for the New Alchemists. The practical reason for the dome was to act as a solar heat trap to keep the pond warm enough for the semi-tropical tilapia fish. Together the dome and the pond acted as an effective passive solar system, with the dome collecting the heat and the pond providing the thermal mass to store it overnight. The symbolic appeal of the dome was threefold. First, as Todd and McLarney stressed in "Walton Two", the geodesic dome, invented by visionary designer Bucky Fuller, had become a "New Age" tool and symbol:

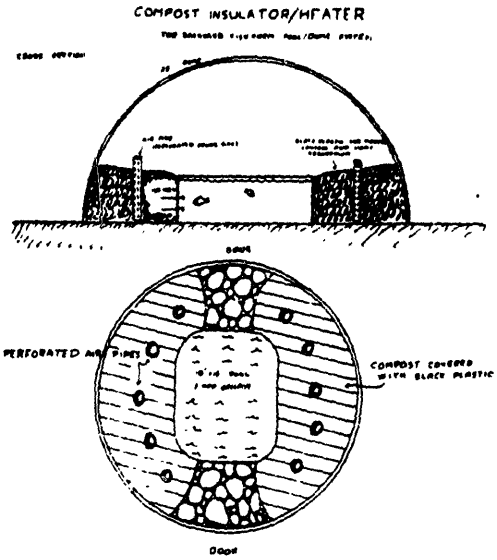
> Equally important (to the practical reason for the dome), at least in the early days of our work, was the fact that geodesic domes seemed to symbolize a new confidence and a sense of mastery. Neither were fully justified, but still the dome was tied to the enthusiasms of Bucky Fuller and a pioneering spirit that was in the air. They were "New Age" tools, and somebody had to find a use for them (p 82).

As noted in Chapters 2 and 3, Bucky Fuller was a hero and prophet for the pioneering outlaw designers in the Southwest and Steward Brand, the creator of the Whole Earth Catalogue, and the geodesic dome became one of their central "appropriate technologies" and symbols, and the New Alchemists picked up the idea and the symbolism of the dome from these sources.

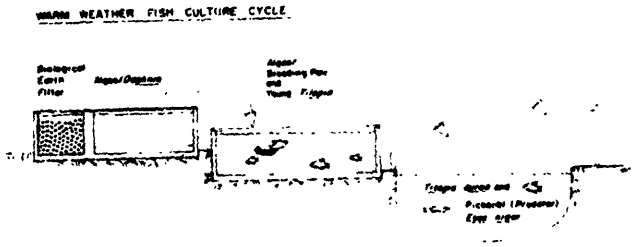
Figure 9: Backyard Fish Farm Designs from Todd and McLarney's "Walton Two" (N. Todd, 1977, p 74-107)



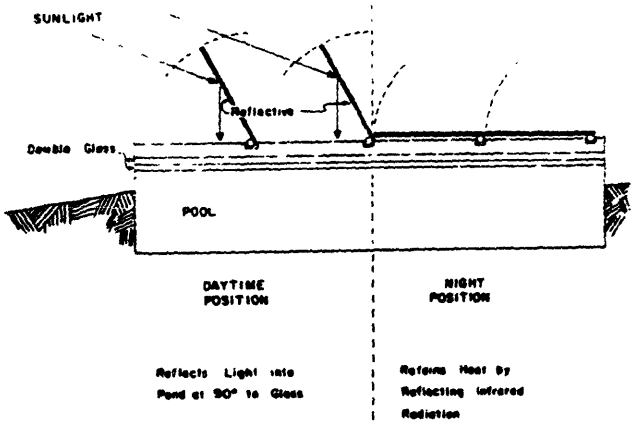
a. diagram of Chinese carp polycultural ecosystem (p 77)



b. diagram of aqua-dome fish farm with compost around pool (not used in actual design, p 80).



c. diagram of three pools and cultures incorporated in the Flat-top fish farm(p87)



d. main (bottom) pool of Flat-top with reflective cover (p 87)

e. the New Alchemists in the aqua-dome farm(p97)

Furthermore, the dome together with the pond, like the alchemical ouroboros-the snake swallowing its own tail, symbolized completness and wholeness. They formed a "closed circle", an enclosed and complete microcosm unto themselves. Or as McLarney succinctly expressed this appeal of wholeness: "domes belong over ponds."

In a similar vein, McLarney and Todd poetically described the completed Aqua-dome as being like "a tiny visitor from space":

> It was situated in an opening in an oak-locust woods not too far from the sea. It had the air of a tiny visitor from space, yet it blended happily with its surroundings. Since that time we have had a somewhat irrational (i.e. symbolic) attachment to the geodesic dome as solar trap and pond cover. There is no other structure that is as much fun to sit in on moonlight nights listening to the water tumbling back into the pool from the filter...(p 82).

The latter part of this passage begins to suggest the third symbolic meaning or appeal of the aqua-dome, that it was a place the New Alchemists could be together in a microcosm of their own creation and thus came to symbolize the "wholeness" and "completeness" of the New Alchemists themselves as a family. And, thus, by both representing a "whole" biological microcosm (the fish-algae ecosystem it enclosed) and the "wholeness" of the New Alchemists, who built and sat in it, the aqua-dome also symbolized the connection between biological microcosms and human macrocosms which, as we've seen, was a central theme for the New Alchemists. The picture of the New Alchemists gathered in the Aqua-dome, Figure 9e, and the picture of the New Alchemist couple and child in the Aqua-dome in the next section (Figure 20b) both reflect and served to reenforce these symbolic meanings.

Later on in an essay entitled "Bioshelters as Organisms" in Journal Four, Ron Zweig made very explicit the New Alchemists' sense of the Aqua-dome as a self-contained "living" microcosm by drawing an elaborate comparison between its elements and analogous elements in a living cell:

> In looking from the macrocosm of the Earth to the microcosm of the indi-

> vidual cell and from these to bioshelters, many similarities can be found... An analogy surprisingly close to the (living) cell can be made with our (aqua-) dome...
> ...The outer structure of the dome is covered with two layers of translucent fiberglass... This membrane, much like (the membrane) of the single cell, allows sunlight to enter and to be absorbed and converted into heat energy...
> ...The microenvironment within the dome can be compared to the protoplasm of the (living) cell...
> ...The chloroplasts of a living plant cell produce oxygen through photosynthesis which, in terms of the dome system, can be compared to the activities of both the aquatic and terrestrial plants living within it...
> ...the biological filter and the polyculture pool can be related to the vacuoles of a single cell. Their function is the purification of toxic compounds...
> ...The electric pump used to circulate the water through the filtering beds can be compared to a ribosome at the cell level...the center for the coordination of protein synthesis in a cell...
> ...The energy for the electric pump could come from a wind generator...If a windmill were used, it could be considered the mitochondria (energy producer) of the dome...
> ...The chief information center of the cell is known to be the nucleus...much of the control and monitoring of the dome system (is now done by humans but might be partly done by a mini-computer in the future)...(Journal Four, p 108, emphasis added to underscore dome-cell analogies).

This passage strikingly illustrates the way the New Alchemists used biological analogies and microcosm-macrocosm correspondences in their thinking and design.

d. The Flat-top Fish Farm

The second prototype backyard fish farm designed and constructed by the New Alchemists was called the Flat-top Fish Farm. As the diagram, Figure 9c, illustrates, the Flat-top was based on the design theme or principle of having multiple pools with different aqua-cultures in each (design theme #xi). The Flat-top had three connecting pools: an upper pool in which water was filtered and algae grown, which flowed into a middle pool where young tilapia were bred, which flowed into a bottom pool where adult tilapia were raised. Figure 9d shows the main (bottom) holding pool with its reflective cover for collecting heat during the day and insullating the pool at night.

When the Flat-top and Aqua-dome were both completed the New Alchemists sought to test and compare their performances and in their playful way of combining work and fun they turned this comparison into the Great Tilapia Race:

> (In comparing the two prototypes) we unleashed a dynamic that quickly turned into the Great Tilapia Race between the two systems. As the season developed and the competition became intense, veiled threats of nocturnal fish raids were heard, and accusations of sneaking unweighed food to the fishes were not uncommon... Yet outwardly the behavior of the participants remained impeccable and they were often to be seen happily chatting about their respective strategies... At the end of the season, when the dust settled, it was concluded that they had produced fish equally well and the race was pronounced a draw (McLarney and Todd, 1977, p 85).

As with Nancy Todd's story about the compost pile and the "new perfume", we see in the Great Tilapia Race and this story about it another example of the New Alchemists' ability to create rituals and myths around their activities and designs which served to reenforce their sense of themselves (as family/fellowship) and their mission (as ecological/pastoral quest).

Regardless of its technical merits, the Flat-top didn't have quite the symbolic appeal and power of the Aqua-dome. As we'll see, however, its three pool design scheme was later incorporated into the Mini-ark bioshelter design.

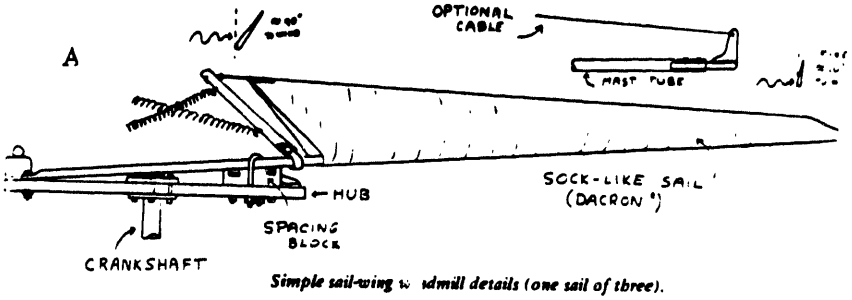
e. Simple Windmill Designs

At the same time the New Alchemists were building and testing their backyard fish farms, they (mainly Earle Barnhart and Marc Sherman) also began designing and experimenting with simple devices to harness the renewable energy (design theme #iii) of the sun and wind. They began experimenting with using simple windmills to pump water, because they wanted to pump the water through the filters in their fish farms by natural means rather than having to use electricity. Figure 10a and 10b show two windmills they designed and built for this purpose. Figure 10a shows the sail, tower and pump design for their "Big-Red" (the sails were bright red) windmill, which they later used to pump water through their Mini-ark bioshelter. Figure 10b shows another pumping windmill they built which utilized a three-tiered Savonius rotor they constructed from plywood and sheet metal.

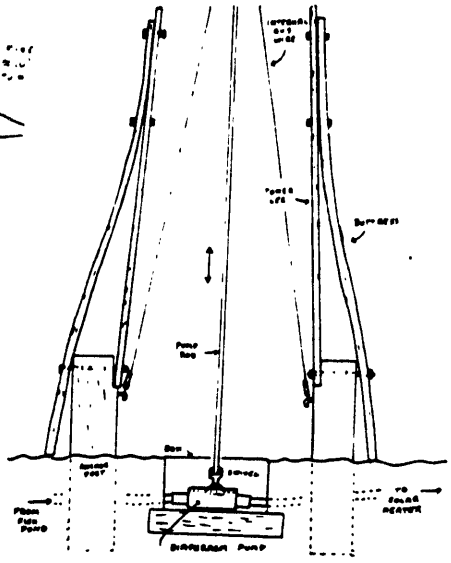
f. Simple Solar Collectors

They also built some simple solar collectors, like the one shown in Figure 10c, to

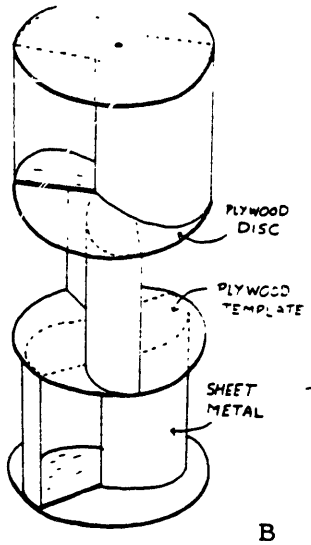
Figure 10: Renewable Energy Designs from the Journal of New Alchemists, #3



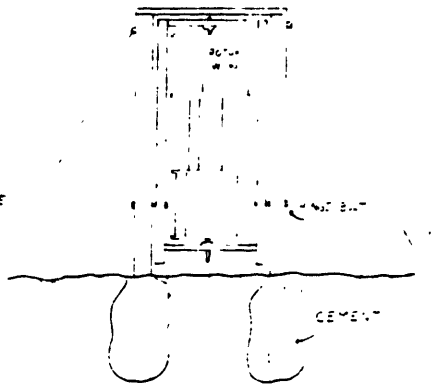
Simple sail-wing windmill details (one sail of three).



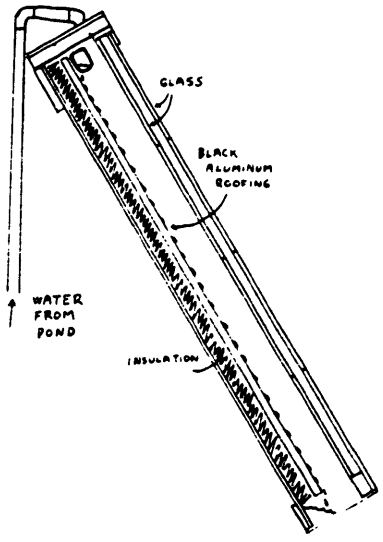
Sail-wing windmill with diaphragm pump.

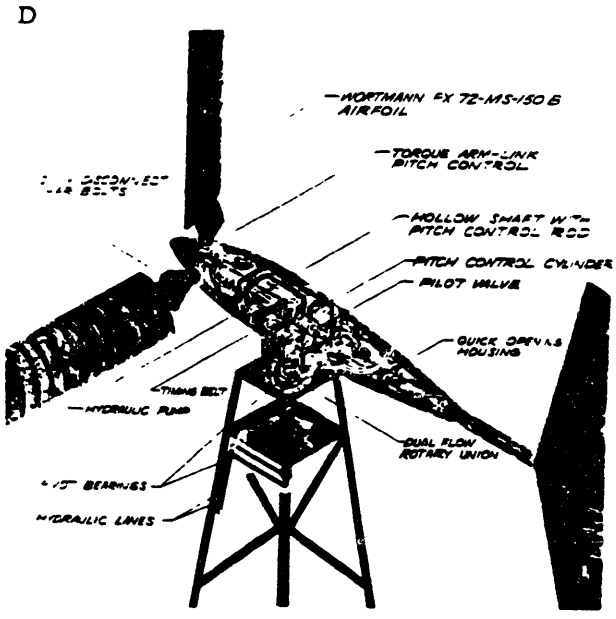


Three-tiered Savonius Rotor



Savonius Rotor Tower





a. sail and pump design for sail windmill
b. rotor and tower design for Savonius windmill (p 28-9)
c. simple solar collector for heating water using aluminum roofing (p 30)
d. advanced hydrolic wind generator design for Prince Edward Island Ark (p42)

supply additional heat to their fish farms. The water from the fish farms could be pumped through these auxiliary collectors to warm it up.

The windmills and the solar collectors, like the fish farms themselves, symbolized the New Alchemists connection with Nature and, by extension, with one another (see the symbolic picture of the New Alchemists grouped around the Savonius windmill in Figure 18b in the next section).

g. The Mini-Ark Bioshelter

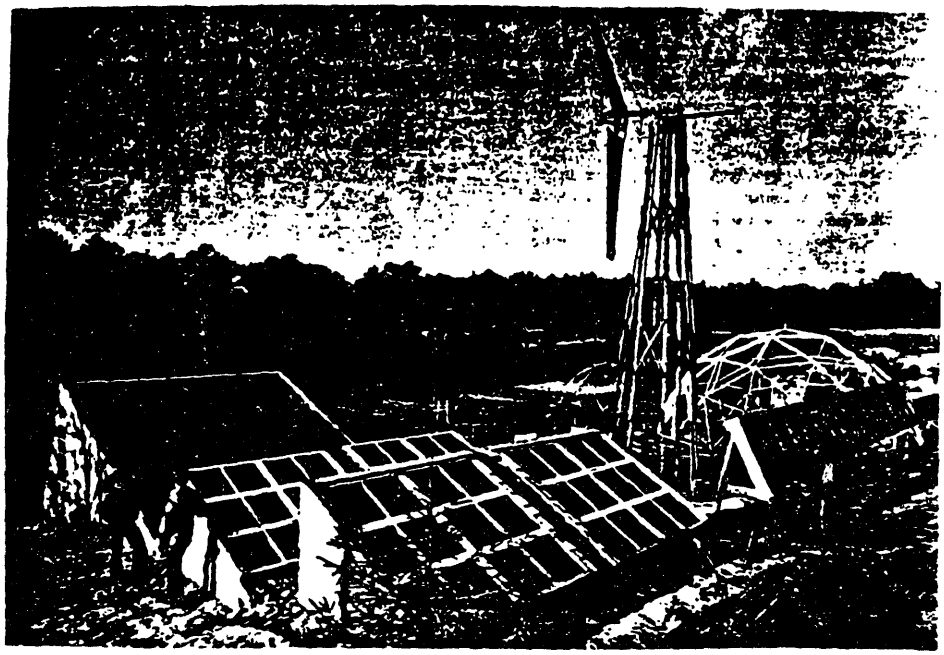
The Mini-Ark or "Miniature Ark" was the first grand design synthesis of the New Alchemists (note how many prior themes and designs converge at the Mini-ark in Figure 8). As McLarney and Todd put it: "The Miniature-Ark is for us a fusion of those things with which we most desire to work; namely the sun, wind, small aquatic ecosystems, food plant associations and cycles linking all of these (1977, p 88)."

Whereas the natural analogy and model for the backyard fish farms had been the fish pond, the natural analog for the Mini-ark was the "fertile river" (design theme # xiv). Todd and Mclarney had been impressed with the amounts of fish produced in the great fertile rivers of the world, and they sought in the Mini-ark to create a bio-technic equivalent of a natural river ecosystem. Figure 11 shows a photograph of the resulting Mini-ark and diagrams of its three pools and how they operated.

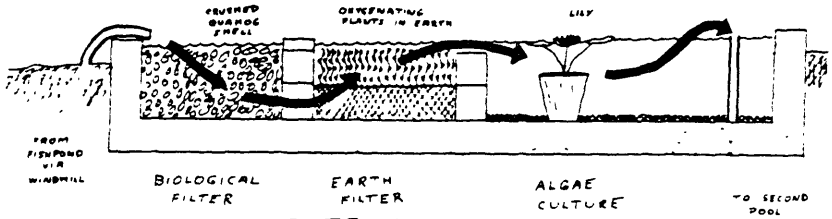
The Mini-ark functioned like a closed-loop "river" with the Big-Red sail windmill (see photo) cycling water first through a bank of solar collectors which heated it up and then through the ark's three pools. As with the Flat-top system, in the upper pool the water was filtered and algae cultivated. The water then flowed into the middle pool where small fish and aquatic plants were cultivated. Last, in its continuous cycle, the water flowed into the lower pool in which large tilapia and other fish were raised and which was covered by a small greenhouse and surrounded by greenhouse plants.

The design and construction of the Mini-ark, thus, brought together and synthesized

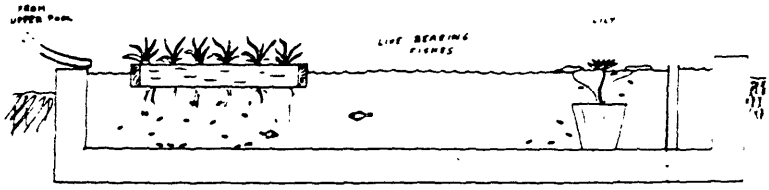
Figure 11: Mini-Ark Design from Todd and McLarney's "Walton Two"



a. photo of Mini-Ark showing sail windmill and shelters for three pools (N. Todd, 1977, p89)



UPPER POOL - FILTER

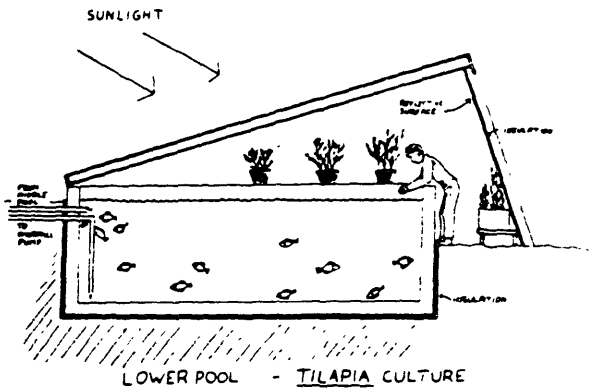


MIDDLE POOL — ALGAE
— AQUATIC PLANTS
— LIVE-BEARING FISHES

b. the upper pool acts as a natural filter for the system

c. algae, aquatic plants and live-bearing fish are grown in the middle pool

d. Tilapia and greenhouse plants are grown in the lower pool/shelter of the Mini-Ark (p 91-2).



LOWER POOL - TILAPIA CULTURE
- GREENHOUSE PLANTS

the New Alchemists' previous work on the Aqua-dome and Flat-top fish farms, their work on organic garden ecosystems and their work on renewable wind and solar energy. The Mini-ark was also partly inspired by solar architects Day Charoudi and Sean Wellesley-Miller's notion of "bioshelters" (see Figure in Chapter 2), which like the New Alchemists "arks" were envisioned as shelters which would enclose self-contained and balanced ecosystems (Charoudi and Wellesley-Miller, 1974).

The use of the name "arks" for their bioshelters, like their calling themselves the "New Alchemists", was very important symbolically for the New Alchemists. First of all, it conveyed their sense of their arks as whole, self-contained microcosms, like Noah's Ark was. As John Todd put it, they were so "named because of their self-sufficient nature and because of the diversity of living things within (J. Todd, 1976, p58)." The name "arks" also conveyed their intention that their bioshelters would be models and vehicles for cultural and spiritual transformation, like Noah's Ark had also been. Or, as Mclarney and Todd put it in "Walton Two": the "New Alchemists are builders of 'lifeboats' and 'arks'. It is our contention that they will be needed desperately, if humanity is to avoid famine and hardship, and manage to shift to moded of living which restore or rekindle our bonds with nature (1977, p 74)." Thirdly, the name conveyed and reenforced the New Alchemists' sense of themselves as a family/fellowship engaged in a cultural and spiritual quest, like the one Noah and his family had been on when they built and journeyed forth on the Ark.

In a long essay entitled "The World in Miniature" in Journal Three, John Todd tells about an experience and insight he had in the Mini-ark, which clearly shows its symbolic significance for him and the other New Alchemists:

> One evening under the light of the moon I sat down to absorb what we had done. The big sailwing mills turned quietly like dancing ghosts against the sky...Within the miniature ark it was warm and the earth and plants reeked of fertility and growth. In the distance there was laughter after the day's work.
>
> That moment became the future...

> ...The (miniature) ark, for all the flaws and the crudeness of early design, has altered my thinking on the future of agriculture and human communities. What once seemed difficult or impossible, no longer seems so. Through emulating nature it should be possible to create highly productive food-producing ecosystems, independent of fossil fuels or nuclear power...(p 76, 58-9).

Here Todd is weaving a symbolic and didactic parable or myth, similar to his story about the tree that "talked" to him. He goes on to say he then understood very clearly how mankind and nature and mind were all part of one continuum:

> ...It is no coincidence that our health and that of the planet are one. We are part of it in a way we only dimly comprehend...There is a continum of being in a hillside brook which extends outward to encompass the world while reaching inward into ourselves. We are a mirror image, a tiny reflection of the earth itself and our collective psyche is a superimposition of images of humanity's experience on earth over time. The same forces which have shaped us have shaped the world. There can be no real separation. The continuities in nature between the design of cells and ecosystems extend from organelles outward to the smallest freshwater pools with their myriad living entities to the oceans and ultimately to the whole planet. These ties are embodied in us too. We look out at the world and yet are of it. It is no accident that our attempt to affirm these mysterious linkages involve touching upon that which is considered holy and sacred. Such feelings cause me to wonder if there are further threads outward in this continuum. If so, is it possible that there is a relationship between what we do in the world and our religious reconstructions of it?...I think perhaps that our mindscape might be an internal ecology with its images in the landscapes of the world...(p 75-6).

In this passage, Todd brings together a number of the general AT and New Alchemy themes we've previous discussed. First, the ancient notion of the "great chain of being", rearticulated by E.F. Schumacher in his Guide to the Perplexed (see discussion of Schumacher's thematic system in Chapter 2), is present here. Also present is Gregory Bateson's notions of the "ecology of mind" and the connection between mind and nature (also discussed in Chapter 2). In addition we see the related alchemical themes of the Earth being "alive" (i.e. the Gaia hypothesis, discussed favorably by Todd elsewhere in the essay) and man as a microcosm of nature, and we see the central alchemical and New Alchemy theme of microcosm-macrocosm correspondences in spades, with Todd drawing comparisons among the small microcosms of cells and pools, the huge macrocosms of oceans and the Earth itself, and the microcosms of man,

mind and religion! As Todd leaves the Mini-ark, he articulates the need for cultural and religious transformation based on the model provided by the ark (p 70, 75):

> ...Looking into one of (the Mini-ark's) tropical pond ecosystems which is sustained by other adjunct ecosystem elements in addition to the wind and the sun, I can see the beginnings of a world in miniature with its various elements in tightly knit concert. A marigold falls to the surface and looming out of the depths come the various fishes which are sustained within... The fish are growing well. We are learning to emulate nature for human ends as well as for Gaia's, but I wonder if we and others like us can learn enough, and in time. Leaving the mini-ark, the cold of the outside chills me as does the thought that what must transpire in our time is no less than a conscious change in our relationship to nature...Existing knowledge will have to be re-integrated into healing wholes, and land tenureship first will have to encompass the vision that a sacred ecology can provide...Perhaps we can gain strength from an old (alchemical) prophecy:
>
> 'This is What the Rebirth/ of the World Will Be/
> A Renewal/ of All Good Things,
> A Holy and Most Solem/ Restoration/ Of Nature Herself'
> -Corpus Hermeticum attributed to Hermes Trismegistus

This little story resembles, in tone and message, Henry David Thoreau's pastoral retreat to Walden Pond (see Marx, 1964 for an analysis of similar pastoral retreat stories by Ameican writers). In it Todd uses the Mini-ark as the central symbol and model for the alchemical and New Alchemical themes which he sees as needed to transform our culture so that we can live in harmony with Nature once again. Hence, not only did the Mini-ark represent a grand synthesis of the New Alchemists' previous designs and design themes, it also represented a synthesis of the New Alchemists' general cultural and spiritual values, themes and symbols.

h. The Convection Filter

After having built and tested the Mini-ark , the New Alchemists were inspired to experiment with a new approach for filtering pond water which relied on "natural convection currents" (design theme # xv) instead of or in addition to a pump. This approach was suggested by the passive solar collector designs which utilized natural convection currents (hot air or water rises) to circulate air or water so that a pump wasn't needed. The New Alchemists glued crushed oyster shells to screens and placed

the screens in the Aqua-dome's pool, allowing the natural currents in the pool to circulate the water through the shells. This approach worked fairly well and the New Alchemists' later used it in their innovative "solar ponds and tubes".

i. The Six Pack

The Six Pack bioshelter and solar greenhouse, so named because it resembled a large "six-pack", was an advanced version of the Aqua-dome, in which the dome was replaced by a more energy efficient structure like the ones used for solar greenhouses. It was designed and built by the New Alchemists in collaboration with the Solsearch architects both to test principles and materials they hoped to use in the large Ark bioshelters they were planning and to serve as a prototype backyard greenhouse/bioshelters which people could build in their own backyards from plans supplied by the New Alchemists.

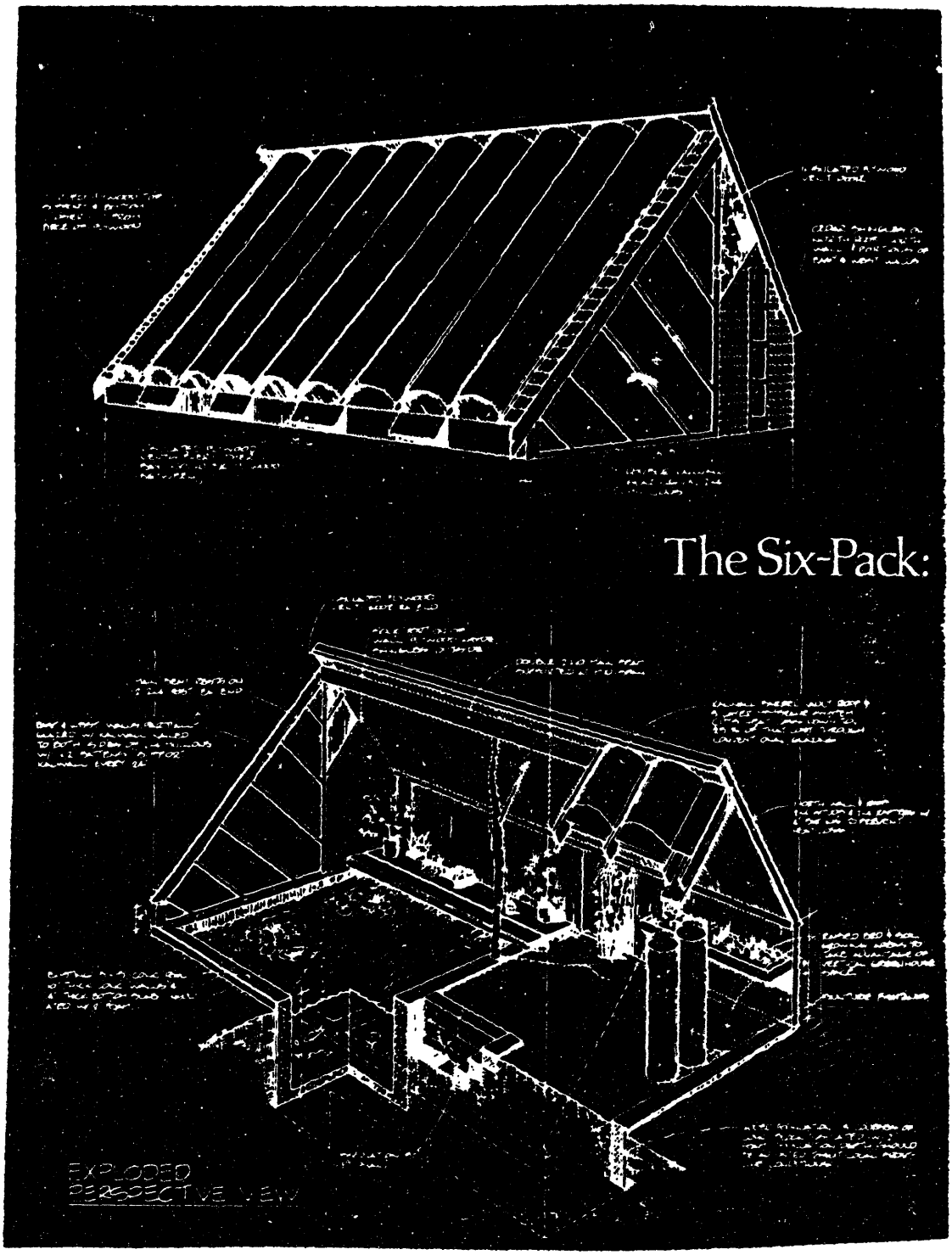
The Six Pack, shown in Figure 12, was a 25-1/2 foot by 15-1/2 foot structure with a south-facing wall of fiberglass glazing and an insullated north wall, which enclosed an aquaculture pond and an ecology of greenhouse plants (for more details on the design and testing of the Six Pack, see Laura Engstrom's article in Journal Four).

j. Solar Tubes and Ponds

One of the drawbacks of the Six Pack design was that not enough light reached the depths of the aquaculture pond for optimum production of algae and fish. John Todd reasoned that if the pond could somehow be raised up so that more sunlight could get to it, its productivity could be increased. Out of this insight grew the innovative design for "solar tubes and ponds", which the New Alchemists created by filling specially made transluscent cylindrical fiberglass containers with water containing algae and tilapia (the large containers called "solar ponds" were 5 feet in height and diameter, the smaller variety called "solar tubes" were only 2 1/2 feet in diameter).

Since the containers were transluscent, plenty of light got into their depths and

Figure 12: The Six Pack Solar Greenhouse from Journal #4 (p 125)



they proved to be a very simple and efficient way to produce fish. The New Alchemists also experimented with interconnecting multiple "solar ponds" to form a "solar river" (For more detail on the creation and testing of the "solar ponds" see Ron Zweig's article "The Saga of the Solar-Algae Ponds" in Journal Four). In their testing for fish yield, the solar ponds were so successful compared with their earlier aquaculture pools, that the New Alchemists incorporated them into their designs for the Cape Cod and Prince Edward Island Arks.

The emerald green solar ponds with their visible golden tilapia darting about inside were, like the Mini-ark before them, both models and symbols of the wholistic microcosms which the New Alchemists saw in Nature and sought to re-create. Also like the Mini-ark, they symbolized the New Alchemists' work together as a family/fellowship and their mission or quest (see the symbolic picture of New Alchemists surrounding one of their solar ponds in Figure 20d in the next section). Whereas, the Mini-ark was a powerful symbol because it brought together and fused so many of the New Alchemists previous themes and the water cycling through it symbolized a cycle or circle of completeness, the solar pond was a powerful symbol because of its simplicity, compactness and elegance.

In addition to the Mini-ark and solar ponds both being powerful symbols for the New Alchemists, the progression from backyard fish farms to Mini-ark to solar ponds (and then on to the Arks), like the steps in the Great Work of the alchemists, was also symbolic, symbolizing the evolution or progression of the New Alchemist fellowship in their quest to "know" the secrets and wisdom of Nature.

k. Innovative Hydraulic Wind Generator

While the New Alchemists were testing and evaluating their solar ponds, they were also planning and designing the large Ark bioshelters to be built on Cape Cod and Prince Edward Island. As part of this effort they had a design team headed by consulting engineers Merrill Hall and Vince Dempsey design and build an innovative

wind generator for the P.E.I. Ark called the HYDROWIND. The HYDROWIND, shown in Figure 10d, had innovative light weight bladed and a hydraulic system which conveyed the power from the blades to the base of the tower where it was then converted to electricity.

l. The Cape Cod Ark

The Ark bioshelters built at their Cape Cod farm and on Prince Edward Island were the second grand synthesis for the New Alchemists (note in Figure 8 how previous themes and designs come together in the ark bioshelters, as they did above in the Mini-ark) and represented the culmination and zenith of their biotechnic design work which had begun with the backyard fish farms and progressed through the Mini-ark and the Six Pack and solar ponds and was finally most fully realized in these Arks.

Figure 13 shows a side view of the inside of the Cape Cod Ark, which was completed in the fall of 1976, with its innovative design features indicated. Figure 14 shows detailed cross sections of it, revealing its biotechnic components which included: i) a south-facing wall of transluscent fiberglass (as in the Six Pack) which heated the shelter and its contents passively; ii) many solar ponds in which fish were cultivated; iii) a small aquaculture pool for experiments and demonstrations; iv) an indoor "garden" or ecosystem of complementary plants and animals; v) a rock storage for storing heat and a fan for circulating it; and vi) a research lab area, where a mini-computer was installed to monitor the temperatures in various parts of the Ark and model its behavior over time.

m. The Prince Edward Island Ark

The Prince Edward Island Ark, shown in Figure 15, was an expanded version of the Cape Cod Ark which included living quarters for a family as well as fish and plant and animal ecosystems. It was designed and built with a large grant from the Canadian government and was officially opened by Prime Minister Trudeau in September of 1976.

In addition to having the same biotechnic components as listed above for the Cape

Figure 13: The Cape Cod Ark (from the Book of the New Alchemists)

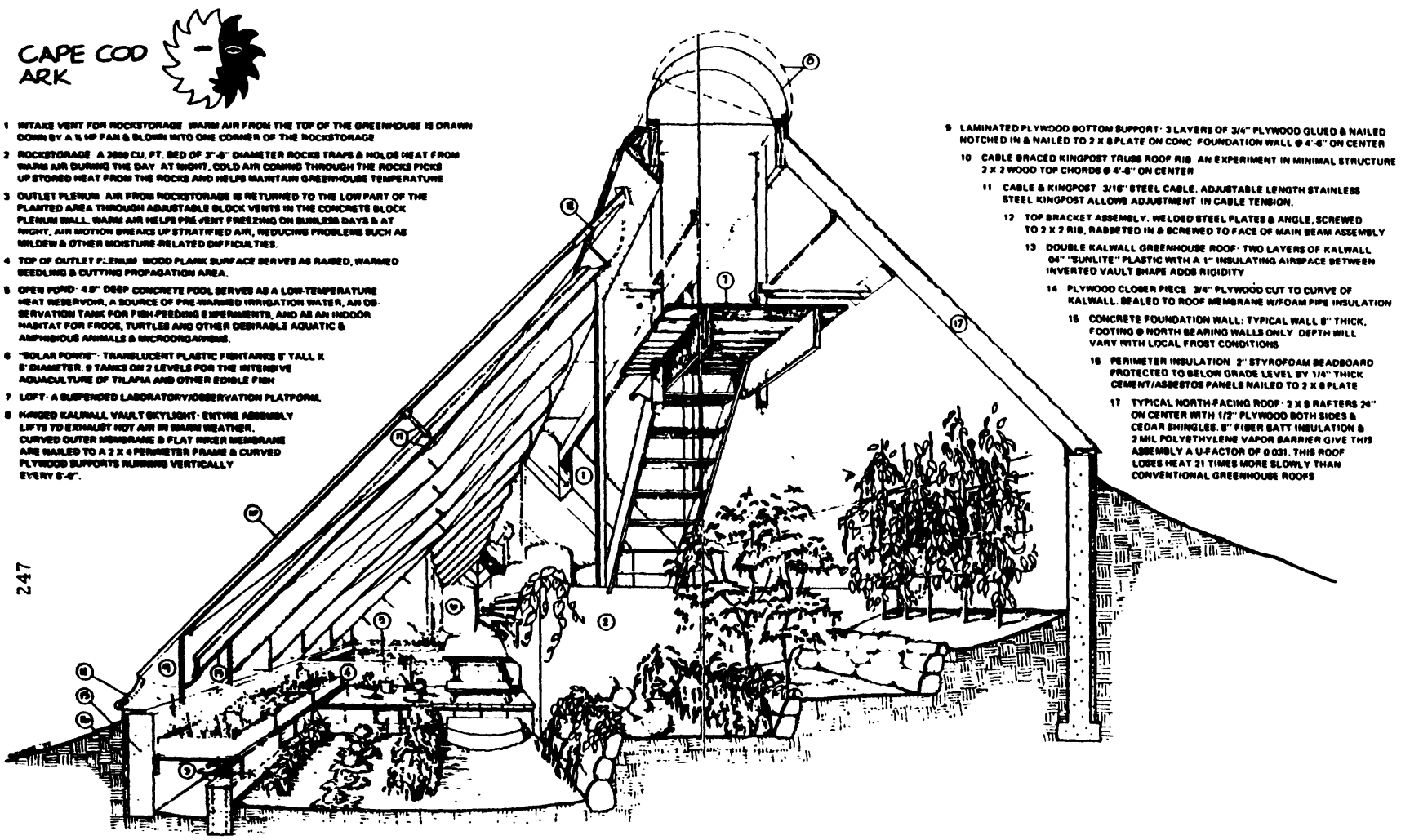


Figure 14: Detailed Cross Sections of Cape Cod Ark (from Journal #4, p118)

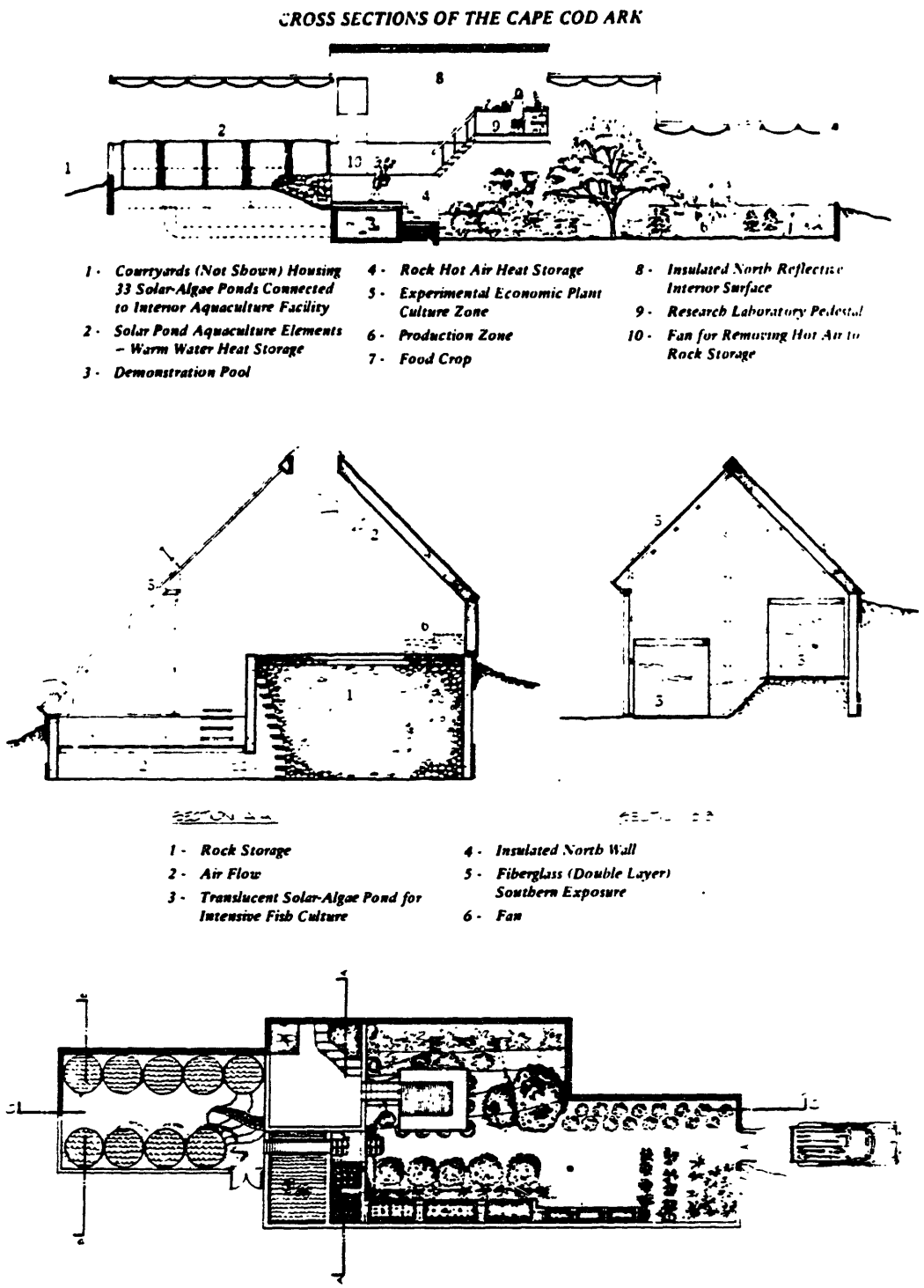
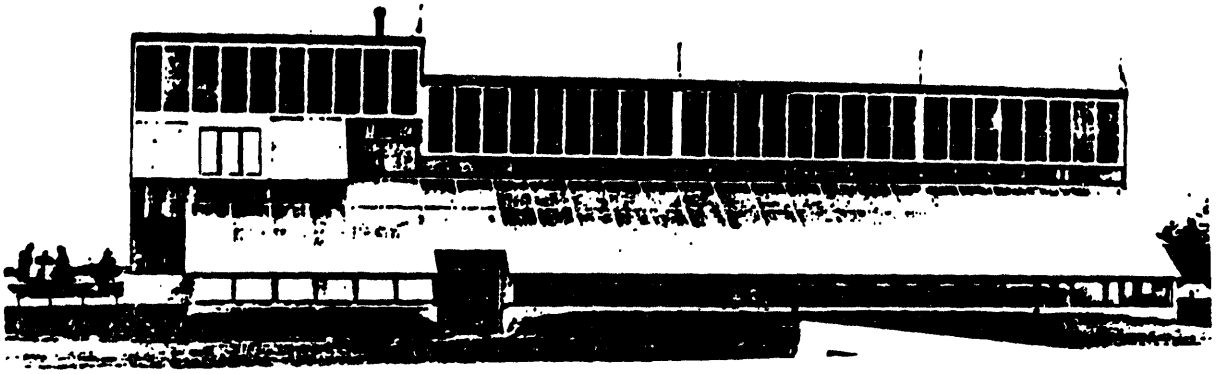
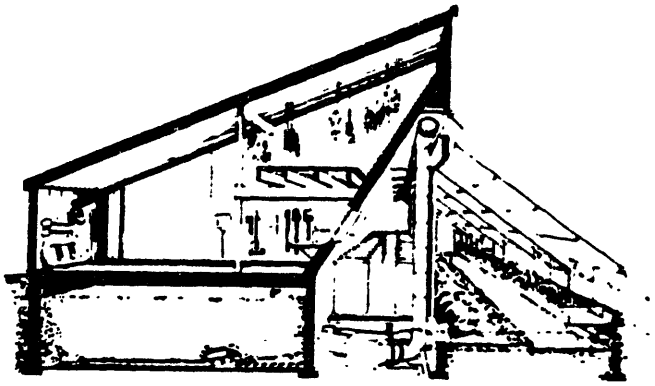


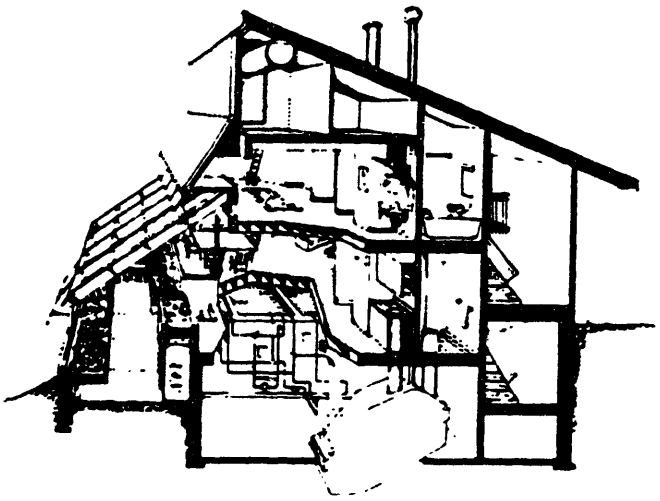
Figure 15: The Prince Edward Island Ark (from Journal #4, p85-106)



a. photo of front of the P.E.I. Ark



b. *Ark Section through Barn, Rock Storage and Greenhouse Areas. Solar-Algae Aquaculture Ponds are in Two Rows Down the Middle.*



c. *Section through Residential Greenhouse, Hot Water Heat Storage, Composting Toilet and Living Areas.*

d. COMPARISON OF THE ARK WITH ORTHODOX HOUSING

CATEGORY	ARK	ORTHODOX HOUSING
UTILIZES THE SUN	Source of Heating, Climate, Purification, Food Production and Much Interior Light	Some Interior Light - Often Negative Role Necessitating Air Conditioning
UTILIZES THE WIND	A Source of Electrical Energy from Windmill Wind-Driven Circulation through Composting Toilet	Only Negatively Increasing Fuel Demands through Infiltration
STORES ENERGY	YES - in Three Systems and Growing Areas	NO
MICRO-CLIMATOLOGICAL SITING	Integral to Design	Rare
WASTE PURIFICATION	YES - Except for Grey Water which is Piped into Leaching Bed	Wastes Untreated and Discharged to Pollute
WASTE UTILIZATION	Purified Wastes are Nutrient Sources in Interior Biological Cycles	NO
FUEL USE	Would a Renewable Source as Supplemental Heat	Heavy Use of Gas, Oil or Inefficient Electricity
ENERGY CONSERVING	YES - Also Uses Energy to Serve Simultaneous Functions	NO or Rarely
ELECTRICITY CONSUMPTION	About same as Orthodox House but Electricity Used for Many Productive and Economic Functions	Fairly Heavy Consumer
FOODS	Diverse Foods Cultured Year-Round	Not Within - Often Summer Gardens
AGRICULTURAL CROPS	Vegetables, Flowers and Young Trees	NO
AQUACULTURAL PRODUCE	Fish for Market	NO
ECONOMIC UNIT	YES - Viability to be Determined	NO - Financial Burden
OPERATIONAL COST	LOW - Ultimately Exporter or Power	HIGH - Particularly in Fuels and Electricity
INITIAL COST	HIGH - Due to Energy and Biological Components - Uses Larger Amounts of Quality Materials	Moderate
VULNERABILITY TO INFLATION AND SHORTAGES	SLIGHT	SEVERE
IMPROVES CLIMATE AND LOCAL ENVIRONMENT	YES - Locally by Windbreak and More Broadly through Reforestation	RARELY - Most Intensify Weather
TEACHES ABOUT THE LARGER WORKINGS OF NATURE	YES	NO
INCREASES SELF-SUFFICIENCY	YES	Rarely
STIMULATES LOCAL AND REGIONAL SOLUTIONS	Possible	Unlikely

Cod Ark, the P.E.I. Ark also had the HYDROWIND generator, described previously, for providing electricity and a composting toilet for turning human and kitchen wastes into compost for its greenhouse gardens. Moreover, it had many more solar ponds and a much larger greenhouse area than the Cape Cod Ark and was intended not only to supply the family living there with most their food needs, but also to provide them a reasonable income through the year-round sale of its fish and vegatable products. The Prince Edward Island Ark, in short, was the New Alchemists' own miniature version of Eden (see Figure 15b and c for interior sectional details of the P.E.I. Ark).

In his essay "Tomorrow is Our Permanent Address" in Journal Four, John Todd summed up the philosophical and design principles on which the Prince Edward Island Ark (and the New Alchemists' other bioshelters) was based, arguing that the Ark represented a "new synthesis" and a "new paradigm" or worldview for ecological design and cultural transformation:

> ...How can we reintegrate modern knowledge and the deepest insights and wisdom from the human experience into a comprehending and satisfying worldview?...We have not yet considered devising a culture which emulates the processes of nature. I should like to propose that culture can be transformed through such an emulation...I hope, in this essay, to delineate the earliest forms of a new synthesis ...using the paradigm of New Alchemy's work on the Ark...Should we create a culture in the image of the biosphere, it would bring about a revolutionary change in the way in which people live on the earth...The Ark on Prince Edward Island is an early attempt by the New Alchemists to explore the landscape of (this) new synthesis (J. Todd, 1977, p 86-7, 90, emphasis added).

Specifically, Todd enumerated five design principles which had guided and were reflected in the design of the P.E.I. Ark and which Todd thought could also guide the larger transformation of culture to create a convivial "adaptive society" based on the emulation of nature:

> ...The central task now is to find an adaptive structure in which individual lives are optimized. In the first place, it should be a structure in which a majority of people participate in the processes that sustain them; in which part of their time is involved in the production of energy and food and in

> tending their shelters and the landscapes that nourish them...People and process must become one...
>
> ...The second aspect in the design of an adaptive human support system is that scale or size be reduced. Present technological societies operate through technocratic elites...If people lived in smaller systems, their experience would be more direct and political judgement on the part of the majority would become more sensitive...
>
> ...A third basis for an adaptive society is that human needs be fused with the needs of the biosphere ...The highest priority is that (natural) ecosystems be enhanced, that their fabric be strengthened by our presence. Only through working with the bioshere can we help ourselves...
>
> ...The fourth essential part is that inexhaustible energy sources- the sun, the wind and biofuels- should be the primary inputs within an adaptive framework. Natural systems are predicated on these forces. Human ones ought to be...This is the case with the (P.E.I.) Ark which is powered by the sun and the wind...
>
> ...(Finally, fifth) we must ask: are there in the living world (analogs) and equivalent processes which, when subtly adapted...can sustain societies...There may be an adaptive design unity inherent in nature which can be used for human ends...In the adaptive model of nature lie design ideas that will enable humans to create societies and cultures as beutiful and significant as any that have been (J. Todd, 1977, p 89-90, emphasis added).

While these five design themes had been foreshadowed or articulated in a tentative way in John Todd's and the other New Alchemists previous writings- e.g., the first principle of participation in nature was foreshadowed by Todd's life themes of "adventure in nature" and "the romance of farming"(1j, 2*j) and his design themes of "people as farmers" and "people as scientists" (vii); the second principle of scale reduction was foreshadowed by his life theme of "mega to micro" (8j) and the New Alchemists' emphasis on creating balanced biological and social "microcosms" (alchemical themes 8b and 8c and design themes ii and vi); the third principle of human/biosphere fusion reflects the alchemical notions of "macrocosm-microcosm correspondences" and "man as microcosm" (8b, 8c), Todds' transforming themes of "knowing nature, being whole" and "natural/social diversity (1, 9) and the New Alchemists' social design theme of pastoral/convivial living (vib); the fourth principle of renewable energy was first tentatively articulated in Todds' "A Modest Proposal" (design theme iii); and the fifth princi-

ple of natural analogs was foreshadowed by Todd's life themes of "adventure in nature"/ "adventure in science" (1j,4j) and the alchemical theme of correspondences (8b) and articulated in a preliminary way in Todds' discussion of the "emulation of nature" in his essay "The World in Miniature" (see quotes p 64-66)- this was the first time they were articulated together in this succinct fashion. Hence, paralleling the culmination of the New Alchemists' biotechnic designs represented by the P.E.I. Ark, the articulation of these design principles in "Tomorrow Is Our Permanent Address" represented a culmination and summation of Todd and the New Alchemists' intellectual ideas and themes up to that point. Thus, when the P.E.I. Ark was officially opened by Trudeau in September of 1976, it represented not only the physical embodiment of the New Alchemists' innovative designs but symbolized their intellectual ideals and accomplishments as well. For John and Nancy Todd it also represented a 'homecoming' both in a real sense, as they were both from Canada, and in the symbolic way that their mentors Schumacher and Bromfield had used the term.

We've, thus, seen in this section how the biotechnical designs and their embodiment in the New Alchemists' bioshelters interwove and coevolved with their general intellectual ideas and themes. Specifically, we've followed the progression towards increasing sophistication and elegance in their bioshelter designs, starting with their backyard Aqua-dome and Flat-top fish farms and progressing through their Mini-Ark and Six Pack to culminate in their Cape Cod and P.E.I. Arks, and seen how these designs were both guided by and also served to reenforce and embody a corresponding progression of evolving intellectual ideas and themes, which were first tentatively articulated by Todd in "A Modest Proposal", were further developed in his and McLarney's "Walton Two" and his "The World in Miniature" and were finally definitively integrated and articulated in the design principles enumerated in his "Tomorrow is Our Permanent Address".

The Design and Meanings of the Journals of the New Alchemists

The annual Journals of the New Alchemists, designed and edited by Nancy Todd, were the literary equivalent of and companion to the New Alchemists' ark bioshelters. Whereas, the ark bioshelters were attempts to embody the biotechnical and social themes of the New Alchemists in space, as we've just seen, these Journals or "literary arks" sought to convey these same themes in words, illustrations and stories, as we'll see in this section.

Reflecting the New Alchemists' social theme of "bridging science and art" (vic), these Journals resembled a cross between a folksy, grassroots technical journal and a literary family diary, reporting on both the New Alchemists' technical designs and progress and their social history and progress as an extended family. I'll illustrate how these Journals conveyed and supported the social and biotechnical themes of the New Alchemists by analyzing the thematic structure and the specific themes embedded in two of these Journals, Journal Three and Journal Four, which chronicled the New Alchemists' technical and social progress during the important period of 1975 and 1976, when they were building the Cape Cod and Prince Edward Island Arks.

All of the Journals were organized around the same general sections. There was, first of all, the covers (both front and back) and the introduction, which set the tone and introduced the key themes for each Journal. The introduction was followed by a New Alchemy section, which described important New Alchemy "family" events (e.g. the births and deaths of family and friends and the openings of the Arks) and the social evolution of the New Alchemists during the prior year. This was followed by a series of technical/research sections, typically including ones on "Energy", "Land and its Uses", "Aquaculture" and "Bioshelters", which contained reports and essays about the New Alchemists' ongoing research and progress in these areas. Finally, at the end of each Journal was an Explorations section, which contained short essays by the New Alchemists and others, exploring general cultural and social themes and alter-

natives related to those which the New Alchemists were trying to develop and promote.

On the cover of each Journal there was a drawing or illustration which was intended to illustrate or symbolize either one of the New Alchemists general intellectual themes or the particular theme or themes which were emphasized in that Journal. On the cover of Journal Three, for example, was a drawing of a unicorn in a pastoral setting, suggesting in a symbolic way the themes of transformation and harmony or unity with nature, the "unicorn" being an alchemical symbol for the "wedding" of male and female qualities and unity in nature (see Jung, 1953 and Figure 5e). In a similar vein, the cover of Journal Four, shown in Figure 16, contained a drawing in which the alchemical symbols for the sun and the moon are shown joined together above the Cape Cod Ark, with one of the rays from the sun touching the roof of the Ark. Since the sun also represented "maleness" or what Nancy Todd called "male transcendence" in alchemy and the moon represented 'femaleness" of "female immanence", this drawing appears to suggest, symbolicly , that the Ark design was inspired and "energized" by the "wedding" or fusion of "male" and "female" qualities and skills (e.g. the fusion of "male" science and "female" art) by the New Alchemists, as exemplified by the marriage of skills and experiences in the Todds' coevolving partnership (this interpretation is strengthened by the fact that this Journal indeed contains an essay on the wedding of the "masculine" and "feminine" principles , entitled "Return to the Feminine Principle", in its Exploration section).

Like the covers, the opening page of the Journals typically conveyed one or more general or particular New Alchemy themes symbolicly through the use of drawings, pictures and/or poems. Figure 17 shows the opening pages for Journal Three and Journal Four. The opening page of Journal Three consisted of a poem by my over a symbolic picture of the New Alchemists in masks on a bridge. The poem and picture work together to symbolicly convey the image and theme of the New Alchemists as

Figure 16: Cover of the Fourth Journal of the New Alchemists, 1977

The light has gone out
and I have been sitting here in the dark
thinking

Is the power off or is the bulb no good?

Very nice to wander in aimless anonymity
among the metaphysics of astrological signs,
but if I can't see where I am,
how can I see where I don't want to be?

I asked Someone in the room
did you notice that the light is out?
and Someone said, I cannot see my Self in others
until I can see my own Self.
Then I asked Another did you notice?
and Another answered, I have to get my head straight first

Finally I asked Everybody
DID YOU NOTICE THAT THE LIGHT IS OUT?
but Everybody was too busy
trying to find space in the dark

Never mind
I will strike a match
and see

- my

a. opening page of Journal #3 with symbolic poem by my and symbolic picture of New Alchemists in masks on a bridge.

Figure 17: Opening Pages of Journals #3 and #4

For E. F. Schumacher

The rule of no realm is mine, but all worthy things
that are in peril as the world now stands, those are my care.
And for my part, I shall not wholly fail in my task
if anything passes through this night that can still
grow fair or bear fruit and flower again in days to come.
For I too am a steward. Did you not know?

Gandalf, *The Return of the King*
- J. R. R. Tolkien

We learned of E. F. Schumacher's death just as this Journal was in its final phase of printing. We share with everyone in our small but beautiful movement a sense of personal and collective loss. It has sometimes seemed to me that in our struggle we are not unlike Tolkien's ragged and assorted fellowship and, if that is so, then Fritz was our wise and gentle wizard. His leadership and guidance, the directness of his thinking will not easily be replaced. Dedicating our Journal to his memory is part of a larger and renewed dedication to all worthy things that were his care.

N J T

b. opening page of Journal #4 comparing Schumacher to Tolkien's wizard Gandalf with picture in which cat symbolizes Schumacher, Gandalf and stewardship.

"cultural transformers". The poem may be interpreted to mean that people haven't yet noticed that we have entered a "dark" (e.g. "technocratic") period or age ("...I asked Everybody: DID YOU NOTICE THAT THE LIGHT IS OUT?/but Everybody was too busy trying to find space in the dark..."), but that the New Alchemists and others like them would be able to provide the "guiding lights" necessary for cultural transformation and renewal ("...Never mind./I will strike a match/and see."). Similarly, the picture echoes Nancy's life theme of "women on the bridge" (3n) and expands it to suggest that the New Alchemists, like women, are "on a bridge" and are themselves part of a cultural "bridge" between our present technocratic culture and a more convivial future one, which they are helping to design and bring into being.

In a similar vein, the opening page of Journal Four (Figure 17b), which came out shortly after E.F. Schumacher had died suddenly of a heart-attack in the fall of 1976, contained a dedication to his memory, in which, as I've previously discussed, Nancy Todd compares the New Alchemists and the larger AT movement to Tolkien's "ragged and assorted" fellowship in The Lord of the Rings and compares Schumacher to the wizard/leader of the fellowship of the Ring, Gandalf. Thus, this page, with its symbolic picture of a white cat on a post and the New Alchemy children in the background (the cat symbolizing Schumacher and Gandalf) and its quote from Gandalf (showing that Gandalf, like Schumacher, was a "steward" of nature) and Nancy's brief epitaph, served not only as a tribute to Schumacher, but also conveyed Nancy and the New Alchemist key transforming theme that the New Alchemists, like the fellowship of the Ring, were a "fellowship" engaged in a "quixotic", but nevertheless heroic, "quest" to renew nature and restore humans' link to it (transforming themes 11 and vi). Furthermore, this analogy, coming just after Schumacher's death, also conveyed the message that the New Alchemy fellowship must have the courage to carryon in their quest after the death of their spiritual leader Schumacher like the fellowship of the Ring had after the "fall" of Gandalf in battle.

Following the opening pages, in her two-page introductions to Journal Three and Journal Four, Nancy Todd elaborates upon and states more explicitly the themes suggested, symbolicly, by their covers and opening pages. Hence, in her introduction to Journal Three, she elaborates on the theme of the New Alchemists as cultural transformers by comparing their work with that of other pioneering cultural transformers and prophets of AT, including William Irwin Thompson, E.F. Schumacher, Murray Bookchin and Stewart Brand:

> ...Voices from disciplines as varied as mythology and art, biology, economics and cybernetics find agreement in the opinion that we are rapidly approaching a point of crisis, or what William Irwin Thompson has called "the edge of history"... The need for fundamental political (and cultural) change is obvious... (What is needed is the development of a new world view which) would provide a framework in which the Gandhian philosophy and appropriate technology of E.F. Schumacher and the ecological perspectives of New Alchemy could have relevance for society as a whole. Cultural consciousness is being touched by the work of such people as Murray Bookchin through his teaching and writing on social ecology, by Stewart Brand's CoEvolutionary Quarterly and by the creative interplay of minds at centers like (Thompson's) Lindisfarne Association... The times are still a-changin' and much of it is good.
>
> At New Alchemy we see ourselves rather as New Age suppliers, offering our energy and food growing strategies and our bioshelters as means by which people can not only survive, but perhaps find their way back to a unity with the living world which, as a culture, we have somehow left behind. We are not unaware of the quixotic quality of our gesture... (p 2-3, emphasis added).

This introductory passage, articulating the theme of the New Alchemists as cultural transformers, was accompanied by photographs of Schumacher visiting the Institute (Figure 19b shows one of these, with Schumacher standing inside the Aqua-dome), which served to link Schumacher with the New Alchemists and, hence, underscore this theme.

Similarly, in her introduction to Journal Four, Todd elaborates upon her theme of the New Alchemists as quest fellowship by comparing their activities and progress to the "soft energy path" or "The Road Not Taken" advocated by Amory Lovins in his Fall, 1976 Foreign Affairs article (discussed in chapter 2). Moreover, she stated that a central goal of the New Alchemists' quest was to find "biological analogs", the fifth

design principle articulated by John Todd in his essay "Tomorrow is Our Permanent Address", which appeared later in the Journal:

> ...Although we have come to articulate it more succinctly with time, the underlying purpose of New Alchemy has always been the search for an answer to a very basic question- one we now refer to as the biological analogue. What the question asks is, "Are there biologically and ecologically viable alternatives to the capital-intensive, highly industrialized methods and technologies...?" Can we find ways in which, in Gary Snyder's often quoted phrase, we may live lightly on the earth? (p 2-3)

Thus, in this introduction, by citing Lovins' "The Road Not Taken" (which as we've seen linked AT and the "soft energy path" with the pastoral tradition in America by alluding to Robert Frost's poem) and the modern pastoral poet Gary Snyder in connection with the New Alchemists' design principles and their work on the Arks, Nancy neatly linked her opening social theme of the New Alchemists as quest fellowship with the biotechnical design principles and their embodiment in the Arks, which was the technical focus of this Journal(see the photograph of the woman walking inside a solar pond, Figure 19d which accompanied this introduction and symbolized its message).

Hence, we've seen how the symbolic covers and opening pages and Nancy Todd's introductions all worked together in Journals Three and Four to convey key themes, the theme of the New Alchemists as "cultural transformers" in the case of Journal Three and the themes of the New Alchemists as "quest fellowship" and the Arks as the embodiment of the fusion of the New Alchemists dualities (male/female, science/art) and their biotechnic design principles in Journal Four.

The "New Alchemy" sections of the Journals contained stories and myths about New Alchemy family events and rituals and their social progress, which served to both convey and reenforce the New Alchemists' sense of themselves as an extended family/fellowship. As in the covers and introductory section, this theme was also conveyed and symbolized through pictures, illustrations and poems.

Figure 18, for example, shows the opening pages to the New Alchemy sections of Journals Three and Four both of which strongly conveyed this theme of the New Alchemists as family. This was done in Journal Three with a photograph of the New Al-

a. picture of New Alchemy children on load of hay underscores the family nature of the New Alchemists

b. picture of the New Alchemists on Savonius windmill likewise suggests their familial nature and the symbolic role of their AT designs

Figure 18: Opening Pages of the "New Alchemy" Sections of Journals #3 & #4

chemy children, holding and eating straw, on a truck; and in Journal Four with a photograph of the New Alchemists embracing around their Savonius windmill, thus, not only symbolizing the family theme (it resembles a family album shot), but also linking it to their biotechnical activities, represented by the Savonius.

Figure 19 shows additional symbolic illustrations and a poem by Nancy Todd from the New Alchemy sections of the Journals (along with the two photographs from introductory sections previously mentioned). Todd's poem about the New Alchemists' "First Summer" again conveys the family theme and links it to their biotechnical activities, in this case, the planting and composting for gardens and the construction of the Aqua-dome ("...sweaty bodies glisten through the translucent sides of a half-finished dome..."). Similarly, the photograph, Figure 19e, conveys the family theme by portraying the New Alchemists as a "country farm family" in an apparent parody of Grant's American Gothic painting. The symbolic drawing of the woman's face in the roots of a tree, Figure 19f, conveyed another of the New Alchemists' social themes, that of pastoral/convivial living in harmony with nature (vib), as well as their general (alchemical) themes of the Earth being alive and man and woman being apart of nature (8a and 8b and Todd's transforming themes 1 and 3).

The New Alchemy section of Journal Three contained a piece by Nancy Todd called "Looking Back" (probably an allusion to Bellamy's utopian novel), which told the story of the social evolution of the New Alchemists up to that point, including a discussion of how they dealt with male/female role stereotypes, which I've previously cited. This piece, thus, functioned as a cultural myth for the New Alchemists, retelling their history and strengthening their sense of who they were and where they were going. Two of the pictures accompanying this piece are shown in Figure 19a and 19h. The first shows an empty outdoors table in front of the Aqua-dome (right) and the Mini-Ark (left), again symbolizing the family theme and linking it to the New Alchemists bioshelter projects. The second shows Earle Barnhart lighting a fire with a bank of focusing mirrors,

A

B

C

The First Summer

A ragged band of children hovers on the crest of the hill
whoops shrilly and is gone.
Dark heads, fair heads, brown legs flashing.

In the field below, their parents and friends
are hunched over tiny plants
transplanting them with infinite care.
They save manure, compost, and earth for flatboxes
talking intensely with swift-moving hands.

Some are careening unsteadily behind wheelbarrows overflowing with seaweed.
Others squat on the earth between the rows of plants
weeding silently, mingling laughter and work.

In the upper field an ancient cutter drones through the tall grass.
There is hammering from near the house.
Nearby, sweaty bodies glisten through the translucent sides of a half-finished dome.

The scream of jets overhead can shatter only momentarily
the karmic high that we share.

Working Saturdays on the farm
sun-drenched Sundays by the sea

that first summer.

—Nancy Jack Todd

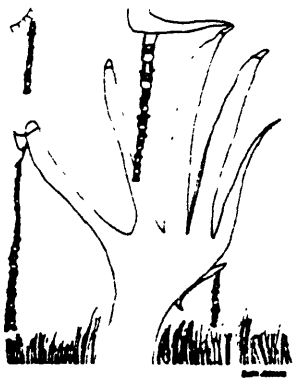


Figure 19: Symbolic Pictures & Poem from the New Alchemy Section of Journals

a. symbolic picture of mini-ark and empty table (#3, p 7)
b. Schumacher visiting aqua-dome (#3, p 2)
c. poem about New Alchemists' first summer (Book of New Alchemists, p 3)

Figure 19 (con't): Symbolic Pictures from New Alchemy Section of Journals

D

E

F

G

H

d. woman carrying solar pond (#4, p3)
e. New Alchemists as "country farmers" (Book, p 44)
f. symbolic drawing of woman in nature (#7, p9)
g. tour of Cape Cod Ark (#4, p 6)
h. Barnhart lighting fire with focusing solar mirrors (#3, p 7)

symbolizing the New Alchemists sense of themselves as modern day questers, alchemists and magicians. This New Alchemy section also contained the New Alchemists' "Trash Fish Cook Book", which described how to prepare the unpopular "trash-fish", such as, dogfish, bullheads and eels.

The New Alchemy section of Journal Four focused on the opening of the Cape Cod and Prince Edward Island Arks, describing the ceremonies officially opening each, accompanied by photographs of the openings and tours of the Arks, including the one in Figure 19g, showing John and Nancy Todd with Prime Minister Trudeau at the P.E.I. Ark Opening. It also mentioned the death of a friend Peter Kaplan, who was a poet, and the birth of a child to New Alchemists' Laura and David Engstrom and contained a piece by Bill McLarney describing the creation of a New Alchemy farm and branch in Costa Rica.

The Biotechical sections, i.e., "Energy", "Land and Its Uses", "Aquaculture" and "Bioshelters", which followed the New Alchemy section in the Journals, contained both specific technical reports on the New Alchemists' ongoing designs and research and more general essays, which discussed the general themes and design principles which informed and guided their specific designs and research. Journal Three, for example, contained specific technical reports by Earle Barnhart on the sail and Savonius windmill projects; by Hilde Maingay on experiments in the organic gardens; and by John Todd on the design of the P.E.I. Ark. It also contained Todd's long philosophical essay "The World in Miniature", which I discussed previously.

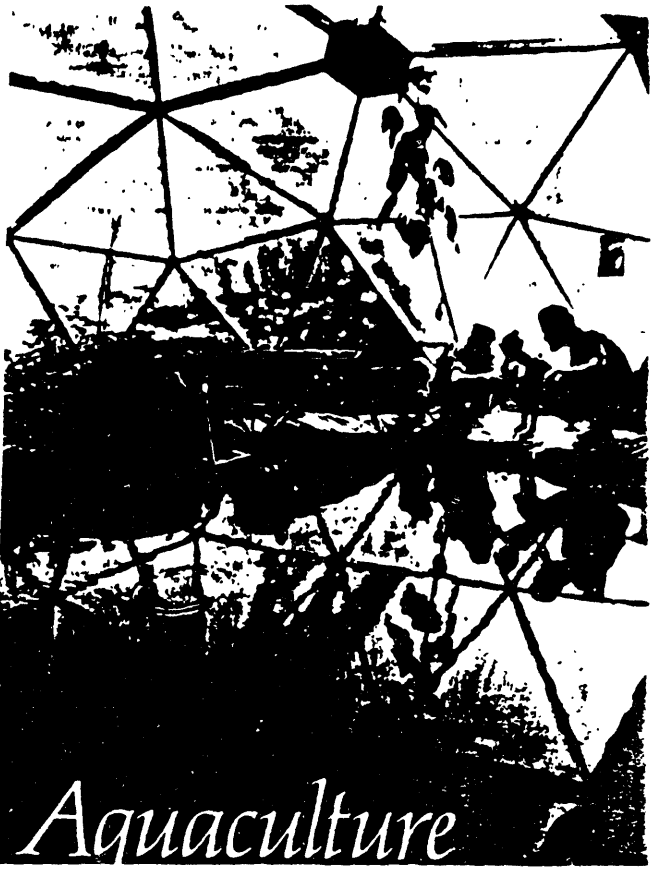
The biotechnical sections of Journal Four, which focused on the design and operation of the New Alchemists' Arks and other bioshelters, contained technical reports by Ron Zweig summarizing their research with solar ponds and their research on the operation of their early bioshelters (the Aqua-dome, Mini-ark and Six Pack); by Laura Engstrom on the design of the Six Pack; by Earle Barnhart on the design and operation of the Cape Cod Ark; and by Bill McLarney on experiments with raising fish

in cages in outdoor ponds. It also contained Ron Zweig's philosophical piece "Bioshelters as Organisms", which drew an elaborate analogy between the Aqua-dome bioshelter and a living cell, and John Todd's general piece "Tomorrow is Our Permanent Address", which articulated the design principles underlying and embodied in the P.E.I. Ark and the New Alchemists' other bioshelters, both of which have been discussed previously.

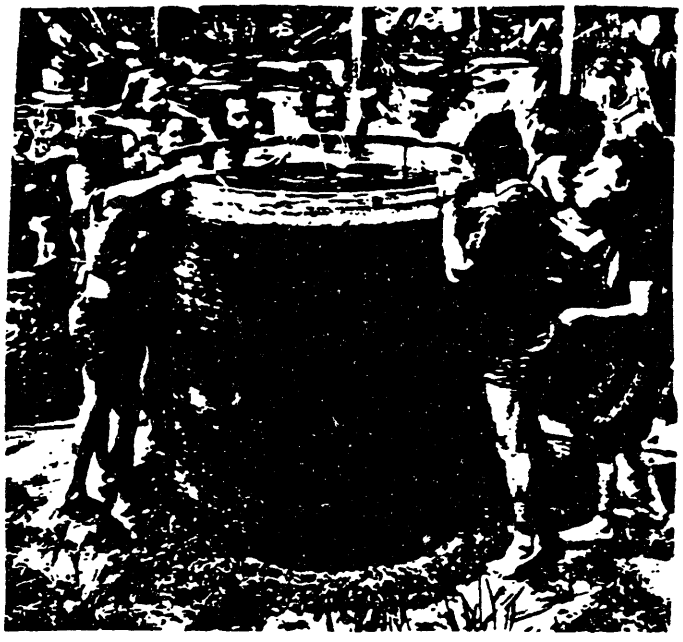
As with the introductory and New Alchemy sections of the Journals, the Biotechnical sections also contained illustrations and poems which symbolicly conveyed and reenforced general New Alchemist themes. Figure 20, for example, shows four symbolic illustrations from the Biotechnical sections of the Journals. The first, from the opening page of the Energy section of Journal Three, shows the New Alchemy children using a focusing lens to light fire, symbolizing, again, the familial nature of the New Alchemists' activities and research. Similarly, the second one, from the opening page of an Aquaculture section, shows a New Alchemy couple and children inside the Aqua-dome, again symbolizing the family theme and linking it to the biotechnical designs of the New Alchemists, in this case their Aqua-dome and the microcosm of nature it enclosed. The third one, from a piece by John Todd on plans for the New Alchemists' Costa Rica farm, shows his plans for creating different plots and different stages of planting and different types of fish ponds in the shape of a circular mandela, a mystical and alchemical symbol of completeness, thus suggesting the wholeness of nature and the evolution in nature towards harmony and perfection. The fourth one, showing the New Alchemists grouped around one of their solar ponds, again links the social theme of family to one of their biotechnical design, this time the microcosmic ecosystem of their solar pond.

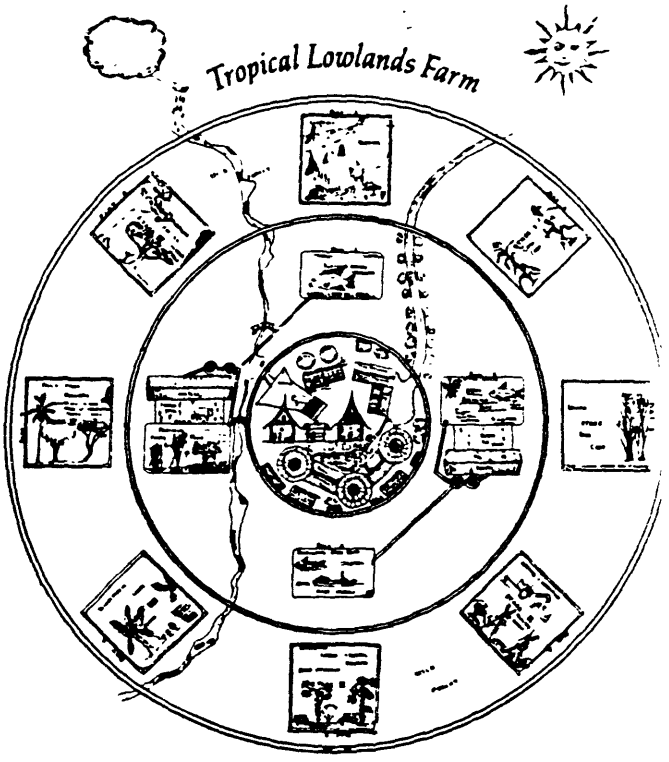
Each Journal was rounded out with an Explorations section, which contained short essays on intellectual ideas and themes related to those which the New Alchemists were developing and promoting. In addition, as with the other sections, these sections

Figure 20· Symbolic Pictures and Drawings from Research Sections of Journals



a. picture of New Alchemy children lighting fire with focusing lens from Energy Section, symbolizing familial nature of New Alchemy research (Journal#3, p23)
b. picture of New Alchemy family in aqua-dome, symbolizing a family in harmony with Nature (Journal#3, p79)
c. a drawing in form of mandela showing plots of plants at different stages for the envisioned Costa Rica farm from an article by John Todd (Book, p28)
d. picture of New Alchemists around solar pond, again symbolizing familial nature of research (Book, p69)



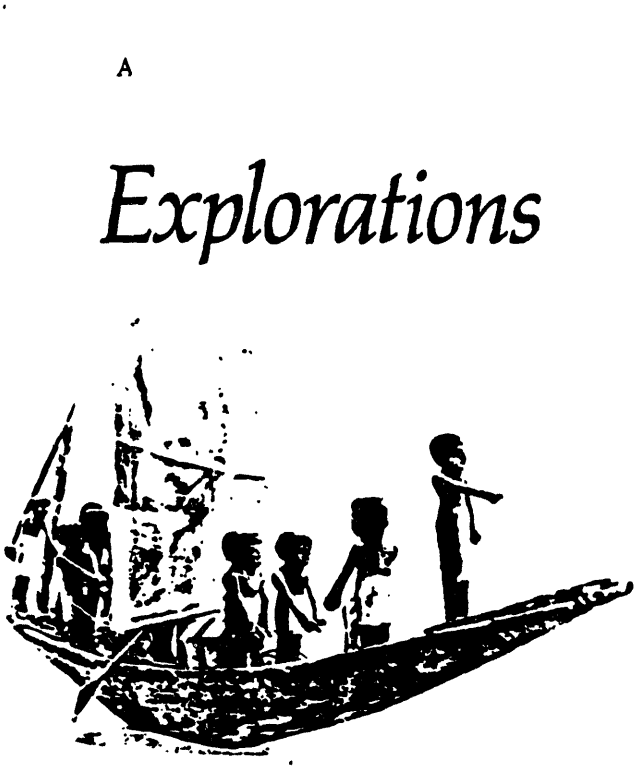


also contained illustrations and poems which symbolized general New Alchemist and related themes. Figure 21, for example, shows two symbolic illustrations and two symbolic poems from the Explorations section of Journal Three. Figure 21a shows the opening page of the section, showing a primative culture's sailing canoe, which symbolized the exploratory and questlike nature (like the tribal ocean voyages or Kula of the natives of the West Pacific studied by Malinowski in his Argonauts of the Western Pacific, 1922) of both the section and the New Alchemists' whole enterprise. Figure 21b shows part of a poem by Lawrence Ferlinghetti, entitled "Populist Manifesto", which urged activists to become poets and poets to become activists ("...Poets, come out of your closets...Poetry isn't a secret society...Clear your throat and speak up, ...Poetry the common carrier/for the transportation of the public/to higher places...), ideas which must have resonated with Nancy Todd's literary life themes (3n, 4n, 5n) and the New Alchemists' vision of people as artists/scientists/farmers.

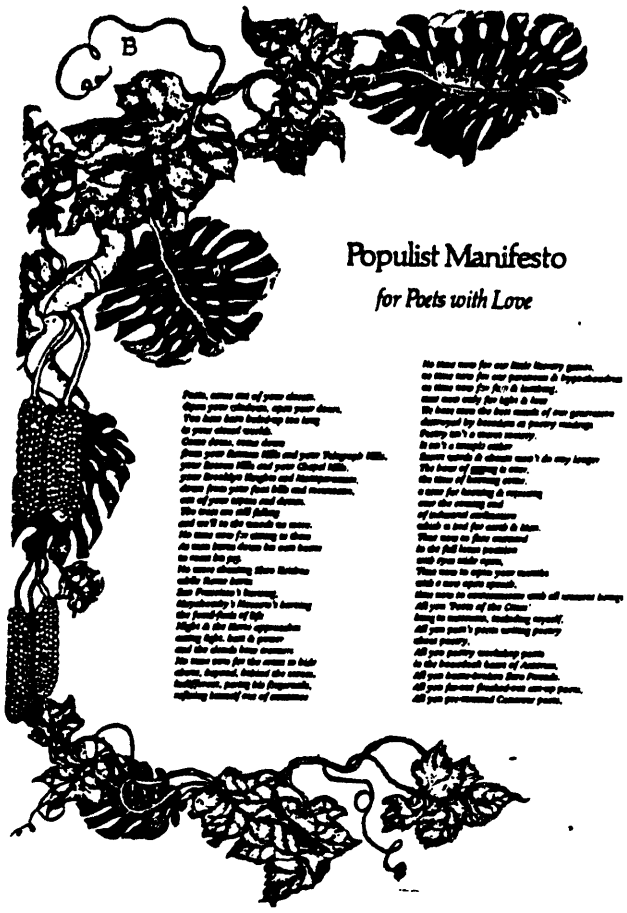
The Explorations section of Journal Three also contained two important essays which further developed its opening theme of the New Alchemists' as cultural transformers. The first of these was a piece entitled "Meditation on the Dark Ages, Past and Present", by cultural historian/designer and New Alchemist mentor William Irwin Thompson, whose ideas on cultural transformation and ecologies and their relevance to the AT movement were discussed in Chapter 2. In this essay, Thompson argued that we were entering another "dark age" as our modern industrial civilization reached its limits and died and that there was, therefore, a need for small intellectual schools and communities which would keep culture alive during this period of collapse and act as beacons guiding the way toward cultural transformation and rebirth. He suggested that such transitional schools and communities could learn from analogous schools and communities in previous dark periods, including the Greek Pythagoras' school at Croton in the 6th Century B.C., the Irish monks school at Lindisfarne in the 7th Century A.D., and the Bauhaus school of design in Germany before WW II:

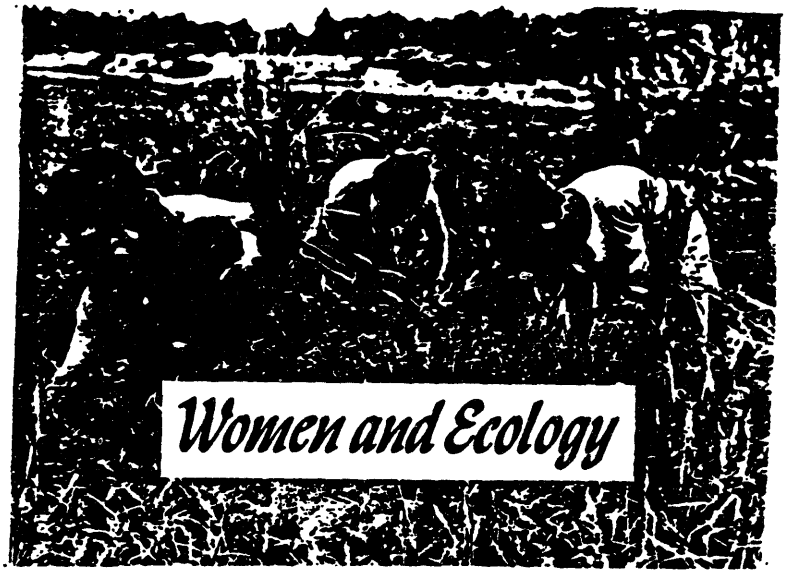
Figure 21: Symbolic Pictures and Poems from Explorations Section of Journals

A



B





D

So one sleep every year I dream
The end of Ramadhan
Or some high holy day
When fathers whistle and mothers sing
And every child is fair of face
And sticks and stones are loving and giving
And sun and moon embrace.

A unicorn runs on this fly-by-day,
Whiter than milk on the grass, so white is he. . . .

—Anne Wilkinson

From "The Wind Has Wings – Poems from Canada," Oxford University Press, Toronto, 1968)

a. boat symbolizing quest-like nature of New Alchemists' "explorations"(Journal#3, p93) b. populist poem by Lawrence Ferlinghetti (Journal#3, p94) c. picture symbolizing women in harmony with Nature from Nancy Todd's "Women and Ecology" article(Journal#3, p107) d. symbolic poem about unicorn from back cover of Journal#3.

> ...How does one hold onto values in an age of the collapse of values?...
> What we can learn from Croton, Lindisfarne, or the Bauhaus is that a small and short-lived community can serve as a catalytic enzyme to effect a change in the entire organism of a civilization...The other principle we can learn from Croton and Lindisfarne is the necessity of conserving a civilization by intensifying it through miniaturization. Pythagoras miniaturized the Near-Eastern civilization;the Irish monks miniaturized Graeco-Roman civilization;now we need to miniaturize industrial civilization (Thompson, 1976, p 97, 99).

These themes of transitional cultural schools/communities and the "miniaturization" of cultures, fit nicely with and served to reenforce the New Alchemists' image of themselves as a family/community of cultural transformers engaged in creating miniature ecological and social microcosms, as conveyed in the opening page and introduction and John Todd's essay "The World in Miniature" in this Journal.

Thompson went on in this essay to describe his own Lindisfarne community in New York as a modern example of the type of transitional schools and cultural beacons he advocated:

> ...Now that industrial society is strangling in its own contradictions, we have one last chance to re-vision human society...
> ...At the contemporary Lindisfarne in America, we have tried to turn the old culture into a new curriculum...Lindisfarne's scientists, artists and scholars have one thing in common: their lives are rooted in one of the great contemplative paths of transformation (of consciousness and culture)...We have gone back on the spiral (of history) to the pre-industrial community to (re-)create, on a higher plane with the most advanced scientific and spiritual thought we can achieve, the planetary village...(p 101).

Both Thompson and the New Alchemists came to view their respective institutions as sister transitional schools/communities with Lindisfarne focusing on transitional cultural and spiritual designs and the New Alchemists focusing on their complimentary biotechnical designs. During the mid-70's they began to interact and share ideas frequently and as a result their cultural/spiritual and biotechnical designs began to converge and coevolve together.

The second important essay in the Explorations section of Journal Three, was Nancy Todd's own essay on "Woman and Ecology", which I discussed earlier and used

to abstract some of her life themes from. Here, as we've seen, in line with the general theme of cultural transformation running through this Journal she explores her theme of "women on the bridge" (?n), that is, the potential for women to act as cultural transformers and a cultural 'bridge" between our modern technocratic culture and a more conv vial and ecological fut ıre one. This essay was illustrated with a number of symbolic photographs of New Alchemy women and men, such as, the one in Figure 21c, which shows the New Alchemy women harvessing their wheat and, hence, symbolizes the essay's theme of women's close connection to nature.

Journal Three ended the way it began, with its unicorn symbol, this time accompanied by a symbolic poem about a unicorn on the back (inside) cover, as shown in Figure 21d. This poem speaks of some idyllic time and place, where "...fathers whistle and mothers sing... 'And sticks and stones are loving and giving/And sun and moon embrace. /(And) A unicorn runs on this fly-by-day...", thus, completing the cycle of this Journal by returning to its opening symbol, the unicorn, and recapitulating its meaning for the New Alchemists as a symbol of the fusion of dualities (sun/moon, sticks/stones) and cultural transformation and unity.

The Explorations section of Journal Four contained two essays which expanded upon themes developed in Nancy Todd and William Irwin Thompson's essays in Journal Three. First, Evelyn Ames, a member of the board of Thompson's Lindisfarne community, elaborated on the themes of the fusion of "male" and "female" qualities and women as cultural transformers developed by Nancy Todd, in her essay entitled "Return to the Feminist Principle", concluding that:

> ...there are signs that the dominance of the masculine may have peaked out and a new age begun in which the feminine principle will again be rehonored, though in a new way...the long predominant masculine principle may now combine consciously and by choice with a long dormant feminine principle. The Sleeping Beauty fairy-tale carried out? Perhaps- for it seems as though we now long for a balanced consciousness as well as desperately needing it (Journal Four, p 131, 136).

Note the use of the Sleeping Beauty myth to symbolize the fusion of the dominant

"masculine principle" and the dormant "feminine principle" in this passage. This piece not only elaborated on and reenforced Nancy Todd's themes from Journal Three, but also reenforced and made more explicit the opening symbolism and themes of Journal Four, underscoring the meaning of the cover as the fusion of the masculine and feminine dualities or "principles" embodied in the Arks and the questlike nature of the New Alchemists' effort to fuse these and related dualities (the theme conveyed in Nancy's opening dedication to Schumacher).

In the second essay entitled "Political Prospects, Cultural Choices, Antropological Horizons", Richard Falk, who was also involved with Lindisfarne, expanded on Thompson's theme of cultural transformation by arguing that a new "politics" of cultural transformation and renewal was needed:

> ...What I wish to consider here are both the limits of our present political structures and the possibilities for cultural transformation of consciousness that will influence the configurations of a (new) global polity...To seek or to create possibilities for cultural renewal is a radical (political) expression, in the sense of going to the root of things...for without a culture-based politics of renewal every prescription for either reform or revolution is certain to fail when put to the test...(Journal Four, p 143, 145, emphasis added).

Journal Four ended, like Journal Three, by recapitulating its opening symbols and themes on its back covers. Its inside back cover contained a photograph of the side of the Cape Cod Ark showing its large ying-yang like half light/half dark sun logo (like the one in the upper left corner of Figure 13) and a quote from e e cummings- "and this is the sun's birthday;this is the birth/day of life and of love and wings:and of the gay great happening illimitably earth" -again underscoring the Arks' importance as models and symbols for natural unity and the fusion of dualities. Lastly, the back cover recapitulates the quest/fellowship theme of its opening page by showing another photograph of the cat on the post and the New Alchemy children.

Thus, we've seen in this section, by closely examining the third and fourth Journal of the New Alchemists, how their Journals, like their ark bioshelters, were designed

and "constructed" to be integrated "wholes" or "microcosms" which embodied and symbolized their general design and social themes. Each Journal represented one "cycle" or year in the evolving life of the New Alchemists and was also organized structurally in a "cyclic" way, starting by symbolizing certain general themes in its cover and introductory pages, e.g., the themes of the unity of nature and the New Alchemists as cultural transformers in Journal Three and the themes of the fusion of dualities in the Arks and the New Alchemists as quest fellowship in Journal Four ; then, running through its New Alchemy section and its Biotechnical sections, where more specific social and biotechnical themes and progress were discussed and linked to its general themes; and then, finally, coming full-circle , to further develop and elaborate its general themes in the essays in its Exploration section and to close by symbolically recapitulating its opening themes on its back covers. Moreover, we've seen how these Journals, also like their bioshelter designs, evolved over time, each Journal and the cycle it embodied building on previous ones, as, for exaple, the essays in the Exploration section of Journal Four built on and expanded the themes of the essays in Journal Three . Hence, the ark bioshelters, discussed in the previous section, and their Journals were equally important cultural products of the New Alchemists and they worked together in a complementary way to embody and convey the evolving intellectual themes of the New Alchemists.

Beyond the Arks: Family Greenhouses, Solar Villages and City Farms

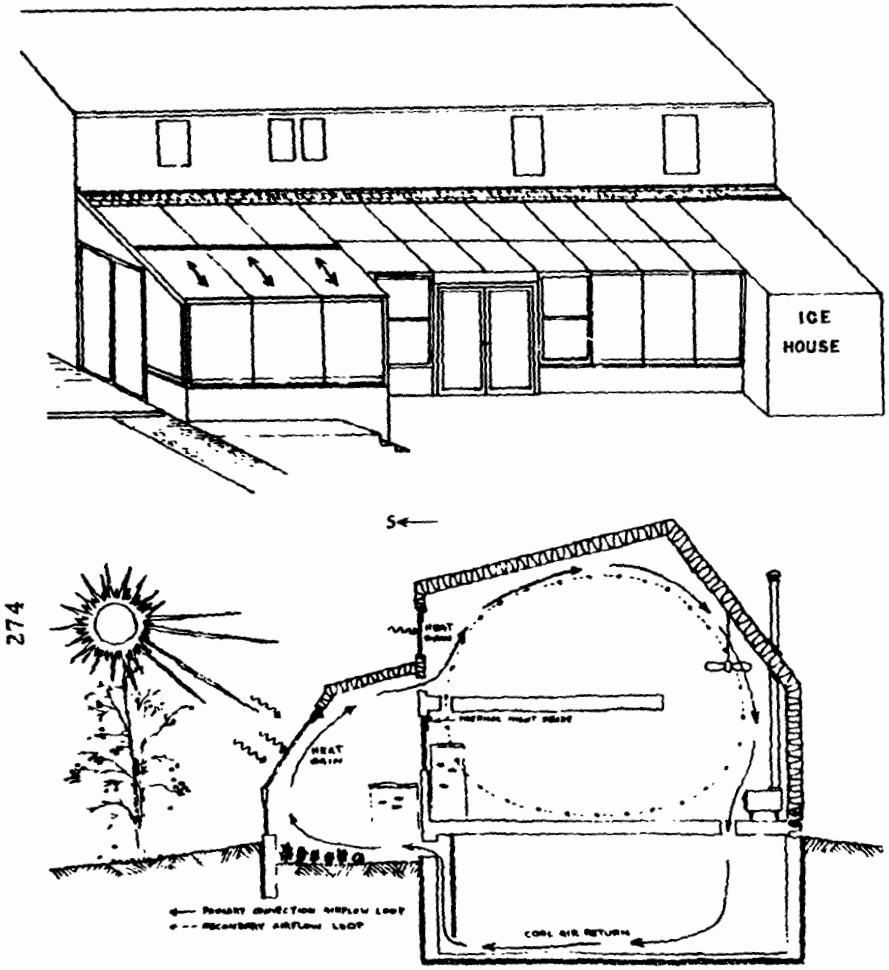
In the late 70's, after the openings of the Cape Cod and Prince Edward Island Arks at the end of 1976, the Todds and the New Alchemists entered a new stage or cycle in their collective evolution in which they sought to move outward and extend the ideas and design principles embodied in their ark bioshelters into new areas, including i) the incorporation of these ideas and principles in their own homes, ii) their application to the design of new "solar villages" and iii) their utilization in the design of "city farms"

and other biotechnical designs to make existing cities more ecological and livable.

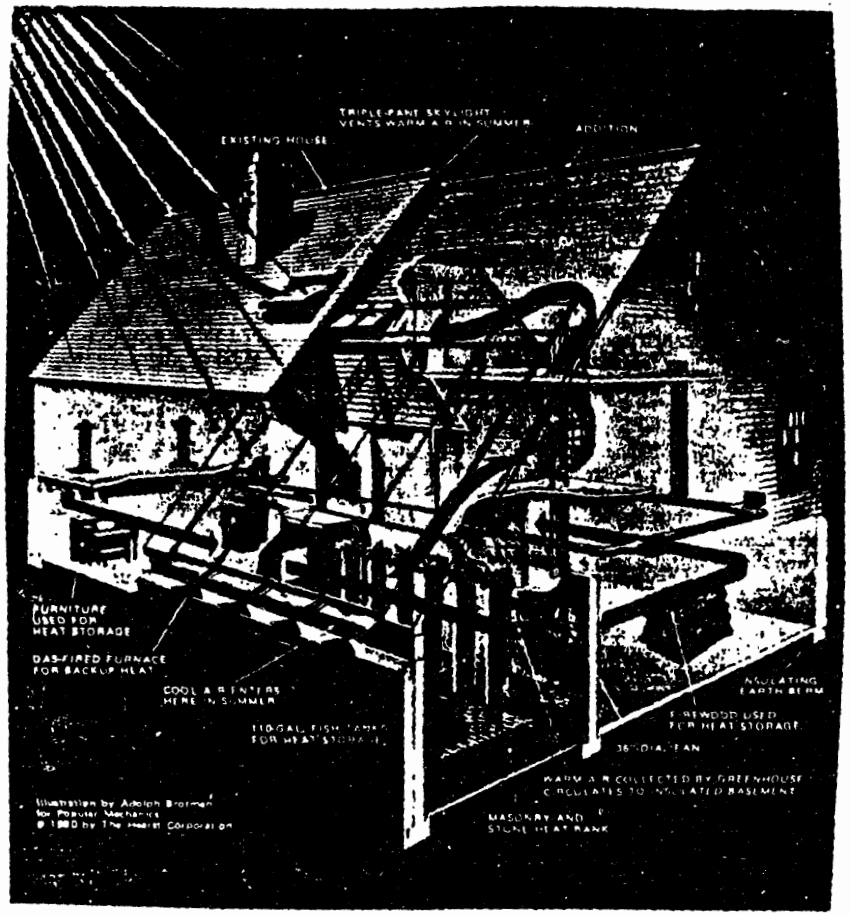
In 1979, a number of families and households within the larger New Alchemy clan began to incorporate the ideas and principles they'd developed through the evolution of their ark bioshelters into their own homes by building solar greenhouse/bioshelter extensions onto their houses. Journal Seven (1981), in fact, described the design and operation of no less than six of these family greenhouse extensions, including the BAM (Barnhart-Atema-Maingay) greenhouse and ice house of Earle Barnhart, Hilde Maingay and Hilde's daughter Atema; the greenhouse built by Ron Zweig and Cristina Rawley; and the greenhouse extension to the Todds' home, all of which are shown in Figure 22. These solar greenhouse extensions incorporated a number of the innovative design features pioneered by the New Alchemists in their ark bioshelters, including passive solar heating of the greenhouses and the houses they were attached to, solar tubes for raising fish, and the organic growing of vegatables. Moreover, these greenhouses not only served to further symbolize and reeforce the general themes of the New Alchemist discussed above, but also came to embody the more specific personal themes of the people who designed and lived in them.

In August of 1978, while attending a conference, the Todds experienced another transforming event, similar to their pastoral retreat in California in 1969. This time it took the form of anthropologist Margaret Mead advising them to move onward and outward from their bioshelters to develop analogous ecological designs for neighborhoods and villages. As Nancy recalled in Journal Seven: "What she said in effect was: You've created and developed the bioshelter. It's a good idea and it works. But most of the people in the world will never be able to afford private houses. You must start to think in terms of villages and neighborhoods, and of how the bioshelter fits there (p 135)."

The Todds accepted Mead's mandate and in April of 1979 held a conference entitled "The Village As Solar Ecology: A Generic Design Conference" at the New Alchemy



a. drawing of the BAM (Barnhart-Atema-Maingay) Greenhouse and Ice House (Journal#7, p121)
b. sideview of the operation of the Rawley and Zweig Greenhouse (Journal#7, p126)



c. diagram of extensions to the Todds' House, including a passively solar heated addition with solar tubes and a masonry and stone heat storage bank and a air circulation system to heat the rest of the house (Journal#7, p 132).

Figure 22: Diagrams of Greenhouse Additions which New Alchemy Households Added to Their Homes

Institute for the purpose of "defining and articulating a vision of the solar village, and subsequently evolving from the vision a communicable and tangible epistemology." To this conference they invited both well known AT designers and pioneers and cultural philosophers and designers. The participants included cultural designer and AT prophet William Irwin Thompson; soft path advocate Amory Lovins; architect and AT pioneer Sym Van der Ryn; CoEvolution Quarterly's soft tech editor J. Baldwin; underground home designer Malcolm Wells; anthopologist Mary Catherine Bateson (daughter of Margaret Mead and Gregory Bateson) and spiritual philosopher Keith Critchlow. (See the Explorations section of Journal Seven for a summary of this confernce and short reports by the participants).

The technical focus of this conference was on extending the features and principles embodied in the New Alchemists' arks to the design of convivial and ecological "solar village ecologies". As Nancy Todd put it in her introduction to the report on the conference in Journal Seven (1981), bioshelters were treated as the prime "power" source or "solar workhorses" for the solar villages of the future:

> In the solar village, ecosystems will provide many of the bases for support. Climate will be modified and improved by them and market food economies will be integral to the overall design. Wastes will be treated in integrated heat-storage and nutrient-cycling systems. Even the landscapes will function to support the whole. Villages will be like earth ships...
> ...Bioshelters will be important. They will function as solar workhorses, heating and cooling, producing foods, and treating and recycling wastes... The bioshelter is not a "monocrop" architecture. It is a state of mind and a way of rethinking how human communities can be sustained.
> Bioshelters can be (1) alleys, (2) covered solar ditches, (3) wells with clear membranes, (4) greenhouses, (5) glassed roofs, (6) streets, (7) interconnected buildings, (8) domes, (9) glass-roofed barges, (10) ocean arks, (11) translucent tents, and (12) landscape microcosms. Bioshelters are the workhorses of a solar era (Journal Seven, p 34, emphasis added).

In this passage we see the expansion of the New Alchemists' design image and theme of the "ark" bioshelter from the family level to the village level, drawing on the transitional or transforming metaphors of "villages as 'earth ships'(i.e. bigger 'arks')" and "bioshelters as 'solar workhorses" to aid in this transition.

Figure 23 shows some of the images and designs developed at this conference. These drawings and designs illustrate some of the ways in which participants envisioned the features and principles of the ark bioshelters being used as the basis for the design of solar village ecologies. Figure 23a, for exaple, illustrates the introduction of the solar ponds and solar greenhouse/bioshelter extensions pioneered by the New Alchemists and organic "street gardens" to an existing neighborhood. Figure 23b shows a greatly enlarged version of the Aqua-dome, which would have solar ponds at its center and organic gardens around them to produce fish and vegatables for a whole community. Figure 23d shows John Todds' site plan for an ecological Maine coastal village which would utilize the expanded community versions of the P.E.I. Ark shown in Figure 23c.

This conference and its participants also emphasized the larger philosophical theme that the design of new solar village ecologies needed to be guided and informed by what some of them refered to as a sense of the "sacred" and a "sacred architecture" that incorporated this sense. As Nancy Todd put it:

> To help us to remember, to reinvent and re-create a sense of the human place in the cosmos, we realized that as important to the conference as physical design was a sense of the sacred. As one of the participants, Keith Critchow, put it, "The necessity of the sacred attitude is one of remembering: remembering the larger context of one's existence, one's duties to one's environment and to the invisible priniples that regenerate life constantly."...A sense of the sacred is the bedrock, however buried or amorphous, on which we build (Journal Seven, p 136).

Thus, in both a design and more general philosophical sense, this conference represented a turning point for the Todds in which they reversed their direction from moving from "mega to micro" (John's life theme 8j and their transforming themes emphasizing "microcosms"), which had characterized their designs at New Alchemy up to and including the Arks, and began to move back upward and outward again, from "micro to mega", towards more global designs and principles, following the new transforming theme:

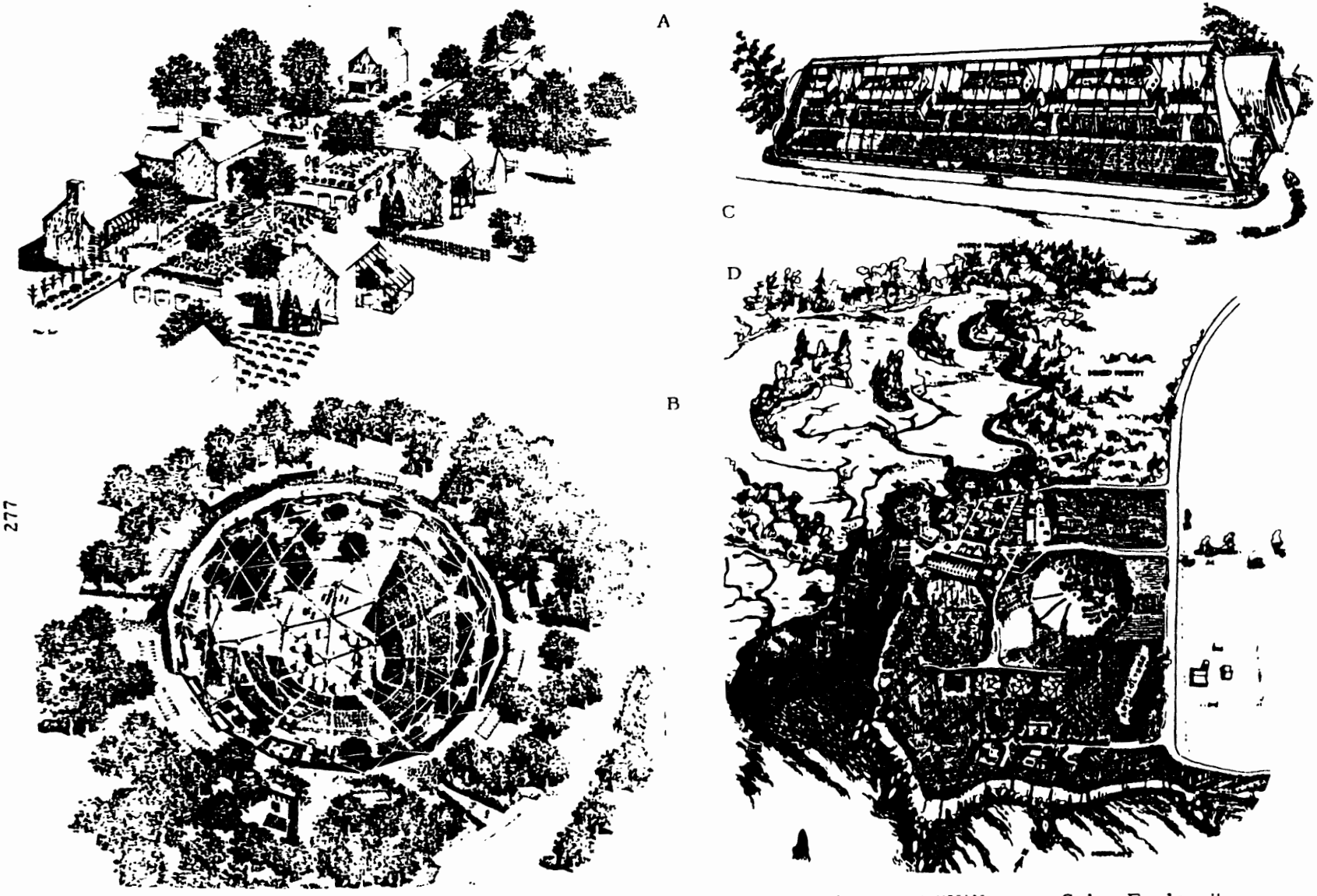


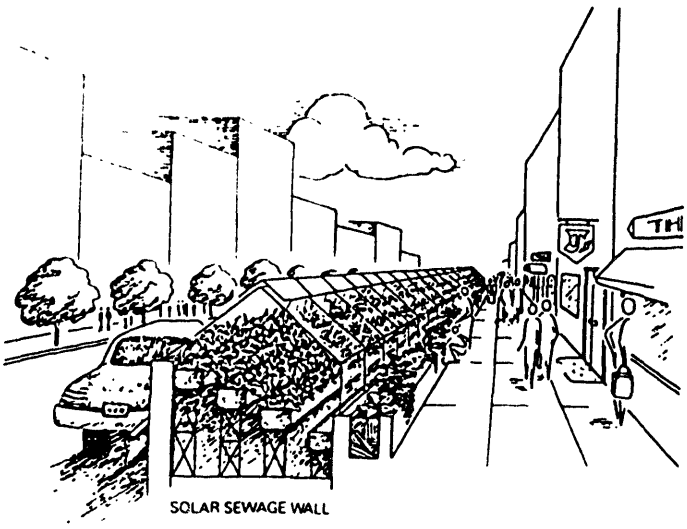
Figure 23· Drawings and Designs Developed Through the New Alchemists' "Village as Solar Ecology" Conference (from Journal#7): a.drawing of an ecological village using solar ponds and greenhouse additions (p137) b.drawing of a large community dome bioshelter (p112) c.John Todd's design for a community-sized bioshelter ark (p172) d.Todd's vision for a Maine coastal village using community arks and other biotechnologies (p173).

12) micro to macro: Extend and expand the design and social principles embodied in the ark bioshelter microcosms to more global macrocosms.

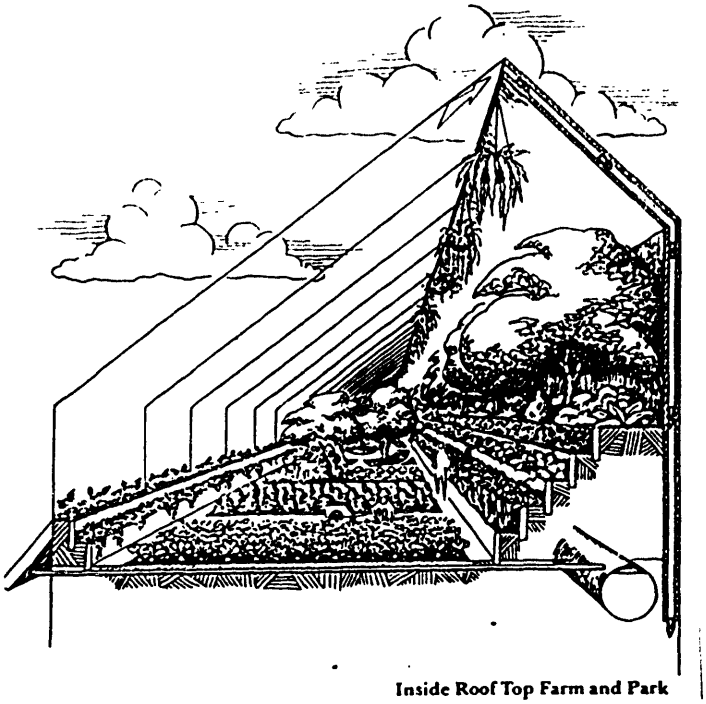
In the late 70's in addition to evaluating the seasonal preformance of their Arks, building their own family greenhouse extensions and holding their solar village design conference, the New Alchemists' also started a large "Tree Crop" program, in which they planted and evaluated the productivity of a wide variety of food producing trees (see Journal Seven, p56-70, for a description of some of this work). John and Nancy Todd also expanded John's essay "Tomorrow is Our Permanent Address" into a book by the same title (Todds, 1980), which further developed and elaborated on their general design principles and their embodiment in the Arks.

In the early 80's, the Todds' left the New Alchemy Institute to continue their co-evolving quest on their own. They began developing designs for ocean fishing vessels powerer by sails, which they called "ocean arks", and they created their own organization, Ocean Arks, International, to support this work. They also began to develop biotechnic designs for raising food and recycling wastes in cities, utilizing the features and principles embodied in the Arks, which they called "city farms". In 1984 they published a book entitled Ocean Arks, Bioshelters and City Farms: Ecology as the Basis for Design which articulated their evolving design principles in a definitive way and described their current design work on ocean arks and ecological city farms. Figure 24 shows some examples of city farms and related designs from this book.

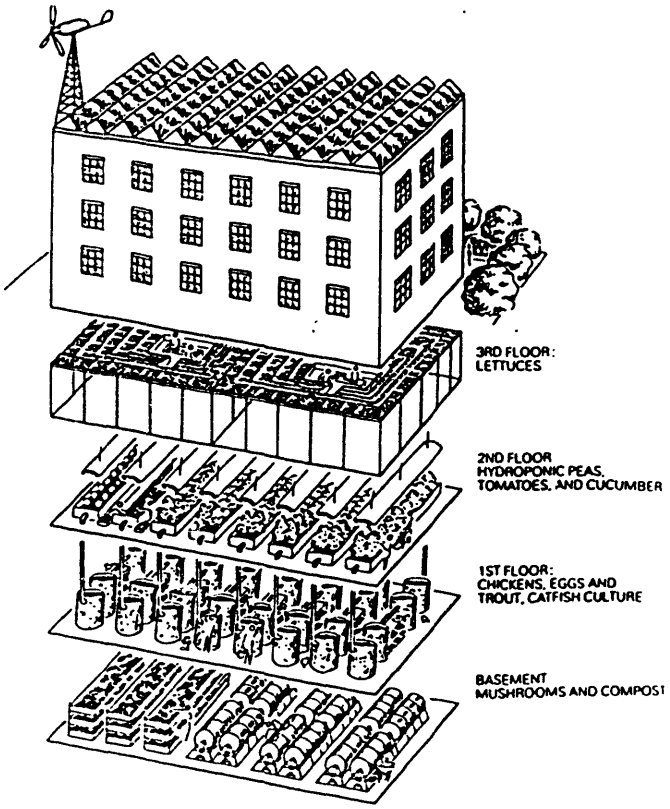
Figure 24: Diagrams and Designs for City Farming from the Todd's Ocean Arks,Bioshelters and City Farms (1984)



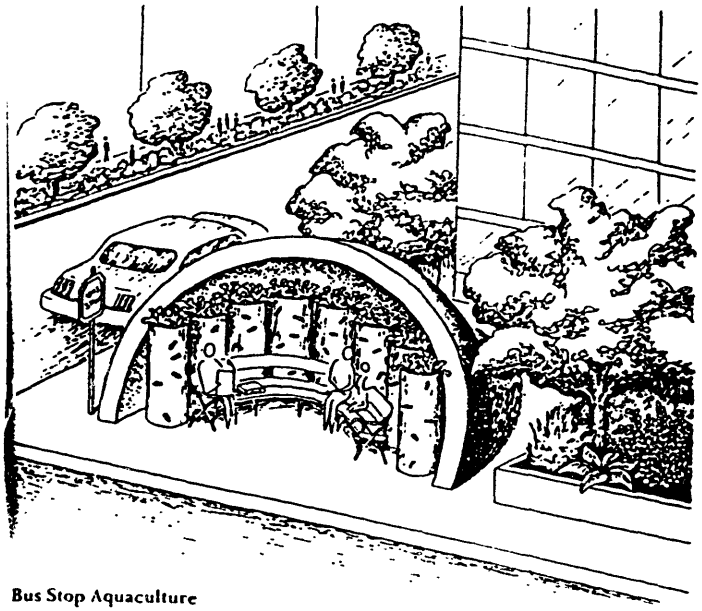
Neighborhood Sewage Treatment Facility



Inside Roof Top Farm and Park



Warehouse Farm Company, Inner City or Suburban



Bus Stop Aquaculture

Chapter 4. Small Technology Meets Community Action: Community Technology Development and the 'Small' War on Poverty

As Gandhi said, the poor of the world cannot be helped by mass production, only by production by the masses...
-E.F.Schumacher, Small is Beautiful

...(Through) meetings between Dr. Plunkett and CSA Staff there evolved the notion that through community action technologies useful to the poor and appropriate to their resources and needs could be brought to low income communities...
-Dick Saul, Preface to NCAT Proposal

I think we're walking up the backend of a huge white elephant!
-Sam Love, during NCAT planning process

The windmill(at 519 East 11th Street means)...now, small people, poor people, can proudly say: There are three legal, recognized power companies in New York City: Con Edison, Brooklyn Union Gas and the people of 519 East 11th Street.
-Roberto Nazario, Windmill Power for City People

What a surprise! I'm proud of what you are doing. I wanted to come down here and see what you all are doing.
-Jimmy Carter to Ramon Rueda on visit to People's Development Corporation

The Bronx FRONTIER Development Corporation is...dedicated to a redevelopment of the South Bronx through land reclamation and recycling operations using new, alternative technology and total, self help, community involvement...
-Bronx FRONTIER fact sheet

'May the Solar Force be with you!'
-sign at San Bernardino Westside CDC's solar manufacturing shop

In the mid-70's a number of AT pioneers began working with the remanents of Johnson's War on Poverty in the 60's, the Community Services Administration and

local community action agencies and community development corporations, to develop and implement small-scale technologies in low income communities. In the late 70's this uneasy alliance evolved into a minor social reform movement refered to as community or neighborhood technology development, or what I will call the " 'Small' War on Poverty", which involved creating community technology projects and demostrations, like the pioneering ones on New York's Lower Eastside and in the South Bronx, at the community level; centers and programs, like New York's Energy Task Force, Chicago's Center for Neighborhood Technology, and Seattle's Neighborhood Technology Coalition, at the city-wide and regional level; and the National Center for Appropriate Technology (NCAT) and related Federal programs at the national level.

In their book Dilemmas of Social Reform, Marris and Rein wrote of Community Action and the War on Poverty in the 60's:

> The history of community action between 1960 and 1970 can be played over as a set of themes, stated and restated now in concert, now in counterpoint, sometimes with the full brass of presidential rhetoric, sometimes in discord, but always returning to the same key notes- co-ordination, innovation, participation ...At times the themes converged in concerted policies, at times drew apart, but they wove in and out continually to compose the history of the decade. Each represented an insight which could neither be ignored, nor reconciled with the others (1973, p 239-40).

With minor revisions- the unreconcilable themes in the case of the 'small' war being AT research, development and transfer, technical support for community action, grassroots AT development and use, and community organizing and empowerment through AT- this could also serve as a summary and epitaph for the 'small' war in the 70's. In this chapter, I'll describe the evolution and clash of themes in the 'small' war, focusing, after a brief overview introduction, on the stormy evolution of NCAT in Part I, and then more briefly on the pioneering community technology development projects in San Bernardino, Chicago, Eugene and Seattle in Part II.

The Emergence of Community Technology Development and the 'Small' War [1]

As we've seem, AT was first promoted in America by ecologists, outlaw designers and the so-called "counterculture" in this country, who saw it as a vehicle for reducing pollution, supporting alternative life styles and enhancing their self reliance, but in the mid-1970's when the energy crisis really hit the poor hard, community groups and anti-poverty activists began experimenting with introducing appropriate technology into low income communities through self help efforts. Early advocates of this new approach to community development and poverty alleviation argued that low income communities in this country shared many characteristics with "underdeveloped" countries (e.g. lack of capital, lack of infrastructure, lack of education, a surplus of labor, domination by the outside, etc.) and hence Schumacher's critique of "high" technology and advocacy of appropriate technology applied to both (Morris and Hess, 1975). The terms "community technology" and "neighborhood technology" came into usage to signify the application of appropriate technology in low income neighborhoods and to distinguish this application from the earlier countercultural/environmental applications of appropriate technology. In this chapter I will use the term "neighborhood technology development" to signify the process of implementing small scale technologies in low income urban neighborhoods. The broader term "community technology development" refers to small scale technology development in both urban and rural communities.

Many of the pioneering efforts in neighborhood technology development occurred in New York City. In the early 1970's, for example, Charas, a Puerto Rican group led by former gang leaders was inspired by the work of Buckminster Fuller (the inventor of the geodesic dome) and began installing geodesic domes on New York's Lower East Side. The geodesic dome proved to be of limited utility on the Lower East Side, but these early efforts stimulated community interest and laid the groundwork for later neighborhood

technology development experiments on the Lower East Side. In 1973 a group of residents on East 11th Street began rehabilitating a burnt-out tenement building at 519 East 11th Street using a new self-help housing approach called "sweat equity," in which residents put in free labor ("sweat") in return for equity and lower rent in the building they rehabilitate. "Sweat equity" itself can be considered an appropriate technology or technique, but what made the 519 Project even more notable was the installation of solar collectors on the roof for heating water in 1975 and later the addition of a wind generator to provide electricity and a community "vest pocket" park next to 519. 519 East 11th Street was widely publicized and became the first major model for neighborhood technology development in the country. Shortly after the "sweat equity" project at 519 East 11th Street on the Lower East Side began, a similar group began rehabilitating 1186 Washington Street, a gutted building in the most devastated part of the South Bronx. As with 519 East 11th Street, solar collectors were installed on the roof. This group grew into the Peoples Development Corporation, which during the 1970's experimented with a number of neighborhood technologies, including solar, energy conservation, boiler repair, community gardens, bioshelters, earthworm farming, and community health care. Also in the South Bronx, the Bronx Frontier Corporation was established in 1976 to "green" the South Bronx through a large scale composting project which supplied compost to community gardens. In 1979 the Bronx Frontier Corporation installed a large wind generator to power the aerators for its composting operation.

As the interest in appropriate technology mushroomed and local experiments in community technology development began in the mid-1970's, a number of Federal and local agencies became interested in the potential of community technology development and its potential for alleviating poverty.

The first Federal agency to take an active role in promoting community technology development was the Community Services Administration (CSA), the successor agency to the Office of Economic Opportunity (OEO) and Johnson's War on Poverty in the 1960's. In 1975 Dick Saul, head of CSA's Energy Office, funded the energy conservation and solar collectors for 519 East 11th Street and also provided the funding for the planning of a National Center for Appropriate Technology (NCAT), which would facilitate community technology development by developing and implementing "technologies appropriate for low-income communities." In 1976 CSA provided $3 million for establishing NCAT in Butte, Montana. CSA also provided funding for the wind generator at 519 East 11th Street, most of the Bronx Frontier Corporation's composting operation, and an energy planning grant to the People's Development Corporation as well as funding for numerous other community technology development experiments across the country.

Soon other Federal agencies began to support community technology development or related activities (e.g. AT research and development), although not to the same extent as CSA. HUD, for example, funded the solar collectors at 1186 Washington Street in the South Bronx and other low income solar projects through its solar demonstration program and provided loans for urban homesteading demonstrations in the Lower East Side and South Bronx based on the 519 East 11th Street and 1186 Washington Street sweat equity rehabilitation projects. ACTION funded a neighborhood technology extension program through the Center for Neighborhood Technology in Chicago to train VISTA volunteers in neighborhood technology development. The Department of Energy (DOE) established an Office of Small Scale Technology and created regional small grants in appropriate technology to support research and development of appropriate/community technology. In 1978 CSA, DOE, and the

Department of Labor jointly supported the experimental SUEDE (Solar Utilization in Economic Development Enterprises) program to support community energy businesses and enterprises. In 1979 the National Science Foundation initiated a pilot program to support AT research and development. During the period from 1975 to 1980 well over $20 million were spent by Federal agencies, the biggest share coming from CSA, to support community technology development projects and related activities.

At the same time these new Federal programs were emerging, a number of new programs and institutions were created at the state and local level to facilitate community technology development. Shortly after taking office, Governor Jerry Brown created the first State Office of Appropriate Technology in California. Lane County, Oregon created the first County Office of Appropriate Technology in 1978. The City of Seattle's Department of Community Development in partnership with local AT advocates and community groups created a neighborhood technology program using its community block grants funds. In New York City the Energy Task Force was supported with CSA funding to provide citywide technical assistance in community energy development. Also, CSA supported the Small Farms Energy Project in Nebraska to provide technical assistance on small scale energy development to family farmers.

Stimulated by the pioneering neighborhood technology development efforts in New York and the availability of funding and technical assistance from the new Federal, state and local appropriate/community technology programs and initiatives, a number of community groups initiated community technology development projects across the country. These included the development of a neighborhood solar system which provided heat and hot water to eight homes by the San Bernardino Westside Community Development Corporation; the Center for Neighborhood Technology's effort to build several community solar green-

houses in Chicago; efforts to install wood stoves and solar devices in the small community of Crystal City, Texas after their gas was turned off during a dispute with the utility; and several neighborhood technology projects supported by the Neighborhood Technology Coalition in Seattle, Washington.

Moreover, pioneering communities and projects got more funding to carry out further, more ambitious neighborhood technology projects. For example, Charas and the Eleventh Street Movement (an outgrowth of 519 East 11th Street), teamed up on the Lower East Side to create LEAC, the Lower East Side Environmental Action Coalition, which received a grant of $100,000 from NCAT to initiate a number of neighborhood technology development projects including growing fish in basement tanks, installing a passive solar wall, manufacturing window greenhouses, starting a community recycling center and creating a fuel cooperative. Similarly, San Bernardino's Westside Community Development Corporation, based on the success of its neighborhood solar system project, was able to obtain funding to initiate a solar collector manufacturing project in conjunction with its vocational training program and subsequently to plan and begin construction on an ambitious 20-acre Energy Technology Center/Industrial Park which would be powered mainly by photovoltaics and other renewable sources of energy.

This whole groundswell of activities -- the local community technology development efforts themselves; the Federal, state, and local programs to support community technology development; regional and local technical assistance and helping institutions; the network of advocates and promoters of appropriate/community technology across the country --I will collectively refer to as "The 'Small' War on Poverty." "Small" because this approach to attacking poverty was inspired by Schumacher's Small Is Beautiful and his ideals of smallness, self-reliance, and decentralization. ("Small," also,

because of the relatively small amount of funding which went into community technology development in the late 70's). Community technology development and the 'Small' War represented a modest new approach to reform and poverty. Whereas, community action and the original War on Poverty in the 60's had emphasized reform in the social sphere and community economic development and community development corporations emphasized reform in the economic sphere, community technology development emphasized reform in the technological sphere as a strategy for alleviating poverty. Figure 1 lists the corresponding aspects of these three successive approaches and programs for alleviating poverty. In noting these corresponding features of community action and community economic development in the 60's and early 70's and community technology development in the late 70's, it should be stressed, however, that while community action and community economic development were conscious, centrally orchestrated attacks on poverty with substantial funding and political support behind them, community technology development was a more grassroots effort with neither central orchestration nor a lot of political support or funding- hence, it was more like guerilla combat than a frontal attack on poverty. Even my whimsically calling it the "Small War", suggests, perhaps, more coherence and rationale than should really be attached to this small impulse and movement.

In any case, there were five important intellectual networks and factions involved in this grassroots movement to implement small-scale technologies in low income communities. First there were the grassroots AT developers, which this study has previously focused on. Grassroots AT pioneers and leaders who got involved in community technology development included Travis Price, the outlaw designer from the Southwest, who launched the solar project at 519 East 11th Street in New York; Tom Bender, the solar architect and RAIN editor, who was a member of the planning committee for NCAT; Helga Olkowski, one of the founders of the Farallones Institute, who became vice-president of the NCAT board; Dennis Holloway, the solar architect and director of the Ouro-

Figure 1. CORRESPONDING ASPECTS AND COMPONENTS OF THE WAR ON POVERTY, COMMUNITY ECONOMIC DEVELOPMENT, AND THE "SMALL" WAR ON POVERTY (COMMUNITY TECHNOLOGY DEVELOPMENT)

	War on Poverty (Community Action)	Community Economic Development	"Small" War on Poverty (Community Technology Development
RATIONALE	poverty cycle, lack of coordinated action	lack of community controlled businesses and economic infrastructure	lack of community access to appropriate tools and technologies
SPHERE OF ACTION	social	economic	technological
STRATEGY	coordinated community action	community economic development	neighborhood/community technology, development
MAJOR FUNDING SOURCE	OEO (later CSA)	OEO/CSA some private capital	CSA Energy Office some HUD, DOE, Action and CETA
NATIONAL FOCUS AND PLANNING	OEO/CSA National Center for Community Action	CSA Office of Community Economic Development National Congress on Community Economic Development	National Center for Appropriate Technology (NCAT)
LOCAL IMPLEMENTATION	Community Action Agencies (CAAs)	Community Development Corporations (CDCs)	Community Technology Development Groups

borous project in Minnesota, who was also on the NCAT Board; Malcolm Lillywhite, the founder of the Domestic Technology Institute, who worked with CAAs in Colorado and Wyoming, installing solar greenhouses in low income communities; and Pliney Fisk, the cofounder of the Center for Maximum Building Potential in Texas, who implemented ATs in the mexican community of Cyrstal City, Texas.

The second important group or faction were the national and local community action and economic development officials and leaders, such as, Dick Saul, the director of CSA's energy programs; Toni Maggiore, the vice-director of the Milwaukee CAP, who became the president of the NCAT Board; and Alfred Navarro, the director of the Central Coast CDC in California, who was also on the NCAT Board.

The third group were progressive scientists, consultants and policy makers, such as, Jerry Plunkett, the director of the Montana Energy Research and Development Institute (MERDI), who conceived the idea for NCAT; Eugene Eccli, an alternative energy writer and consultant, who was on the planning committee for NCAT and a consultant to CSA on energy policy; and Jack Hershey, an environmental consultant, who was on the NCAT Board and briefly its president.

The fourth group were indigeous low income community leaders, such as, the former Puerto Rican gang leaders Chino Garcia and Angelo Gonzales, who formed the Charas dome builders group and participated in the Loisaida Environmental Action Coalition AT demonstration on New York's Lower Eastside; Rabbit Navarro, a community organizer for Adopt-A-Building and one of the leaders of the 519 East 11th Street project; Ramon Rueda, the founder and director of the Peoples Development Corporation in the South Bronx; and Valerie Pope Ludlum, the founder and director of the San Bernardino Westside CDC,

The fifth and final important group or faction were progressive or radical community organizers, such as, Michael Freedberg, one of the organizers and leaders of of the 519 East 11th Street project; David Morris, the director of the Institute for

Local Self Reliance in Washington, D.C. and a member of the NCAT Board; Harriet Barlow, a public interest and community action lobbyist in D.C., who was also a member of the NCAT Board; and Jim Schmidt, a former CAP director, who became the first director of NCAT.

During the evolution of community technology development projects and demonstrations in low income communities and the development of community technology development programs at the city-wide, regional and national levels, these five groups vied for influence and power, each having somewhat different perspectives on and goals for community technology development and the 'Small' War. As was the case with the original War on Poverty as analyzed by Marris and Rein, "each (perspective/faction) represented an insight which could neither be ignored, nor (fully) reconciled with the others (1973, p 240)."

This ongoing struggle for influnce among these five groups, made the role and effectiveness of the leaders and change agents I call AT transformers especially important in community technology development, since these transformers had to try to bring these conflicting factions together into a viable coalition to promote community technology development projects and programs at either the community, city-wide, regional or national levels. Accordingly, in my description of the evolution of NCAT in Part I and my briefer descriptions of the evolution of local pioneering community technology development projects in Part II, I've emphasized the approach taken and role played by transformers in the process and their effectiveness in building and sustaining workable coalitions from among these five groups. I'll also, particularly in the case of NCAT, look at the dynamics of conflict, decision-making and coalition formation among these five factions and analyze which groups and leaders were most effective in promoting their themes and goals for community technology development and the 'Small' War.

Part I- The Nine 'Lives' in the Evolution of the NCAT [2]

In early 1975, Dr. Jerry Plunkett, a progressive engineer and independent inventor, who had just founded and was director of the Montana Energy and MHD (Magneto-Hydrodynamics) Research and Development Institute (MERDI) in Butte, Montana, conceived the idea of creating a national center for appropriate technology which would develop technologies appropriate to the needs and resources of low income communities. In March of 1976, such a center, the National Center for Appropriate Technology or NCAT for short, was incorporated as a nonprofit research institution in Montana and in September of 1976, after a stormy planning process, NCAT received an initial grant of 3 million dollars from the Community Services Administration (CSA) to develop a national program to "develop and implement technologies appropriate for low-income communities". In January of 1977, Jim Schmidt, a community activist/organizer and former CAP director, was hired as NCAT's first staff director and began to staff and organize the Center. In April of 1978, after a stormy first year of operations, characterized by tensions and conflicts between Schmidt and the NCAT Board, among the NCAT staff and between NCAT and the CSA/CAP world and grassroots AT pioneers and groups, Schmidt was fired by the NCAT Board and a number of staff members loyal to him left with him. In December of 1978, Ed Kepler became NCAT's second director and guided the Center in a more conservative direction emphasizing technology transfer and support to CAAs, until the Reagan Administration did away with CSA, which had been NCAT's principal funding source, in late 1981, forcing NCAT to make drastic staff cuts and shift its emphasis toward providing technical support services to the Department of Energy.

Over its difficult evolution, first in its convoluted planning by committee, which took almost two years, and then in its conflict filled first two years of operations, the NCAT went through no less than nine distinctive operational or structural stages, which

I like to think of as the nine distinctive 'lives' of the NCAT. In this part I will describe and analyze the themes, visions and social designs and the sociopolitical dynamics that characterized each of these stages or 'lives'.

The four main intellectual groups or factioned that vied with one another to influence the design and direction of NCAT during its planning process and its first two years of operations, were as follows, roughly in order of their power and influence:

I. CSA and Community Action Officials and Leaders

Two of the people who were most influencial during NCAT's planning and first two years were Dick Saul, who directed CSA's energy programs and exerted pressure at key points to make sure NCAT would be the kind of technical support center that he and the CSA/CAA (Community Action Agencies) faction wanted it to be, and Toni Maggiore, the vice-director of the Milwaukee CAP (Community Action Program[3]) and chairman of Saul's CAA energy advisory committee, who eventually became president of the NCAT Board. Other important representatives of this CSA/CAA group and perspective included John Brown, the director of a Connecticut CAP; Moses Freeman, the director of a Florida CAP; Bob Meskunas, a staffer at the National Center for Community Action in D.C. and Alfredo Navarro, the director of a California CDC, all of whom were on the NCAT planning committee and became members of its initial Board of Directors. Later on, Hiram Shaw, who became associate coordinator at NCAT for grants, and Ed Kepler, who became NCAT second staff director (or 'coordinator'), also represented this perspective.

This group/perspective basically wanted to insure that CAA representatives controled or dominated the NCAT Board and that NCAT served the needs of CSA and the CAAs. Since they were in a majority on the planning committee and the NCAT Board, they were often, but not always able to do this.

II. Progressive Scientists, Consultants and Policy Makers

The most influencial representative of this perspective was Jerry Plunkett, the

progressive engineer and founder of MERDI, who first conceived the idea of NCAT and received a planning grant from CSA to plan the Center. He was able to get his friend, then Senate Majority Leader Mike Mansfield to put $3 million and more energy money into CSA's authorization appropriation, which put him in a powerful position during the planning process. Other representatives of this group were Eugene Eccli, an alternative energy consultant and editor of the Alternative Sources of Energy magazine, and Ceccil Cook, a former CAP director and AT consultant, who were on the planning committee and subsequent organizing committee for NCAT and were hired by Plunkett to develop a systematic plan and funding proposal for NCAT. Cook also served on the initial NCAT Board. Later on, Jack Hershey, an environmental/management consultant, who served on the planning committee and initial Board and was briefly president of the Board; John McBride, who headed MERDI's interdisciplinary R&D team for NCAT; and Scott Sklar, who headed NCAT's D.C. Office under Kepler also represented this group/perspective.

Basically, the progressive group/perspective wanted NCAT to have a highly competent interdisciplinary technical staff (to be located at MERDI) which would carry out AT research, development, and transfer to low income communities in a systematic and integrated fashion.

III. Progressive/Radical Community Activists and Organizers

This group/perspective was not very visible during the planning process, but gained a significant voice when Jim Schmidt was chosen as NCAT's first director and David Morris was added to NCAT's Board. Schmidt represented a 'wild card' in the NCAT process. He was chosen by NCAT's CAA dominated Board, in part, because he was a former CAP director and CAA representatives thought he would therefore represent and carry out the wishes of the CSA/CAAs faction, but Schmidt was really at heart a radical social and community activist and organizer, and he sought to emphasize the radical political and organizing potential of AT as he staffed and

organized the Center. Many of the regional organizers that he picked also shared his radical/organizer perspective. For a time David Morris, an advocate of what he and Karl Hess called "the new localism" (Morris and Hess, 1975) and the director of the Institute for Self Reliance in D.C., and Harriet Barlow, a D.C. community and public interest lobbyist, who had been a member of NCAT's planning committee and initial Board, represented this perspective on the Board, but, ironically they became two of Schmidt's strongest critics on the Board and eventually resigned in protest over the way he was running the Center.

IV. Grassroots AT Developers and Promoters

The fourth and least powerful of the factions/perspectives vying to influence the design of NCAT were the grassroots AT pioneers and developers. They wanted the NCAT to be as decentralized and regionalized as possible and to insure that grassroots AT groups and pioneers were able to influence and participate in the NCAT funded actities in their region. This perspective was represented on the planning committee most strongly by Tom Bender, one of the editors of RAIN Magazine; Travis Price, an outlaw designer, who initiated the energy conservation and solar project at 519 East 11th Street in New York; and Kye Cochran, the director of Montana's Alternative Energy Resources Organization (A.E.R.O.). Also, within CSA this perspective was represented by MaryAnn Mackenzie, a member of the program evaluation staff, who worked closely with Saul in developing the Center. Also important was Sam Love, one of the organizers of Earth Day and the Environmental Action environmental lobbying group, who was hired as a consultant to the planning committee to develop its preliminary plan for NCAT and who later became a member of NCAT's initial board. Helga Olkowski, one of the founders of the Farallones Institute, was also on NCAT's intial Board and became vice-president of the Board, but she never became a strong spokesperson for this group/perspective. Dennis Holloway, the solar architect and director of the Ourouborous project in Minnesota, was added

to the Board to represent this group/perspective.

These, then, were the four factions/perspectives that vied for power and influence in the NCAT evolutionary process. The fifth group or faction, which I previously mentioned as being involved in the 'Small' War, indigeous low income community leaders, were not very visible or important in the NCAT process.

Figure 2 depicts the waxing and waning of the influence of these four factions and the key milestones, designs and transitional dramas or conflicted that occured over the nine 'lives' of the NCAT. It combines in one diagram both an evolutionary diagram of the four NCAT factions/perspectives as distinctive meaning or cultural 'ecologies' similar to my diagram of the meaning ecologies of the 60's in Chapter 2 (top of figure) and an AT innovation transitional diagram as described in my transformer model of AT design and innovation in Chapter 1 (bottom of figure). As the top of Figure 2 illustrates, the evolution of NCAT during its planning, from January 1975 to January 1977 (its first five 'lives'), exhibited a different dynamic among the vying factions than during its first two years of actual operations, from January 1977 to January 1979 (its sixth through eighth lives and the beginning of its ninth). During its planning and first five stages or 'lives', the design or plan for NCAT oscillated back and forth between a CSA/CAA dominated vision and a Progressive dominated vision of what NCAT would be, with grassroots AT people and progressive/radical activists acting together as a third less powerful group, which was able to influence the process marginally from time to time when the CSA/CAAs and the Progressives influence offset one another. This process culminated in a compromise proposal which had aspects of both the CSA/CAAs' and the Progressives' visions of what NCAT should be, with a few of the decentrist ideas of the Grassroots ATers/Activists thrown in for good measure. This compromise plan (the Green Book, so named because of its green cover) was accepted by CSA and funded in the fall of 1977 and after this,

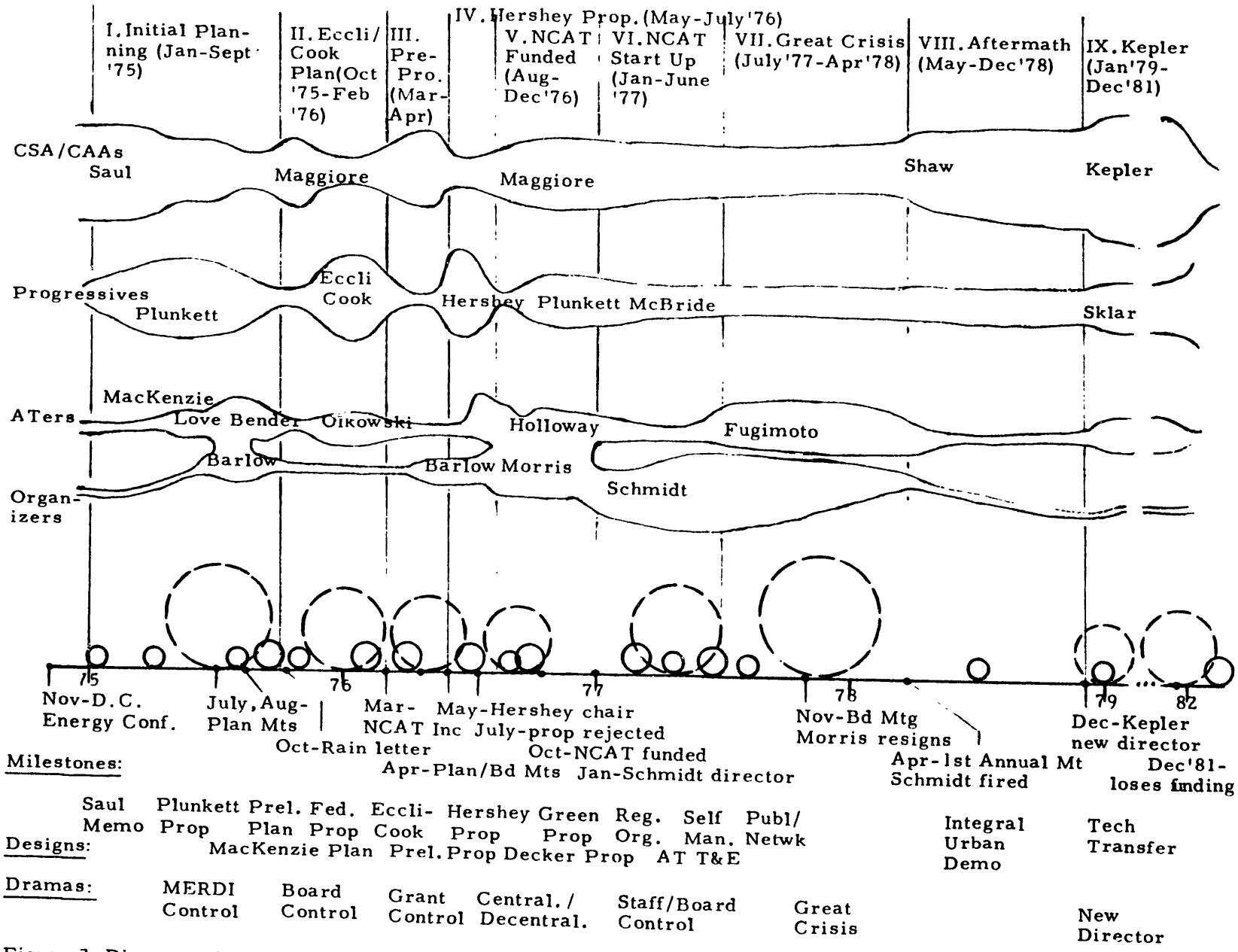


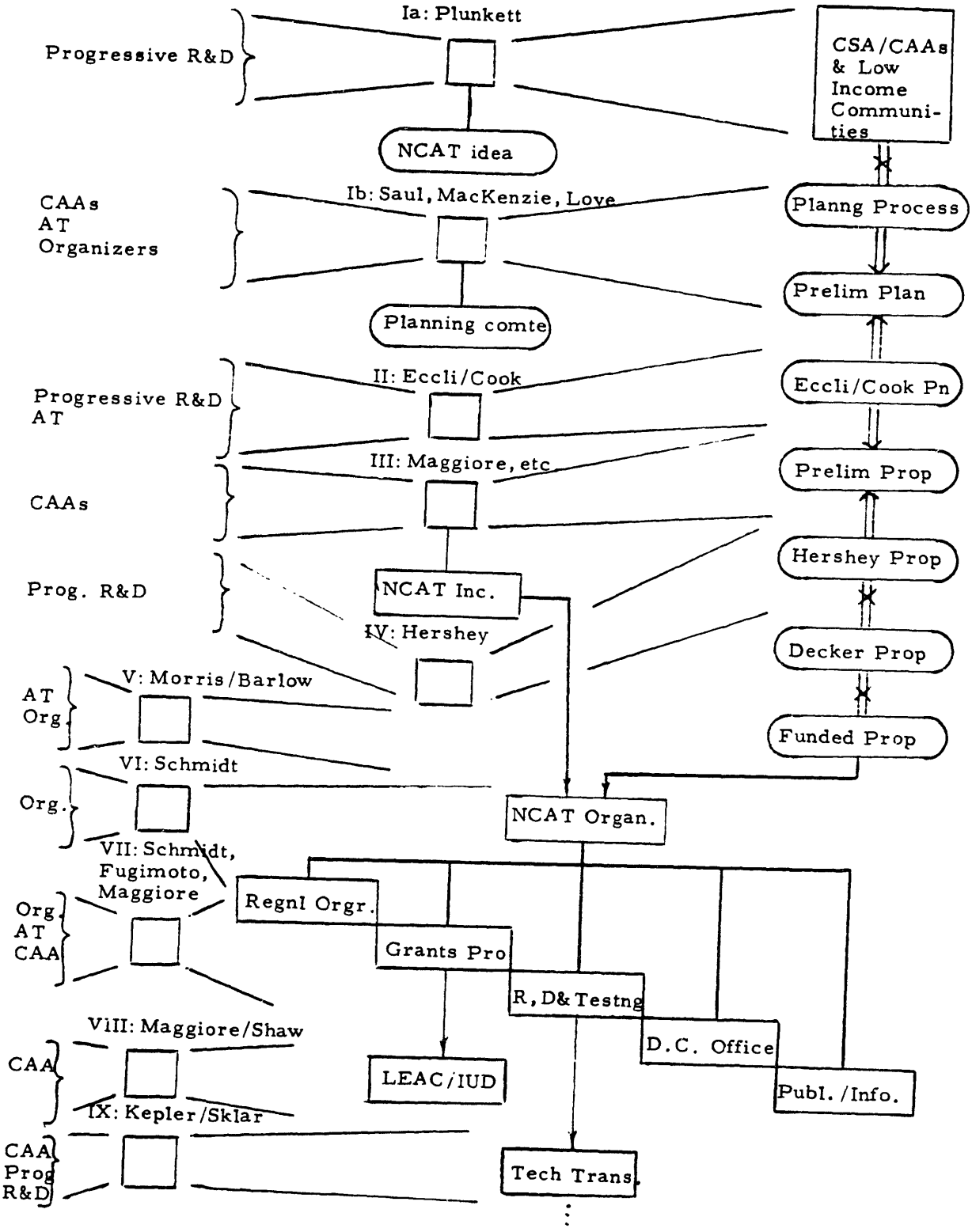
Figure 2: Diagram of Nine 'Lives' in Evolution of NCAT Showing Power of Factions, Designs, Milestones & Dramas

with the selection of Jim Schmidt as the first director/coordinator of NCAT at the end of 1977, the whole political dynamic of NCAT's evolution changed. Now the most important factions which vied to shape NCAT's direction were first Schmidt and the staff and Board members supportive of his direction (mainly progressive/radical activists and some AT people), second the members of the NCAT Board opposed to Schmidt's direction (mainly CAA people and later activists and AT people as well) and third the members of the NCAT staff opposed to Schmidt's direction who came to be led by associate director and ATer Isao Fugimoto (mainly technical/MERDI people and some AT people). This struggle ultimately ended in Schmidt being fired by the Board in April of 1978 and a more conservative director, Ed Kepler taking his place.

These general ongoing struggles and dynamics were reflected in each stage or life of the NCAT through a particular transitional crisis or dramas, which are depicted by the larger dotted circles at the bottom of Figure 2. In the subsections on the nine distinctive lives of the NCAT which follow, I'll describe each of these transition dramas and the alternative plans and designs for NCAT which preceeded and followed them.

Because of the ongoing power struggle and conflicts that characterized the evolution of NCAT, the role and effectiveness of AT transformers in the process was especially important. Unfortunately, none of the individuals who acted as transformers during the evolution of NCAT were able to remain in a position of influence for very long (with the possible exception of Saul and Maggiore) or bring the conflicting factions together around a unifying vision and design for NCAT, and as a result NCAT ended up meandering from one shortlived vision to another, as those playing the role of transformer changed during each of its lives as shown in the transformer diagram for NCAT's evolution in Figure 3. These numerous transformers and their effectiveness will also be discussed in the subsections on NCAT's lives which follow.

Figure 3: Transformer Diagram of the Nine 'Lives' of the NCAT



Life I: Conception and Initial Planning (Jan-Sept 1975)

The event which inspired Jerry Plunkett to conceive his idea for a national center for appropriate technology, was a conference held by CSA's Energy Advisory Committee in Washington, D.C. in November of 1974. Low income families had been hard hit by the rising energy costs triggered by the Arab oil embargo and the CSA and its network of local Community Action Agencies (CAAs) had launched a weatherization/energy conservation program to help them conserve energy. CSA's Energy Advisory Committee was made up of CAA representative and chaired by Toni Maggiore, the vice-president of Milwaukee's Social Development Commission (the Milwaukee CAP) and advised Dick Saul, the CSA staffer who directed this program. Part on the November conference was a solar energy panel, organized by MaryAnn MacKenzie of CSA's program evaluation division, which brought together for this first time AT and solar pioneers and leaders of the CSA/CAA world. This solar panel included AT pioneer Pliney Fisk, the founder of the Center for Maximum Building Potential (Max's Pot) in Texas; Sam Love, the environmental activist who had organized Earth Day; Eugene Eccli, an alternative energy consultant and editor of Alternative Sources of Energy magazine; and Jerry Plunkett. Many of those present at this meeting later began important actors in the evolving drama of NCAT, including Plunkett, Saul, Maggiore, MacKenzie and Love. The AT/solar experts and CSA/CAA people present at the solar panel began to explore the possibility of CSA supporting and CAAs implementing the kind of "low technology" solar and energy conservation techniques and devices, which the panel members described, for use by low income families and communities . Out of these preliminary discussions, Plunkett conceived his notion of a center for appropriate technology, which would do R&D on such low-tech possibilities and adapt them for use in low income communities. He approached Dick Saul with this idea and as Saul later recalled, "in subsequent meetings between

Dr. Plunkett and (CSA) staff there evolved the notion that through community action technologies useful to the poor and appropriate to their resources and needs could be brought to low income communities...What seemed to be needed was a mechanism which could, in concert with community action agencies...help to focus technological research and development resources on the advancement of these appropriate thechnologies in low income communities (Green Book Proposal, preface)."

Plunkett then approached Mike Mansfield, then the Majority Leader of the Senate, who had recently helped Plunkett establish the Montana Energy and MHD Research and Development Institute (MERDI, Plunkett being an expert on "magneto-hydrodynamics" as well as solar) in Butte, Montana, with his idea. Mansfield like the idea and got $3 million for such a center along with additional money for CSA's weatherization program put in CSA's authorization for the following year.

IA: Plunkett's Initial Planning Proposal (Apr 1975)

Saul and Plunkett decided that Plunkett and MERDI should first apply to CSA (i.e. Saul) for a planning grant to set up a committee of CAA people and alternative energy/AT experts to plan a Center for Appropriate Technology. Plunkett submited an initial, hand-written and very sketchy proposal for such a planning grant in April of 1975 (Plunkett Initial Planning Proposal, April 21, 1975). In it he argued that such a center was needed to target a small part of the Federal R&D effort towards the needs of the poor:

> ...In no area are the interests of low income people more poorly served than in the area of science and technology...It is time to re-examine the federal position on R&D priorities and determine if there is not a more positive stance and position plus positive action that the U.S. can take toward directing at least a limited amount of R&D toward the specific needs of the poor (Plunkett Proposal, p 1-2).

He, then, went on to argue that the kind of technology the poor needed was not high-technology but "low-technology":

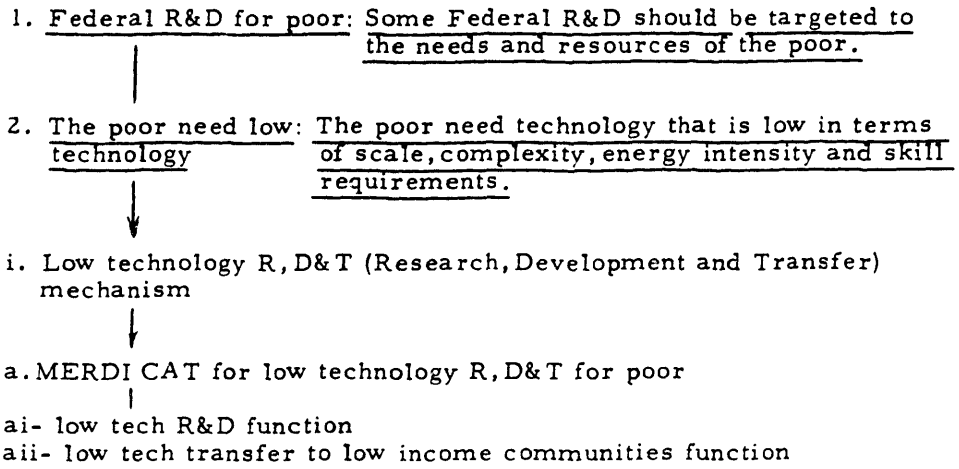


Figure 4: Plunkett's Initial Vision/Thematic System of NCAT as MERDI Run Low Tech Research, Development and Transfer Center

> ...The technology relevant to the needs of the poor largely falls into the area usually referred to as low technology (in terms of scale, complexity, energy intensity, skills requirements and materials intensity)...(but) the Federal government provides little or no funds to low technology (Plunkett Proposal, p 4-5).

Note that the emphasis here is on "low technology" rather than on AT as conceived by the AT movement. Plunkett goes on to conclude that what is needed is a national R, D&T (Research, Development and Technology Transfer) mechanism or CAT (Center for Appropriate)which would carry out two basic functions:

> ...The basic strategy of providing R&D for low income people must rest on two basic functions: 1) the identification, modification, and delivery of technical assistance (to low income communities)...and 2) development of new practical technology that can be put into direct use to meet identified specific needs (of the poor)(Plunkett Proposal, p 7).

Figure 4 shows Plunkett's initial thematic/design system for NCAT as a MERDI run low tech R, D&T center, which I've reconstructed from these passages. Note that this vision is very different from and in fact in conflict with the way that the AT pio-

neers and movement had conceived AT and AT development and use.

IB: Saul and the CSA/CAAs Faction's Initial Vision for NCAT (Early 1975)

Plunkett's original vision for NCAT, as articulated in his initial planning proposal was also somewhat different from what CSA and the CAA community had in mind. In a January 1975 Memo to the CSA Director and his Energy Advisory Committee, entitled "Some Suggestions for a Comprehensive Energy Plan for CSA" (Saul Memo, January 28, 1975), Dick Saul articulated in a preliminary way what the CSA/CAAs faction envisioned the Center as. Here he first developed the theme of the need for energy technology appropriate to the needs of the poor:

> A major long term thrust of both energy conservation and the alleviation of energy-related hardship among the poor must be the development of energy technology appropriate to the needs of people, and particularly poor people... It became clear at the CSA Energy Advisory Committee Conference in November that different technologies are appropiate for different climates and different parts of the country, and that if a way could be found at the national level to give encouragement and modest financial support to existing projects with real promise of technological innovation that such projects could in a relatively short time provide opportunities for significantly reducing the energy costs of the poor (Saul Memo, p 3-4).

He then went on to argue that CSA should be the advocate for such 'appropriate' energy technology in the Federal government, but at present it didn't have the technical expertise and support to do so, and therefore what was needed was a Center for Appropriate Technology which would provide technical support to CSA and CAAs on energy and other technologies appropriate to the needs of the poor:

> ...It is proposed (therefore) that CSA establish a Center for Appropriate Technology...(which) would provide information, publish reports and manuals on energy technology and related subjects, and provide technical assistance and modest financial support to projects and programs of CAAs and other qualifying local groups seeking to develop and improve innovative energy technology and energy systems appropriate to the needs of the poor. The Center could also assist in the development of a low technology industry in such a way as to provide significant economic development opportunities to the poor (Saul Memo, p 4).

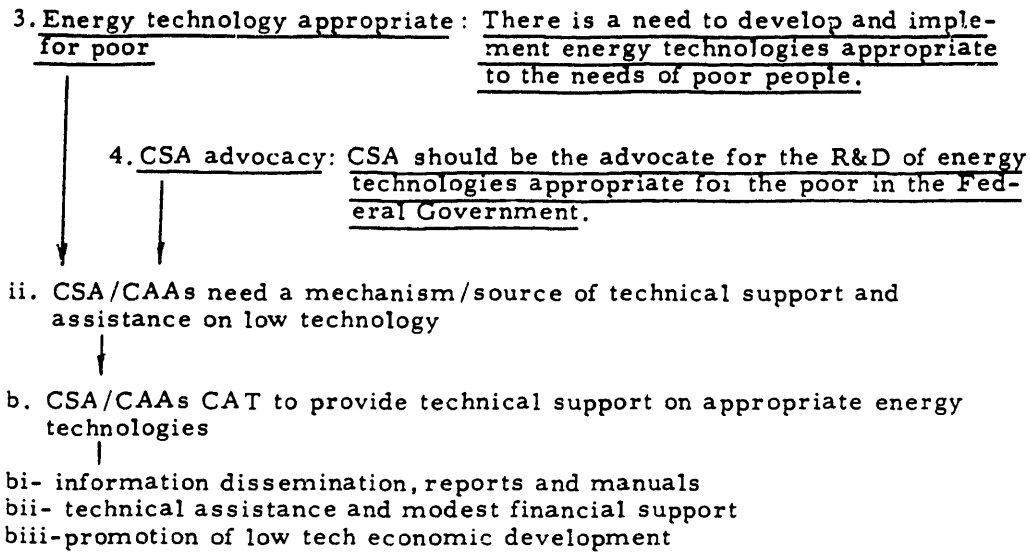


Figure 5: Saul and the CSA/CAAs Faction's Intial Vision/Thematic System of NCAT as a CSA/CAA Low Technology Technical Support Center

Figure 5 shows Saul and the CSA/CAAs faction's initial vision and thematic/design system for NCAT, which I abstracted and reconstructed from these passages. Note that there is more emphasis on CAAs and on technical support and advocacy and less on R, D&T than in Plunkett's initial Progressive vision.

IC: MacKenzie's Decentralist Vision and the Organizing of the Planning Committee (Apr-June, August 1975)

MaryAnn MacKenzie, a staff member of CSA's program evaluation division, worked closely with Dick Saul on NCAT during its planning stages and quickly became an advocate for the Grassroots AT/Community Activists perspectives and factions within CSA. In April of 1975, she wrote an internal memo expressing support for the notion of a CAT, but arguing that MERDI was the wrong organization to plan or house such a center:

> ...(Instead of funding the MERDI planning grant, CSA should) fund some neutral body to sponsor the planning activity...perhaps the National Center for Community Action...It is far too early to blindly fund the Montana Research Institute which will be spending its major efforts in long-term high technology research funded through ERDA...I strongly feel that this group, even indirectly, must not become involved in the planning activities for the Center...The proposal itself is acceptable;the potential grantee is not... (MacKenzie Memo, April 25, 1975).

This was the first volley in a struggle among Plunkett (MERDI) and his Progressive faction and the other factions involved in the planning of NCAT over who would control NCAT, which took up much of the time and energy of its long and convoluted planning process and undermined the potential for bringing these factions together in a viable coalition to promote community technology development.

During the summer of 1975, MacKenzie participated in Murray Bookchin's Social Ecology Institute at Goddard College in Vermont, which brought her into contact with the ideas and leaders of the AT movement. Then, for the second meeting of the NCAT planning committee, which was held at Goddard in August of 1975, she developed a proposal for an alternative, much more decentralized vision and plan for NCAT, based on the Grassroots AT Developers and Community Activists/Organizers perspectives on what a national AT center/network should be (MacKenzie Proposal, August 15, 1975).

She began this proposal, entitled "Community Technology: Making Poor Communities more Self-Sufficient", by arguing that the goal of alternate "community technology" and a center or network for AT should be to make low income communities more self-reliant:

> ...I beleive that this (NCAT) Planning Committee (is/should be) suggesting that local communities, especially poor communities can become self-sufficient through the appropriate use of alternate (community) technology; that they can be freed from the necessity of breaking into the existing economic system...(and) from total economic dependence on big business, big utility companies, (and) agri-business...(It is therefore not enough to just make) individuals and families more self-sufficient through the use of adaptive technology...It is equally important, if not more important, to build community through these technologies, once again creating an environment which encourages people to become socially and economically interdepent upon each other (MacKenzie Proposal, p 1, 2).

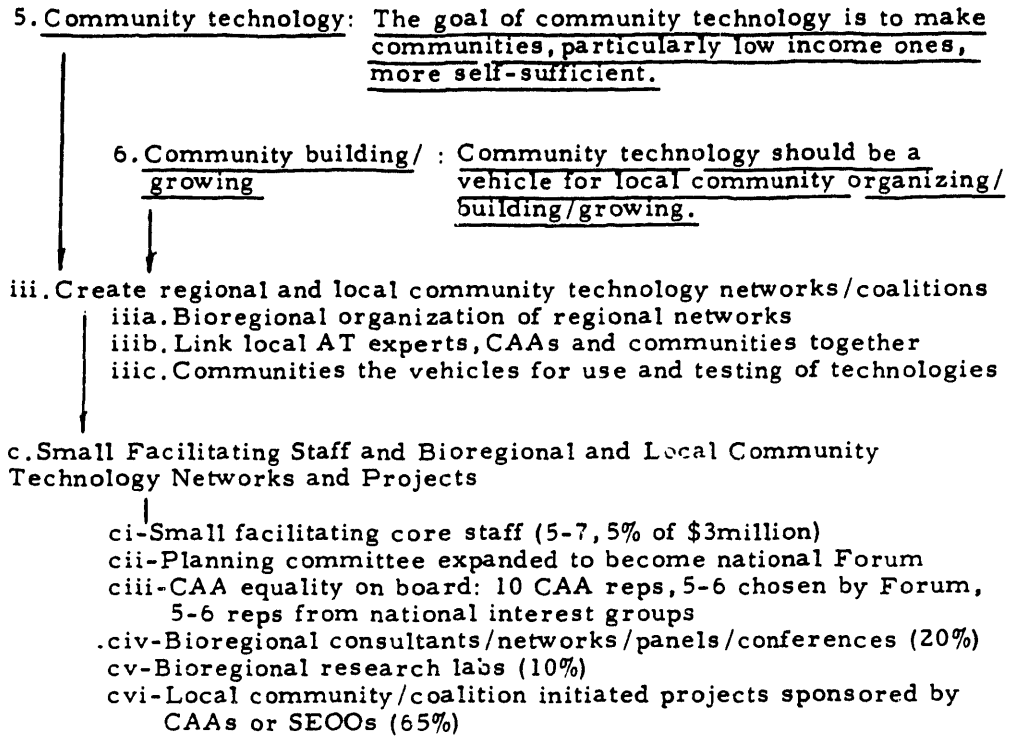


Figure 6: MacKenzie's Thematic/Design System for NCAT as a Small Core Staff and Decentralized Bioregional and Local Networks and Projects

She then went on to argue that the Planning Committee should create a decentralized network of bioregional and local community technology projects rather than a centralized national center:

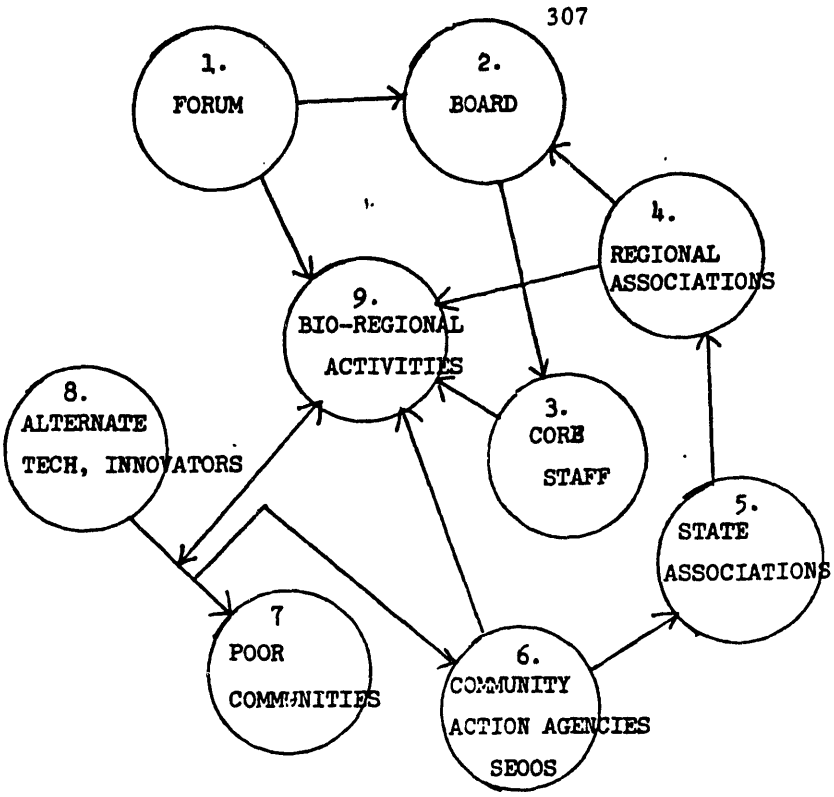
> ...I should like to argue strongly that as we consider establishing community networks for technology that we avoid the temptation of establishing a strong central operation which hires research staff, technicians, evaluators and innovators taking valuable talent out of local communities...It seems critical that existing skills and technology be adapted by the community (itself) for that community. Building a community is like growing a good garden...It means building up the "soil" of the communities in which we live...(MacKenzie Proposal, p 1, 2).

MacKenzie then described the elements of her decentralized design/plan for bio-

regional and local networks and projects to promote community technology development and community building. Figure 6 shows MacKenzie alternative, decentralized vision/thematic system for spending the $3million authorized for NCAT, which I abstracted from these passages and her proposal. Figure 7 shows a diagram from her proposal illustrating how she envisioned the different components she proposed working together. This vision/design reflected the views of grassroots AT developers and community activists/organizers, with the possible exception of MacKenzie's requirement that local CAAs or State SEOOs sponsor community technology projects (some ATers and activists/organizers saw CAAs as another governmental bureaucracy and didn't want their sponsorship to be required for NCAT funding).

There were thus three different initial polar visions/conceptions of what NCAT could and should be: the one held by Plunkett and the Progressive faction for a centralized R,D&T Center (Figure 4), the one held by Saul and the CSA/CAA faction for a CSA/CAA energy technical support Center (Figure 5), and the one held by MacKenzie and the Grassroots AT/Community Activists factions for decentralized bioregional and local community technology networks and projects (Figures 6 & 7). The ensuing planning process for NCAT basically involved a struggle over which vision or visions would prevail, which finally resulted in a compromise plan (the Green Book Proposal funded by CSA) that included aspects of all three visions.

After receiving Plunkett's sketchy planning proposal in April 1975, Saul hired environmental activist and writer Sam Love to flesh out and rewrite the proposal which he then funded, giving Plunkett and MERDI a grant to plan an NCAT. It was Saul, MacKenzie and Love, however, who chose who would be on the planning committee for NCAT. The resulting committee was dominated by CAA people, but also, as a result of MacKenzie and Love's inputs, contained a number of grassoots AT pioneers, such as, Travis Price, Tom Bender and Helga Okowski, and other consumer and public interest representatives. This action of funding MERDI but creating a



1. The Forum would be an outgrowth of the Planning Committee expanded to include additional interests. The Forum would serve as an advisory committee to the Board
2. The Board would be representative of the involved interests: 10 representatives elected from the Community Action world; 5-6 representatives elected and appointed by the Forum and 5-6 representatives elected from national interest groups.
3. The Core Staff would be a relatively small staff (5-7) whose main responsibility would be coordinating the efforts of the Bio-Regions, deciding % of funds to be made available to each Bio-Region

4 and 5. The State and Regional Associations would serve as mechanisms to elect representatives to the Board from the Community Action world, and to select panelists for the Bio-Regional technical review panels.

6. The Community Action Agencies and SEOOs would serve as sponsors for the community technology grant proposals.

7 and 8. The poor communities and alternate tech innovators would be the original initiators of the proposal.

9. Bio-Regional Activities would include technical review panels recommending to the Core Staff that projects be funded, a STAP operation identifying technicians and consultants in the Region making them available to local communities, and some system for information exchange

Figure 7: Diagram from MacKenzie's Proposal Showing the Elements of Her Decentralized Vision/Design for NCAT and How They Would Interact.

planning committee made up mainly of CAA and AT/public interest representatives set the stage for the drama and struggle that would unfold at the first two planning conferences.

Likewise, there were inherent tensions in the social organization/relationships that emerged during the conception and preplanning of NCAT. The working together of Saul and Plunkett, Saul and MacKenzie and MacKenzie and Love on the preplanning of NCAT constituted the first three potential intellectual marriages in the evolution of NCAT, but MacKenzie and Love's suspicion of Plunkett and MERDI made it ultimately impossible for this foursome to evolve into a coherent intellectual family and team of transformers for NCAT.

ID: The First Planning Conference, Butte, Montana (July 20-22, 1975)

Not surprisingly, given the three competing visions that the conceivers/preplanners of NCAT had, the first planning meeting of the thirty member planning committee, which met at a hot springs resort near Butte Montana on July 20-22, 1975, didn't go smoothly. Tom Bender of RAIN magazine and other grassroots ATers and activists on the committee felt that the site itself was inappropriate, later recalling:

> ...(We were)flown in at a cost of $20,000 to a $35/day hot springs resort in Montana, complete with astro-turf surrounding the artificially cooled, chlorinated hot springs swimming pool and golf course surrounded with condominium lots...We were brought there to talk about simple living. And to explore the inherent contradictions of the world's largest government proposing to develop technology for locally self-reliant living. A Center for Decentralized Technology (promoted by)...a Montana Energy and Magnetohydrodynamics Research and Development Institute (MERDI), whose board members represented such compatible bedfellows as Edward Teller, Anaconda Copper, Montana Power Company, banks and technical universities. Those were bad omens...(Bender, 1978).

Jerry Plunkett opened the meeting by making a case for his centralized R,D&T vision for the Center, arguing that AT movement hadn't linked AT to Federal policy or been able to capture Federal resources:

> ...I've observed the AT movement for several years, I haven't contributed myself, but I've followed it. It's very important that AT be integrated into public policy... The two problems with small(/appropriate) technology have been that small technologists have been primarily concerned with doing their own thing and secondly they have not really had the resources to tie it into the public as a whole nor into the needs of the low income people...
> ...Our real purpose is to tie diverse or intermediate technology with the Federal government. That seems a contradiction in terms when you first think about it...yet I think it can be done and that it has to be done...
> ...The Center concept is only a transitional phase to get the government's attension...You've got to have a centralized focus to start from and then you've got to have growth out from that...I think there will be regional centers established very quickly and there'll be state centers and perhaps local centers...(Butte Planning Conference Tape).

Sam Love and MaryAnn MacKenzie, however, immediately followed Plunkett's presentation with remarks advocating a more decentralized approach. Love expressed skepticism about the federal government doing something good in the AT area saying, "My background is very different from Jerry's...The approach the government takes to things has made me question whether good things can come out of what we're doing here...AT by necessity requires regional solutions and can't be centralized ...(we should) tap people's social energy (as in VISTA and Peace Corp.) and plant some seeds (for social change) which may germinate in the future (Butte Tape)." In a similar vein, MacKenzie argued that the planning committee shouldn't lock itself into (Plunkett's) centralized vision/approach, saying, "Perhaps we shouldn't talk so much about a 'center'. Maybe we should talk about a 'network' or a 'resource'- some term that is neutral, that we can play around with and that allows us to be as creative as possible...Should the center have a flat rather than hiearchical organization? Should local people evaluate projects rather than a core staff of national people? Etc. (Butte Tape)."

Over the next two and a half days members of the committee aligned themselves and became advoctes of one of the three initial visions/designs for NCAT. Most of the CSA/CAA people, which made up the majority of the committee, led by Tony Maggiore, Bob Mescunas and Moses Freeman, lined up behind Saul's vision of the Center

as a CSA/CAA technical support/advocacy center. Eugene Eccli emerged as the strongest supporter of a progressive, centralized R&D center like Plunkett envisioned. And, Travis Price and Tom Bender emerged as the spokespersons for a more decentralized approach like MacKenzie and Love envisioned.

In addition some people emerged that might act as links or bridges (or 'transformers') among two or more of the factions/perspectives involved in the process. These included Harriet Barlow, who chaired the meeting and had links to the CAA world but was sympathetic to the decentralist point of view; Ceccil Cook, who was a former CAP director and also a solar advocate and had, as he said at one point, "a love/hate relationship with community action"; Al Navarro, who headed a California CDC already working with solar and AT and was sympathetic to the notion of decentralized community technology development; Jack Herhey, an environmental/management consultant, who was most sympathetic to the progressive (Plunkett, Eccli) point of view, but sought to act as a mediator among the competing visions; and Helga Olkowski, who was a grassroots AT developer and also a scientist (specializing in integrated pest management with her husband Bill, who also attended the meeting) sympathetic to Plunkett's progressive vision.

There were a lot of hopeful visions and enthusiasm for some sort of NCAT expressed over the course of the meeting, but it ended on a sour note in a huge controversy over MERDI's relationship to/control over the Center. As Kye Cochran recalled in her notes of the meeting:

> ...(It got) pretty heavy... Lola Redford (consumer advocate and wife of Robert Redford) said, 'We really have to thrash this out and get a compromise, because it's terribly important, and it's not black and white (She was almost crying)'..so we thrashed- and many got quite discouraged- and we by no means finished. But at about 12:30 we adjourned...(Cochran Notes, Butte Conf.)

Cochran, however, ended her notes on a hopeful note:

> ...They really do care about this; it isn't easy at all, but it seems to me it's a great group, and if we do something it will be good. I have hardly- maybe never- seen a group so diverse, talented and honest the (really) got along so well (early in the meeting) and was so earnest about something... (Cochran Notes).

As someone who followed and at times participated in the NCAT process, I, too, can testify to the earnestness and commitment of the people involved. Many of the people at this first meeting, including Plunkett, Love, Eccli, Cook, Navarro, Barlow, and Hershey, later got disallusioned, 'burnt-out' and felt they had been mistreated in the process, but most of them kept coming back for a long time, drawn by the hope that despite all the conflicts, something really important could come out of the process.

IE: The Second Planning Conference, Goddard College, Vermont (August 17-20, '75)

At the second planning conference for NCAT, held at the Social Ecology Institute at Goddard College in Vermont, the design controversy over MERDI's relationship to the Center continued and got even more heated. In addition, three more controversial design issues/alternatives emerged concerning i)the compostion of the Board of Directors of NCAT, ii)the centralization or decentralization of the Center, and iii)the role of local CAAs in the grants given by the Center for local community technology projects. These four design themes/controversies and the planning committee's deliberations upon them will be discussed in some detail below because they became the key polarizing issues over which the factions involved fought during the rest of the NCAT planning process.

In the continuing deliberations over MERDI's relationship to the NCAT, four possible alternative designs or arrangements emerged:

> (1) CSA would make the grant directly to MERDI, under which there would be several divisions, one of which would be the CAT... The CAT would be under overall administrative control of the MERDI Board...
>
> (2) CSA would fund the money directly to MERDI, who would contract with the CAT to manage the grant...It would be a 'delegate agency' arrange-

> ment, with MERDI as the prime grantee who would subcontract the CAT functions out to the CAT Board...
>
> (3) MERDI and CAT would be two entirely separate organizations, with the money going directly to the CAT Board. The only relationships would be contractual relationships with MERDI for various services...(which) would be agreed upon in advance and spelled out in the proposal...
>
> (4) Completely separate organizations, with no formal relationship predefined by the grant at all, CAT would be autonomous and would receive and spend funds independently...(Goddard Planning Conference Minutes, p 8-9)

I've summarized these alternative options in the following design theme. This design theme is somewhat different from the ones we've encountered before, in that, it expresses alternative, mutually exclusive, design themes or options. I've refer to such themes as 'branching' design themes:

iv-Alternative arrangements for MERDI/NCAT relationship:
- iva. NCAT under MERDI.
- ivb. NCAT independent, subcontracts with MERDI.
- ivc. NCAT completely autonomous

In this theme, option iva covers both the first and second options in the above passage, ivb corresponds to the third and ivc to the fourth (I've tried in this and the following three branching design themes to make the 'a' option correspond to the Progressive/MERDI perference, the 'b' option to the CSA/CAAs perference, and the 'c' option to the Grassroots AT/Community Activists perference where possible).

These alternative arrangements for the MERDI/NCAT relationship were hotly debated during the meeting and the discussion and negotiation over MERDI's role in the Center ended up taking up most of the planning committee's time and energy.

Plunkett started the debate by saying his MERDI Board would probably only accept options '(1)' or '(2)' and that, "Within MERDI there is going to be a CAT! I don't know how it will be supported...(but) there will be a center in MERDI, regardless of what this group does!(Goddard Meeting Tape)" He, then, made his case for option (1), arguing:

> ...I believe it's crucial that before AT goes very far, we bring to bear (on it) the kind of hard critical analysis (that MERDI can provide). I'm not saying I'm unsympathetic, but I haven't seen any AT work today reviewed by a peer review system ...which sifts out the desirable from the less desirable ...I think its essential that soft technology be tied to hard technology...I'm not saying that all AT is soft, but a lot of it is...Until (AT passes the test of critical analysis) AT will just be a hoax...(Goddard Tape, emphasis added).

This argument, while making perfect sense from Plunkett's Progressive perspective, infuriated the grassroots AT people on the committee, and reenforced their sense that MERDI represented the kind of high tech mentality they were fighting against and that a CAT in MERDI would be a 'disaster'. Thus, Travis Price, in arguing for option (4), called Plunkett's argument "the worst of all arguments" that could be made for a close relationship with MERDI, because, "the thing we do want to get rid of is the cadre of hard-core professionals!...The kind of people you want active (in NCAT) will bulk at a close relationship with MERDI (Goddard Tape)."

Similarly, Tom Bender, also arguing for option (4), said a completely autonomous NCAT "would allow for evaluation of AT by people having the right values" and that staffing and overhead would be a lot cheaper in a separate center, saying, "MERDI already spent three times what it needed on the first planning meeting. Community operations have a much lower overhead than MERDI (Goddard Tape)."

Other committee members expressed concern that options (1) or (2) would place the CAT "at the mercy of MERDI" and that MERDI's Board "would not have the best interests of low technology or of poor people at heart" (Goddard Minutes, p 9).

The discussion then got very heated with Peter Konijn, a CSA staffer, calling the advocates of options (3) and (4) "a bunch of spoiled brats in a certain sense": "Most of you are assuming we're going to get money no matter which form of organization is proposed. I don't believe that is the case...Let us maximize the chances of getting the bloody contract and after you get the contract you can rearrange the words on paper!"(Goddard Tape).

In a similar vein, Valerie Ransone of the Washington based Citizens Action Commit-

tee, argued that the end of creating a NCAT justified the means of working closely with MERDI:

> I invite you all to examine your personal motives, do you want to be on the staff, the Board, massage your own ego or do you really want to see AT get into the mainstream of American life. The end in this case is more important than the means... If you go to (MERDI with a cooperative attitude) you can have a fine marriage... These men that sit on Jerry's Board, they're not all evil, they don't have blood dripping from their hand! They were raised in a different school than you. They weren't exposed to the opportunities and experiences we have had that made it possible to develop the philosophy we now share. We're on the fence and if we make the wrong decision while we're up here we'll blow the whole thing! (Goddard Tape, emphasis added).

Despite this and other pleas for compromise, after hours of heated discussion the committee was unable to arrive at a decision on MERDI's role. Finally, a subcommittee with a representative for each option (Plunkett for (1), Mescunas for (2), Navarro for (3) and Price for (4))and Hershey as chairman was formed to try to work out a compromise, but this group was unable to reach an agreeable compromise either. At last, however, back in the whole committee, Maggiore and Saul were able to develop a variation on option (3) (design theme vib), which most the committee felt was "a decent compromise". Maggiore proposed that an independent Board for a National Center for Appropriate Technology, a NCAT, not a CAT in Montana be established and that MERDI provide contract services to this NCAT. Saul amended Maggiore's proposal by suggesting that MERDI be given the grant to establish this independent NCAT and that Plunkett be chairman of the NCAT Board. This was referred to as option (5) by the committee.

Several members spoke in support of option (5) as a reasonable compromise, but Plunkett wasn't entirely won over. The committee had been trying to make decisions by consensus, up until that time, but finally a vote was taken on option (5) with 13 voting for and 4 against (of these four, two were for option (1) and two were for option (3)) and, thus, option (5) was accepted as the compromise the committee would recommend.

Later in the meeting, however, this compromise seemed in danger of unraveling

when Plunkett said he would not accept a suplemental grant for the committee because "he was not satisfied that the committee had addressed itself efficiently and expeditiously to the resolution of important questions regarding the structure of the proposed Center (Goddard Minutes, p 22)." This touched off another heated discussion in which Plunkett and committee members "aired their feelings", which went on past midnight.

When the committee met the following morning (Plunkett wasn't present at this meeting), the consensus on the committee had clearly shifted away from working closerly with Plunkett and MERDI towards the committee itself creating the kind of NCAT it envisioned, as indicated by the following comments:

Love: "The problem is he (Plunkett) thinks we've taken the pieces of his baby and reassembled them in a way that doesn't fit the the vision in his head."

Olkowski: "That's the trouble with having babies always."

Price: "What Sam (Love) is saying is it's our baby at this point and no one else's."

Love: "Jerry (Plunkett) is not right when he says this has not been a productive group! This is a really hard working group. The reason we haven't been more productive is that we've had to spend three or four days talking about MERDI!..."

Mescunas: "Can we have the organizing committee incorporate NCAT if MERDI rejects our proposal?"

Navarro: "If MERDI has an inventors orientation and we develop one for poor people, then only ours will really be AT."

Price: "Jerry's view of this thing is real different from what's going on here."

Saul: "Jerry has been brought up and speaks in a language that is not the same as that used by a lot of people here and I think that's really part of the problem (Goddard Tape)."

The committee was now of a mind to incorporate its own NCAT through its NCAT

organizing committee, which had been elected earlier in the conference (see discussion of Board composition below). Accordingly, Mescunas proposed that "if MERDI does not want to go along with our recommendation...(then) the organizing committee (should) incorporate and take whatever steps are necessary to carry out the idea of the center as developed by this group", and this motion passed 10 to 4, with 2 abstentions (Goddard Minutes, p 24).

Saul, who still wanted NCAT to have a close relationship with Plunkett for political (i.e. Mansfield's support) and legitimacy reasons, tried to head off this rebellion by the planning committee by warning it that CSA wouldn't fund an NCAT proposal unless it included certain pieces, including the political support of Mansfield and the "respectability" that Plunkett provided:

> What is needed for this proposal to be funded by CSA is some combination of the various forces that will support it...(These pieces are:) the political support of Mansfield; a certain amount of just exactly what a lot of people here don't like, that is, the respectability of MERDI's Board, which sort of hided some of the radicalism; and the community action and poor people piece... The unorganized counterculture and AT people don't stand much of a chance with any governmental agency of getting funded (Goddard Tape).

The committee responded by substituting a milder motion that simply said the organizing committee would meet with the MERDI Board to discuss the planning committee's position on the Center, but despite this opening for a reconciliation, the mood of the planning committee had now shifted and it now viewed NCAT, to use Price's metaphor, as its "baby" rather than as Plunkett's. The birth, however, as we will see, would not be an easy one.

Besides the issue of MERDI's relationship to the NCAT, which took up most the planning committee's time and energy during the Goddard meeting, three other controversial design issues/themes were raised during the meeting. The first of these was the issue of what the composition of interests/factions on the NCAT Board

would be. Three general alternative Board compositions were envisioned by the factions on the committee, which can be summarized in the following branching design theme:

v-Alternative compositions for NCAT Board of Directors:
- va. A balanced Board representing all factions/interests.
- vb. A CAA dominated Board.
- vc. A Board with roughly half CAA representatives and half other factions/interests.

The Progressive faction on the committee favored a "balanced Board"; the CSA/CAA faction favored a CAA dominated Board; and the Grassroots AT/Community Activists faction favored at least a 50-50 split (vc) and ideally a majority of non-CAA Board members. Maggiore chaired a subcommittee on Board composition, which recommended a 15-member Board (expandable to up to 21 at the Board's discretion) of which ten would be CAP regional representatives, one would represent CDCs, one would be from MERDI, two would be ATers and one would represent organized labor (i.e. a vb-"CAA dominated" Board).

Representatives of other factions on the committee, however, felt this was "heavily over-balanced with CAP representatives". Bender, for example, argued that either the number of CAP reps be lowered or the Board be 21 members, with no more than 10 from CAPs (Goddard Tape). After debating the issue the committee finally agreed to a 21 member Board, 15 of which would be as specified in Maggiore's recommendation, and the nature of the other 6 to be decided on later (i.e. a vc-"roughly 50-50" type Board) (Goddard Minutes, p 15).

It was then decided that the planning committee would elect six of its members as an organizing committee or interim board, which would help establish NCAT and organize its initial Board. This group wasn't to be part of the initial NCAT Board unless the Board chose to add one or more of them to open slots, but as we will see five members of this group, in fact, became part of and played dominate roles on NCAT's

initial ten member Board, the other five of which were also later elected from the planning committee- another illustration of how the planning committee came to feel that NCAT was its own "baby".

The voting procedure that was used to select this organizing committee is noteworthy. Each planning committee member wrote down six names and the six whose names appeared most frequently became the organizing committee. No effort was made to balance this committee to represent the different perspectives/factions on the planning committee itself. Despite this fact, a reasonable organizing committee was selected which included:

*Tony Maggiore, the leader of the CSA/CAA faction on the planning committee.

*Bob Mescunas, another member of the CSA/CAA faction.

*Alfred Navarro, a CDC director who was part of the CSA/CAA faction, but also fairly independent minded in his thinking.

*Eugene Eccli, the leader of the Progressive faction.

*Ceccil Cook, a former CAP director, who had a "love-hate" relationship with CSA and was sympathetic to both the Progressive and AT/Activists perspectives.

*Helga Olkowski, who was one of the quieter members of the AT faction also sympathetic to the Progressive perspective.

A rough weighting of the relative power of the factions on this committee would, thus, be as follows: 3 votes for the CSA/CAA faction (Maggiore's, Mescunas', Navarro's), 2 for the Progressive faction (Eccli's and 1/2 of Cook and Olkowski's) and 1 for the AT/Activists factions (1/2 of Cook's and Olkowski's).

The third controversial design issue/theme had to do with how decentralized the Center would be, which got debated in terms of how much would be spent on NCAT's central staff and operations versus how much would go out in grants to the grassroots. Again, three different broad alternatives were advocated by different members and factions of the planning committee, which I've summarized in the fol-

lowing branching design theme:

vi-Alternative degrees of decentralization in terms of NCAT funding:
via. A centralized NCAT: 2/3 for central operations, 1/3 for grants.
vib. A moderately decentralized NCAT: 1/3 central ops., 2/3 grants.
vic. A highly decentralized NCAT:more than 2/3 out to grassroots.

The Progressive faction on the committee favored a centralized NCAT (via-the "2/3-1/3" option); the CSA/CAA faction, initially at least, favored a moderately decentralized NCAT (vib-the "1/3-2/3" option); and the AT and Activists factions favored a highly decentralized NCAT (vic-more than 2/3 of the expected grant of $ 3 million going out to the grassroots in grants, as in MacKenzie's decentralized vision for NCAT). Not much time was spent on this issue at Goddard, but it would become increasingly important and controversial in the months to come. In his report on the recommendations of the planning committee, after the Goddard meeting, Love stated that, "The Planning Committee would like the Center to allot 65 to 75 per cent of its budget to grants for demostration projects (Love Interim Report, p 14)", so apparently the committee was leaning toward the 1/3-2/3 option (vib) or even more decentralization at this time (although I couldn't find this figure mentioned in the minutes).

On a related design issue, the grassroots AT people on the committee pressed for NCAT to have "regional coordinators" and to develop and support a "regional infrastructure" similar to the one envisioned by MacKenzie in her decentralized proposal. Kye Cochran, of AERO, chaired the subcommittee on regional infrastucture, which advocated that NCAT have grassroots regional coordinators to do regional information networking and that they be tied to existing regional AT networks as much as possible. Bender added that, "the primary reason for establishing regional coordinators is to move operations to a small enough scale so they could use already-financed institutions, such as unions, PIRGS, etc., existing information networks, people doing research, and be able to pull out of the woodwork who is doing what (Goddard Minutes, p 19)."

This design theme can, thus, be summarized as follows:

viii. Regional coordinators and infrastructure	Hire regional coordinators to help facilitate regional AT networking and infrastructure building.

The fourth controversial design issue/theme raised at the Goddard conference dealt with the role that local CAPs and other CAAs would play in the grants given by NCAT for local community technology development. Again, three broad alternatives emeged on this issue, which I've summarized in the following branching design theme:

vii-Alternative requirements for local CAP/CAA involvement in NCAT grants:
- viia. Local CAP may review and comment on proposals from its area, but NCAT makes final decision.
- viib. Grants must be endorsed/sponsored by relevant CAP/CAAs, except in unusual situations.
- viic. Local CAPs should have input into proposals and those endorsed by CAPs should receive preference by NCAT.

Progressives and AT/Activists on the committee generally favored option viia or possibly option viic, while CSA/CAA people generally favored option viib or possibly viic. Robert Griffee, a state legislator from Iowa, chaired the subcommittee on grants and argued in his report to the full committee for a viia type arrangement in which the relevant local CAP would be "informed" and could "offer recommendations" but would not have a "sign-off" or "veto" capability. The CSA/CAA people on the committee, however, felt CAPs should have more input, either a viib or viic type arrangement. No final decision, however, was made on this issue at the Goddard meeting (a related design issue which was raised at the Goddard meeting and became more controversial later on was the question of whether the Board or staff of NCAT or both should have primary responsibility for approving grants-see discussion under Life VI).

The four controversial design issues/themes raised at Goddard- MERDI's role (iv), the NCAT Board composition (v), the degree of centralization of NCAT in terms of how its funding was allocated (vi), and the role of local CAAs with regard to NCAT grants (vii)-

MERDI Relationship to NCAT (iv):

Alternatives:	Prog:	CAAs:	AT/Act:
a. NCAT under MERDI	1	3	3
b. Independent NCAT, MERDI subcontract	2	1	2
c. Autonomous NCAT, No specified relation	3	2	1

NCAT Board Composition (v):

	Prog:	CAAs:	AT/Act:
a. Balanced	1	3	1
b. CAA controled	3	1	3
c. 50/50	2	2	2

Centralization of NCAT Funding (vi):

Alternatives:	Prog:	CAAs:	AT/Act:
a. 2/3 central, 1/3 grants	1	2	3
b. 1/3 central, 2/3 grants	2	1	2
c. less than 1/3 central operations	3	3	1

CAAs Role in NCAT Grants (vii):

	Prog:	CAAs:	AT/Act:
a. CAA review only	1	3	1
b. CAA sponsorship	3	1	3
c. CAA input, endorsement	2	2	2

Figure 8: Summary of the Preference Rankings of Factions on the NCAT Planning Committee On the Four Controversial Design Issues/Themes (Prog- Progressive Faction; CAAs- CSA/CAA Faction; AT/Act- AT and Community Activist Factions)

became the pivotal issues over which the factions involved in the planning of NCAT fought, schemed, and eventually compromised during the months which followed. Figure 8 summarizes the factions' perference ranking of the alternative options for each of these controversial design issues. Note that the preference matrices for Board Composition and CAAs' Role in Grants are identical with both Progressives and AT/Activists (which I've treated as one faction during the planning of NCAT) prefering option a and the CAAs prefering option b, and that the MERDI Relationship and Centralization of Funding Matrices are almost identical (the only difference being that the CAAs' second and third preferences are interchanged) with each faction prefering either the first, second or third option in both. These preference rankings suggest a lot of options for negotiation, vote trading and/or coalition formation. Each of

the six distinctive subsequent plans/proposals for NCAT which emerged during the rest of the planning process took a somewhat different position on these four pivotal design issues. In discussing each of these plans below, I'll focus on how they each dealt with these four issues and how well each faction made out on promoting their preferences as a result.

IF: Love's Interim Planning Committee Report and Preliminary Plan For NCAT (Oct. 1, 1975)

After the Goddard meeting, Sam Love, who acted as the reporter/writer for the planning committee, was faced with the difficult task of putting together an interim planning committee report containing a coherent preliminary plan for NCAT based on the scattered and heated and at times contradictory deliberations of the planning committee at the Butte and Goddard meetings. Love did, in fact, somehow manage to produce a reasonably coherent preliminary plan for a CSA funded CAT, which I've labeled the "b1" design or plan for NCAT, because it was essentially an elaboration of Saul and the CSA/CAAs faction's initial vision of NCAT as a CSA/CAA technical support center (the "b" vision depicted in Figure 5). The key components of this preliminary design/plan, abstracted from Love's interim planning committee report (dated Oct. 1, 1975), were as follows:

b1- Love Preliminary Plan for a CSA/CAA Technical Support CAT:
- b1i. Independent CAT to be incorporated by MERDI; MERDI to provide technical support through subcontract.
- b1ii. 21 member Board: 10 CAP reps., 1 CDC rep., 1 MERDI rep., 1 labor rep., 2 AT experts, and 6 others.
- b1iii. 65-75% of NCAT funding for grants; small core staff.
- b1iv. CAA endorsed grant proposals to be given preference by NCAT.
- b1v. Center would have 'field liaison staff' and would evolve a regional network of AT centers throughout country.
- b1vi. A national advisory "forum" would be created to bring together the constituencies for AT and advise the CAT.

The first four of these design components relate, respectively, to the four controversial design issues/themes debated at the Goddard meeting (design themes iv-vii;

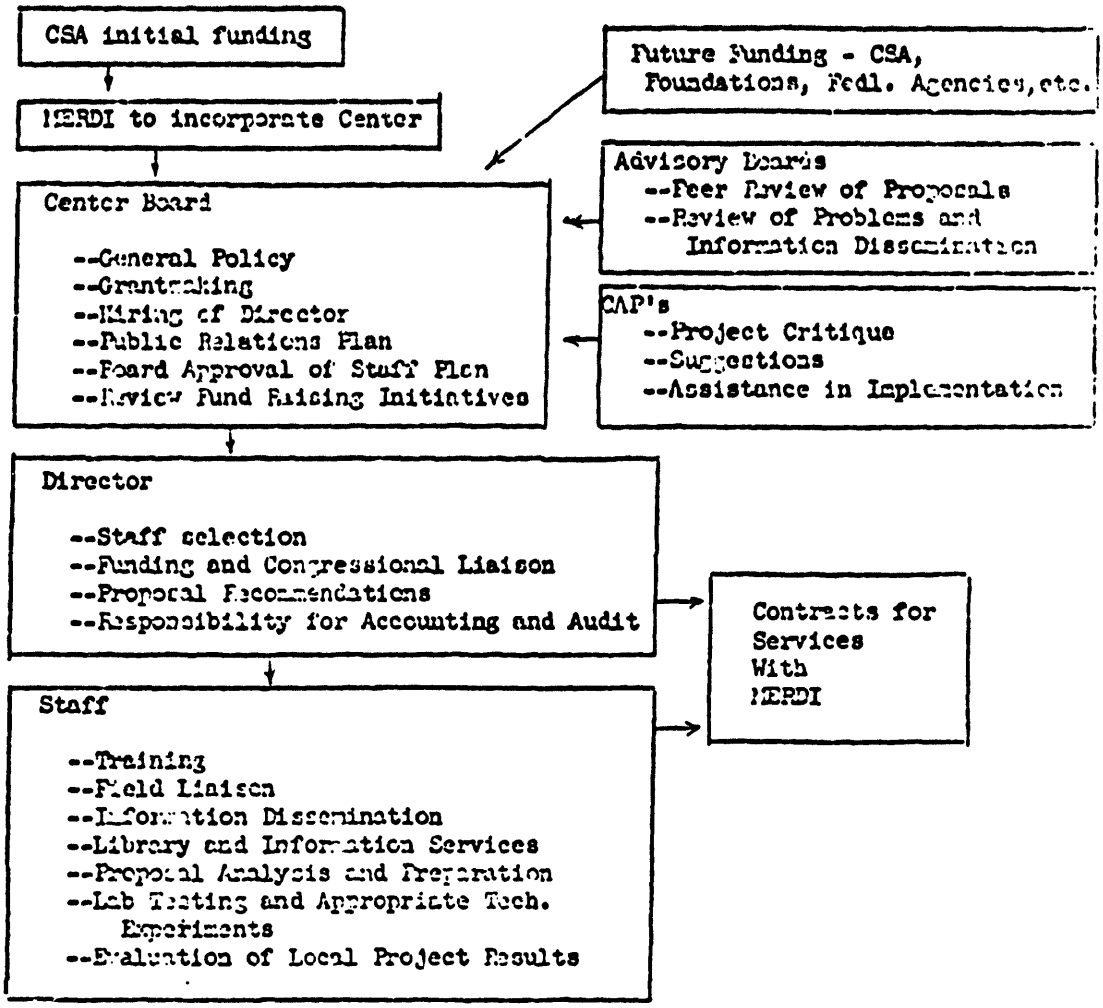


Figure 9: Diagram from Love Report Showing Components of CAT and How They Would Interact with One Another

I'll follow this convention of the first four design components corresponding to these branching design themes in my summaries of subsequent NCAT plans also) and correspond, respectively, to the "b", "c", "b" (or possibly "c") and "c" options under these controversial design themes. Thus, it can be seen by consulting the preference rankings in Figure 8, that while the Love plan emphasized the CSA /CAA vision (Figure 5) of

what NCAT should be, it was nevertheless a reasonable balanced compromise proposal in which each faction got (and also gave up) some of what it wanted. Thus, the plan reflected the CAAs first prefence on MERDI's relationship to the CAT (that is, ivb) and Funding Allocation (i.e. vib), but only their second choices on Board Composition (vc) and CAAs Role in Grants (viic).

The Grassroots AT/Community Activists factions got their second choice on all four controversial design issues. They also got the regional coordinators they had advocated (refered to by Love as "field liasison staff")(design theme viii, above) and a commitment that the Center would evolve and support a regional infrastucture and network (component blv). Also, Love, who was most sympathetic to and later became part of the Grassroots AT faction on the NCAT Board, included wording in his report which reflected this factions' perspective on what NCAT should become, emphasizing, for example, that the goal of AT was to enhance the "self-reliance" of low income people and communities (reflecting MacKenzie's rationale/vision for NCAT as depicted in Figure 6) and that the Center should be "constructed in such a way that it embodies the philosophical spirit inherent in appropriate technology (and) in line with this, the Center must emphasize that there is not a uniform technological solution to our problems, but that technologies must be tailored to specific regional characteristics (hence the need for a decentralized Center and regional infrastructure) (Love Report, p 9-10)."

Finally, Plunkett and the Progressive faction got the opportunity to incorporate/organize a CAT and assurance that it would provide the technical support for the CAT through a subcontract and would have a representative on its Board. As with the AT/Activist factions, however, it only got its second choice on all four controversial design issues. Still, the Love plan seemed to offer a reasonable potential for providing a basis for a compromise design agreement among the factions vying to create NCAT. As we'll see next, however, Plunkett and the Progressives opted to create and promote their own alternative plan in the second "life" of the NCAT process.

Life II: The Eccli/Cook Progressive Plan (Oct. '75-Feb. '76)

In the second life or stage in the evolution of NCAT, which lasted from October, 1975 through Feburary, 1976, Plunkett and the Organizing Committee seemed to be working towards a compromise plan for NCAT based on Love's Preliminary Report/Plan, but then Plunkett, angered by a letter from Tom Bender and the RAIN staff, calling on AT people to establish their own AT federation and his general frustration with the planning process, instead hired Eccli and Cook as consultants to develop an alternative progressive plan/proposal for NCAT.

IIA: The Denver Organizing Committee Meeting (Oct. 14-16, 1975)

On October 14-16, 1975 the Organizing Committee, which had been elected at Goddard, met with Jerry Plunkett in Denver (Saul and Love were also present) to see if an agreement could be worked out on how to proceed on NCAT in the aftermath of the stormy Goddard meeting. At that time Plunkett seemed resigned to giving up his "baby" or vision of NCAT and letting the Organizing Committee take the lead in organizing an independent NCAT. He and the Organizing Committee reached an agreement that an independent NCAT would be incorporated and that the initial grant from CSA for NCAT would go through the Montana SEOO, rather than MERDI. All that Plunkett wanted was the guarantee of a (large) subcontract to do technical support for NCAT, "because of the time and energy that he and MERDI had invested in promoting the idea of a CAT" (Love's Report on Denver Organizing Committee Meeting, October 20, 1975). In order to provide such a subcontract to MERDI, however, the Organizing Committee found they would have to spent more than 1/3 of the potential $3 million for central operations, so as Love reported, the committee began to shift away from the moderately decentralized, 1/3(central)-2/3(grants), allocation option towards the more centralized, "2/3-1/3", option (that is, from design alternative vib towards via).

It was also agreed at this meeting that Jim Parker of the Montana SEOO, who had

also been on the planning committee, would "take charge" of preparing the final funding proposal for CSA with help from Love and Plunkett.

IIB: RAIN Letter and AT Federation Idea (October 1, 1975)

Meanwhile, Tom Bender and the RAIN staff, partly in reaction to the Butte and Goddard planning meetings, sent out a letter in early October to grassroots AT people raising the concern that Federal agencies becoming involved in AT might centralized and coopt the goals of the AT movement and that AT groups might, therefore, want to "beat the top-down (Federal) organizations to the pass" by creating their own national AT "federation". As envisioned in this letter, the AT federation would be made up of, supported by, and serve the interests of grassroots AT and related groups across the country:

> ...The federation would be formed on cooperative principles. Member organizations would participate on a policy board...(where) each member organization would have an equal vote...There would be a small coordinating staff...But most of the work would be done by people working wherever they are...Basic support (for the Federation would be) via membership (fees and services)-not grants...(RAIN Letter, Oct. 1, 1975).

This AT federation idea, thus, reflected the following design theme:

ix. National AT federation: Create a national federation of AT and related groups to promote the interests and goals of the grassroots AT movement and community.

And, more specifically, the RAIN preliminary vision/design for such a federation, which I have labeled "c1" to indicate its resemblence to MacKenzie's earlier decentralized network vision for NCAT funding (design c; see Figures 6 and 7), included the following design elements:

c1- RAIN idea for a national AT ferderation/network:
- cli. Member organizations represented on policy making Board.
- clii. Small coordinating staff; most work done by member groups.
- cliii. Support from member group fees and services.

The RAIN letter drew a favorable response from the AT groups and individuals to whom it was sent, but it angered some of the members of the NCAT planning committee, who interpreted it as an attack on the NCAT planning process and an attempt by the grassroots AT faction to establish their own alternative to NCAT. Plunkett, in particular, when he saw a copy of the RAIN letter, wrote Bender an anger letter, saying:

> ...For me it was one of the saddest occasions of my life to read (your letter) ...let me say that I believe that you have every right to push for a Federation of Appropriate Technology groups (FAT)...(but) it is almost beyond words for me to see why it was necessary to transmit such a distorted, false, paranoid reading of the (NCAT) planning group...in order to justify FAT. The tone and content of this letter is simply a fabrication...(and) I believe you owe a personal apology to all the members of the planning committee...(Letter from Plunkett to Bender, October 21, 1975).

Eccli, moreover, sent a letter to all the groups that had received the RAIN letter, arguing that the RAIN letter had conveyed some "misconceptions" about the CAT to be funded by CSA and that CSA wasn't a centralized "top-down" bureaucracy but a network of local CAPs and the envisioned CAT would also be a decentralized operation.

The RAIN letter and the critical responses it drew from Plunkett and Eccli, thus, served to widen the already existing gap between the Progressive and Grassroots AT factions involved in the planning of NCAT, making some sort of coalition among them more difficult. This, in turn, probably strenghtened the CSA/CAAs faction's position in the power struggle over NCAT.

IIC: The Eccli/Cook Plan (Feburary 1976)

Plunkett already felt he had been treated badly in the planning process and the RAIN letter seemed to him to add insult to injury. So, in November, instead of handing over his CAT "baby" to the Organizing Committee and the Montana SEOO, as had apparently been agreed to at the Denver Organizing Committee in October, he made one last ditch effort to create the kind of progressive R, D&T CAT he had originally

envisioned by hiring Organizing Committee members Eccli and Cook as MERDI consultants and telling them to produce the best systematic plan/funding proposal for an NCAT that they could come up with. Plunkett was able to carry out this strategic maneuver, because technically, under the terms of the original planning grant to MERDI, MERDI was supposed to produce a CAT plan/funding proposal for CSA, and Plunkett still had some money left for this purpose.

Eccli and Cook then spent from November 1975 through part of Feburary 1976, developing an extensive plan and funding proposal for NCAT (over 100 pages) which represented a fleshing out of Plunkett's original R, D&T vision for NCAT along with some ideas from the planning meetings and some of Eccli and Cook's own ideas.

Besides Plunkett's original design theme of a low or appropriate technology R, D& T mechanism (i in Figure 4), Eccli and Cook's plan also reflected two new design themes. The first of these was need to bring together or "fuse" the various contituencies, factions, or what Eccli and Cook called the "sub-cultures", which had a common interest in promoting AT for the poor, including CAAs, low income communities, appropriate technologists, scientists and engineers, and environmentalists and other public interest groups. This idea of coalition building around AT had always been implicit in the NCAT planning process, but Eccli and Cook made it very explicit in their plan, realizing, perhaps, from the stormy planning process so far that this would not be easy task to accomplish. This design theme may be summarized as follows:

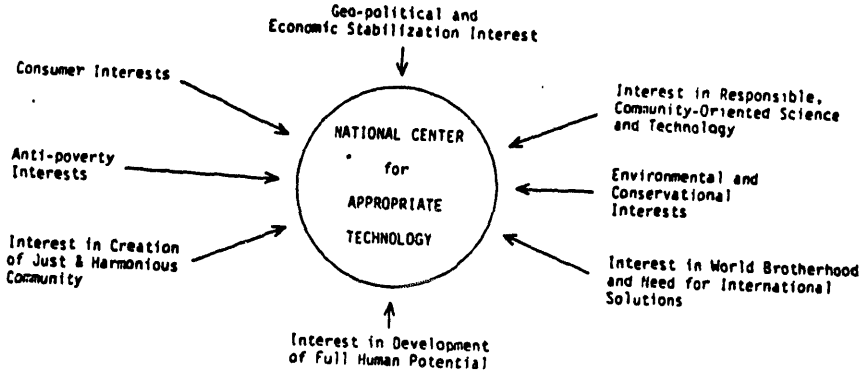
x. A new AT coalition: Bring together or fuse the potential constituencies and sub-cultures for AT for the poor into a new national coalition/movement.

Figure 10a shows a diagram from the plan illustrating this theme by depicting the various interests/constituencies that Eccli and Cook envisioned being brought together into a national movement through the Center.

The second new design theme embodied in the plan, picked up on the idea discussed

Figure 10: Diagram from the Eccli/Cook Proposal

A - --Convergent Interests Supporting the Center and Reinforcing the Impact of Appropriate Technology on Poverty



All of these groups have a natural community of interests and a healthy self-interest in creating a broad based coalition that moves our society toward a viable social and economic system in which the human needs are met. The Center concept aims at overcoming the isolation of the low income community by involving it in a socio-technological movement that draws these otherwise separate groups together in a mutually reinforcing way. This convergence of effort greatly enhances the probability of success by the Center transforming those conditions creating impoverishment.

B -

I. Concept Development

-problem definition
-data gathering
-identify gaps
-develop a comprehensive solution
-strategy

II. Proof of Concept

-development of prototype solutions
-pretest hardware, techniques, & social processes

Consulting Services

III. First Generation Demonstration

-test marriage of technical solution & community in one locale

Develop Training Packages

IV. Second Generation Demonstration

-generalize results to other communities and regions
-full marriage between appropriate solution and community

Advocacy with Federal, State, and Regional Agencies

V. Guidance During Implementation

-full societal application

in the planning meetings that the organizational structure of the Center should reflect the values and spirit of AT and advocated a "horizontal organizational structure/process" for NCAT. As Eccli and Cook wrote in their proposal:

> It is critical for the success of the Center that its internal style of organization put into practice the integrative, holistic, and community oriented philosophy embodied in the very concept of appropriate technology. The National Center must discover and apply to itself appropriate methods of organization and decision making...Rather (than a top down or functional grouping pattern) the Center is to follow a horizontal model in which the directors function as catalysts of consensus within the whole organization (and) ...maintain an open ended consultative attitude toward decisions about specific project priorities and methods...This horizontal organizational process is designed to maximize the diversity, and, therefore, the comprehensivity of inputs into the appropriate technology design and development process... (Eccli and Cook proposal, p III-23, 4, emphasis added).

This horizontal organizational theme can, thus, be summarized as follows:

xi. Horizontal organizational model/process: Create an "appropriate" horizontal organizational structure in which leaders promote participation, flexibility and consensus among staff.

The specific design components of the Eccli/Cook plan, which grew out of these three design themes (i, x, xi) are summarized below; I've labeled this plan/design as "a1" to indicate it grew out of and expanded upon Plunkett's original vision for NCAT (a in Figure 4):

a1- Eccli/Cook Progressive Plan for NCAT:
- a1i. MERDI runs interdisciplinary research group through subcontract.
- a1ii. Balanced Board representing different constituencies/factions for AT.
- a1iii. Centralized 60/40 allocation.
- a1iv. 75% of grants to CAA related projects.
- a1v. Systematic five stage AT design and development process/methodology
  - a1va. Interdisciplinary research core group heart of Center.
  - a1vb. Grants program tied to D&D process.
- a1vi. Advisory/regional infrastructure promoting coalition building
  - a1via. Strong Advisory Forum representing constituencies
  - a1vib. Nine bioregional extension workers
  - a1vic. Evolving bioregional infrastructure and pilot NW regional center.

alvii. Horizontal organizational structure
  alviia. NCAT staff as organic, mutually supportive "community"
  alviib. Participatory decision making
  alviic. Flexible ad hoc interdisciplinary problem solving teams
  alviid. Flattening of staff salary differentials

alviii. Technological intervention and resource mobilization

alix. Extensive communications component
  alixa. AT library/hotline
  alixb. multimedia manuals, reports, films, magazine, etc.
  alixc. national/regional conferences and design competitions

As this extensive summary suggests, the Eccli/Cook plan constituted the first full-fledged design/plan for NCAT. Following my convention for summarizing NCAT designs, the first four design elements listed above relate to the four controversial design issues raised at Goddard (themes iv-vii). On the MERDI issue, the Eccli/Cook plan gave MERDI a subcontract to provide the interdisciplinary research core group, which was the heart of their vision for NCAT. On the Board composition issue, they deviated drastically from the Board composition agreed to at Goddard, proposing instead a "balanced board" (option va) which would bring together the various constituencies/sub-cultures for AT for the poor. The Board they proposed would have four representatives from each of four catagories: (i)people from science, industry and government; (ii) CAP organizations; (iii) Non-CAP low income and community development groups; and (iv) appropriate technology and social ecology people. The CSA/CAA faction, as we'll see, were outraged by this proposed composition and as a result took drastic action against the plan (the plan further diluted the power of CAPs on the Board by specifying that the four CAPs be selected by the Advisory Forum from the Forum, as descibed below). On the Funding allocation issue, the plan proposed a centralized allocation in which 60% of the expected $3million would go for central operations and only 40% would go out in grants. And, on the CAA involvement in grants, the plan specified that 75% of the grants would either be sponsored or endorsed by CAAs. Thus, the Eccli/Cook plan reflected the Progressive faction's preference on Board composi-

tion and funding allocation (centralization) and a compromise position between the Progressive and CSA/CAA faction's preferences on MERDI's role and CAA involvement in grants (see preference rankings in Figure 8).

At the heart of the Eccli/Cook plan was the five stage AT design and development process and method (a1v) depicted in the diagram in Figure 10b (an elaboration of Plunkett's R,D&T mechanism theme #i) which NCAT was suppose to use in designing, developing and transfering ATs to low income communities. The dozen person interdisciplinary research group run by MERDI was suppose to support and facilitate this process and the grants made by NCAT were also to be tied to and made in a way that supported this process.

Also, the plan emphasized constituency coalition building (design theme x) through a strong Advisory forum and bioregional infrastructure (a1vi). The advisory forum was to have 30 members, 10 of which would be regional CAP representatives and the rest would be from other constituencies. The advisory forum would select from its CAP representatives the four which would sit on the NCAT Board. The plan also called for 9 regional extension workers who would begin to evolve bioregional infrastructures and eventually regional AT centers across the country. The Center at Butte was also intended to function as a pilot regional center for the Northwest region of the country.

In accordance with Eccli and Cook's horizontal organizational design theme (xi), NCAT was to have a flexible, horizontal organizational structure (a1vii), in which the directors and staff functioned as a supportive AT "community" with participatory decision making, flexible ad hoc problem solving and design teams and a relatively small salary differential among the staff. Figure 11 shows the organizational roles that Eccli and Cook envisioned within this horizontal staff structure (note that while this figure resembles a traditional hiearchical organizational chart, Eccli and Cook didn't intend for NCAT to operate that way- hiearchical authority was only to be used

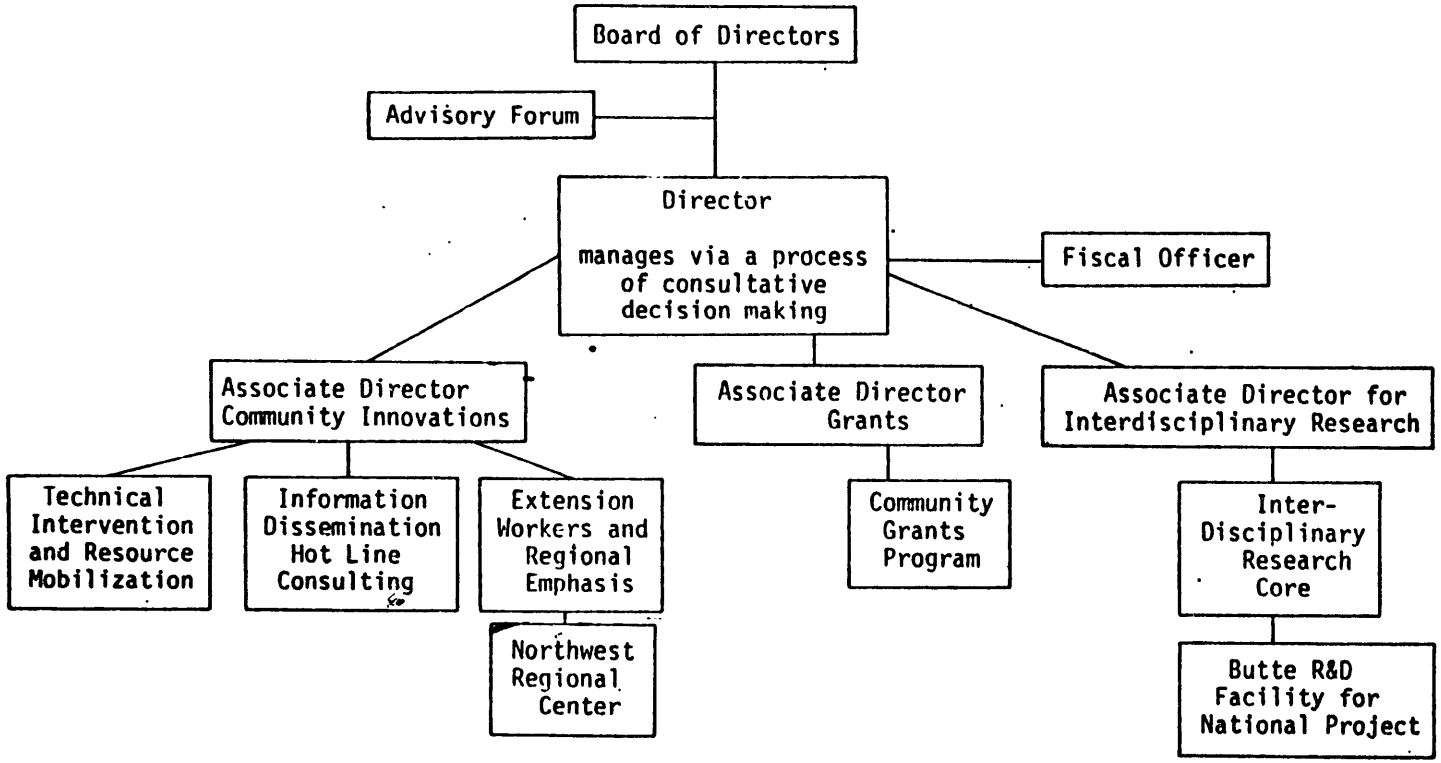


Figure 11: Chart of Staff Roles Envisioned in Eccli and Cook Plan's Horizontal Organizational Structure for NCAT (From Eccli/Cook Proposal, p I-18)

when participatory decision making failed to yield a consensus).

The plan also proposed that NCAT carry out "technological intervention" aimed at removing policy and institutional barriers to the development and utilization of AT by the poor and that it "mobilize resources" and funding for AT for the poor from private foundations and Federal agencies (in addition to CSA)(a lviii).

Lastly, the Eccli/Cook plan proposed an extensive information and communications component, which was to include: (a) an AT library and hotline, (b) a multimedia production capability for producing films, manuals, reports and a newsletter/magazine about community technology, and (c) a conference organizing capability for organizing national and regional AT conferences and AT design competitions (a lix).

All in all, the Eccli/Cook plan represented quite an innovative and ambitious progressive vision/proposal for NCAT. There were some problems with integration in their design- it wasn't clear in their document how their three main goals/processes of systematic design, development and transfer; coalition building; and horizontal organization and decision making would fit and work together at NCAT- but this was perhaps inevitable in the first-cut full-fledged design of something as multi-dimensional as NCAT (this problem of integration indeed plagued NCAT's actual operations as we will see later). Moreover, the partnership of Eccli and Cook, to which Eccli brought the technical expertise and ties to the altenative energy community (through editing Alternative Sources of Energy) and Cook brought his community development experience and ties to the CAP world, represented the first real intellectual marriage to emerge out of the NCAT planning process. As with Plunkett before them, both Eccli and Cook hoped to guide their embryonic plan (their "baby") to implementation- Eccli, in particular, had hopes of becoming the first staff director of NCAT- and this might have indeed occured if the NCAT planning process had been a cooperative and trusting one, but, as we have seen, this was not the case, and Eccli and Cook's grand scheme was "shot down" and taken apart by the CSA/CAA faction, who were

outraged by Eccli and Cook's "balanced board" composition.

Both Eccli and Cook realized that their "balanced board" composition would cause "a big stink", as Cook later put it, but they felt it was much more compatible with their vision of NCAT as a coalition/movement builder among different constituencies. As Cook later recalled at the last planning committee meeting:

> ...We knew it would cause a big stink, and it caused a big stink, and here we are...(but) we felt we had fought the battle of MERDI in Vermont (Goddard meeting) and Butte, and now were getting around to fighting the battle of NCAT and its relationship to CSA...We felt it (would be) an inherent contradiction, if we are talking about a certain relationship (among constituencies) in the community and we don't preserve that relationship at the Board level (Washington Planning Committee Minutes, April 3-4, 1976, p 10, 40).

To which Eccli added:

> ...We were coming from a position where there had been quite a bit of debate on board structure and quite a bit of dissatisfaction on the part of everybody. Ceccil and I had been spending many weeks on that issue. We felt that the best way to bring up the question was to bring up an alternate structure to the Planning Committee meeting. Primary in my mind was the issue of a coalition attempt, a co-mingling, or merging, of several different sub-cultures (Washington Planning Minutes, p 40).

The CSA/CAA people, however, didn't take Eccli/Cook's alternate proposal in this spirit, but saw it as a violation of the agreement on Board composition they had gotten at Goddard. Dick Saul, in particular, was infuriated by Eccli and Cook's proposed composition, telling Olkowski and others that it was "totally unacceptable", that it "completely destroyed the board we decided on in Vermont" and that "CSA would never fund it that way" (Washington Planning Minutes, p 40).

The CSA/CAA faction didn't just object to the proposed Board composition, although this was the focal point of their anger, but to Eccli and Cook's entire underlying philosophy of creating a national coalition/movement in which CAA were only one constituency rather than the dominate force. This is made clear by Saul's comments on a copy of the Eccli/Cook which he marked up and made changes in (Saul gave this marked-

up copy to me in March of 1976). Besides completely crossing out the proposed Board and advisory forum structures with large Xs, Saul wrote over the diagram of potential constituencies for NCAT (see Figure 10a) "a little far out" and in the descriptions of the NCAT constituencies he replaced "community organizers" with "CAAs" and crossing out references to "low income community" and "low income citizens" (Saul Mark-up of Eccli/Cook Proposal, p I-3, 4, 7 and II-3-5). Saul and the CSA/CAA faction, thus, wanted themselves to be the sole representatives of the poor in the NCAT "coalition". Saul also indicated that he wanted a strong Board controling NCAT, by replacing decisions to be made by staff, such as on grants, organization and evaluation, with the words "Board decision" or "Board policy" several places in his mark-up (Saul Mark-up, p II-11, 12, III-23, 24, III-35, etc.). Hence, rather than wanting NCAT to be a broad AT coalition with a strong, independent staff, Saul and the CSA/CAA faction, in line with Saul's original vision of NCAT as a CSA/CAA technical support center (see Figure 5), wanted NCAT to be controled by a strong Board of Directors, dominated by CAA representatives.

The other faction in the NCAT process at this time, the Grassroots AT/Community Activist people, had little time to react to the Eccli/Cook proposal because the CSA/CAA faction acted swiftly to dismantle it and reassemble one more to their liking, but judging from Bender's largely favorable letter which said "the proposal generally looks great" although overly centralized and "the revision in the Board of directors composition seems excellent"(Bender letter on Eccli/Cook Proposal, Mar. 10, 1976), there might have be much in this plan that both the Progressives and the AT/Activist factions could have agreed on in this plan and it might have been the basis for a coalition of these groups against the CSA/CAA faction if there had not already been so much suspicion and hostility between them.

Whereas, to use Cook's battle metaphor, the first life of the NCAT revolved around the "battle or MERDI" (theme iv), in its second life, through the Eccli/Cook plan, the Progressives fired the first volley in the "battle or CSA/CAAs" (themes v and vii), a volley which we will see was swiftly answered by the CSA/CAA faction in NCAT's third life.

Life III: The Initial NCAT Board and Preliminary Funding Proposal (Mar.-Apr. '76)

The Progressives in the NCAT planning process, led by Plunkett and Eccli and Cook and later Hershey, despite the fact that they had Mansfield's clot behind them, were not particularly skilled in the art of political infighting. They were driven, rather, by what they saw as a "systematic" and "rational" vision for NCAT as a R,D&T "show place" for small technology. The CSA/CAA people, on the other hand, had had to perfect their political skills just to survive in the intense political infighting that characterized the War on Poverty and its aftermath. Thus, when Plunkett, Eccli and Cook sent out their extensive progressive proposal for NCAT to the planning committee in Feburary of 1976 and the CSA/CAA faction became concerned that they might be losing control of the planning process, they moved quickly, led by Saul and Maggiore, to reestablish their influence and control over the process.

IIIA: The Butte Organizing Committee Meeting and Incorporation of NCAT (Mar. 14-15, 1976)

The political strategy that Saul and Maggiore used to regain control over the planning process was a masterstroke in what William Riker calls "heresthetics" or "the art of political manipulation" (Riker, 1986;as discussed at the end of Chapter 1). After Eccli and Cook had developed and mailed out their plan, which Saul and Maggiore found "totally unacceptable", they moved to have Eccli and Cook removed from the Organizing Committee, arguing that it was a "conflict of interest" for Eccli and Cook to be on the Organizing Committee and serve as consultants for MERDI at the same time. This "conflict of interest" argument must be seen, I believe, as a clever and convenient rationale for an essentially political act, because all the members of the planning/organizing committee were technically advisors and consultants to MERDI under the original planning grant and because the "conflict of interest" issue wasn't raised until after Eccli and Cook had distributed the "unacceptable" proposal. The stategy worked, however, with the rest of the Organizing Committee going along with Saul and Maggiore and

voting Eccli and Cook off the Committee (of the other members of the Committee, Mescunas and Navarro, though somewhat independent, were part of the CSA/CAA faction and thus could be expected to go along with this move; and Olkowski, who later admited to be "naive" about the politics of the planning process, accepted the "conflict of interest" rationale and went along with the others). This had the double positive effect, from the CSA/CAA faction's point of view, of, first, removing Eccli and Cook, the current leaders of the Progressive faction from the decision making process, and, second, shifting the balance of power on the Organizing Committee from a roughly even split between the CSA/CAA and other factions to a 3/4 majority for the CSA/CAA faction (with the other member Olkowski's sympathies split between the progressives and the grassroot AT factions and her being "politically naive" besides).

Having gained control of the Organizing Committee, Maggiore and the CSA/CAA faction convened a meeting of the reduced organizing committee in Butte on March 14-15, 1976 and adopted the following measures:

* First, the Eccli/Cook proposal sent out in Feburary was not to be considered a "funding proposal" but just one possible "model" for NCAT.
* Second, to file Articles of Incorporation for NCAT with Maggiore, Navarro, Mescunas and Olkowski as the incorporators and initial Board of Directors.
* Third, to write a new funding proposal more along the lines of the Love plan but with some aspects of the Eccli/Cook plan also included.
* Fourth, to convene a last meeting of the planning committee in D.C. in early April to review and endorse the Organizing Committee's new funding proposal (Memorandum from Newman (Director of the Montana SEOO), Maggiore, Navarro, Mecunas, Olkowski to Planning Committee, March 25, 1976)

By taking these actions, the CSA/CAA faction put itself back in, seemingly, firm control of the planning process. Thus, while the Progressives had fired the first volley, in what Cook called "the battle of the CSA/CAA Relationship to NCAT", the CSA/CAA faction quickly retaliated and recaptured the process without scarcely "firing a shot".

IIIB: The Last Planning Meeting and Compromise Funding Proposal, Washington, D.C. (April 3-5, 1976)

The third and final meeting of the NCAT planning committee in Washington, D.C. on April 3-4, 1976 might have been expected to be the third round in the "battle of NCAT's CSA/CAA relationships", given the division on the committee and its stormy first two meetings, but it actually turned out to be fairly tame compared with the Butte and Goddard meetings, with the planning committee raising some concerns but, ultimately, going along with what the reduced Organizing Committee and incorporators of NCAT wanted, except in one important respect. The meeting was chaired by Maggiore and dominated by the members of the Organizing Committee, who led the planning committee through the new funding proposal they had put together from pieces of the Love and Eccli/Cook plans and their own compromise plan for Board composition. The Organizing Committee, which was also now the initial Board for NCAT, also recommended that three additional Board members (two to replace Eccli and Cook and one additional one) be elected from the planning committee. This would almost certainly have insured the CSA/CAA faction continued control of the NCAT Board (with a CSA/CAA majority on the planning committee, they were almost certain of electing at least one and perhaps two additional CSA/CAA Board members). Hershey, however, made a motion, which the planning committee supported, to elect six new Board members instead of just three. Since, there were only a limited number of vocal CSA/CAA leaders on the planning committee (five or six including Maggiore, Mescunas and Navarro), this resulted in a number of members of non CSA/CAA factions getting elected to the Board. Maggiore also tried to keep Eccli and Cook from being eligible or voting for the new Board members, because of "conflict of interest"; but Cook resigned as a MERDI consultant and was ruled eligible and then elected to the Board by the committee, in what must be seen as a mild protest by the committee over what the Organizing Committee had done. The process for electing the new Board members was the same

as at Goddard, with each member of the planning committee listing six members, and the six who were listed the most often were elected to the Board (see D.C. Planning Committee Minutes, April 3-4, 1976, p 42-54, for committee discussion about electing new Board members). The additional Board members elected besides Cook were:

* Moses Freeman, the black director of a Florida CAP.

* John Brown, the black director of a Connecticut CAP.

*Sam Love, the environmentalist and grassroots AT supporter, who had writen the interim planning committee report/plan for NCAT.

* Harriet Barlow, a community action and public interest lobbyist in D.C., who had chaired the first and second planning meetings and been an advocate for a decentralized NCAT.

* Jack Hershey, an environmental and management consultant, supportive of the progressives' vision for NCAT.

Tom Bender of RAIN Magazine, who along with Travis Price had been the leader of the Grassroots AT faction on the committee, received the seventh most votes and was named as an alternate for the Board, should a vacancy arise. After the meeting, Bender wrote a letter complaining that the initial NCAT Board was too dominated by the CSA/CAA community/faction, with 70% of its members affiliated with this faction (including Freeman, Brown, Maggiore, Cook, Mescunas, Barlow and Navarro; Bender letter of April 13, 1976). Bender's count, however, over estimated the size of the CSA/CAA faction, by looking at members' past affiliations, rather than where their current sympathies lay. In actuality the initial Board was equally divided between CSA/CAA and non CSA/CAA factions, with the strength of the four factions (with the election of Barlow the Community Activists faction began to emerge and become somewhat distinctive from the Grassroots AT faction) roughly as follows:

* CSA/CAA Votes: 5 (Maggiore, Mescunas, Navarro, Brown, Freeman)

* Progressive Votes: 2 (Hershey, 1/2 Olkowski, 1/2 Cook)

* Grassoots AT: 2 (Love, 1/2 Olkowski, 1/2 Cook)

* Community Activists: 1 (Barlow)

This equal division of strength would become significant, as we will see, in NCAT's fourth life.

By this time, Plunkett, the originator of the NCAT idea, had become throughly alienated with the planning process. As Maggiore and the Organizing Committee led the planning committee through its new draft funding proposal pieced together from parts of Love's and Eccli/Cook's plans, he sat passively in the back of the room for part of the meeting like a martyr or ghost, which the committee hadn't yet managed to bury, and, when someone asked if he was a voting member of the committee, he replied angrily from the back of the room, "I do not choose to be on the Planning Committee! I want no connection with the Planning Committee! That should be very clear (D.C. Planning Meeting Minutes, p 52)."

The majority of the planning committee, however, was ready to go along with the Organizing Committee's new draft funding proposal for the sake of getting something to CSA, which it (and Saul in particular) would be willing to fund. The main features of this new draft proposal, which the committee discussed and ended up endorsing, can be summarized as follows; I've labeled this design/plan as "ab1" to indicate it was a composite and compromise of Love's initial plan, "b1", which emphasized the CSA/CAA vision for NCAT and Eccli/Cook's subsequent plan, "a1", which stressed the progressives' vision for NCAT:

ab1- Composite Organizing Committee Preliminary Funding Proposal for NCAT:
- abli. MERDI runs interdisciplinary technical support group (as in a1).
- ablii. Compromise 27 member Board with 10 CAP representatives.
- abliii. More centralized funding allocation (than either b1 or a1): 2/3 central, 1/3 grants split.
- abliv. 75% of grants CAA related (as in a1)

ablv. The design, development and transfer (D,D&T) process/method present but not as emphasized as in a1, relegated to appendices.
ablvi. Coalition building, the advisory forum and regional infrastructure also less emphasized than in a1.
ablvii. A larger, more traditionally (i.e. hiearchically) organized staff and much less emphasis on appropriate or horizontal organization than in a1.
ablviii. Specific staff positions for technological interventionist and resource mobilizer included (a1 had only listed these as general functions).
ablix. Extensive communications/information component as in a1.

While there were echos of the debates at Goddard over the first four elements of the proposal, which deal with the four controversial design issues raised at Goddard (branching themes vi-vii), and some members, particularly Price, Bender and Barlow, objected to the relatively centralized and traditional nature of other elements of the plan, the total committee ended up endorsing this plan with only minor changes.

On the four controversial design issues that had dominated the Goddard meeting, after a lot of discussion, the committee ended up basically endorsing the Organizing Committee's recommendation on each. Thus, on the issue of MERDI's relationship to NCAT,(vi) it was agreed that MERDI would get 22% of the funding in a subcontract to run an interdisciplinary technical support group for NCAT after Maggiore and Navarro made clear that this was part of the "deal" that had been cut with Plunkett to allow the Organizing Committee to incorporate an independent NCAT. This occured despite protest by Price that such centralized R&D wasn't needed or "appropriate" for AT and was nothing but "welfare" for MERDI and efforts by Price, Bender, MacKenzie and Barlow to not specified MERDI by name in the proposal and to reduce the amount of the technical support subcontract (D.C. Planning Meeting Minutes).

On the issue of Board composition (v), the Organizing Committee proposed and, after much discussion, the planning committee eventually went along with a compromise composition in between the 21 member "50-50" Board proposed at the Goddard meeting and the 16 member "balanced" Board proposed by Eccli and Cook. This compromise

plan called for a 27 member Board composed as follows:

1. Ten regional CAP representatives;
2. Seven representatives of the following constituencies/disciplines: farmworkers, CDCs, native Americans, the elderly, consumers and ATers and technical experts;
3. Ten members representative of the following constituencies: universities, inventors, artist/humanists, foundations and corporations, the sciences, labor, government and small business.

On the issue of the centralization of the funding allocated for NCAT (vi), the Organizing Committee proposed an even larger central staff and budget than in the Eccli/Cook proposal, in which 2/3's of the $3million for NCAT would go for central operations and only 1/3 would go for grants, and the planning committee went along with this, despite strong protests by Price, Bender and Barlow that more should be spent on g ·ants and less on central operations, especially the technical support subcontract going to MERDI.

And, finally, on the issue of the role of CAAs in NCAT grants, the committee agreed to go along with the wording of the Eccli/Cook and Organizing Committee's proposals that 75% of the NCAT grants would go to "CAA related projects" (i.e. those sponsored or endorsed by CAAs), despite protests by Bender and Price that this violated the understanding of the Goddard meeting that grants would be reviewed by CAAs but could go to any appropriate group.

Hence, the composite preliminary proposal prepared by the Organizing Committee and endorsed by the planning committee, reflected the following options on the four pivotal design issues/themes: ivb on MERDI relationship; vc on Board composition (the proposed structure above looks more balanced than 50-50 but later the Board decided that the initial Board would fill the third category slots for the first year, so the Board ended up being roughly 50-50); via on the allocation of NCAT funding; and a compromise between viib and viic on CAA involvement in grants. And, by consulting

the preference rankings in Figure 8 again, we can see that, not surprisingly, the CSA/CAA faction made out best, preference wise (with rankings of 1, 2, 2, and 1.5, respectively, "1.5" indicating a compromise between a 1st and 2nd choice); the Progressive faction made out next best (with rankings of 2, 2, 1, and 2.5, respectively) and the Grassroots AT/Community Activist factions made out worst (with rankings of 2, 2, 3, and 2.5, respectively).

Similarly, as with the proposal's positions on the four pivotal design issues, its other design elements (abiv-ablix) also represented compromises or composites of the CSA/CAAs and the Progressive factions' visions for NCAT. Hence, the systematic design and development process/method (which the progressives advocated) was included but in a deemphasized form, despite criticism from Price that it represented "a whole technologist's viewpoint of technological development" and was "ass-backward" from an AT point of view because it was product rather than need-oriented, and from Bender that it was too "linear" and one-dimensional (D.C. Planning Meeting Minutes, p 14, 23). Also, the proposal deemphasized coalition-building, the advisory forum, and regional infrastructure and decentralization (things that the progressives, grassroots AT and community activist factions wanted) in favor of a strong CAA dominated if not controled Board (what the CSA/CAA faction wanted). And, the proposal called for a large central staff (what the Progressives wanted), organized in a fairly traditional (i.e. hiearchical)way (what the CSA/CAA faction wanted), despite protests from the Grassroots AT/Community Activists factions and some progressives, especially Barlow, Love, Price and Bender, that this wasn't in the spirit of AT and that the salary differences shown in the proposed budget were too large (D.C. Planning Meeting Minutes, p 57-62, Barlow and Price proposed a salary differential no more than 2 to 1 for NCAT, but this wasn't agreed to by the full planning committee).

Hence, at the end of the third life or stage in the planning of NCAT, with Maggiore as the acting president/chairman of the NCAT Board and a favorable draft funding proposal, the CSA/CAA faction appeared to be back in firm control, but, as we'll see in the fourth life of NCAT, this was not actually the case.

Life IV: The Hershey Proposal and Its Rejection By CSA (Apr.-July, '76)

After the last planning committee meeting in early April, the CSA/CAA faction seemed to be in control of the initial NCAT Board and moving smoothly towards submiting for funding the composite proposal they had put together and gotten the planning committee to endorse, but, then, during a Board meeting on April 23, Angel Rivera, Dick Saul's boss at CSA, droped a 'bomb', telling the Board he felt that AT grants should be made by CSA not NCAT. This outraged the non-CAA members of the Board and led to the selection of Jack Hershey, a progressive consultant, as the president/chairman of the Board on a coin-toss, thus, giving the Progressives another chance to put together a plan/proposal that reflected their priorities.

IVA: The April 21-23 NCAT Board Meeting and Hershey Funding Proposal (April-May, '76)

On April 21-23, the initial NCAT Board met at the CSA building in Washington, D.C., with Maggiore as acting chairman, to review and hopefully finalize their funding proposal to CSA. It was on the final day of this meeting, just before the Board was scheduled to elect its permanent officers, that Angel Rivera met with Board members and droped his 'bomb', telling them:

> ...You should be thinking in terms of the possibility that you won't be funding (grants) as an institute. Think in those terms...Martinez (the new CSA director) wants a handle on whatever he runs...we (CSA) will (probably) fund the grants regionally (through our regional offices). The Center (will be) the back-up thing for energy...The regional director is a brother. We have to think in terms of the turf...You may have problems with it (but) that's the way it's going to be...(NCAT Board Meeting Minutes, April 21-23, 1976, p32-35).

The non-CAA were shocked and felt "betrayed" by this revelation. Cook said he was "stunned". Eccli, who was now working as a consultant to the Board on the proposal, added, "We can't have a really great center (without grants)...What (I'm) feeling, (is) here we are, working pretty hard, and just getting somewhere, and now we've got another car that has been hitched on behind the appropriate technology engine."

And, Olkowski, who had mainly gone alone with the CSA/CAA faction on the Organizing Committee and initial Board up to this point, was the most angry, protesting that "perhaps the appropriate technologists who criticized the Center for being stacked for CSA were right" and that "we're not talking about AT- we're just talking about a CSA project!"(April 21-23 Board Minutes, p35, 37). Even, the CAA members of the Board, despite their efforts to put the best face they could on Rivera's bombshell by telling the rest of the Board that they could negotiate the grants issue and Rivera would probably "back-off" his insistence that grants go through CSA, were also taken aback by Rivera's statement.

Given this climate of anger and sense of having been betrayed by CSA among the non-CAA Board members, its not surprising that when the Board voted for permanent officers following the meeting with Rivera, the non-CAA members banded together behind Jack Hershey for president/chairman of the Board forcing a five-five tie vote with Maggiore, which was broken with a coin-flip that went in Hershey's favor (the vote was secret, but I assume the CSA/CAA faction (Maggiore, Navarro, Mescunas, Brown, Freeman) lined-up behind Maggiore and the rest of the Board voted for Hershey). The rest of the officers elected, however, were CAA people, with Brown becoming vice-president, Maggiore becoming secretary and Freeman becoming treasurer.

After becoming president of the NCAT Board, a transformation took place in Hershey. Up until that time, he had often played the role of a mediator and compromiser on the planning committee and initial Board, which was one of the reasons the non-CAA Board members banded behind him in making their coup. After his most narrow election as president, however, he seemed to feel that the NCAT was now his "baby" and over the next two months he put together his own funding proposal for NCAT, with only marginal input from the rest of the Board, and submited it to CSA in June, 1976. It's unclear that the CSA/CAA faction would have tolerated a non-CAA president/chairman of NCAT in any case, but Hershey's independent and free-wheeling style as presi-

dent further antagonized this group and helped contribute to his downfall.

The funding proposal Hershey developed was essentially an elaboration of the progressive Eccli/Cook plan, in which Hershey sought to better integrate the three central design features/components of the Eccli/Cook plan, that is, (i) the design, development and transfer process (design theme i), (ii) the building of coalitions among potential contituencies (design theme x), and (iii) an innovative horizontal organizational structure (design theme xi), through what he called a "management-by-objectives (MBO) system through which the various components of the NCAT program will be integrated" (Hershey Proposal, p 7). Hence, Hershey sought to bring together and subordinate the main design themes and components of the Eccli/Cook plan under his own new design theme of "integration through management-by-objectives":

xii. Integration through management-by-objectives: Design a management-by-objectives system to integrate the other design features and components of NCAT.

Figure 12 shows a diagram from Hershey's proposal illustrating how he envisioned this management-by-objectives system/process (cirle in diagram) working to bring together NCAT components ("services") with NCAT's contituencies ("participation") and Figure 13 shows a more detailed chart from the proposal that depicted Hershey's elaborate scheme for relating the stages of the design, development and transfer process to both NCAT's components and its contituencies.

The main elements of the Hershey proposal (as compared particularly with the Eccli/Cook plan out of which it grew) may be summarized as follows (I've labeled this plan "a2" to indicate it was an elaboration of the Eccli/Cook plan, "a1", which, in turn, was an elaboration of Plunkett's original vision, "a"):

a2- Hershey's Progressive Funding Proposal for NCAT:
- a2i. MERDI runs Interdisciplinary Technical Support Group (as in a1)
- a2ii. 17-27 member Board, composition unspecified
- a2iii. Centralized funding allocation: 2/3 central, 1/3 grants.
- a2iv. CAA's role in grants unspecified (review only implied).

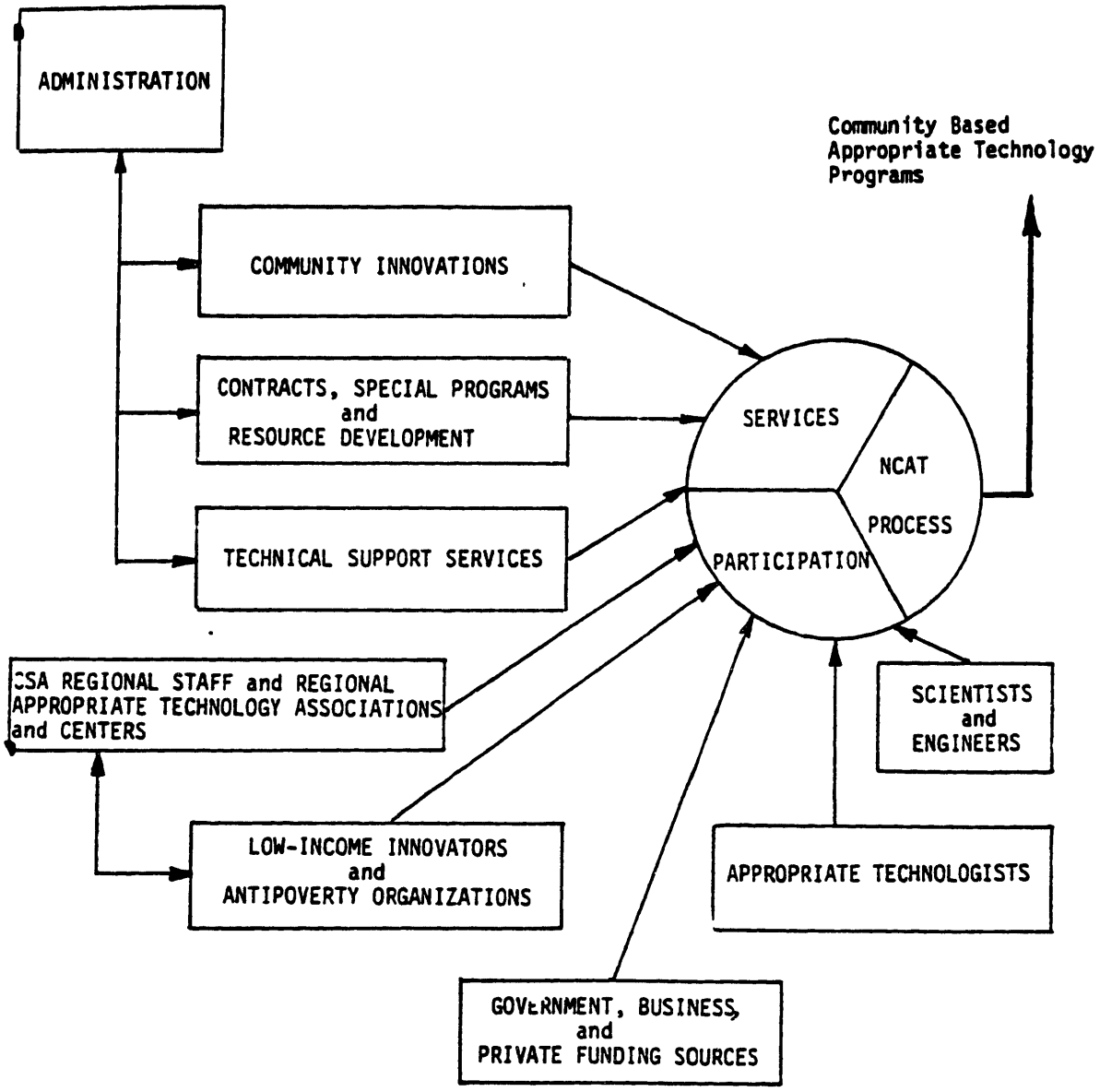


Figure 12: Diagram from Hershey Proposal Illustrating the Integration of NCAT's Components and Contituencies Through Its Management-By-Objectives Process

a2v. Integration of components/activities through management-by-objectives system.
- a2va. MERDI interdisciplinary 'technical support' group as in a1.
- a2vb. Grants and coalition building tied to D,D,&T process.

Figure 13: Matrix from Hershey Proposal Showing Relationship Between Design Process Steps and Constituency Groups

DESIGN AND DEVELOPMENT PROCESS STEPS	NCAT CONSTITUENCIES			
	LOW-INCOME INNOVATORS AND ANTI-POVERTY ORGANIZATIONS	APPROPRIATE TECHNOLOGIST/ SCIENTISTS AND ENGINEERS	CSA REGIONAL STAFF AND REGIONAL APPROPRIATE TECHNOLOGY ASSOCIATIONS AND CENTERS	GOVERNMENT, BUSINESS AND PRIVATE FUNDING SOURCES
	Input by all constituencies as design and development process unfolds. NCAT administration facilitates the formation and activities of intrastaff and staff-constituency groupings. Groups are drawn from local, state, and national spheres of activity. Emphasis on small groups to allow full participation by all members.			
1 Facilitate Participation by Constituencies - task forces and problem solving teams - hotline and reference system form basis of communications center - regional associations and regional research centers - multimedia and educational materials development	provide contacts with local resources and experience in a given problem area contacts: local		contacts: regional, local	contacts: regional, local, national
	All constituencies bring local organizational and other appropriate technology experience to a focus in regional associations and research efforts that make maximum utilization of available resources			
2. Concept Development - problem definition, data gathering and identification of gaps in information or experience - develop a comprehensive solution strategy	help define needs, make input of experience with community-based contracts for research, development.	needs; community-based contracts. input. help develop programs that meet regionally specific needs	needs, community-based contracts; input help develop programs that meet regionally specific needs	needs; input; help transmit educational materials to a wide audience; provide funds for wide-scale distribution
	define needs, draw forth local experience and resources, make local leaders aware of problems and opportunities, explore options and impacts of policy decisions	needs, experience; develop specialized local research efforts	needs, experience, draw state and regional institutions into awareness of problems and opportunities	experience; lend support in data and information gathering; make their own constituencies and clientele aware of problem and solution possibilities
	help organize community efforts; train community participants	organize; train	organize; train	draw together support funds; provide release-time to staff to help with community organizing and training
3. Proof-Of-Concept - development of prototype solutions; protect hardware, techniques, and social processes	low-income innovators & interested community groups participate in a program of construction, testing and redesign; notify local people about options being explored & progress of experiments; develop links with local institutions for loan of support facilities	participate, notify; link; provide technical assistance and integrative design services locally	participate; links; notify interested regional groups and institutions of progress;	make equipment and testing facilities available
4. First Generation Demonstration - test marriage of technical solution and community in one locale	low-income innovators and local groups organize and conduct project; bring in many interested community people, develop training & economic development strategies; develop links with local institutions for support services and personnel	organize; conduct; develop, link; help optimize technical aspects of program	links; help develop matching funds; public relations about progress and opportunities of program	links; public relations; matching funds;
5 Second Generation Demonstration - generalize results to other communities and regions. Full marriage between appropriate solution and community	facilitate initiation of new project in community through the organization of public awareness efforts, training sessions, fund raising campaigns, and linkage with appropriate institutional resources	facilitate; provide technical assistance at various phases of project	coordinate efforts in region; draw together funding sources and institutional support mechanisms; at end of project, draw NCAT services and regional constituencies together for evaluation, development of regionally specific training program, and formulation of wide-scale utilization strategies;	provide funding; help with public awareness efforts; supply materials give release-time for staff efforts; self-examine institutional barriers
6. Guidance During Implementation - full societal application	amplification of local manpower resources; creation of community-based business developments, producer/ consumer coops, and/or each-one-teach-one programs	technical assistance; organize personalized problem solving task forces and other supportive efforts	coordinate activities through networks of implementing agencies to insure that training, manpower, funds, materials and components are available when needed	help with funding; public support efforts; make expertise available;

a2vi. Advisory/regional infrastructure integrated with D,D,&T process.
a2via. Advisory forum deemphasized; 50 state and 10 regional AT associations added.
a2vib. Ten regional extension workers.

a2vii. Larger more traditional organizational structure than in a1 (horizontal management idea present but deemphasized, new emphasis on management-by-objectives).

a2viii. Staff positions for technological interventionist and resource mobilizer (as in ab1).

a2ix. An even more extensive communications component than in a1.

a2x. New testing and evaluation of AT equipment component added.

While the Hershey proposal succeeded in better integrating the D,D&T and coalition building features and components proposed for NCAT than the Eccli/Cook plan had, it did so at the expense of readability and comprehensibility. It enumerated scores of detailed objectives but provided little rationale or background on the evolution of the NCAT design. Without having seen the more comprehensive Eccli/Cook plan out of which it grew, it would, therefore, be hard to understand the reasoning or logic underlying the Hershey proposal. Also, it was filled with management "jargon" and despite some wording suggesting there would be staff participation in decision-making("... The NCAT coordinator will coordinate his or her decision making process and implementation of policy via consultative sessions with the associate coordinators and the staff...", Hershey Proposal, p 16), the overall impression given was of a large, fairly traditional bureaucratic organization, as suggested by the organizational chart from the Hershey proposal in Figure 14, rather than the innovative horizontal organization advocated by Eccli and Cook in their plan.

IVB: June Washington Meetings and the Rejection of the Hershey Proposal By CSA (June-July, '76)

In June, around the time Hershey submited his proposal to CSA for funding, he had a number of important and controversial meeting with CSA officials in D.C. On June

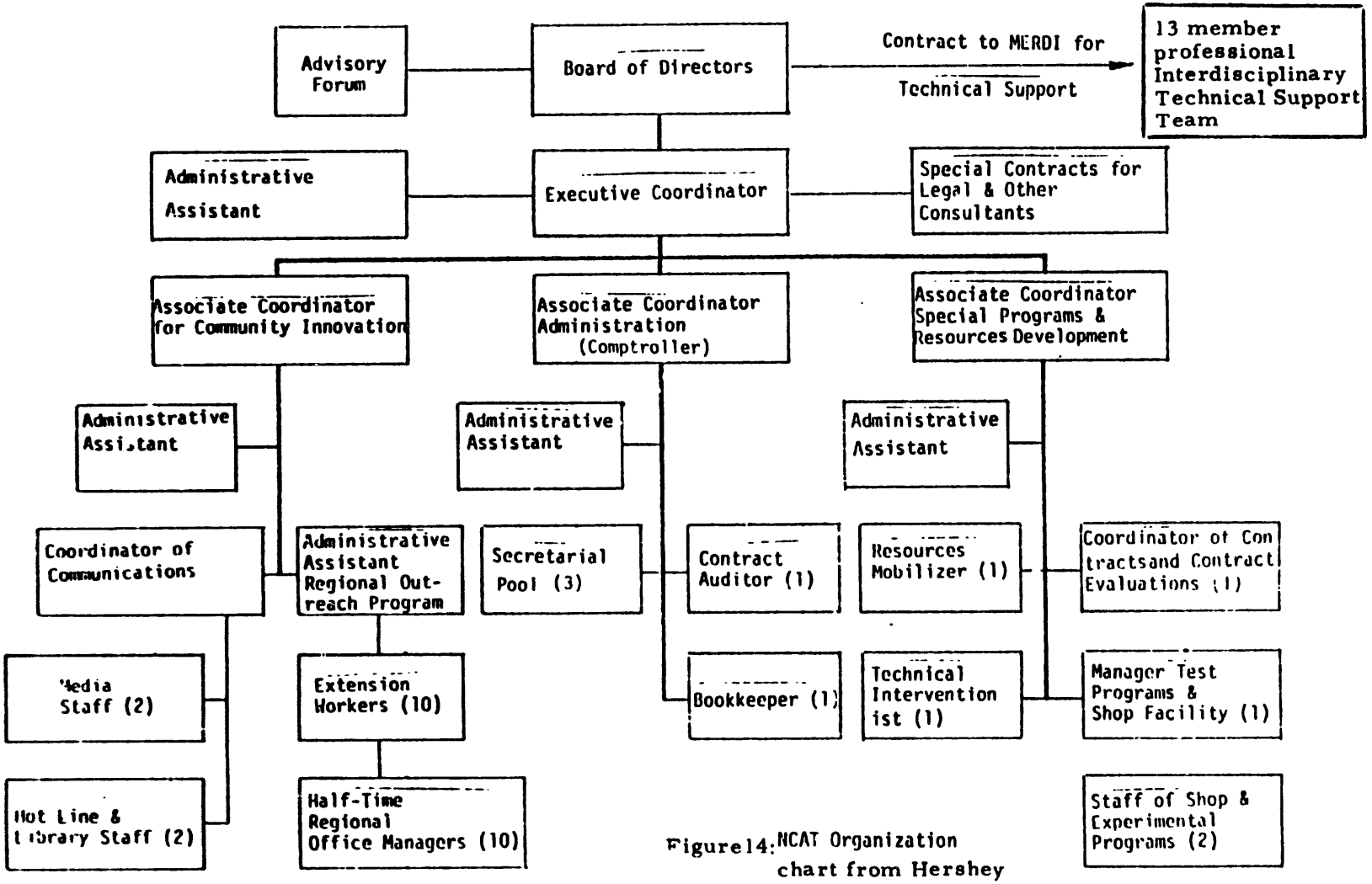


Figure 14: NCAT Organization chart from Hershey Proposal

11th, Hershey and Plunkett gave a presentation on NCAT to Sam Martinez, the new director of CSA, and representatives from other Federal agencies. This meeting, by all accounts, was a "disaster" with Plunkett going into a tirade and chiding the representatives from other agencies on their centralized and elitist R&D programs and, as a result, turning Martinez off on the whole idea of NCAT. On June 22, Hershey met alone with Martinez and salvaged NCAT by telling the director he could "handle Plunkett" and that it wouldn't happen again. Later that day, however, there was a heated meeting between Hershey and Dick Saul and Angel Rivera, who were angry that the meeting with Martinez hadn't been cleared with them. After this heated meeting, as MaryAnn MacKenzie, who was also presented, noted, an even more "hostile" exchange occured in the hall in which Saul and Hershey "openly ventilated" their dislike and distrust of one another, Saul accusing Hershey of making decisions without the support of the Board and Hershey accusing Saul of "owning and buying people on the planning committee and Board" (MacKenzie Notes on June 22 and June 23 CSA meetings). The following day, in a follow-up meeting with MacKenzie, Saul said that Hershey's "head would roll" and that "the Board would not put up with such nonsense" (MacKenzie Notes). In her notes on these meetings, MacKenzie reflected on this schism between Saul and Hershey as follows:

> ...It is confusing to have such a strong figure (Saul) from the government side getting entangled in the innerworkings of the Board; and it is wrong for Saul to have such strong personal antagonism toward Hershey. There is a feeling that he (Saul) sways and controls the Board and that he did the same for the planning committee. I should like the Board to regroup and correct its own mistakes for that allows for strength...To throw Hershey off the Board would be another wound that has to heal- but if they agreed to replace him with Bender (the Board alternate), I would lean in that direction. A lot of ego games are involved, I have no solution for correcting those. I have my own role to protect- to stay involved...and to keep my sources open...(MacKenzie Notes on June 22 and 23 CSA meetings).

In this passage we see an effort by an NCAT insider to think simultaneously about both the general welfare of NCAT and the interests and strategies of her own particular

perspective/faction. As the planning process wore on and the initial Board members came to feel genuine ownership for NCAT, this dual concern with the general good of NCAT as well as one's own personal and factional interests became more prevalent on the Board.

Soon after this flare-up occured between Saul and Hershey, Hershey submited his proposal to CSA and it was reviewed and critiqued by CSA staff and outsiders. These reviews were generally highly critical of the proposal. Miriam Charnow, who worked with Saul on energy, for example, in an unusually literary and satirical critique, compared Hershey's vision for NCAT unfavorably with that of Candide and Dr. Pangloss:

> If Candide and Dr. Pangloss were out today searching for the best of all possible worlds, this proposal (at first glance) would (seem to) be their salvation. However, Candide had his Dr. Pangloss to provide direction and leadership, a focus for their travels and an oblective to reach...Unforetunately (while this proposal's objective is worthy, its) road is fraught with misdirection, no leadership and a hazy focus...It takes on too global a thrust... It completely lacks any glimmer of methodology by which to arrive at its worthy objectives...Its staffing plan is a grandiose scheme...(that) lacks administrative soundness...(Its whole) grand design is more an academic abstract than a clean, clear exposition of goals...(Charnow Review, July 9, 1976).

Pat Stolfa, of CSA's policy and evaluation division, was even more blunt, concluding that the proposal was "so inadequate that it raises serious and substantial questions about the process that produced it as well as the group that submitted it...In view of the poor quality of this work product of the Planning Committee...I suggest that the participation of Planning Committee members in the operations of (NCAT) be (very limited)...(Stolfa Review of Hershey Proposal)."

MaryAnn MacKenzie and David Morris, codirector of the Institute for Local Self Reliance in D.C., wrote critiques advocating a more decentralized approach to NCAT, along the lines of MacKenzie's original decentralized vision, MacKenzie arguing that:

> ...CSA/OEO has consistently developed (a centralized) model for establishing a (new) national entity...(which) develops the major capability in a single organization, staffs it with 40-50 people and creates a regional network to ac-

> complish the work of the organization...
> ...The Center for Appropriate Technology should follow a different model from the beginning. It should be a grass-roots effort largely, with a limited core staff; the majority of the staff should be attached to existing organizations and networks, working part-time(for NCAT)...(MacKenzie Review of Hershey Proposal, July 1, 1976).

Similarly, in his critique, David Morris reiterated MacKenzie's theme (design theme iii) that the goal of community/appropriate technology was community organizing/building and advocated a more decentralized approach quite similar to MacKenzie's original vision (see Figures 6 and 7):

> ...(Since AT is essentially) an organizing technique, which permits the development of self-confidence, community industry, and (local) cooperation...I would suggest a (more decentralized and) modest beginning for NCAT. In terms of structure, it should have three sections: information services... outreach, based on extension workers...(and) a technical component which works very closely with outreach...
> ...I would see four community organizers initially...trained both as organizers (and technical people)...(A core staff including) a business/financial analyst;a microeconomist;an ecologist/biologist;a lawyer;a chemist (and) a mechanical/industrial engineer...local work panels(e.g. in waste recycling, solar energy, food production, etc.)(which would eventually do)the vast bulk of NCAT's outreach work...and a loan fund for up to $20,000 to get projects off the ground...(all totaled) this comes to (only) about $1.2 million ($375,000 for core and outreach staff;$300,000 in grants and $500,000 for loans)...(Morris Review of Hershey Proposal).

Hence, the key design features of this alternative proposal, labeled "c2" to indicate its similarity to MacKenzie's earlier decentralized vision, "c", may be summarized as follows:

> c2- Morris' Alternative Decentralized Design for NCAT:
> c2i. Four communityorganizers.
> c2ii. Core technical/administrative staff of 10-15.
> c2iii. Bulk of support and outreach work done by local advisory panels
> c2iv. A loan fund to get local projects started.

Some of these elements were later incorporated into my own decentralized funding proposal for NCAT, which will be discussed in the next section/life of the NCAT.

In a memorandum to the NCAT Board, I summarized the criticisms of the Hershey

Proposal expressed in seven different reviews (five by CSA staffer MacKenzie, Charnow, Stolfa, Checkan and Christensen and two by outside AT advocates Morris and William Ellis) as follows:

> 1. Too narrow a view of AT and a lack of examples of past and potential AT activities that might help low income communities.
>
> 2. Lack of clear needs/problems assessment (i.e. why is NCAT needed?).
>
> 3. Too theoretical and abstract; lack of concrete plan of action.
>
> 4. Too ambitious, trying to do too many things with too little money.
>
> 5. Too centralized an approach and too large a staff (more money should go into grants and more should be done locally and regionally).
>
> 6. MERDI's large interdisciplinary R&D team is unnecessary (R&D should be done locally and contracted for as needed).
>
> 7. Lack of a phased start-up (NCAT should start small and grow gradually) (Decker Memo to NCAT Board, July 18, 1976).

Not surprisingly, given all these criticisms, when Saul's internal CSA review committee met on July 1 to consider the Hershey proposal, they rejected it, calling for a complete rewrite with more money going to grants and much less for central staff and operations (Saul Memo to NCAT Board, July 2, 1976). While the quality of the proposal, particularly its lack of clear examples and rationale and comprehensibility by anyone who hadn't followed the evolution of NCAT's design, was a factor in its rejection, it wasn't the only reason. It was also rejected because both the CSA/CAA and the Grassroots AT/Community Activists factions thought they could negotiate a plan more to their liking. Furthermore, it appears to have been a way for Saul and the CSA/CAA faction to discredit Hershey and remove him as leader of NCAT (see discussion under July Board meeting in next section).

Thus, the fourth life of the NCAT closely resembled its second life, with progressives in both cases (Eccli and Cook in the second and Hershey in the fourth) getting into a position which allowed them to produce a progressive plan for NCAT, but one which would ultimately be rejected when the CSA/CAA faction regained control of the process.

Life V: The Funding of NCAT (July-December, '76)

Just as the fourth stage or life of the NCAT resembled its second, its fifth life resembled its third with the CSA/CAA faction regaining control of its leadership and working out a new compromise proposal with the progressives. This time, however, the proposal finally got funded by CSA.

VA: The July Board Meeting and the Decker Decentralized Proposal (July-Aug, '76)

The NCAT Board was at its low point when it met in late July, 1976 at Harriet Barlow's house in the Washington, D.C. area to try to salvage their NCAT proposal. They'd gone through the last of $110,000 in planning grants and the proposal that Hershey had submited had been throughly criticized and rejected by CSA. Saul told them that it was "not a question of just tinkering" with the proposal, but it would require "going back to the beginning and doing it all over again." He also had told Maggiore and Navarro that the proposal would never be funded with Hershey as Board president/chairman.

The atmosphere of the meeting was, therefore, gloomy and tense. It was also, however, an important turning point for the Board in which the pressure of the moment seemed to forge them into more of a working unit and community than they had been before. The old factional interests and tensions that had divided them were still present, but now there was a growing sense that they were "all in this together" and that they now had to "fish or cut bait" together. Some anger was directed at Hershey for promoting his own ideas and not consulting the rest of the Board more, but as much or more was directed at CSA, a number of members agreeing with Love when he said he felt they had been "fucked over" by CSA. Moreover, the Board agreed with Maggiore that they should "disregard" past arrangements, commitments and deals and just "do what we think is good."

After a heated discussion, from which the following exchanges was exerpted, the

Board agreed to deal with their leadership problem (i.e. Hershey and Saul's mutual dislike of one another) by effectively removing Hershey as NCAT president and having Maggiore and Navarro negotiate with CSA:

Freeman:	...This whole NCAT alliance has been unholy from the beginning! We shouldn't keep knocking off our leaders Mafia style.
Barlow:	But,we're now in a crisis and salvage effort. We're interpreted by CSA as an incompetent Board. We need to have somebody experienced in the CAP world negotiate with CSA.
Navarro:	The Center won't get funded with Jack (Hershey) as chairman! He's totally discredited us...
Love:	It's easy to look for a scapegoat. If I was Jack,I'd resign...I guess we need someone who knows who sleeps with who at CSA.
Cook:	I have problems with outside pressure from CSA forcing us to rearrange the Board.
Navarro:	I'm resigning from the Board if you don't remove Jack as chairman. We've fucked up and are going to lose the Center unless you do!
Hershey:	That's a half-assed way of acting,Al!
Brown:	A change of leadership is needed for dealing with CSA.
Hershey:	O.K.! I won't take anymore actions on behalf of NCAT...You go ahead and negotiate with CSA...(Decker Notes on July,1976 NCAT Board meeting).

On rewriting the proposal for NCAT,since the Board was out of money for staff support,I,who had been following the NCAT planning process since the last planning committee meeting in April as part of my dissertation research,volunteered to take a crack at it and the Board accepted my offer.

I made this offer because,given the CSA criticisms of the Hershey proposal (summarized on p 76) and the Board's current inclination to "disregard past deals" and start new,I felt there was a real opportunity to develop and win approval for a very decentralized NCAT along the lines of MacKenzie's original decentralized vision,

which was where my sympathies lay (that is, I was sympathetic of the grassroots AT perspective/faction, being, at this time, involved in grassroots AT networking activities, including the creation of NEAT-NET, myself).

In retrospect, this hope was somewhat politically naive. Plunkett and the Progressives' "big stick" of Senator Mansfield, which was the main force pushing for a large central operation with a big subcontract to MERDI, hadn't gone away. It was merely dormant at this time. But, at the time, it seemed to me and the members of the Grassroots AT/Community Activist factions (e.g. MacKenzie, Barlow, Love) that the Progressive and CSA/CAA factions had both had opportunities to develop plans for NCAT, which ultimately failed to win approval, and now it was the Grassroots AT/Community Activists turn to see what they could do.

Accordingly, over the next month, I basically started from scratch and produced a new, very decentralized proposal for NCAT. Central to this proposal was a new rationale for NCAT which argued that economic and institutional "barriers" existed to the desirable use of AT by low income communities and that NCAT would work to reduce these barriers. Thus, the proposal was based in part on the following design theme, which was an elaboration of Eccli and Cook's notion of "technological intervention":

> xiii. Remove barriers to AT: NCAT through its technical and policy research, outreach and grants program will remove social, economic and institutional barriers to the use of AT by low income communities.

The design elements of this new proposal, which I've labeled "c3" to indicate that it grew out of and was inspired by MacKenzie's and Morris' decentralized visions/designs for NCAT, c and c2, may be summarized as follows:

> c3- Decker's Decentralized Draft Proposal:
> c3i. No subcontract or commitment to MERDI.
> c3ii. 27 member compromise Board composition assumed (as in ab1)

c3iii. Very decentralized funding allocation, over 2/3's in grants.
c3iv. No restrictions on grants, open to both CAAs and non-CAAs.

c3v. Small core staff (around 10) of professionals to handle both administration, networking and technical support.

c3vi. Decentralized Bioregional Planning and Priorities
- c3via. Bioregional planning conferences to decide regional priorities for WCAT.
- c3vib. Bioregional advisory panels to help implement priorities and provide regional technical support.

c3vii. Information Sharing and Dissemination Component
- c3viia. National AT information sharing system network.
- c3viib. Modest library, clearinghouse and publications component.

c3viii. Regional Outreach, Education and Training
- c3viiia. Four regional extension workers.
- c3viiib. Seed grants to existing grassroots groups for education and training.
- c3viiic. Internship program for training CAA and other regional and community people.

c3ix. Decentralized Technical Support provided by Core staff, Seed grants and Bioregional advisory panels.

c3x. Bulk of Funding (around 2/3's) going for Support and Evaluation of Community Technology Development Experiments and Demonstrations.

c3xi. Social and Policy Research to Reduce Barriers and Promote AT Use in Low Income Communities.

Thus, on the four controversial design issues, my proposal reflected the Grassroots AT/Community Activists preferences (except on Board composition, which was a compromise between their first and second preferences). It also, like Morris' design, called for a small core staff of around ten professionals that would jointly handle networking, technical support and administration. It envisioned six program components, five of which would be quite decentralized. These included: bioregional planning and establishment of priorities through bioregional planning conferences and advisory panels (c3vi); AT information sharing through a national AT information network and clearinghouse (c3vii); regional outreach, education and training through extension workers, seed grants to existing groups and an internship program (c3viii); decentralized techni-

cal support through the bioregional advisory panels, seed grants and the core staff (rather than a MERDI team, c3ix); and a large grants program (around 2/3's of funding) for support and evaluation of community technology experiments and demostrations (c3x). The last program component (3cxi) involved doing social and policy research aimed at reducing barriers to the utilization of AT by low income communities. Despite the very decentralized nature of my plan, I still felt it had a good chance of being approved by the Board and CSA, given their current state of mind. This, however, was not to be.

VB: The Green Book Compromise Proposal and Its Funding By CSA (Sept., '76)

As soon as I submited my draft proposal to the Board, Plunkett got wind of it. He was understandably outraged, feeling it violated the "deal" he had made with the Organizing Committee for MERDI to get a large technical support subcontract from NCAT, and he immediately got in touch with Mansfield's office, which, in turn, put pressure on the NCAT Board and CSA, threatening to see that all CSA's energy money was taken away if MERDI didn't get its piece of the action. Under this pressure, the NCAT Board did an immediate about face (not one of its finer moments) and switched back from a decentralized allocation of funding (over 2/3's in grants) to a highly centralized one (2/3 central operations, 1/3 grants), giving MERDI an even bigger subcontract (over $890,000) than in the Hershey proposal (which had been thoroughly criticized for being too centralized). CSA and Saul also got into this final round of NCAT planning politics, drafting a series of "special conditions" to attach to the NCAT grant/contract, favoring the CSA/CAA faction, the most important of which was the requirement that grant proposals to NCAT be sponsored by CAAs, except in unusual circumstances.

The final funding proposal put together by Harriet Barlow and the Board from my draft, the changes forced on them by Plunkett/Mansfield and CSA, and their own last minute revisions, reminded one of the joke about a camel being a horse designed by a

committee, because this proposal, which came to be known as the 'Green Book', because of its green cover, surely resembled a plan "designed by a committee". It kept my rationale for NCAT and my six program components, but expanded and centralized some of them, especially the technical support (MERDI) component, so that the coherence and consistency of my integrated decentralized design for NCAT was muddled if not lost.

The key features of this compromise Green Book proposal, which I've labeled "abc" to indicated it grew out of a compromise among the Progressive (a), CSA/CAA (b) and Grassroots AT/Activists (c) factions' visions for NCAT, may be summarized as follows:

abc- Compromise Green Book Proposal Funded by CSA:

- abci. Large MERDI technical support subcontract ($890,000 plus).
- abcii. Compromise 27 member Board (but initial Board fills 3rd category slots, so more like 50-50 composition).
- abciii. Very centralized allocation of funding (2/3-1/3).
- abciv. CAA grant sponsorship/endorsement required (CSA special condition)
- abcv. Large central staff (around 50 professionals, 25 at MERDI, 25 at NCAT).
- abcvi. Bioregional Planning and Priorities as in c3.
- abcvii. Enlarged Information Component and Staff (over c3, more like a2).
- abcviii. Regional Outreach, Education and Training as in c3.
- abcix. Centralized Technical Support on Priority Areas done by Large (25 plus) MERDI Staff.
- abcx. Less than 1/3 Funding Allocated for Research and Demostration Grants.
- abcxi. Social and Policy Research deemphasized (present but no staffing for).

This proposal presented a somewhat disjointed vision for NCAT, because of the way it was put together and the factions it tried to satisfy. Most of the wording and program component descriptions, taken from my draft, reflected the decentrists' vision for NCAT (along with some progressive ideas such as policy research to remove barriers).

The budget, however, which was put together by Progessives (MERDI put together its own budget for the technical support component) and the CSA/CAA factions, reflected their priorities and visions for NCAT, and the special conditions added by CSA, reflected its own priorities and requirements for NCAT. Figure 15, for example, shows a diagram of how I envisioned the six decentralized components in my draft proposal interrelating, which was taken from my draft and included in the Green Book without any changes to reflect how my components and their relationships had been changed (e.g. that technical support was now centralized under MERDI rather than decentralized).

Thus, the Green Book was a "camel" of a proposal, but it seemed at the time about the best compromise that could be worked out among the three competing factions in the NCAT planning process (in retrospect I think perhaps a slightly better compromise on technical support (say $500K instead of $890K for MERDI) and CAA involvement (say 50-70% sponsorship rather than 100%) could have been worked out), and backed by Mansfield's pressure/support it sailed through CSA, despite the fact that it contained some of the same elements (a large, centralized staff and centralized technical support) that CSA staffers had strongly objected to in the Hershey proposal. And, while members of the NCAT Board and some CSA staffers realized the Green Book was a "camel", they seemed to hope that, like the camel which is well suited to the desert, their camel-like NCAT design would prove to be well suited to the hot and arid political climate in which NCAT would have to exist. Later, as we'll see, however, the disjoint nature of the Green Book would cause some confusion and problems in the start-up of NCAT.

VC: The Atlanta Board Meeting and Program Committee's 'Start-Up' Agenda For NCAT (Oct.-Dec., 1976).

The first meeting of the NCAT Board after CSA agreed to fund its Green Book compromise proposal was held on October 16-17 in conjunction with the National

Program Activities and Their Interrelationship

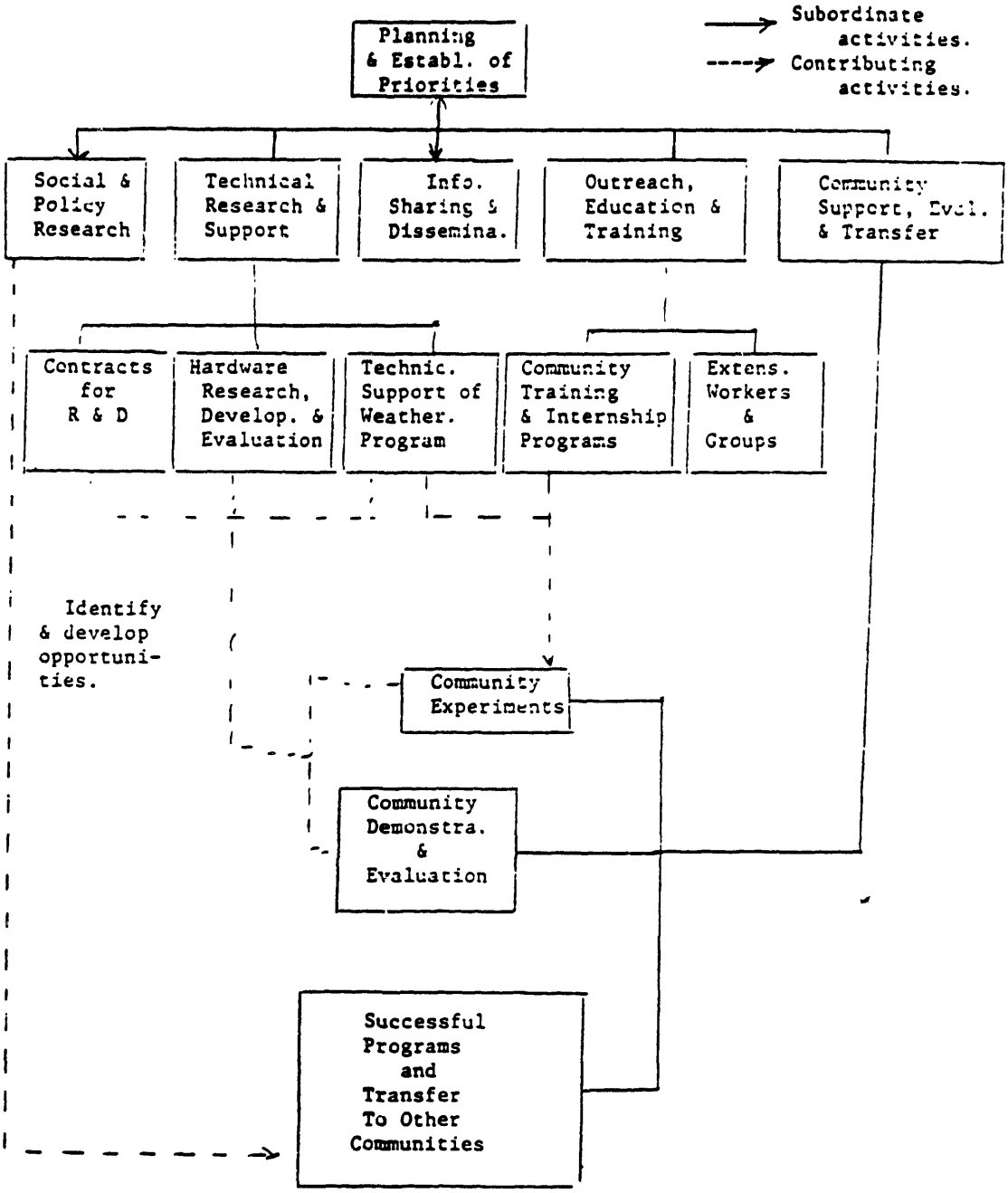


Figure 15: Diagram From Decker Draft Proposal Showing How Six Decentralized Program Components Interrelated, Also Used in Green Book Proposal

CAP Directors' Conference in Atlanta, Georgia. This was the first NCAT planning or Board meeting not to be dominated by factional infighting and an atmosphere of political tension and crisis. Having struggled through the convoluted NCAT planning process and finally gotten funding for NCAT, the Board was in a jubilant and harmonious mood. Despite the fact that they'd had to compromise with MERDI and CSA to get funding and, as a result, the Green Book plan wasn't as decentralized or as coherent as they might have hoped, they seemed to feel that they at least, having gone through the long planning process, now shared a reasonably coherent vision of what they wanted NCAT to be and would now be able to implement that vision. At this meeting, NCAT also "went public" for the first time, with Malcolm Lillywhite, an AT pioneer from Colorado, conducting a series of hands-on AT workshops sponsored by NCAT at the CAP Directors' Conference.

Two new members, David Morris of the Institute for Local Self Reliance and Dennis Holloway of the Ouroborous Project in Minnesota, were added to the Board at this meeting to increase its AT expertise and credibility. This made the relative strength of the four factions on the Board roughly as follows: CSA/CAAs- 5 votes (Maggiore, Brown, Freeman, Navarro, Mescunas); Grassroots ATers- 3 votes (Love, Holloway, 1/2 Olkowski, 1/2 Cook); Community Organizers/Activists- 2 votes (Barlow, Morris); and Progressives- 2 votes (Hershey, 1/2 Cook, 1/2 Olkowski). Hence, the Grassroots AT and Community Activist factions, which had similar goals and tended to work together, now had roughly equal strength with the CSA/CAA faction, with the weakened Progressive faction in third position. Moreover, these faction seemed to reach an implicit power-sharing arrangement at this meeting. New elections were held and the following officers were elected: Maggiore as chairman/president, Olkowski as vice chairman, Brown as secretary, and Freeman as treasurer. Thus, the Board's Executive Committee, made up of these officers, initially, was dominated by the CSA/CAA faction, with

Olkowski as the token non-CAA member.

The Board's Program Committee, on the other hand, which was to start implementing NCAT's programs while a staff was hired and brought up to speed, was made up exclusively of the Grassroots AT and Community Activists factions of the Board, consisting of Cook, Morris, Love, Olkowski, Barlow and Holloway, with Cook and Morris as cochairmen. Moreover, Barlow was also the cochairman and dominant member of the Personnel Committee, which now was screening applicants for the Executive Coordinator of NCAT. Thus, in the implicit power-sharing arrangement that emerged out of this meeting, the CSA/CAA faction was in control of the Executive Committee and hence general Board policy, but the Grassroots AT and Community Activist factions, through the Program Committee, were to take the lead in starting-up NCAT's programs (these factions also had a powerful input into the Executive Coordinator selection process through Barlow's position on the Personnel Committee).

This arrangement seemed to work fairly well over the next three months until an Executive Coordinator was hired. The Program Committee, led by Cook and Morris, put together a three-month "start-up" agenda or plan for NCAT, the main elements of which are summarized below (I've labeled this agenda/plan as "c4" to indicate it mainly grew out of the previous decentralized visions/plans, including "c", "c2" and "c3", for NCAT):

c4- The Program Committee's Three Month Start-Up Agenda/Plan for NCAT:

- c4i. Contract for regional training workshops like the one Lillywhite did in Atlanta.
- c4ii. Identify regional AT people and groups to serve on regional panels and provide regional technical support.
- c4iii. Contract with someone to design and begin to implement an internship program at NCAT.
- c4iv. Hold regional workshops at regional CAA meetings to design role and responsibilities for field workers.
- c4v. Contract for study of potential application of AT in CDC development.
- c4vi. Have MERDI do design studies for creating national AT information system and making NCAT building in Butte more energy self-reliant.

(from letter from Morris to Program Committee, October 22, 1976)

Thus, after the long and frustrating planning process, the Program Committee wanted to move quickly and "hit the ground running" as one of its members put it. Most of the Committee's agenda of start-up measures, however, were held up until Jim Schmidt, the first Executive Coordinator was hired, and, as we'll see in the next section, Schmidt had somewhat different priorities for NCAT.

During this period two new potentials for intellectual marriages emerged on the Board, between Maggiore and Olkowski and between Barlow and Morris. On the first of these, while Maggiore and Olkowski worked fairly well together as chairman and vice chairman of NCAT (Maggiore, being the more dominant of the two), their relationship never developed further into an intellectual marriage. Barlow and Morris, however, did achieve something like an intellectual marriage, with Barlow bringing her D.C. lobbying experience and ties to the CAA world and Morris bringing his radical community organizing perspective plus ties to the AT world. After Morris joined the Board, they worked closely with each other and together became an influencial force on the Board, with Barlow cochairing and dominating the Personnel Committee and Morris one of the leaders on the Program Committee. Later, they resigned from the Board together in protest over Schmidt's leadership and Barlow joined Morris at the Institute for Local Self Reliance (their positions and collaboration made the Community Activists faction they represented more influencial on the Board than their numbers (2 out of 12 members) would suggest).

Also, at the Atlanta Board meeting, the Board began interviewing candidates for the Executive Coordinator of NCAT and narrowed the field to two finalists, Jim Schmidt and Ed Kepler (who later became NCAT's second Executive Coordinator). Then, at their next Board meeting, held in D.C. in November, they reinterviewed Schmidt and Kepler and selected Schmidt to be NCAT's first Executive Coordinator. Schmidt was chosen, in part, because each of the three now dominant factions on the Board chose to see what they wanted to in Schmidt: To the CSA/CAA faction, he was a former CAP di-

Love Preliminary Plan (b1)

factions:	design alternatives: iv: b	v: c	vi: b	vii: c	o*
CSA/CAAs:	1	2	1	2	
Progressives:	2	2	2	2	
AT/Activists:	2	2	2	2	+

Eccli/Cook Plan (a1)

	design alternatives: iv: b	v: a	vi: a	vii: b/c	o*
CSA/CAAs:	1	3	2	1.5	
Progressives:	2	1	1	2.5	+++
AT/Activists:	2	1	3	2.5	++

Organizing Committee Proposal(ab1)

factions:	design alternatives: iv: b	v: c	vi: a	vii: b/c	o*
CSA/CAAs:	1	2	2	1.5	+
Progressives:	2	2	1	2.5	+
AT/Activists:	2	2	3	2.5	+

Hershey Funding Proposal (a2)

	design alternatives: iv: b	v: c/a	vi: a	vii: a	o*
CSA/CAAs:	1	2.5	2	3	
Progressives:	2	1.5	1	1	++++
AT/Activists:	2	1.5	3	1	+

Decker Decentralized Draft Proposal(c3)

factions:	design alternatives: iv: c	v: c	vi: c	vii: a	o*
CSA/CAAs:	2	2	3	3	+
Progressives:	3	2	3	1	+
AT/Activists:	1	2	1	1	++++

Green Book Proposal (abc)

	design alternatives: iv: b	v: c	vi: a	vii: b	o*
CSA/CAAs:	1	2	2	1	++
Progressives:	2	2	1	3	+-
AT/Activists:	2	2	3	3	++

Figure 16: Summary of How Well Each Faction Did on Preferences in Each of the Six Plans/Proposals Conceived During NCAT Planning Process (* "o" column indicates "other" positive design features for each faction)

rector and hence one of them; to the Grassroots AT faction, his radicalness and emphasis on decentralization was appealing; and to the Community Activists, his radical politics and background in community organizing made him one of them. In retrospect, we will see that the Community Activists, Barlow and Morris, were indeed most correct in their initial assessment of where Schmidt's sympathies lay. But, ironically, Barlow and Morris would also eventually become two of Schmidt's strongest critics on the Board, as we'll see in life VII.

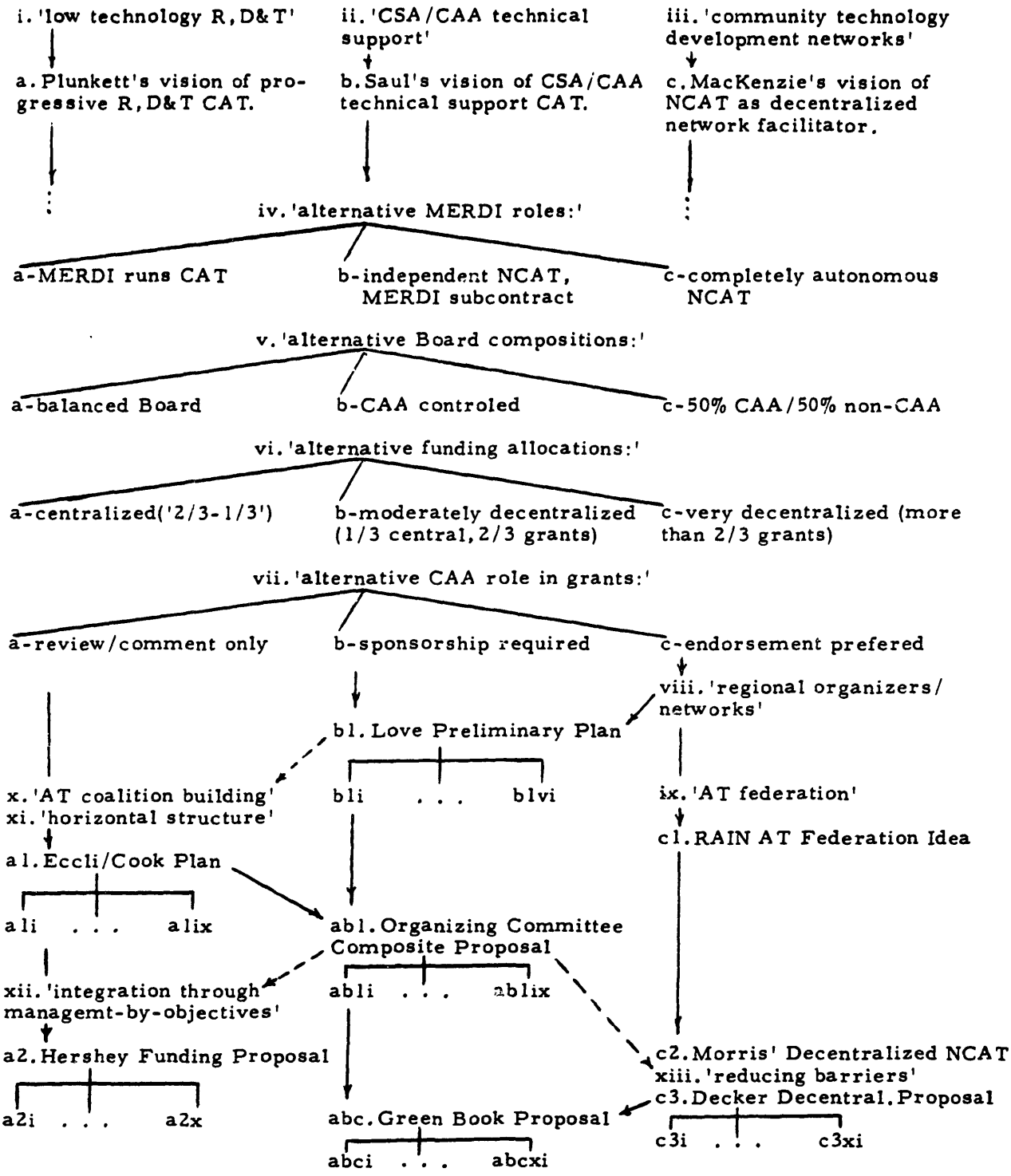
Before turning to NCAT's further evolution during its first year of actual operations, I want to pause to briefly review and summarize its evolution during its long planning process. As we've seen the planning of NCAT started with three distinctive visions (Plunkett's, Saul's and MacKenzie's) of what it might be and evolved through five distinctive stages or lives and six distinctive plans which sought to realize one or more of these original visions. As with Marris and Rein's description of the key themes of Community Action and the War on Poverty in the '60s, each of these visions and the themes that inspired them (design themes i, ii, iii) "represented an insight which could neither be ignored, nor reconciled with the others"(Marris and Rein, 1973, p 239-40). Each of the three factional groups involved in the planning, the CSA/CAA faction, the Progressive faction and the Grassroots AT/Community Activists (which functioned as one group or coalition during NCAT's planning phase), likewise, represented a force that could "neither be ignored, nor fully "reconciled" with the others- the CSA/CAA faction had the support of CSA and the CAA world behind it, the Progressives had Mansfield's clot and scientific "respectablity", and the Grassroots AT/Community Activists had innovative AT ideas and the support of the grassroots AT and community organizer communities, and, as Saul pointed out at the Goddard planning meeting, all three of these forces and resources seemed to be necessary if NCAT was to work. As a result, the proposed design for NCAT seemed to swing back and forth like a pendulum, as different factions, mainly either the CSA/CAA or Progressive factions, gained momentary control of the design process and producted a new design that reflected their priorities.

This oscillatory aspect of the planning of NCAT is well illustrated by Figure 16, which summarizes how well each faction did, preferencewise, on the four key controversial design issues (iv-vii) in each of the six distinctive plans produced during the planning process. As the figure shows, with regard to these issues, the process seemed

to swing between designs favoring the CSA/CAA faction (the Love, Organizing Committee, and Green Book designs) and designs favoring the Progressive faction (the Eccli/Cook and Hershey plans), with the weaker Grassroots AT/Community Activists coalition briefly promoting a design of their own (the Decker draft plan) toward the end of the process.

Besides this oscillatory rhythm, however, there was also a progressive evolutionary or coevolutionary movement in the planning of NCAT, which was somewhat masked by this very visible back-and-forth rhythm. This progressive coevolving character is more clearly seen in the coevolving thematic system diagram of the evolution of the NCAT design in Figure 17. Here, we see how the three distinctive formative or transforming themes (i, ii, iii) and the corresponding design alternatives (generally a-alternatives, b-alternatives and c-alternatives) of the four controversial branching design themes (vi, v, vi, vii) triggered three distinctive lines of design evolution: first, the "a" or "progressive" line, which evolved from Plukett's original vision (a), through the Eccli/Cook plan (a1), to the Hershey proposal (a2) (left-side of figure); second, the "c" or "decentralist" line, which evolved from MacKenzie's original vision (c), through RAIN's federation idea (c1) and Morris' alternative decentralized design for NCAT (c2), to Decker's decentralized proposal for NCAT (c3)(right-side of figure); and third, the "b/ab" or "community action" line (which later evolved into the "composite or compromise" line), which evolved from Saul's original vision (b), through the Love preliminary plan (b1) and the Organizing Committee's preliminary proposal (ab1), to the final Green Book compromise proposal (abc) (center of figure). Moreover, the solid (indicating major influences) and the dotted (indicating minor influences) diagonal arrows indicate how these relatively distinctive lines of development coevolved with one another. Thus, while the evolving design of the NCAT was more politicized and disjointed than, say, the smooth and coherent coevolution of the designs of the New Alchemists, it, nevertheless, did coevolve, and the Green Book, despite its disjointedness, represented the culmination of this coevolutionary process.

Figure 17: Coevolving Thematic System Diagram Summarizing NCAT Planning Process



Life VI: Schmidt's Vision and the Start-Up of NCAT's Operations (Jan.-June, 1977)

Thus far, we've seen how the planning of NCAT was characterized by a cyclical pattern of conflicts and compromises among the three factional groups-the Progressives, the CSA/CAA people and the Grassroots AT/Community Activists-involved in the process and how it finally culminated in the imperfect and fragile compromise design represented by the Green Book proposal. In this section we'll see how Jim Schmidt, the first Executive Coordinator of NCAT, brought with him an entirely new vision of what NCAT should be, distinctive from the three visions/factions which the planning process had oscillated among, and how this new vision and the new faction Schmidt created around it caused a realignment of relevant NCAT perspectives/factions and changed the whole dynamics of the evolution and politics of NCAT.

VIA: Schmidt's New Vision for NCAT (January, 1977)

Before coming to NCAT, Schmidt had worked as a migrant organizer, been director of the Cayuga County Action Program in New York and organized the People's Power Coalition, a coalition of groups working for utility reform in New York. He hadn't been involved in the AT movement, prior to coming to NCAT, and instead brought with him a strong Marxist/socialist critique of American society and a radical organizing philosophy. This background and philosophy led him to have a new perspective on and vision for NCAT different from the three pivotal visions around which the planning of NCAT had revolved. This new perspective/vision is reflected in the following exerpts from interviews I did with Schmidt in November and December of 1977:

> Q: How might AT help eliminate poverty?
>
> A: AT won't eliminate poverty...AT can only come about in this country after certain other things take place- radical changes that will allow AT to develop. You're not going to have AT side by side with a Nuclear economy or in a limited capital market (system)...

Q: Do you see AT as a vehicle for social change?

A: Social change is going to come about, has to come about...but AT itself isn't going to bring about social change...

Q: So you think institutional changes in the social and political structure need to come first...

A: Yes...You're not going to have AT under our present economic system...

Q: What kind of system do you think we need?

A: We need an economic system which places more emphasis on human services ...A system that allows for the socialization of capital. A system that will guarentee jobs for people...not a system that's based solely on making money.

Q: So you think we have to move towards a more socialistic system?

A: We need to move towards a more human economic system. You can call it what you want. A system that relies on and supports human dignity. We don't have that in this country...AT offers an alternative but it's not going to take hold until we begin to change our structure...

Q: What strategy are you using to mobilize political support for NCAT and social change?

A: Political support for social change will come out of the local communities ...(We are) bringing together more activist groups with AT groups, so that the activist groups working for change will have alternatives to offer... We want to put AT in a political focus...Most the stuff that comes out of AT newsletters is nice technical stuff but ...it doesn't say where you go with it. People need to see where AT fits into a community (organizing and political) process and that's the focus we can give. (first Q&A from November 5, 1977 interview; rest from December 6, 1977 interview, emphasis added)

As these exerpts suggest, Schmidt had an initial vision/thematic system for NCAT resembling the one shown in Figure 18. Hence, because of his skepticism about AT itself being a vehicle for social change, Schmidt's goal/vision for NCAT was to form a community/network of radical organizers who would link AT people and their ideas up with more "activist" and political community, regional and national groups, which Schmidt saw as the real vehicle for radically changing the country's political economy. Schmidt's skepticism about AT (as a vehicle for social change), his overt radical organizing strategy for NCAT and his Marxist/socialistic politics soon brought him in-

7. Radical socialistic critique: AT will only be accepted after radical changes are made in America's capitalistic political economy.

xiv. AT should be "politicized" and linked to more radical community, regional and national organizing efforts.

d. NCAT as community/network of radical orga[illegible] who will link AT people and ideas to more radical organiz[illegible]ts.

Figure 18: Schmidt's New Vision/Thematic System for NCAT to be a Community/Network of Radical Organizers Linking AT to More Radical Movements

to conflict with members of the Board and grassroots groups that did see AT as at least a limited vehicle for social change and whose politics were either different from Schmidt's (such as those who were apolitical, progressive or anarchistic) or more circumspect (some members of the Board and AT community, such as, Barlow and Morris, shared Schmidt's socialistic perspective to some extent, but were less public or vocal about it, realizing that it would turn some people off and create political problems for NCAT).

Also, Schmidt's lack of previous experience with AT and his lack of links or familiarity with the AT community, made grassroots AT people suspicious of him and, hence, limited his ability to forge the kind of coalition between AT groups and more radical groups/movements that he envisioned NCAT doing. Jim Parker, a staff member of the Montana SEOO and a member of the NCAT planning committee who had been active in promoting AT among CAAs and SEOOs in the Northwest, for example, told me the following story of an encounter between Schmidt and an AT friend of Parker, shortly after Schmidt arrived in Butte and began organizing an NCAT staff:

> . . . I invited (Schmidt) to come over and he did. An AT friend of mine happened to be staying with me that weekend. That wasn't good because (my friend) is very off the wall and a heavy theory guy. . . that's not one of Jim's strong suits and to have him get chopped up by someone like that wasn't a very good experience (for Jim). . . (My friend) went after him with some basically Tom Bender type positions. . . and basically embrassed Jim, because Jim didn't know anything about any of that kind of stuff. (My friend) wanted to know what the hell he took the job for if he didn't know anything about AT. . . (and Jim said) basically because he was a socialist and thought it was a way a socialist agenda could be implemented. . . (Schmidt didn't) have it together to deal with those kinds of people. . . It got so there were really big distances between (Jim and those kind of) people. . . I didn't get anything out of Jim for some time after that. . . (Interview with Jim Parker, December 3, 1977).

Through this and other similar encounters, an unfortunate mutual distrust quickly developed between Schmidt and a number of grassroots AT people.

VIB: The Restructuring of NCAT Factions and the Emergence of New Controversial Design Issues (Jan-June, '77)

Schmidt's new vision for NCAT as a community/network for radical organizing was quite different from the other original vis ions (a, b, c) for NCAT or the fragile composite vision represented by the Green Book, and, as a result, Schmidt's subsequent efforts to realize his vision triggered a realignment and restructuring of the factional groups on the Board and within the emerging staff of NCAT. This restructuring ultimately resulted in the formation of five distinctive factional groups in place of the three that had dominated the planning process. These five resulting factional groups were:

1. The CSA/CAA faction on the Board, left over from the planning process which now controled the Executive Committee of the Board (i.e., Maggiore, Brown, Freeman, Mescunas and Navarro).

2. The Grassroots AT and Community Activists factions on the Board, also left over from the planning process, which continued to act as a coalition and was now in control of the Program Committee (i.e., Barlow, Morris, Cook, Love and Holloway).

3. The Radical Organizers faction within the NCAT staff, which consisted of Schmidt and the NCAT staffers sympathetic to his vision and priorities for NCAT, such as, Bob Knickmeyer, the supervisor of NCAT's regional organizers, Joe Gonzales, a program analyst, Beth Sachs, a communication specialist, and many of the regional organizers, who were hand picked by Schmidt and Knickmeyer.

4. The Progressive, Technical Support faction, which consisted mainly of technical staffers from MERDI's interdisciplinary technical support group, directed by Associate Coordinator John McBride, which worked under Jerry Plunkett, MERDI's director.

5. The AT faction within the NCAT staff, led by Associate Coordinator for Information and Communications Isao Fugimoto, a California grassroots AT person, who sought to build better ties with grassroots AT groups and had more of a decentralist (i.e. MacKenzie's c vision) than a radical organizing (Schmidt's d vision) vision for NCAT (this group, thus, had a similar perspective to the Grassroots AT/Community Activist coalition on the Board.

Just as the planning of NCAT had been characterized by the infighting and vying for power among its three pivotal factional groups (during which some coevolution managed to occur), the first year and a half of NCAT's actual operation was characterizing by intense infighting and vying for power among these five NCAT factions (during which even less coevolution took place than during the planning process). Also, as with the planning process, this vying for power revolved around a new set of controversial design/operational issues or themes that emerged in early 1977.

The first of these controversial issues dealt with whether NCAT should adopt a conservative "inside" (cooperative) strategy or a radical "outside" (confrontational) strategy for promoting AT. The perceived alternative options on this issue are summarized by the following branching design theme:

xv-Alternative NCAT strategies for promoting AT:
- xva. inside, cooperative strategy emphasizing technology transfer and working "within the system" for reform.
- xvb. mixed inside/outside strategy emphasizing some working "within the system" and some outside advocacy and organizing locally around community technology development.
- xvc. outside, confrontational strategy emphasizing radical organizing and confronting the existing high-tech establishment.

On this issue/theme, Schmidt and his Radical Organizer faction sought mainly to promote and adopt an outside strategy, confronting the "establishment" whenever possible

and dealing reluctantly and suspiciously with CSA, CAAs and other Federal and regional agencies and organizations. At the other extreme, the more conservative factions, including the progressive Technical Support faction and the majority of the CSA/CAA faction, wished to adopt an inside strategy, working with CAAs and other local, regional and Federal agencies to promote the transfer of AT and related programs to low income communities. And, in between, the AT/Activist faction on the Board and the AT faction within the staff (and some CAA people) wanted to adopt a mixed inside/outside strategy that included both outside advocacy and local organizing around community technology development and working with progressive Federal, regional and local agencies, where appropriate, to promote AT.

The second new controversial issue dealt with how power and responsibility would be shared between the NCAT Board and staff. Here, again, there were three main perceived options, as summarized in the following branching design theme:

xvi-Alternative Board-staff power-sharing arrangements:
- xvia. A strong policy-making Board, with staff implementing NCAT program.
- xvib. A working Board, which works with staff to implement a NCAT program.
- xvic. A strong autonomous staff, responsible for developing and implementing NCAT policies and programs subject to general guidelines provided by Board.

On this issue, the CSA/CAA faction on the Board favored a strong policy-making Board, while the AT/Activist faction on the Program Committee, many of whom had been very involved in the planning of NCAT, favored a working Board/power-sharing arrangement in which Board members and staff would work together to develop and implement the NCAT program. Schmidt and his Radical Organizer faction and the AT staff faction both, however, favored a strong autonomous staff arrangement. Finally, the MERDI Technical Support faction seemed to favor a strong policy-making Board arrangement, in which the Board would give more policy guidance to Schmidt and the

program staff, but stay out of the day-to-day programmatic operations of the Center.

The third and final new controversial issue dealt with how paticipatory or democratic the organizational structure and decision-making process of NCAT should be. This issue had been raised during the planning process, around Eccli and Cook's proposal for a "horizontal" structure/process for NCAT and the debate over salary differentials at the final planning committee meeting, but had never been fully resolved (the Green Book didn't specify a particular type of organizational structure/process). The perceived options, at this point, may be summarized in the following branching design theme:

xvii-Alternative organizational structures and decision-making processes:
- xviia. Fairly traditional, but flexible hiearchical structure
- xviib. Participatory, horizontal structure
- xviic. Democratic structure

On this issue, the CSA/CAA faction favored a fairly traditional (i.e. CAP-like) management structure; whereas, most of the Radical Organizers and AT staff and the AT/Activists on the Board favored a very democratic workplace. Most of the Technical Support staff favored either a somewhat participatory horizontal structure (like Eccli and Cook had envisioned) or a more traditional structure.

The charts in Figure 19 summarize the preference rankings among the options for each of these new controversial design issues/themes for each of the five new factions involved in starting up NCAT's programs (at times these rankings are rough median estimates in cases where members of a faction had different preference rankings).

VIC: The Start-Up and Fragmentation of NCAT Components (Jan.-June, '77)

During its first six months of actual operations, five of the component parts of NCAT mandated in the Green Book were staffed and started-up. These included the MERDI Technical Support Group, the Grants Staff and Program, the Information Program,

A. Preferences on Alternative Organizing Strategies (xv)

altenatives: factions:	CAA/B	AT-CA/B	RO/S	TS/S	AT/S
a. inside/technology transfer	1	3	3	1	3
b. mixed/community technology development	2	1	2	2	1
c. outside/radical organizing	3	2	1	3	2

B. Preferences on Alternative Board-Staff Power (xvi)

alternatives: factions:	CAA/B	AT-CA/B	RO/S	TS/S	AT/S
a. strong, policy Board	1	2	2	1	3
b. working, program sharing Board	2	1	3	3	2
c. strong, autonomous staff	3	3	1	2	1

C. Preferences on Alternative Organizational Structures (xvii)

alternatives: factions:	CAA/B	AT-CA/B	RO/S	TS/S	AT/S
a. fairly traditional	1	3	3	2	3
b. participatory, horizontal structure	2	2	2	1	2
c. democratic	3	1	1	3	1

Figure 19: Preference Rankings for Five NCAT Board/Staff Factions On Three Controversial Operational Design Issues (CAA/B- CAA faction on Board and its Executive Committee; AT-CA/B- AT and Community Activist faction on Board and its Program Committee; RO/S- Schmidt and the Radical Organizers on NCAT staff; TS/S- the Progressives on MERDI Technical Support staff; AT/S- AT and Information Networking faction on NCAT staff.)

the Regional Organizers Component, and the Washington, D.C. Resource Mobilizing Office. Instead of operating as parts of an integrated whole, however, these components for the most part tended to operate as separate entities, dominated by different factions, visions, and priorities. Thus, NCAT came to resemble a feudal system of separate and competing serfdoms rather than one unified institution. The start-up of each of these fairly autonomous components, which I've labeled as operational designs "oa" through "oe", respectively (the "a" through "d" in the first four of these indicating the vision/faction that most influenced and controled these components), is described briefly below:

od-the Regional Organizers Component: In starting up NCAT, Schmidt was most interested in its Regional Organizers Component, which he wanted to be the heart and nucleus of his vision/design for NCAT as a community/network of radical organizers. In early 1977 he got the Board to agree to expand the number of regional workers/organizers from four (the number mandated in the Green Book) to ten and he hired Bob Knickmeyer, another radical organizer with little familiarity with AT, to supervise these organizers. He and Knickmeyer then hand picked ten regional organizers, most of which had backgrounds and a radical political perspective similar to their own. Many of these, like Schmidt and Knickmeyer, had little familiarity with AT and little contact with AT groups in their region. This lack of AT experience and contacts, subsequently created credibility problems for many of these organizers among AT and CAA groups and people in their regions. The Regional Organizers Component became the core of Schmidt's Radical Organizing faction within NCAT.

oa-the MERDI Technical Support Component: The interdisciplinary Technical Support Group run by Plunkett and MERDI under a subcontract from NCAT became the new focal point of the progressive R, D&T perspective/vision within NCAT (after Hershey's removal as president/chairman of NCAT, the Progressive's influence on

the Board waned considerably). It was, in fact, a miniature version of what Plunkett had originally envisioned NCAT to be. In early 1977 Plunkett selected, with the approval of Schmidt and the Board, John McBride, who was already on the MERDI staff, to head this group. McBride then began hiring engineers and technical people and this group quickly became the largest component of NCAT.

This group was mandated by the Green Book to work on four priority R,D&T areas during NCAT's first year: improving heat source efficiency (e.g. flue dampers), low-energy cooling and ventilation, improving the manufacture of inexpensive cellulose insulation, and weatherizing mobile homes. McBride and his group dutifully began working on these priority areas, but soon discovered, as we'll see in the next section, that these weren't particularly appropriate things for the Technical Support Group to focus their time and effort on.

ab-the Grants Program: The Grants Program and staff became the component of NCAT most dominated by the CSA/CAA perspective and faction. This was because, first of all, grants normally had to be endorsed or sponsored by an appropriate local CAA (a special condition CSA attached to the Green Book). Also, grants had to be approved by the CAA dominated Board and all grants over $5000 had to be approved by CSA headquarters. In addition, the Grants Program and staff was headed by Associate Director Hiram Shaw, who was a friend of Maggiore and had formerly worked with him at the Milwaukee Social Development Commission (the Milwaukee Community Action Program).

Because of all the conditions attached to grants, there was initially a lot of delays and redtape in getting grants out to grassroots CAAs and AT groups, which resulted in a lot of complaints and dissatisfaction among grassroots groups. This was somewhat ironic, in that the NCAT planning group had envisioned a very streamlined and simple grants process (Besides the Board, program staff, local CAAs, regional CSA offices, and CSA headquarters, grants also had to be reviewed and reported on by the

Technical Support Group).

oc-the Information and Communications Component:

The NCAT Information and Communications Program was the last NCAT component to be staffed and organized, because its head, Associate Coordinator Isao Fujimoto, was the last senior staffer to be hired. Fujimoto, who had taught courses related to AT and alternative agriculture at the University of California at Davis and organized AT and alternative agriculture activities and networks in Davis and Northern California, was also the only senior NCAT staffer to have a strong grassroots AT background and perspective. Fujimoto and his small staff, naturally then, became the focal point and core of the grassroots AT perspective and faction within the NCAT staff.

In designing and beginning to implement the national AT information-sharing system and the library, clearinghouse and publication functions mandated by the Green Book, Fujimoto sought to insure that these information components were guided by and reflected approriate AT values, as is shown in the following exerpt from a position paper he wrote later on the "Purpose and Philosophy of NCAT's Information Program":

> NCAT's information and communication efforts are directed towards ...encourag(ing) networking on a decentralized basis, especially among groups and people working out ways to live self-managed lives on a human scale.
>
> We aim to do this by using both manual and self contained electronic information systems...the guiding principle behind NCAT's choices in the development of an information system is not whether an approach stresses low or high technology, but whether it is appropriate to getting the job done, and whether it also contributes to increasing the quality of communications, self management, and more humane working and social relationships. ...A major role for NCAT is as a networking resource center...What it can do is expedite the linkages between groups in more effective ways...NCAT's information component sees itself involved in this linking process. In so doing, NCAT will not only be a resource, but provide an active example of a demostrable networking system (Fujimoto paper, December, 1977).

Hence, Fujimoto sought to realize within his information component a miniature version of what grassroots ATers and decentrists had envisioned for NCAT as a whole

(i.e., visions/designs c, c2, c3 and c4).

oe-the Washington Office

The fifth component of NCAT was its small Washington, D.C., which was intended to lobby and mobilize resources for its other components. I served briefly as a D.C. based consultant to NCAT in early 1977, until Herb Epstein, a D.C. environmental lobbyist was hired in April to head NCAT's D.C. Office. Under Epstein, the Washington Office wasn't really dominated by any one of the NCAT perspectives/factions, but, nevertheless, like the other NCAT components it tended to also become an autonomous entity, whose activities were not closely related to or integrated with those of the other components.

There were a number of reasons why these five components, which the NCAT planning committee and Board envisioned as being very integrated (especially in the Love, Eccli/Cook, Hershey, and Decker plans), became so separate and fragmented. First, there was a natural tendency towards fragmentation because of the four distinctive competing visions and factions involved (visions/designs a, b, c, and d). To have effectively integrated the NCAT components against this strong natural tendancy would have required both a strong integrative vision/design and a powerful and effective transformer, who could bring the competing visions/factions together around this integrating vision. Unfortunately, neither of these emerged in the case of NCAT.

Thus, while after the long planning process, the NCAT Board had an implicit sense of how the NCAT component should fit and work together, they failed to spell this out clearly in their compromise Green Book proposal, which, as we've seen, was somewhat disjointed in its treatment of NCAT's components and their interrelationship. Moreover, Schmidt, instead of working closely with the Board to try to clarify and implement a unified and integrated NCAT program, as we've also seen, had his own alternative, radical organizing, agenda for NCAT and saw the Board mainly as an impediment to this agenda. Schmidt, as a result, focused his time and energy on the

component that most reflected his philosophy and priorities, the Regional Organizers Component, made up of the radical regional organizers which he and Knickmeyer had chosen, and tended to let the other components, in which considerable opposition to his radical perspective soon developed, go their own way, except when he saw an opportunity to use them to promote his radical vision/agenda.

Finally, the political compromise with MERDI, which resulted in the large separate MERDI Technical Support group, also promoted fragmentation by separating the technical support staff from the program staff and puting them under the control of very different organizations and leadership (MERDI and the progressives Plunkett and McBride versus NCAT under radical organizer Schmidt).

Ideally, during this period a new intellectual marriage might have developed between two or more of NCAT's senior staff (Schmidt, Shaw, Fujimoto, McBride, Epstein), but unfortunately the components led by each of these got fragmented and polarized so quickly, that no such intellectual marriage(s) ever developed.

VID: NCAT's Democratic Workplace Experiment (of)

Towards the end of this start-up stage/life, Schmidt launched a controversial experiment in participatory decision-making that became known as NCAT's "democratic workplace" experiment or process. In an interview in November, 1977, he explained the nature and rationale behind this experiment (which I've labeled as operational design "of") as follows:

> ...You can't talk about AT for the rest of the world if inhouse you don't do an appropriate management system...(so) we're developing a management system that allows for greater staff input and staff involvement in decision-making...We have four or five standing committees (one for each component) which are program and policy committees (on which staff members) participate and vote on major decisions. Everything is done in the form of recommendations (to me), because I still have responsibility to the Board...(Through this process) staff has a greater sense of responsibility for what happens at the Center (Schmidt interview, November 5, 1977).

There appear to have been three reasons for the launching of this highly participa-

tory "democratic workplace" experiment. First, as the above passage suggests, there had been discussion and some support for an "appropriate" organizational structure (e.g. Eccli and Cook's proposed "horizontal" structure) during the planning process and was now considerable support for such a structure among the new NCAT staff. Second, the experiment fit in with Schmidt's vision of NCAT as a community and forum for radical organizing. Third, the introduction of this "democratic workplace" experiment was probably a way of putting the best possible face on the fact that NCAT's components and staff were fragmentation and becoming polarized. The disjointedness and fragmentation at NCAT could thereafter be rationalized as the unfortunate, but necessary, result of this bold experiment in democratic management, rather than, simply the result of poor organization or management.

In any case, Schmidt described this experiment and its progress in glowing terms in December of 1977:

> ...The beauty of this process...is watching the change from three or four months ago...We're the only group of people I know in the country who have taken social planners...and technical people, brought them together, and said to the technical people: 'you're going to be responsible for the social implications of the technology you're developing', and said to the social planners: 'you're going to be held responsible from a technical point of view for the processes you've been developing'...
>
> There's been some incredibly fine debates here about the implications of technologists not taking social responsibility and social people not being concerned about the technical aspects...What happened with the Atomic Bomb could not happen under the structure here...because here it is a joint decision (of technical and social people). Sure it sometimes delays action...(and) there is hostility, anger and conflict (sometimes), but that's good because no change can come about (without that). Every single person here loves that- they may not admit it, but they like...to be held accountable...(Schmidt interview, Dec., 6, 1977).

Others on the NCAT Board and staff were not as happy with the experiment and the time and energy its participatory committee meetings consumed, however. In November of 1977, for example, Al Navarro, who had just left the NCAT Board, complained that NCAT's "democratic workplace" was a "cop out" and waste of valuable

time that should have been spent on NCAT's clients (November 14, '77 interview):

> **...There's such a thing as having a democratic process of input but still having accountability... I don't think there's any accountability when you appoint a committee to make a decision... It's a cop out... they're selfishly looking at themselves rather than the community they're suppose to be serving. I can't see a group spending that much time (on internal process)...I think it's very patronizing to minority communities...**

Some of the NCAT staff, particularly the technical support staffers, also felt that the process tended to waste time and energy that could be better spent on substantive work. Peter Antonioli, a mechanical engineer in the MERDI Technical Support group, for example, remarked in an interview:

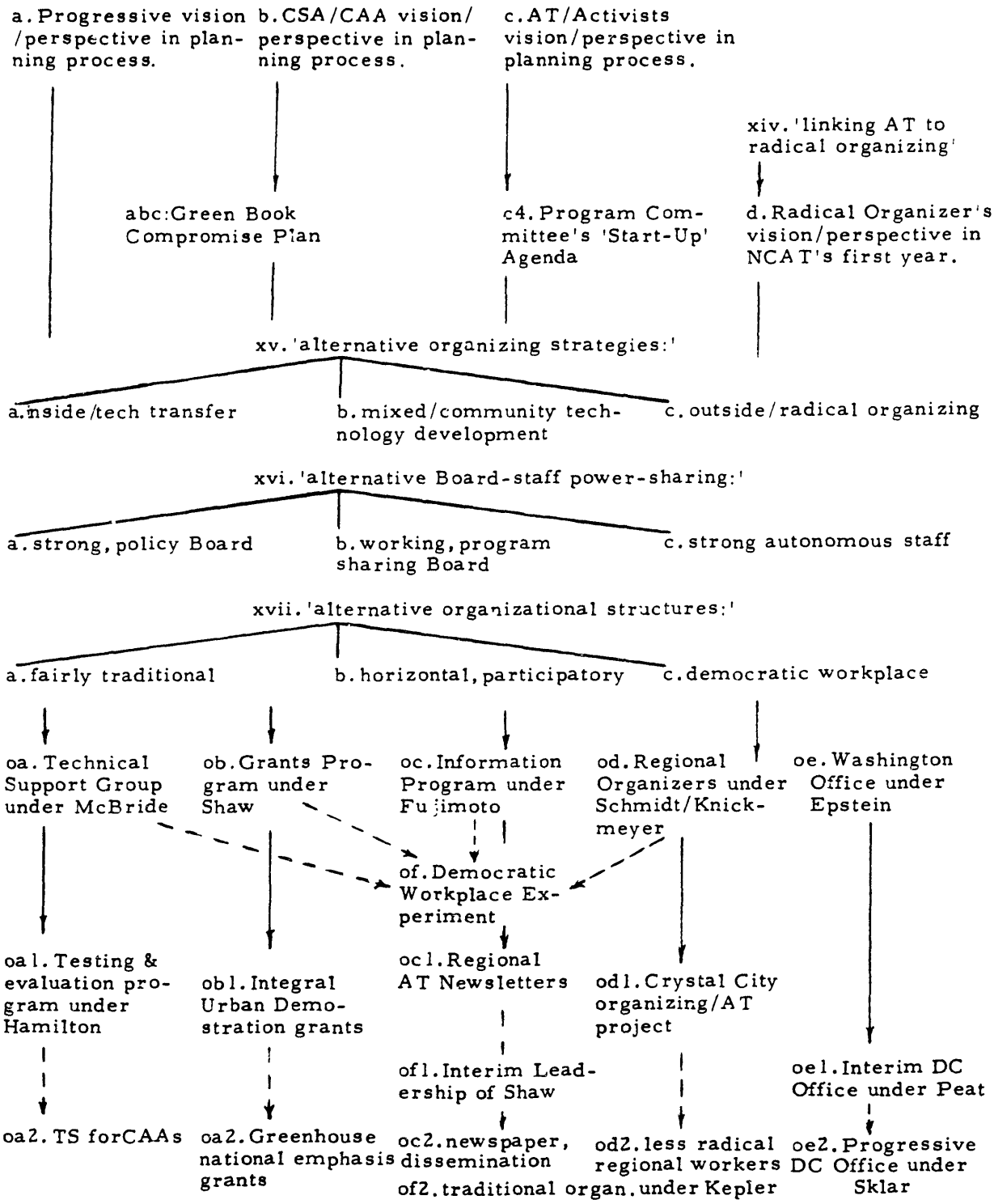
> I think sometimes we tend to look inward instead of looking outward... There's a lot of meetings. I mean we have meetings on meetings and everything!...(there's) a lot of discussion and rhetoric which consumes a lot of time and is counterproductive (Antonioli interview, December 5, 1977).

Some members of the staff, including Isao Fujimoto, also felt that while the process was supposedly "democratic", in reality, Schmidt ended up making a lot of important decisions himself (Fujimoto interview, December 7, 1977).

As we'll see in the next section, NCAT's democratic workplace experiment became on of the focal points of controversy and conflict during NCAT's "Great Crisis".

The coevolving thematic system diagram in Figure 20, which may be viewed as a continuation of Figure 17, the coevolving system diagram for the planning of NCAT, summarizes the emergence of the new controversial design themes and the fragmented NCAT components discussed above during NCAT's first two years of actual operations. Notice the parallel lines of design evolution, with little mutual interaction or coevolution, inspired by the four distinctive visions/factions for NCAT (starting with visions a, b, c and d).

Figure 20: Coevolving Thematic System Diagram for NCAT's First Two Years of Operations



Life VII: The Great Crisis (July '77-April '78)

In the second half of NCAT's initial year of operations, the fragmentation of NCAT components continued and the polarization among its factions and parts, especially between Schmidt and the Board and among the radical organizer, progressive and AT factions within the staff, intensified to the point where unhealable schisms developed and something had to give. I, accordingly, refer to this stage or life in the evolution of NCAT as "The Great Crisis". What finally did give in this struggle was Schmidt and his faction, when he was terminated by the Board in April of 1978 and the staff members that had been most supportive of him left NCAT in protest.

VIIA: Mounting Dissatisfaction with NCAT Components and Polarization of NCAT Factions (July'77-September'77)

Unlike the planning process in which factions on the planning committee and Board were able to heal their wounds and reach some sort of compromise after periods of heated conflict, no such healing and compromise occured during NCAT's initial year of operations. After the 'honeymoon' start-up stage/life of NCAT, criticism and dissatisfaction with NCAT's components and operations began to be voiced and the parts and factions of NCAT became more fragmented and polarized. This polarization and conflict occured on three different levels, which I'll describe briefly below:

A. Polarization Between NCAT Board and Staff

During the summer and fall of 1977, many members of the NCAT Board began to become increasingly dissatisfied with Schmidt's leadership of NCAT. This dissatisfaction emerged and began to be voiced in both the CSA/CAA faction which controled the Executive Committee and the AT/Activist faction which controled the Program Committee. Members of the CSA/CAA faction, who had favored an inside strategy, felt Schmidt was endangering NCAT with his radical politics and rhetoric and that he wasn't exhibiting sound management and was wasting valuable time and energy in his "democratic workplace" experiment. AT/Activist members on the Pro-

gram Committee, led by Barlow and Morris, were not bothered by Schmidt's radical politics or democratic management, but felt he had failed to develop an effective AT/community technology program and good ties with grassroots AT and community groups.

Schmidt, conversely, saw the Board and its involvement in the programming area as NCAT's main problem:

> The weakness of NCAT is a really nonfunctioning, nondirected Board who still see themselves in the programming area... Once you bring together a Board that's been in program operations with a certain vision and a full staff... there has to be a new vision, a reworking of the relationship and the Board has to give up its control. It has to only set policy and turn the thing lose... So it's a crisis... either that Board will dissolve itself or the staff will dissolve itself...
> ... That Board doesn't know how to function. That Board does not know how to structure itself. It doesn't know how to discipline itself... It needs Board training... We don't want to resort to spanking the Board, but we may have to do that. I think the Board has hit a new low in its inability to function... (Schmidt interview, November 5, 1977, emphasis added).

Here, Schmidt was prophetic in saying that either the Board or staff would have to "dissolve" (at this point he probably hoped it would be the old Board members rather than him and his staff). It also reflects Schmidt's confrontational rather than compromising style, which served to further widen the gulf between Board and staff. Other members of the staff, which not as unhappy with the Board as Schmidt, also felt that it involved itself too much in the programming and day-to-day operations of the Center and thus undermined the staff's ability to do their job in an unhindered fashion.

This increasing polarization between Board and staff can thus be seen as resulting from and revolving around their difference of opinion on the three new controversial design issues/themes: an inside versus outside organizing strategy (xv), Board-staff power-sharing (xvi) and organizational structure (xvii); and, when viable compromises couldn't be negotiated on these issues the polarization worstened.

B. Polarization Among NCAT Staff Components and Factions

Polarization also increased during this period within the NCAT staff. The first big split to emerge was between the MERDI Technical Support staff dominated by the progressive perspective/faction and the program staff (staff not under MERDI) dominated by Schmidt and his radical organizing faction. This clash occured over the difference in politics, ideology and strategy between Schmidt's more radical perspective and approach and the technical staff's more conservative progressive perspective, as the following exerpts from interviews with two technical staff members, Peter Antonioli and Larry Farrar suggest:

> The real problem here lies (in the clash between) the socialist-Marxist consciousness... (and) the system we live under now, whatever it is. (The program staff's) notion of what's wrong with America... runs into opposition from a lot of people on the technical staff who just don't buy that garbage- what I consider garbage- to them it isn't garbage.
>
> It's well known that Jim is a socialist. He's avowed it to the Board and everybody else. A lot of goals he envisions I don't participate in because on the one hand AT is preaching that "small is beautiful", so it's a dichotomy- how can you advocate socialism which is centralization and AT which is decentralization. There's an incongruity there! ... I lean more towards giving individuals more private incentives. (Antonioli interview, Dec. 6, 1977)

Antonioli then went on to cite the regional organizers and their training as an example of how this difference in politics and ideology got reflected in NCAT policy and operations:

> We brought outreach workers in here and gave a lot of social action type things for them, but we never taught them anything on technical types of things. I think the meaning right there was... 'we'll put a solar collector on your house but this is the message- take over the utilities'... (The outreach workers) are operating out of the rhetoric of the 60s and I'm not so sure that time hasn't passed.

In a similar vein, Larry Farrar, another engineer on the Technical Support staff, remarked (Farrar interview, Dec. 6, 1977):

> **I have a lot of problems with the political and social aspirations of the program staff... A lot of people think you have to have revolutionary type social and political change and I don't think anybody's going to buy that and as soon as you start saying these sorts of things (AT) are associated with Marxism or socialism, you are going to turn off a lot of people...**

Later in this period another split developed within the NCAT program staff between Schmidt and his radical organizer faction and a smaller AT faction that emerged out of the Information and Communications Component led by Fujimoto. This split occured over internal politics and NCAT's relationship to grassroots AT groups, Fujimoto's group feeling that NCAT's "democratic workplace" wasn't entirely democratic and that NCAT wasn't doing enough to reach out and work with grassroots AT pioneers and groups (which Fugimoto had strong ties to, but Schmidt and his faction were suspicious of, viewing them as not being political/radical enough). The other senior staff members Shaw and McBride tried to stay clear of these factional conflicts as much as possible. Fujimoto, as a result, became the focal point for criticizing and the leader of the opposition to Schmidt's leadership within NCAT.

C. Polarization Between NCAT and Other Groups

A third level of polarization occured between NCAT and the groups which were suppose to have been its clients and constituencies, including grassroots AT and CAA groups and relevant Federal, regional and local agencies.

In November and December of 1977, I made a research trip on which I interviewed a number of AT groups, mainly on the West coast, about their interaction with NCAT. Most of the responses of the groups I interviewed were very negative, saying they had no or very little positive interaction with NCAT despite considerable effort on their

part. Typical of this general dissatisfaction was the reaction I got from RAIN editors Lane DeMoll and Lee Johnson, when I interviewed them in November, with DeMoll expressing her frustration with trying to deal with NCAT as follows:

> It isn't as if we haven't asked. It isn't as if we haven't talked to everybody that we know there... All the other groups all over the country that we work with- bureaucracies and private groups both- send us stuff. We're used to calling and getting answers. We're just not used to this blank wall that we've been getting out there. And that's what's so frustrating... The problem with NCAT is that it's falling into that same old trap of setting up a large institution which now has its own survival first and foremost... They just have not come through with their purpose.

To which Johnson added, with emotion:

> God! This is enough to make me get someone from NCAT and beat the shit out of them... I've got better contacts with ERDA than I have with NCAT and I'm dumping on them. Maybe that's what I have to do (with NCAT).

Another illustration of this dissatisfaction was NCAT's lack of interaction with the California OAT. OAT's director Kirk Mackelwald, who was very upset that he hadn't even been notified about NCAT's Board meeting in San Francisco, stated (November, 1977):

> On certain personal levels, there's been some interest and interaction, but nothing of substance. No building of coalitions. No networking. No sharing of resources. No political outreach... In fact, I've never talked to Jim Schmidt which I find a little astounding... I would think that (returning my phone calls) would be a smart thing to do. (Mackelwald interview, Nov. 16, 1977)

He also acknowledge that there'd been friction between OAT and NCAT over the DOE Small Grants Program:

> ...They want to grab all the action and think they ought to run the whole program... I think that that smacks of the same problem of centralism that dealing with ERDA does.

I also got a similar reaction from Webb Otis, who had worked closely with the California OAT and other regional AT groups in implementing the Department of

Energy pilot regional AT small grants program for the Pacific Coast region. In an interview in November, he said that while he had wanted to work with NCAT, he had sense suspicion and reluctance on their part(November 14, 1977 interview):

> When we first undertook the program, I went to Butte and spent a couple days with the NCAT people ... (I sensed some antagonism) when I first went up there ... I didn't create the legislation, I'm just the program manager... I've tried to work with th a to the extent possible. We're not trying to paint them into a corner. They've criticized our objective of going to the states and working in that fashion. They've criticized the way we've solicited and in both cases I think their criticisms have been unwarranted ...I haven't criticized them at all. I really look forward to working with them. I don't feel I'm being received with open arms quite frankly. I sense a certain reluctance for them to work with us and I think that's unfortunate.

Many grassroots CAA people and organizations were likewise dissatisfied with NCAT and its lack of responsiveness to their problems and requests. Former Board member Al Navarro's California CDC, for example, had requested some technical assistance from NCAT but never got any, prompting Navarro to work with USDA instead:

> We asked NCAT for technical assistance...to look into an alternative system (to gas heating of our housing project) ...Two or three times we asked. It's a perfect proposal (for NCAT)... They said 'we would rather have you submit a proposal' ... (but) we don't need money... we ended up working with a USDA architect... the worst bureaucracy of all, the USDA, responded faster than NCAT...

Similarly, according to Jim Parker of the Montana SEOO, CAA people in the Rocky Mountain region felt that NCAT was unresponsive to their needs and that it lacked "credibility" because Schmidt treated it as a radical "movement" rather than as a service "institution":

> There's a question about NCAT-is it a movement or is it an institution. Clearly to me, what we ended up with because of the whole planning process was an institution, and you accept the fact that it's an institution, it's a beach-

> head, and you use that to facilitate other (more radical) action indirectly-you try to open up spaces for other action to occur in. If you try to make (radical) action happen (directly) through the institution (as Schmidt is trying to do), you'll kill the real action...
> ...(As a result of Schmidt's outside, confrontational style) what's generally happened is that NCAT is not seen as being very credible by CAA people in this region. It's seen as a boondoggle I guess...It is really viewed antagonisticly as not being together, as being confused, and as being overly bureaucratic and unresponsive...Either they're so self-righteous or they're not competent...Their not really linked in with (CAA or AT) people in a strategic way...(Parker interview, December 3, 1977)

Part of these complaints and dissatisfaction among NCAT's potential grassroots supporters and clients were due, of course, to the inevitable problems that emerge when a new organization tries to gear up as fast as NCAT did, but as the above remarks by Parker suggest, they were also partly due to Schmidt's outside, confrontational style and his reluctance to work with AT people, which he viewed as too apolitical and naive, and CAA and other agencies, which he saw as being too conservative.

Besides these three general levels of increasing tension and polarization, more specific problems and complaints about particular NCAT components also were voiced during this period. The Board, for example, expressed strong "displeasure" with Herb Epstein and the performance of the Washington Office at their August, 1977 meeting and Epstein left NCAT soon after, partially because of this (Minutes of NCAT Board Meeting, August 16-17, 1977).

Also, on my November/December 1977 research trip, I encountered numerous complaints about long delays and other problems with NCAT's Grants Program from grant applicants and grantees, such as, the following typical complaint that David Baylon of the Ecotope AT R&D group in Seattle, Washington made about their difficulty in getting a small grant from NCAT (Baylon interview, November 22, 1977):

> **It was obnoxious. We had the proposal approved by the technical staff by the end of June. It didn't go to the Board until the 12th of August. It was approved by CSA in the middle of September and we got the money (only) in the middle of November... We've worked with bureaucracies- USDA, DOE, ERDA- and I admit they're all pretty terrible, but CSA takes it hands down...**

Many of these complaints were the result of the delays caused by having to get several layers of approval (i.e. local CAAs, NCAT's technical staff, NCAT's program staff, the Board and CSA headquarters) on most grants. There were also internal staff and Board complaints about the amount of the Technical Support staff's time (one technical staffer, Antonicli, estimated that 30-40% of his time was taken up simply in reviewing and critiquing proposals(Antonioli interview, December 5, 1977)taken up in reviewing proposals.

It also turned out that the four first year R&D priorities for the Technical Support group, mentioned above, had not been well chosen (this isn't particularly surprising in that these priorities were chosen by Saul and some Board members, none of whom had a strong technical background in less than an hour during the finalization of the Green Book proposal). Soon after the team to work on heat source and flue damper efficiency, was organized, for example, it realized, as Larry Farrar recalled, that this wasn't an appropriate thing for the group to work on (Farrar interview, December 5, 1977):

> **...It took two or three days of looking through literature, calling vendors and making contacts with Federal groups and private industry (to decide) that the task (of developing a flue damper)... was not really the right thing for us to do here- (that) we should redirect our energy towards evaluating what was currently being done ... (But) then we found out Brookhaven National Labs, NBS, FEA, Consumer Products Safety Commission, Honeywell, etc. were already evaluating flue dampers). So it seemed kind of silly for us to get involved... building and testing (dampers) would have been a waste of time.**

Likewise, the low energy cooling team came to a similar conclusion, as team member Bert Naumann recalled in a December interview (December 6, 1977):

> **What we have developed is recognition of a few facts that had they been known (this area) never would have been used as an objective in the original funding document... The facts are that people with a low income can barely afford to build a house and if they can they aren't going to have enough money to make that house energy efficient... because they can**

> **buy an air conditioner, a fan, or a cooler... (for) much less than any other kind of measure they could take architecturally... (Also) low income people don't consider(cooling) one of their major problems and the obvious question for someone that's working here (at NCAT) is "why do I have to work on this when we've already identified it as an item of relatively little importance...**

There were also similar problems with the other two priority areas: mobile home weatherization and cellulose insulation manufacturing. As a result of these poorly chosen priorities, the Technical Support Component was left, for a time, without a clear focus or direction and , moreover, the program staff that it reported to lack the technical expertise to formulate a new one. As a result, this Component drifted for a while, until some of its own members, notably Blair Hamilton and Andy Shapiro, began to formulate their own new priorities and programs.

There were also problems with the Information/Communication Component being understaffed and complaints from regional groups about their regional organizer not being familiar with AT or in contact with regional CAA and AT groups. The regional organizers themselves, moreover, complained that they weren't receiving enough support or backup from the central staff in Butte. And, finally, the already controversial "democratic workplace" process drew increased criticism from the Board and staff that it was either a waste of energy and/or that it wasn't really democratic.

Despite the growing fragmentation, polarization and dissatisfaction that charaterized this "Great Crisis" period or life of NCAT, there was nevertheless some degree of evolution and innovation within the various NCAT components, some of which are shown towards the bottom of Figure 20 (oa1, ob1, oc1, od1). Blair Hamilton, for example, started an AT device testing and evaluation program (oa1) that eventually became the largest and most successful element of the Technical Support Component. Likewise, another technical staffer proposed and designed an Integral Urban AT Demonstration planning grant program (ob1) that the Grants Program implemented. Also, the Informa-

tion Component provided grants to establish a number of regional AT newsletters (ocl), some of which, such as, New Roots in New England, were fairly successful. And, Schmidt and the radical organizing faction focused some of its effort on mobilizing support for the small Mexican American community of Crystal City, Texas, whose natural gas was turned off by a large Texas utility after the community refused to pay a substantial rate hike, and ended up providing the community with some useful altenative energy options and technical support (odl). These innovative initiatives and designs, however, were the exception rather than the rule during this period.

VIIB: The November Program Committee and Board Meetings (Nov. '77)

The above dissatisfactions and tensions simmered on the Board and at NCAT and at the grassroots through the summer and fall of 1977 and came to a public boil during heated Program Committee and Board meetings in November.

In a special Program Committee meeting held in Washington, D.C. on November 4-5, 1977 and attended by Schmidt and Board members Maggiore, Mescunas, Barlow, Morris, Cook, Love, Olkowski and Hershey, Love seemed to speak for a number of the Board members present when he said:

> From my perspective this organization has some very real problems ...I've never been associated with an organization that isn't able to focus itself, like this one. I'm not proud of this organization! I think it's a fucking mess...We're wasting tax payer's dollars...
> ...The problem I have with the Center is that I don't see any creative energy coming out of it. I don't know if (this is because) the Butte community doesn't act as a catalyst or the staff isn't of high enough quality or all the red tape in staffing the Center and giving grants...We must rethink and clarify our vision for NCAT...(My notes on Nov. 4-5, 1977 NCAT Program meeting)

To which, Schmidt angrily responded:

> There is not a mess in the Center! I do see a great deal of problem with this Board, however...If I knew what I know now when I took this job, I wouldn't have taken it. I'm completely frustrated! We're now at a crisis center and I have to make a personal decision soon about whether I want to stay with the Center...(My notes on Nov. 4-5, 1977 Program meeting).

Morris and Barlow suggested a number of drastic proposals for remedying some of the problems and polarizations discussed above, which were debated at this meeting, including:

*Moving NCAT from Butte to a more appropriate and conducive place-Barlow proposed Denver (it had been hard to recruit competent staff, especially minorities, and do networking from Butte).

*Doing away with the MERDI subcontract and letting NCAT hire its own technical staff (to reduce the fragmentation and polarization between the program staff and the technical staff).

*Eliminating or subcontracting NCAT's grants program (which was hampered by redtape and took staff away from providing technical assistance).

*Having the NCAT staff chose a new Board in a year (to eliminate Board-staff polarization and make NCAT truly worker managed).

Barlow and Maggiore also proposed that a three month evaluative study be done of the NCAT staff. Schmidt saw this evaluation as being directed towards him personally and his leadership, but he welcomed it, saying "I want an evaluation done that results either in my being dismissed for incompetence or a vote of competence for my leadership".

At the full Board meeting, which occured several days later on November 11-12 in San Francisco, the debate continued on these and other possible options for dealing with NCATs problems and shortcomings. Morris made a detailed and highly critical assessment of NCAT and Schmidt's performance to date and argued that something drastic had to be done to turn NCAT around. And, when the Board failed to do something drastic enough for him, he resigned in protest, followed shortly thereafter by Barlow. The rest of the Board did, however, agree to a three-month evaluation of Schmidt's performance to be conducted by its Executive Committee.

As mentioned earlier, it was somewhat ironic that Morris and Barlow would become two of Schmidt's strongest critics on the Board and resign in protest over his leadership, in that they all shared a similar radical/community organizer political

perspective (and were leaders of this faction on the Board and staff). It was what they perceived as Schmidt's lack of performance and leadership, however, rather than his politics that they were critical of.

After this meeting, Schmidt incorrectly assumed that with Morris and Barlow off the Board and new members being added his problems and conflict with the Board would lessen. When I asked him about Board concerns about NCAT's performance in an interview in December, he suggested that Morris had been his main critic on the Board and now that he was gone, the Board was changing to more of a policy (rather than programming role) and as a result Board-staff relationships would be better:

> ...It was just one Board member (i.e. Morris that) raised some concerns about certain reports...What happened was not so much NCAT's (fault) but that of the Board members who were using NCAT for (their own) other reasons to tie into the CAP world...It's predictable that when you have a group of people involved in the planning and development process and then all of a sudden they lose control with the staff, the dynamics change...power relationships change...certain people couldn't accept that, certain people had needs for greater control...so charges and countercharges are made, people resign and new people are added...
>
> ...The Board has realized that it had to change and it has changed and it's let go of the Center. The Board is now beginning to function on policy and not in the program area...(Schmidt interview, December 6, 1977).

Here, Schmidt apparently grossly underestimated the strength of the dissatisfaction with his and NCAT's performance on the Board (I say "apparently" because he may have been more aware, but trying to present a more positive picture to me). Even without Morris and Barlow, there remained strong dissatisfaction and concerns about NCAT's performance on the Program Committee (particularly for Love and Cook). More importantly, the members of the Executive Committee, led by CSA/CAA faction leaders Maggiore, Brown and Freeman, who were to conduct the evaluation of Schmidt, although they had been less vocal about it, were in fact very dissatisfied with Schmidt's outspoken radical confrontational style and what they viewed as his failure to manage the Center (as exemplified in his "democratic workplace" experiment which they were

very critical of) (private conversation with Maggiore).

VIIC: NCAT's First Annual Meeting and the Firing of Schmidt (Feb-Apr.'78)

For the three months following the November Board meeting, Maggiore and the Board's Executive Committee quietly went about putting together their evaluation of Schmidt, carefully building a case for his termination. In early 1978, however, Schmidt and his faction got wind of this and began a last ditch effort to mobilize support for Schmidt and discredit his opponents. As a result the tension and polarization between pro- and anti- Schmidt factions on the Board and within the staff escaladed into open warfare, with Maggiore and most of the Executive Committee leading the anti-Schmidt forces on the Board and Dennis Holloway becoming Schmidt's strongest supporter on the Board and Fujimoto becoming the leader of the anti-Schmidt forces on the staff. In a bitter struggle that went on for weeks the pro-Schmidt forces attacked the anti-Schmidt staffers for being disloyal and the anti-Schmidt Board members as being puppets of CSA and the anti-Schmidt forces charged that NCAT had been ruined by Schmidt's confrontational politics and his incompetent management. Saul and CSA added fuel to the fire by refusing to refund NCAT for its second year until this "leadership issue" had been "resolved", by which it probably meant until Schmidt had been fired. The pro-Schmidt forces, however, used this to win a little support among non-CSA/CAA people on the Board who resented once again being pressured by CSA.

The final major confrontation in the bitter struggle that characterized NCAT's Great Crisis occured fittingly at the first annual NCAT meeting held on Febuary 11-12, 1978 in Washington, D.C., which instead of a self-congratulatory celebration of NCAT's first year achievements, turned into a pitched battle, with the pro- and anti-Schmidt forces heatedly attacking each other during public forums and in private confrontations.

After this acrimonious final confrontation, however, the die seemed to be cast as

far as Schmidt was concerned, and at a Board meeting in April, in a fairly close vote, the Board voted to terminate Schmidt, bringing to an end the Great Crisis, NCAT's most conflict ridden stage in a stormy history where conflict was the rule rather than the exception.

Opponents of Schmidt argued that the decision to terminate him was made solely on management grounds, but Schmidt and his supporters argued that his termination was politically motivated because he had been too independent for the Board and CSA headquarters.

After his firing, a number of Schmidt's strongest supporters left NCAT, including Holloway, who resigned from the Board in protest, and Knickmeyer, Hamilton and Sachs, who left the staff. After the bitter struggle that had pitted him against Schmidt, Fujimoto also left NCAT to return to teaching in California.

Also in April, Tom Bender published a critical article in RAIN, entitled "NCAT-Where are you at?", which proved to be both a critique and epitaph for NCAT under Schmidt, concluding that:

> NCAT has (serious) problems...There doesn't seem to be any single cause for all the problems...A board of directors that won't give the staff space or authority to do its work is a major problem...The size and rapid growth is probably another cause of difficulties...Staff competency appears to be another difficulty...Both NCAT staff members and board members point the finger at inadeqate management by the director (Schmidt)as a major problem...Another dimension of NCAT's problems is...(that it) is dominated by the CSA world...Adding to all these operational problems is an underlying spirit of distrust and divisiveness-on the board, between board and staff, and between the whole operation and its various constituencies on the outside...(Bender, 1978, p4-5).

Despite these problems, however, Bender held out the hope that there could be a rebirth of NCAT, saying: "None of these problems is insoluble. NCAT has to decide what it is and wants to be...and focus on doing <u>well</u> whatever it decides to do. It ain't easy, but it is possible." And, later NCAT indeed had a rebirth of sorts in its ninth life under Kepler, though not perhaps the kind that Bender and other grassroots AT people had hoped for.

Lives VIII and IX: Aftermath and the Coming of Kepler (May'78-June'79)

After Schmidt's termination brought NCAT's Great Crisis to a close, I stopped following NCAT closely and, therefore, I will only very briefly describe its two subsequent lives: the aftermath or hiatus after the Great Crisis when Hiram Shaw was interim director (May-December'78)(Life VIII) and its "rebirth" under Kepler (Jan.'79-Dec.'81)(Life IX).

After Schmidt's termination and the Board resignations that occured during the Great Crisis (particularly those of Morris, Barlow and Holloway), the CSA/CAA faction led by Maggiore was able to firmly reassert its control on the Board and over NCAT. After firing Schmidt, the Board, now dominated by the CSA/CAA faction, made Hiram Shaw, the most senior CAA person at NCAT, the interim director, while it searched for a replacement for Schmidt.

The low-keyed leadership of Shaw from May, 1978 to January, 1979, when Kepler took over as executive coordinator, (Life VIII) was a hiatus between Schmidt's stormy radical leadership during NCAT's start-up (Life VI) and Great Crisis (Life VII) and NCAT's "rebirth" and restructuring under Kepler's more conservative leadership (Life IX), during which NCAT sought to heal its internal wounds while it waited for a new executive coordinator to take over.

After a long search for a new executive coordinator, the Board finally agreed upon Ed Kepler, who had been the runner up to Schmidt for the original opening. Kepler, who had been an oil company executive and was currently the director of a CAP in New England, was viewed by the Board as a CAA person who would be a strong traditional type administrator. And this time the Board got exactly what it expected. Thus, when Kepler took over in January of 1979, he sought to restructure NCAT, with the support of the Board, to reflect the compromise vision/perspective worked out by the CSA/CAA and progressive factions (e.g. in the Organizing Committee's preliminary proposal, ab1, and the Green Book, abc) during the planning process. He, accordingly, sought to

refocus NCAT towards doing mainly technical support and transfer to CAAs (i.e. original visions a and b), believing NCAT's main strength was its technical expertise and that:

> ...We can't be all things to all people...Our function should be to build the technical base for appropriate technology. If there's no technical base for appropriate technology, there's no need for this movement to exist (quoted in Baldwin and Kinney, 1979).

Conversely, he deemphasized NCAT's role in AT networking, organizing and coalition building and in local community technology development (i.e. visions d and c), arguing that local CAAs were "better suited than NCAT for community development tasks." Hence, while Schmidt had emphasized a radical "outside" strategy (xvc), Kepler employed a conservative "inside/tech transfer" strategy (xva). As my preliminary analysis of local community technology development projects in the second half of this chapter will suggest, the optimum strategy for NCAT probably lay in between these extremes, i.e., a "mixed" strategy emphasizing facilitating community technology organizing and development(xvb), but after Schmidt's extreme radicalism and the reduction of the ranks and influence of the AT and Community Activist factions on the Board and staff caused by the Great Crisis, the pendulum tended to swing too far in a conservative direction.

Besides reflecting a "inside" progressive general strategy (design option xva), the "reborn" NCAT under Kelper also reflected the CAA/progressive preferences on the other two controversial operational design issues: the Board, now dominated by CSA/CAA people became a policy-making Board that left the programming to Kepler and his staff (xvia) and Schmidt's "democratic workplace" was replaced with a traditional hiearchical structure controled by Kepler (xviia).

During his first months at NCAT, Kepler sought to get control of the center and implement his CAA/progressive tech transfer and support vision by (1) ending

"democratic management" and replacing it with a traditional management hiearchy, (2) filling staff vacancies left by the Great Crisis (including associate coordinator for information, the field worker supervisor, a number of regional workers and the D.C. resource mobilizer) with people sympathetic to his approach, (3) transfering the Technical Support group from MERDI to NCAT, (4) focusing the grants program on tech support and transfer to CAAs, and (5)requiring field workers to work more closely with CAAs and CSA regional offices (Baldwin and Kinney, 1979).

Through these and other changes, Kepler was able to better integrate the conponents of NCAT under his progressive/CAA vision. These reoriented components are listed at the bottom of the coevolving system diagram in Figure 20. Thus, the Technical Support group, now within NCAT itself, now focused on providing technical support and advise to CSA and CAAs (oa2). The Grants Program now emphasized what Kepler called its "national emphasis grants" which sought to tranfer specific AT devices, solar greenhouses during Kepler's first year to low income families through CAAs (oa2). The Information Program was shifted from national AT networking to publicizing and promoting NCAT's own activities and products and its regional newsletters replaced with an NCAT newspaper that promoted both AT and NCAT (oc2). Also, the work of the regional outreach workers was shifted from radical organizing to mainly supporting and advising regional CAAs on AT and energy (od2).

The most important new staffer Kepler hired was Scott Sklar to head NCAT's Washington Office. Sklar was a progressive, who had worked many years for Senator Jacob Javits and knew Washington well and also had good contacts with AT groups. As a result, he was able to run the D.C. office more effectively than it had been run before and he and Kepler together functioned as a strong leadership team for NCAT, forging the third real intellectual marriage in the evolution of NCAT (Eccli/Cook and Morris/Barlow being the others).

Under the leadership of Kepler and Sklar NCAT ran much more smoothly and efficiently than before, but in "taming" the NCAT much of the visionary spirit and excitment that had characterized its planning and start-up were lost.

This concludes my case study of the stormy evolution of the NCAT. The difficult evolution of the design for NCAT can be usefully contrasted with my earlier case study of the evolution of the designs of the New Alchemists in Chapter 3. It appeals that the evolution of the NCAT exhibited more conflict and polarization and less real coevolution of leaders,designs and organization for a number of reasons. First the design of NCAT was much broader and dealt more with social/institutional design,so it could naturally expected to be more conflictual and politicized than the New Alchemists' design. Equally important,however,were two addition factors: first,that in the New Alchemy case there was a relatively unified group doing the design and implementation,whereas,in the NCAT case,as we've seen,there four distinctive factions,with very different worldviews and interests,involved in the design process; and second,in the New Alchemy case there was a strong,effective and constant leadership/transformer team,John and Nancy Todd,present, whereas,in the case of NCAT,no leader/transformer was able to build a coalition or mediate among the factions long enough to design and implement an integrated vision and plan for NCAT. To have mediated across the different factions involved in the design of NCAT would have been difficult,given their different visions and interests,but perhaps not impossible if the right transformer with the right vision and leadership skills had come along at the right time.

Part II- Community Technology Development Projects in San Bernardino, Chicago, Eugene and Seattle[4]

After having followed the stormy evolution of NCAT for a year or so, I decided to broaden my study of the "small war on poverty" to also look at and analysize a number of pioneering local community technology development efforts, reasoning that I couldn't say anything definitive about community technology development and the "small war" and their potential and limitations without looking at these local efforts as well as the national effort to plan and implement NCAT. Accordingly, from 1979 to 1981, I studied pioneering community technology development efforts and projects in five cities: New York (on both the Lower East Side and in the South Bronx), Chicago, San Bernardino, Eugene (Oregon) and Seattle (see Decker, 1979 and 1981; some of this research was supported by CSA and the National Park Service). Figure 22 summarizes some of the key features of the various community/neighborhood technology projects I looked at in these cities, including the community/community development group involved ("CD group"), the AT or technical support group involved ("TS group"), the technology involved, the innovative process involved (to be discussed later), and the source and amount of financial support involved. In this part I will briefly describe four of these community technology development efforts, which illustrate the potential and limitations of these efforts, and I will draw some tentative conclusions about the strengths and weakenesses of these efforts in general. The four illustrative examples of community/neighborhood technology development I will describe here, are all from the "second wave" of projects/experiments that were inspired by the earlier pioneering efforts in New York City. They include: (i) the community solar projects of the Westside CDC in San Bernardino, California; (ii) the solar greenhouse projects of the Center for Neighborhood Technology done with various community groups in Chicago; the Integral Urban AT Demostration (IUD) supported by NCAT and carried out by the

Figure 22: Summary of Neighborhood Technology Experiments in New York and Four Other Cities

Locality	CD Group	TS Group	Technology	Process	Support
NY Lower East Side	*CHARAS	Bucky Fuller	Domes	Mutual/Bottom	<25k, private
	*519 E. 11th St.	Energy Task Force	Housing/Solar/ Wind	AT/Bottom	<100k, CSA/NYC
	*Adopt-A-Building		Urban Homesteading	Com/Mixed	>1M, HUD/CETA
	*LEAC/11th St.	UHAB, ETF	Aquaculture & others	Mutual/Bottom	<100k, NCAT/CSA
	*LEAC/CHARAS	Goddard College	Recycling Center	Mutual/Bottom	<50k, NCAT
	*LEAC/CUANDO	Energy Task Force	Solar Wall, etc.	AT/Bottom	<50k, NCAT
South Bronx	*Bronx Frontier Corp.	ETF	Composting	AT/Bottom	<500k, CSA/Found.
	*Peoples Development Corp.	UHAB	Housing	Com/Mixed	>1M, HUD/CETA
	*PDC/BESS	Self	Recycling/ Bioshelters	Com/Bottom	<25k, Found.
	*PDC/Energy Team	ETF/Self	Energy conservation	Com/Bottom	<100k, HUD/State
	*Open Space Task Force	ILSR	Gardening, Open Space Planning	Mutual/Mixed	>1M, Interior
Chicago	*CAM	CUA/CNT	Rooftop greenhouse	Com/Bottom	<25k, Private/Found.
	*Operation Brotherhood	Center for Neighborhood Technology	Solar greenhouse	Mutual/Bottom	<25k, City
	*18th St. Corp.	CNT	Solar greenhouse	AT/Bottom	<25k, City
	*1st Presbyterian	CNT	Solar greenhouse	Com/Bottom	<50k
San Bernardino Westside	*Westside CDC	Earth/Life Systems Research	Neighborhood Solar System	Com/Bottom	<250k, HUD/CSA
	*Westside CDC	Self	Solar Collector Manufacture	Com/Bottom	<250k, State/CSA
	*Westside CDC	Solarex/Calif. Poly.	Solar Drying/ Industrial Park	Com/Bottom	>1M, CSA/EDA
Eugene, Oregon	*Whiteaker Community Council	Oregon AT, etc.	Integrated Urban Plan	Mutual/Mixed	<100k, NCAT
Seattle	*South Park Committee	CNT/Ecotope	Solar greenhouse	Mutual/Mixed	<25k, City CBG
	*Madison/Jackson Council	CNT/Ecotope	Solar Collector Workshops	Mutual/Mixed	<25k, City CBG
	*Active Mexicanos	CNT/Ecotope	Thermal Shutters, Window Greenhouse	Mutual/Mixed	<25k, City CBG

Whiteaker Community Council in Eugene, Oregon; and (iv) the various community technology projects supported by the Coalition for Neighborhood Technology in Seattle, Washington. The pioneering community technology efforts on New York's Lower East Side and in the South Bronx were described in a prior report (Decker, 1981), so they will not be described in detail here. They will, however, be utilized along with the other four later efforts, discussed here, in drawing my tentative general conclusions about the strengths and weaknesses of community technology development as a community development and empowerment strategy.

The pattern of design evolution exhibited by these pioneering community technology development projects generally fell somewhere in between the smooth, progressive coevolution of AT designs exhibited by the New Alchemists and other pioneering AT families and groups and the stormy, convoluted evolution of the NCAT. As with NCAT, there were some factional conflicts and disputes, particularly in the original pioneering efforts in New York. There was also, however, more cooperation among factions, resulting in the progressive coevolution of designs and their implementation, than in the planning and early start-up of NCAT. The most important perspectives/factions in these local efforts were:

> 1) AT pioneers, such as, Travis Price, the outlaw designer from the Southwest, that conceived and carried out the alternative energy projects at 519 E 11th St. in New York.
>
> 2) Indigeous community leaders, such as, Rabbit Navarro, who worked on and legitimized the 519 E 11th St. sweat equity rehab and energy project and later ran Adopt-A-Building's large Urban Homesteading Program on the Lower East Side and Valerie Pope Ludlam, the welfare mother who organized San Bernardino's Westside CDC and later launched its solar demostration and manufacturing projects.
>
> 3) Progressive to radical community organizers, such as, Michael Freedberg, who assumed leadership of the 519 E 11th St. project after Price moved out and organized the Eleventh Street Movement and the Lower Eastside Environmental Action Coalition, who sought to use AT as a vehicle for organizing and empowering communities.

4) Progressive technical and nontechnical support people and officials, such as, CAA staffers, city officials and technical experts that provided financial, technical and organizational support for these projects.

As with the important NCAT factions on the national level, all of these factions seemed to be necessary if community technology development efforts were to work on the local level, but, as with the NCAT factions, there were inherent tension among these factions that flared up from time to time and made the creation of lasting partnerships or coalitions for community technology development difficult. While difficult, however, such partnerships were not impossible (as sometimes seemed the case with NCAT), particularly in the second wave of community technology development efforts I will describe here (the earlier pioneering New York efforts exhibited more intense and frequent inter-factional conflicts and often broke down as a result of these conflicts; see Decker, 1981).

Ideally, a detailed coevolutionary cultural/conflictual analysis, like the one done of NCAT in Part I of this chapter, should be done on a number of these community technology development efforts, so as to give a fairly comprehensive picture of the "Small War on Poverty" and community technology development as a coevolving cultural movement on both a national and local level. In the future I intend to do such an analysis of some of these efforts, particularly the pioneering ones in New York; here, however, I will have to limit myself to a simpler, more functional analysis, based on my preliminary research and findings on these efforts.

Research Questions and a Preliminary Functional Framework

As I began to study various local community technology development efforts, I framed the following twelve research questions (taken from Decker, 1981), which I hoped to address through my study and analysis of these efforts (since all these efforts dealt with urban neighborhoods, I've used the more specific term "neighborhood techno-

logy development" rather than the more generic term "community technology development" in formulating and later addressing these questions):

1) Does Neighborhood Technology Development really work? That is, do these neighborhood technology development efforts show the potential for alleviating poverty and/or enhancing the self reliance, development and empowerment of low income urban neighborhoods and families?

2) If Neighborhood Technology Development does work, how and why does it? That is, if neighborhood technology development efforts do help alleviate poverty or enhance low income neighborhoods, exactly how and why do they?

3) More specifically, what is the relationship between Neighborhood Technology Development and other, more traditional, forms of community development? That is, are neighborhood technology development and community development separate and distinct activities or should NTD be viewed as one input to or as one type or component of CD?

4) What alternative approaches, models and processes for Neighborhood Technology Development are reflected in the various pioneering efforts to date? That is, what important structural and process dimensions and variables should these efforts be categorized and analyzed under?

5) How should Neighborhood Technology Development projects be evaluated? That is, what should be looked for in analyzing these projects and what criteria should be used in assessing their success or failure?

6) What improvements in service or goods delivery, if any, resulted from these efforts? That is, what were the direct, concrete accomplishments of these efforts: Did they save money on energy or deliver it in a more reliable way? Did they reduce food costs or provide more nutritious food? Did they result in better housing? Etc.

7) What "capacity building" and other indirect benefits resulted from these efforts? That is, what additional benefits did these efforts have beyond their direct impact on goods and service delivery? Did they, for example, provide new skills, create new jobs, enhance the community and its members self confidence or otherwise increase its "capacity" to deal with its problems?

8) Which Neighborhood Technology Develoment efforts were the most successful? This is, how would these efforts be ranked, roughly, according to an appropriate success or effectiveness criteria?

9) What factors are most critical to the success of Neighborhood Technology Development? That is, what dimensions or variables of these efforts are most related to their relative success?

10) How can effective Neighborhood Technology Development systems and partnerships be created and maintained? That is, how can the necessary factions and interests be brought together into an effective partnership that then coevolves an approriate local neighborhood technology delivery system?

11) More specifically, what type of neighborhood and city-wide technical support infrastructure is appropriate to support Neighborhood Technology Development? That is, can technical support best be provided by city-wide neighborhood technology support groups, by neighborhood based TS groups, within CD groups themselves, from established institutions, such as, universities, or a combination of all four of these?

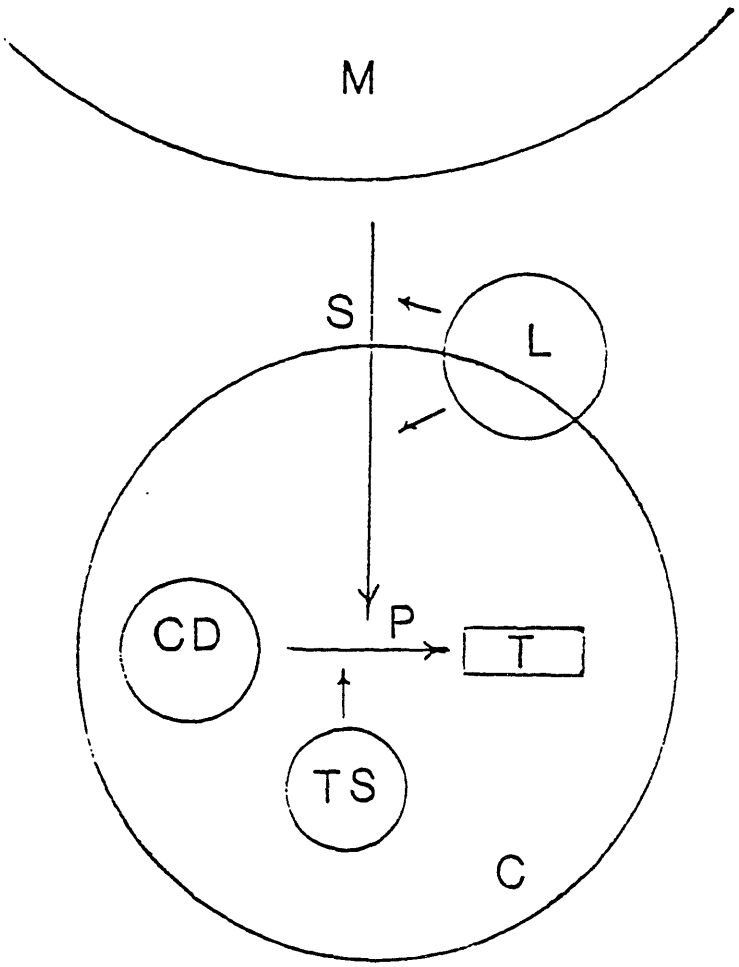
12) What role should Federal, state, and local agencies play in facilitating and supporting Neighborhood Technology Development? That is what type of approach should agencies take in supporting, sponsoring and providing resources for neighborhood technology development efforts?

I used these research questions to guide my initial study and analysis of the pioneering neighborhood technology development efforts in New York and the four cities to be described below. Admitedly, these questions are rather narrow and functional in scope and do not fully reflect my current coevolving cultural perspective and approach for analyzing AT and community technology as cultural movements. They, nevertheless, I think, provide a useful starting point in beginning to assess these efforts and their significance. Accordingly, after describing the four exemplary neighborhood technology efforts in San Bernardino, Chicago, Eugene and Seattle, I will briefly address each of these questions in a preliminary way. And after that, I'll suggest how these questions and my preliminary functional assessment based on them might later be expanded into a fuller cultural assessment reflecting and utilizing my current coevolutionary perspective and approach.

In order to begin to address these questions, I developed the simple diagram or model of the typical neighborhood technology development process shown in Figure 23. This diagram showed the eight aspects or elements that were typically present in the neighborhood technology development efforts I observed. For each of these typical elements or components, I then isolated some variable features that might possibly affect the relative success of these efforts. These possible independent variables and factors are listed in Figure 24.

Having developed some candidate factors and variables that might help explain the

Figure 23: ELEMENTS OF SIMPLE MODEL OF NEIGHBORHOOD TECHNOLOGY DEVELOPMENT PROCESS



C = Relevant Community
CD = Relevant Community Development Group
T = Technology Being Implemented
P = Process for Implementing Technology (Neighborhood Technology Development Process)
TS = Technical Support Group
S = Outside Support for Project
L = Relationship of Local Institutions to Project
M = Macro Aspects of Neighborhood Technology Development and Delivery

Figure 24: Factors and Variables Which Might Affect the Success of Neighborhood Technology Experiments

T NATURE OF TECHNOLOGY

- T1 Complexity of Technology (Simple, Moderate, Complex)
- T2 Cost Effectiveness of Technology (<1 year, <5 years, <10 years, >10 years*)
- T3 Relevance to Perceived Community Problems/Needs (Low, Medium, High)

C NATURE OF COMMUNITY

- C1 Type of Neighborhood (Integral, Parochial, Diffuse, Stepping-Stone, Transitory, Anomic**)
- C2 Amount of Poverty (% of Poor or Near Poor)
- C3 Type of Poverty (Resistant, Upward Mobile, Voluntary, Mixed)
- C4 Degree of Conflict (High, Medium, Low)

P NATURE OF NEIGHBORHOOD TECHNOLOGY DEVELOPMENT PROCESS

- P1 Goal and Ideology of Project (Revolutionary, Alternative/Environmental, Mixed, Evolutionary***)
- P2 Initiation (Community, AT, Mutual, Other)
- P3 Type of Change Agent(s) (AT Oriented, Community Oriented, Mixed)
- P4 Degree of Participation by Community (Low, Medium, High)
- P5 Project Leadership (Indigenous, AT, Outside, Mixed)
- P6 Cooperation Among Leaders and Community (Low, Medium, High)

CD NATURE OF COMMUNITY DEVELOPMENT GROUP

- CD1 Approach of Group (Self Help, Service Delivery, Institutional/Capacity Building, Political Organizing)
- CD2 Group Focus (General, Education/Culture, Housing, Energy, Economics, AT)
- CD3 Maturity of Group (<1 year, <3 years, <5 years, >5 years)
- CD4 Relevance of Previous Experience to Current Project (Low, Medium, High)

TS NATURE OF TECHNICAL SUPPORT

- TS1 Ideology of Technical Support Group(s) (AT, CD, Mainstream, Mixed)
- TS2 Client/Community Empathy (Low, Medium, High)
- TS3 Quality/Experience (Low, Medium, High)

S NATURE OF OUTSIDE SUPPORT

- S1 Total Amount of Outside Support (in $/year)
- S2 % of Support from Federal Grants
- S3 % of Support for Management/Education/Capacity Building/Planning)
- S4 Understanding of Supporting Agency (Low, Medium, High)

L RELATIONSHIP WITH LOCAL INSTITUTIONS

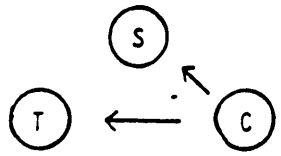
- L1 Relationship with Local Government (Strong, Good, Fair, Poor)
- L2 Relationship with Other CD Institutions (Strong, Good, Fair, Poor)
- L3 Relationship with Other Local Institutions (Strong, Good, Fair, Poor)

*estimated payback period for technology
**Warren and Warren's categories of neighborhood types (1977)
***"revolutionary" and "evolutionary" categories from Rybczynski (1980)

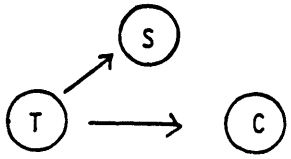
how and why neighborhood technology development worked (question #2 above) and the relative success of different efforts (questions #4, 5, 8, and 9 above), I began to look for indications of which of these factors/variables seemed to be the most critical in the efforts I was studying. This and the literature on the process of technological innovation (particularly Havelock's "linkage model" of innovation, 1969; and Berman and McLaughlin's studies of the implementation of innovations in schools, 1978), which heavily influenced my thinking about neighborhood technology development at this time, caused me to focus in on the nature of the neighborhood technology innovation or development process and process variables in attempting to explain the relative success or failure of different efforts. Specifically, variables P2, where the initiative for the effort originated, and P3, the type and effectiveness of change agents, or what I've come to call AT "transformers" in the efforts, seemed particularly important in explaining the degree of success or failure in the different efforts I studied. This realization, in turn, led me to develop two more specific process models of neighborhood technology development and innovation. Figure 25 depicts the first of these models, which characterized alternative approaches or processes for neighborhood technology development according to how the components of sponsor (S), technical support (T), and community members and groups (C) are linked to deliver neighborhood technology and where the initiative comes from. Figure 25 depicts five alternative approaches or categories of neighborhood technology development based on this variable: (1) the community control approach or model; (2) the transfer approach; (3) the top-down approach; (4) two types of linkage approaches (technology support/community linkage and community/sponsor linkage); and (5) the full partnership approach.

The second specific model of neighborhood technology development involved applying my general model of the role of AT "transformers" in AT innovation, described in Chapter 1, to the special case of neighborhood technology innovation. Figure 26, for example, illustrates the use of my transformer diagramming scheme

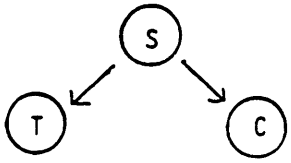
Figure 25: ALTERNATIVE APPROACHES TO NEIGHBORHOOD TECHNOLOGY DEVELOPMENT



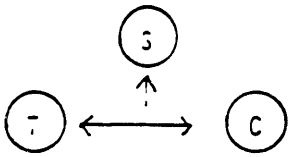
I. COMMUNITY CONTROL
(initiative comes from community)

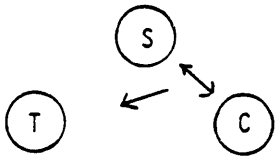


II. TRANSFER
(initiative comes from technology developers)

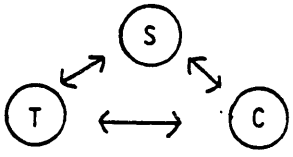


III. TOP - DOWN
(initiative comes from sponsoring agency)





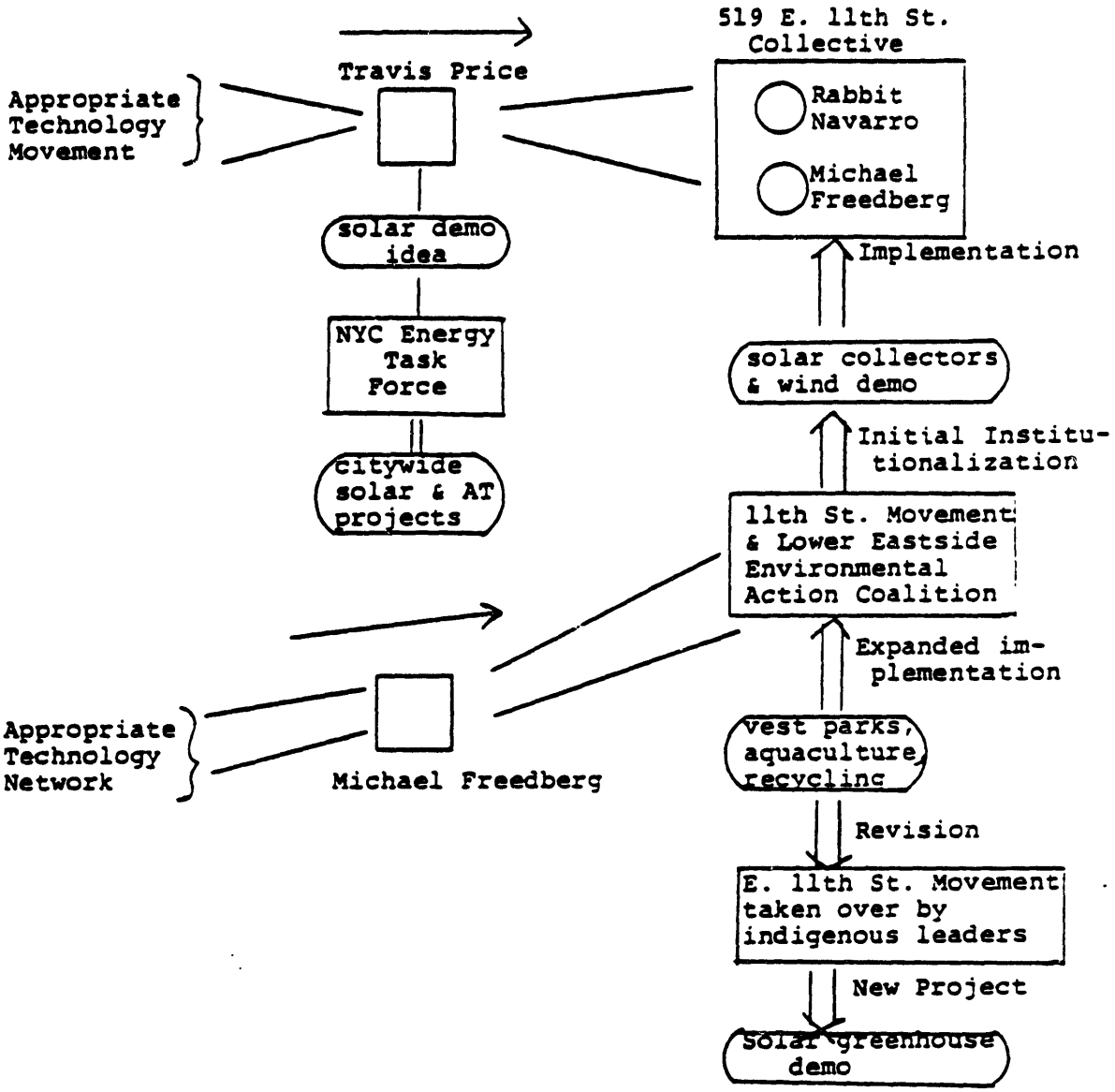
IV. LINKAGE MODELS
(initiative comes from
a. community and technology developers or
b. community and sponsoring agency



V. FULL PARTNERSHIP
(shared responsibility among community, technology developers, and sponsor)

Key: S = sponsoring agency for project
C = community implementing technology
T = technology developers, advisors and consultants

Figure 26: Example of Role of AT Transformers in : E. 11th St. in NYC
Neighborhood Technology Development



in depicting the role of transformers Travis Price and Michael Freedberg and the progression of designs and projects in the pioneering neighborhood technology development effort on E. 11th Street in New York. While not as comprehensive as my later coevolving system diagrams used in the analysis of the evolution of the designs of the New Alchemists in Chapter 3 and the evolution of NCAT in Part I of this chapter, I've found such diagrams useful in depicting the general steps and actors involved in neighborhood technology development.

In the four preliminary local descriptions, which follow, after very briefly describing the community setting and other components of the effort, I, then, focus in on the process of innovation characterizing the effort, using both my initiation/linkage model (Figure 25) and my transformer model/diagram (as illustrated in Figure 26) to depict and characterize this process. After this, I suggest some tentative lessons about the potential and limits of neighborhood technology development that might be drawn from each of these efforts.

Finally, after these four local descriptions, I will briefly address each of the above research questions, generally, drawing on these four case descriptions and the pioneering New York efforts described elsewhere (Decker, 1981).

LOCAL CASE I: SOLAR IN SAN BERNARDINO

One of the most promising series of neighborhood technology development projects were carried out by a Community development Corporation in San Bernardino, a small city about 50 miles east of Los Angeles. The San Bernardino Westside Community Development Corporation (SBWCDC) was organized by a group of welfare mothers in 1972 to improve the quality of life of low income residents at San Bernardino's Westside, and to train and motivate youth in the area. As an outgrowth of its community revitalization program, SBWCDC moved into the solar field in 1976, obtaining federal funds to build a neighborhood solar system to service

ten low income homes. Subsequently, as part of its youth training program SBWCDC began manufacturing simple "breadbox" solar hot water heaters and installing them on low income persons' homes. Then in 1980 SBWCDC started to plan and to build an ambitious industrial complex which was to contain a twenty acre Energy Technology Center which would develop, test and manufacture energy related products and produce renewable energy for the rest of the complex. Figure 27 lists major milestones in the evolution of SBWCDC's solar projects. SBWCDC was definitely one of the big thinkers in small technology.

The Westside of San Bernardino was particularly hard hit by the closing of an airforce base a few years ago. There are still a large number of abandoned houses in the area. The welfare mothers that created SBWCDC felt that certain problems of the community needed to be addressed by positive action by the residents instead of protest and demonstration and that the CDC could be the vehicle for such action. Between 1972 and 1975 the organization focused on traditional community development activities such as community organizing, home repair, vocational training and crime reporting. In 1974-5 SBWCDC got involved in building rehabilitation -- rehabin 21 abandoned homes for the Veteran's Administration using youth crews.

In 1976 some SBWCDC youth went on a tour of Congressman George Brown's district office where they saw a homemade solar hot water heater. They came back enthusiastic about the prospects for solar and as a result of their interest the CDC decided to include some solar development within its rehabilitation and vocational training programs. The first solar project, an ambitious neighborhood solar system with common collectors and storage funded by HUD and other agencies, captured the enthusiasm of CDC's staff and workers and since 1976 solar energy development has been

Figure 27: Milestones in the Evolution of San Bernardino Westside CDC's Solar Projects

Period	Project/Program/Event	Description
1972-present	San Bernardino's Westside Community Development Corporation	formed by a group of welfare mothers, from 1972-75 SBWCDC focused on traditional community development activities, got into solar in 1976
1974-1976	SBWCDC Rehab Program	SBWCDC youth crews rehab 21 abandoned houses for the VA
1976-1977	SBWCDC Neighborhood Solar System	with a grant from HUD, SBWCDC installs a solar system with common collectors and storage to provide heat and hot water to ten low income homes. Installation includes hydroponic greenhouse.
1977- 1981	SBWCDC Solar Manufacturing Vocational Training Program	SBWCDC runs a vocational training program for youth in which the youths build and install solar collectors on low income persons' homes
1978-1981	Initiation of Energy Technology Center/Industrial Park	SBWCDC started to build a 20-acre Energy Center/Industrial Park which will include a solar concrete plant, solar component assembly plant, 10 light manufacturing tenants, a research institute and training center. The park would be powered by photovoltaics and other renewables.

a major focus of the CDC.

Nature of Innovations

SBWCDC initiated three major solar projects in the late '70s: (1) the neighborhood solar system demonstration, (2) the manufacture and installation of solar "bread box" collectors and panels, and (3) the planning of a twenty acre Energy Technology Center.

Figure 28 shows a pictoral representation and layout and design diagrams for the neighborhood solar system designed and built by SBWCDC in the Pelmann Heights neighborhood of San Bernardino's Westside. The system provides heat and hot water to ten small houses rehabilitated by the CDC for the VA and was built with $437,500 in governmental funding, mainly from HUD, CSA and CETA(DOL). The system consists of 70 solar collectors generating heat which is stored in a buried 5,000 gallon water tank from which water is pumped to provide heat and hot water to the attached houses. The facility also has a solar greenhouse which was intended to be used by residents to grow vegetables hydroponically. When the author visited (August '79) the greenhouse was not in use.

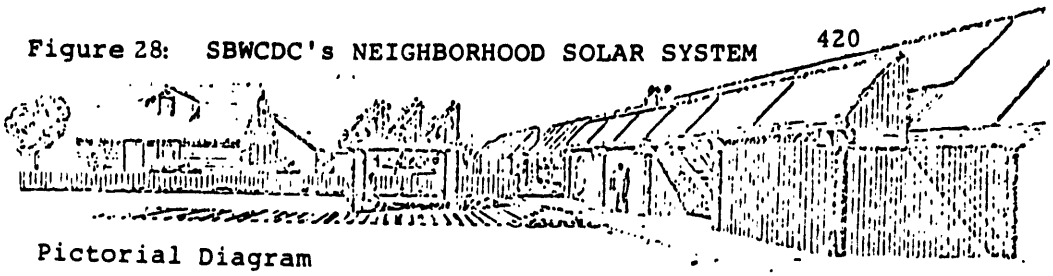
The system was intended to provide 80% of the space heating and 100% of the hot water needs for the ten attached houses but probably it provides less than that but good monitoring data is not at present available on the system.

It was originally intended that the system be turned over to the residents of the ten homes to be run as a cooperative utility but this did not happen and, instead, the systems had to be maintained by consultants and staff of the CDC.

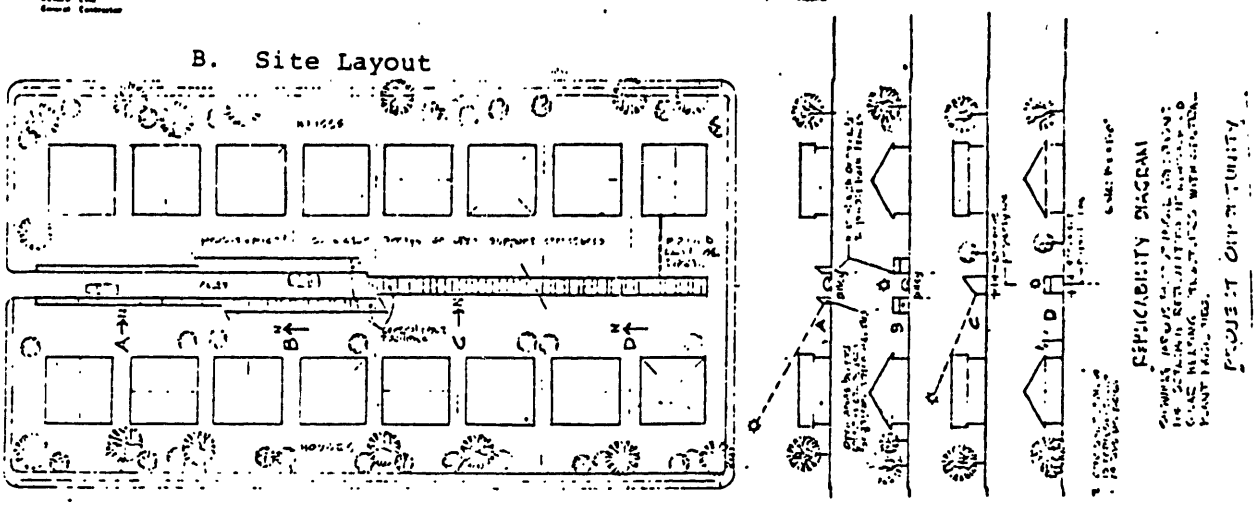
SBWCDC's second solar project involved a simple "bread box" solar hot water heater which the CDC manufactured in its vocational training shop. This collector, made of two blackened oil drums and a box covered with glass,

Figure 28: SBWCDC's NEIGHBORHOOD SOLAR SYSTEM

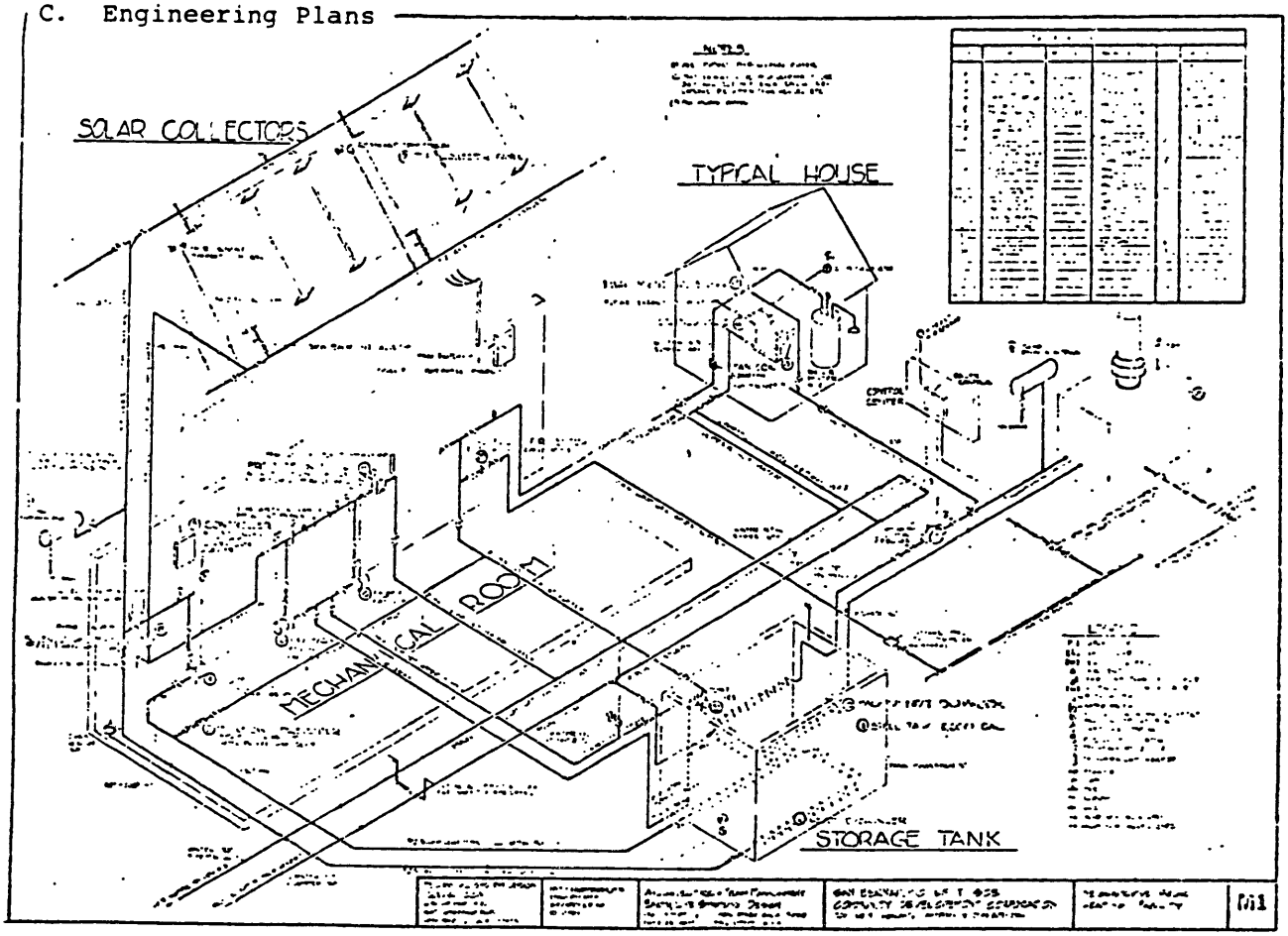
A. Pictorial Diagram



B. Site Layout



C. Engineering Plans



could be manufactured for around $200 (about 1/10 of what commercial systems cost) and so would have a short payback period. The CDC installed and tested over 30 such collectors on low income persons' homes around San Bernardino and got in 1979 a contract to install 40-50 more on farm workers' homes.

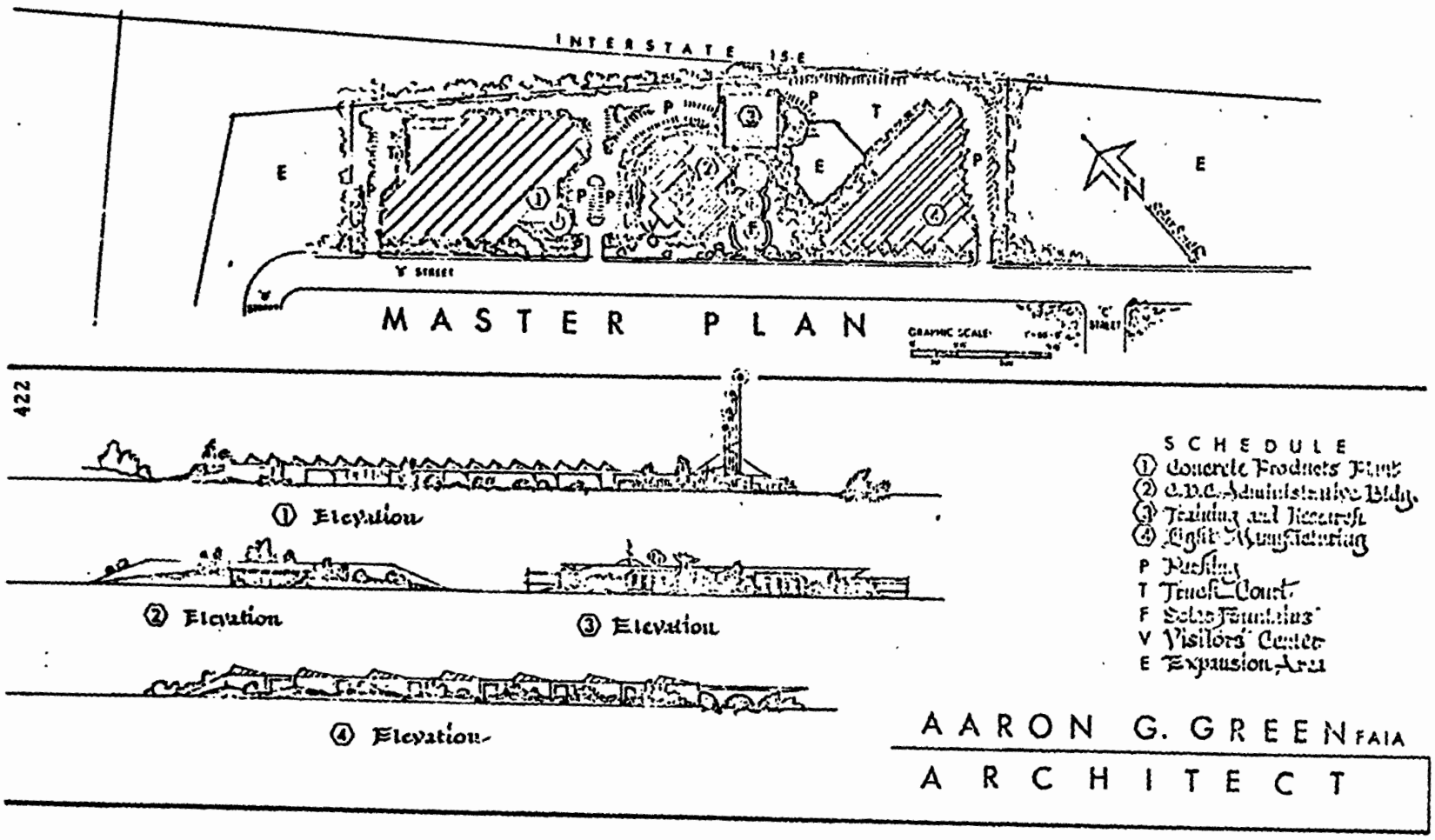
The SBWCDC's most ambitious energy project was a planned 20 acre Energy Technology Center to be located in a 222 acre industrial park also planned by the CDC.[29] Figure shows a plan for the Center. The CDC, in 1980, completed a comprehensive proposal for the Center, obtained the land from the city, and negotiated with EDA and other governmental agencies to implement the first phase of the plan, concrete products plant in which concrete blocks will be dried with solar. Other components planned for this Center included:

* a plant for assembling solar components, intended to employ approximately 100 people and turn out forty solar panels a day.
* space for approximately ten energy-related light manufacturing tenants, such as photovoltaic fabrication, each with 10-20 employees.
* an energy research institute operated in conjunction with Caly-Poly with approximately 30 staff and trainees and a training center for technological training in industrial solar and environmental management areas.

The Innovation Process

Figure 30 shows the solar innovation process at SBWCDC. The initiative and momentum for solar innovation has come from the organization itself rather than from outside the organization (i.e. the community control model). Moreover, the solar projects have been a natural extension of the CDC's ongoing programs,

Figure 29 : SITE PLAN FOR SBWCDC'S ENERGY TECHNOLOGY CENTER



CDC ENERGY TECHNOLOGY CENTER

SAN BERNADINO, CA.

DD&A CONSULTANTS

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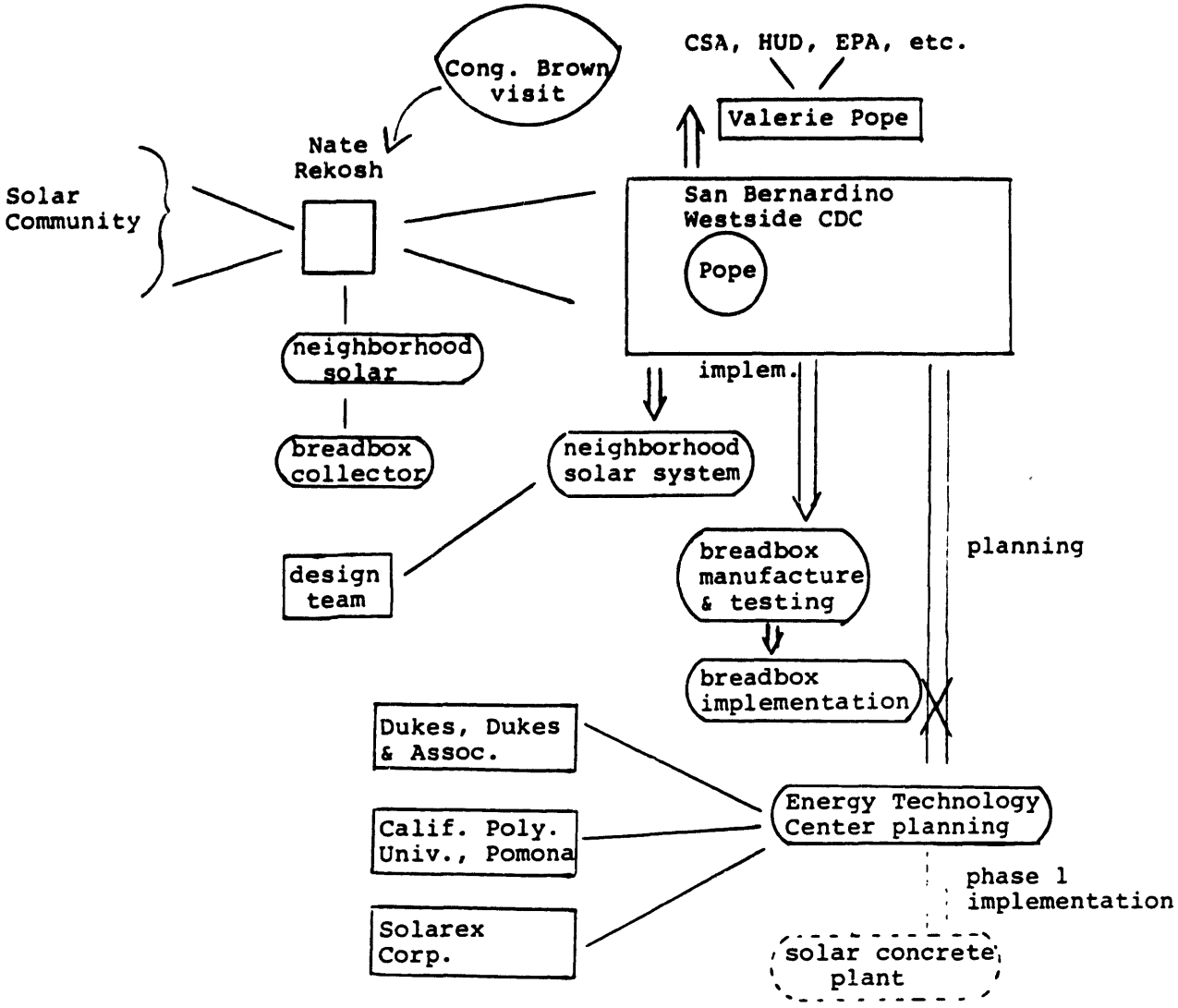
Figure 30· SOLAR INNOVATION PROCESS AT SAN BERNARDINO WESTSIDE CDC



especially housing rehabilitation, vocational training and more recently economic development, rather than a new point of departure.

As mentioned above the original stimulus for getting into the solar area came when a group of youth from the CDC visited Congressman George Brown's district office and saw ahome-made solar collector demonstrated. They cameback enthusiastic about solar and Valerie Pope Ludlam, the charismatic black women who directs SBWCDC, and Richard Cole, SBWCDC's director of construction, began exploring options for solar projects. Nate Rekosh, the CDC staff engineer, a retired Naval engineer, came up with the idea for the neighborhood solar system, won endorsement from Ludlam and Cole, and developed a design for the system. Pope took the plan to Washington and eventually got funding from CSA and HUD (as well as CETA funding for labor) to carry out the project. Rekosh also conceived the idea and developed the design (from similar plans) for the breadbox collector which the CDC manufactured. In the early stages of the CDC's involvement with solar, Rekosh was the key transformer of ideas of the solar community into specific projects for the CDC. (as shown in Figure 30) The idea for the Energy Technology Center and its subsequent design came from many sources, Valerie Pope Ludlam being a key catalyst.

The planning and design of the neighborhood solar system was done by Rekosh with the assistance of an outside design team. The planning and design of the breadbox collectors was done mainly by Rekosh himself based on designs he'd seen in the solar literature. The planning of the Energy Technology Center, however, involved a wide group of people both within and outside of SBWCDC.

In part as a result of moving into the solar area, SBWCDC in 1979 created a central planning and research component to plan & develop new solar projects

in the future. The CDC also began to rely more on outside consulting and research organizations, such as Dukes, Dukes, and Associates, Green Associates, California Polytechnic University and Solarex Corporation, in developing its plan for the Energy Technology Center.

The neighborhood solar system and breadbox collector projects were implemented by CDC staff and trainees. In the case of the neighborhood solar system, the project was built by youth crews under the supervision of Richard Cole, head of construction for the CDC and Rekosh. The breadbox collectors were built, tested and installed by youth in the CDC's vocational training staff. A wider group was to be involved in the implementation of the Energy Technology Center. Solarex Corporation, for example, was to provide the photo voltaic technology used in the Center. Dukes, Dukes, & Associates was to provide architectural plans and California State Polytechnic University at Pomona was to provide technical support.

View of Appropriate/Neighborhood Technology

Valerie Pope Ludlam and the SBWCDC leadership, in contrast to the more radical elements of the appropriate/alternative technology movement, sees solar not as an alternative to the existing system but as a vehicle for minorities to gain access to that system. Solar is viewed not as an alternative to modern "space age" technology, but as the latest example of such technology. Pope feels that too often in the past minorities and the poor have been excluded from using new technologies because they haven't "gotten in on the ground floor" and she wants to make sure that doesn't happen with solar. Accordingly, the SBWCDC and their technical consultants don't subscribe to values such as "small is beautiful," "voluntary simplicity," or "labor intensiveness." They are interested in promoting solar technologies which enhance the visibility of SBWCDC and

contribute to their economic development goals.

Nate Rekosh, the transformer for SBWCDC's first two solar projects, came out of an engineering career in the navy rather than out of the AT movement like transformers at many other sites. His motivation was to develop innovative projects which would hopefully be useful to residents of the target area. Because he was on the staff of the CDC he probably had higher client identification than many transformers who are outside the target organizations.

Community Impacts and Lessons

The neighborhood solar system was an innovative demonstration, one of the few neighborhood, as opposed to individual, solar demonstrations in the country. Its cost effectiveness over alternative, e.g., individual systems, however, was never proved and better monitoring should have been required. The hydroponic greenhouse component was a disappointment since it hasn't been utilized by residents. Also the interest or capacity is not yet present among residents to manage the system themselves. It was, however, a worthwhile learning experience for the staff and youth involved in its construction and did enhance the visibility and reputation of the CDC.

The bread box collector project appears to be an excellent example of an appropriate solar innovation. The technology appears to be very cost effective and hence have the potential of leading to a viable money making enterprise. Moreover, the technology and manufacture, testing and installation process is simple enough to be understood by CDC staff and trainees. Furthermore the project fitted naturally into and enhanced the CDC's vocational training program -- the youth got more excited about building and installing collectors than, say, metal cabinets. Manufacturing the units provided trainees with skills that could be used both in traditional

fields (plumbing, carpentry, etc.) and in the solar field as it emerges.

The embryonic Energy Technology Center and solarized cement plant seemed to be a very ambitious and exciting project in 1979. However, there were still a couple of important questions to be raised. First, how reproducible would the model be? Many of the technologies proposed for the Center such as wind and photovoltaics for generating electricity are not cost effective at this time, hence the project depends heavily on federal grants. Would other community groups be able to get the millions of federal dollars necessary to duplicate the project? Second, how much control would the CDC leadership be able to maintain over the Center given the increased technical sophistication and systematic planning implicit in the project? Third, how relevant would be the Energy Center to the day-to-day needs of the low-income clients of the CDC?

The SBWCDC experience suggests that neighborhood technology innovation may be most successful when (1) the initiative for the innovation comes from the target organization, (i.e. the community control model) (2) the target organization is mature and has a good track record in its mission areas, (3) the transformer is client oriented and not an AT idealogue, and (4) the AT innovation grows out of and is compatible with the target organizations existing activities (e.g., vocational training). The experience also suggests that simpler technologies such as the "bread box" collector may be more appropriate and useful to low income communities than more sophisticated technologies like the neighborhood solar system (although this is not clear because comparative cost benefit data isn't yet available). Nevertheless, there seems to be a tendency for groups like the CDC to move towards more ambitious and sophisticated projects like the proposed Energy Technology Center.

LOCAL CASE II: SOLAR GREENHOUSES IN CHICAGO

In 1977 the Center for Neighborhood Technology (CNT) was created in Chicago to assist community groups in developing and implementing technologies and projects which would make their communities more self reliant. In 1978 CNT received a grant of $90,000 from the City's Department of Human Resources to assist groups in ten Chicago communities in building and maintaining solar greenhouses. By late 1979 only two new greenhouses when I visited, however, had been completed and only one of those was being utilized.

Figure 31 describes the 10 greenhouse projects envisioned by the Center for Neighborhood Technology and the communities where they would be built. Figure 32 lists the major milestones in the evolution of CNT and these projects. Three of the community groups which were active in developing greenhouses with the help of CNT were:

1. The Christian Action Ministry (CAM), a community service organization run by churches in a predominately black, low income area of Chicago. The governing board of CAM is made up of the Pastors and three members from each of CAMs member churches. CAM activities and programs are planned and overseen by four task forces on Education, Community Development and Economics, Health, and Family Services. CAM programs include: day care centers, sheltered workshops for handicapped, a health service center, a community counseling center, an alternative high school (CAM Academy), adult education and career counseling programs, and an economic cooperative for existing minority businessmen.

2. Operation Brotherhood, a multi-purpose social center run by a

Figure 31:

Ten Neighborhood Solar Greenhouse Projects

NEIGHBORHOOD-BASED ORGANIZATION	MAJOR PURPOSES	NEIGHBORHOOD & GROUPS SERVED	PLANNED USE OF GREENHOUSE
Christian Action Ministry	Wide range of social programs	E. & W. Garfield Park, S. Austin, N. Lawndale; Mostly black; low income	Job creation, healthful produce, reduce food costs for seniors and other constituents
Chrysalis Learning Community	Alternative high school	Uptown, Ravenswood; Appalachian, Native American, Latino, low-income	New curriculum in science, health, shop and job training, reduce operating costs in food and energy
18th Street Development Corporation	Housing rehab and rehab employment training	Pilsen; low-income Latino	New marketable skills, job creation and training, heat savings, crop income
Operation Brotherhood	Hot meals service, food distribution & activity center for senior citizens	N. & S. Lawndale, other West Side; Low-income, mostly black, and residents at s.c. housing throughout Chicago	Food for sale in current operating food distribution system, job creation and training, heat savings at program center
Jane Addams Center Hull House	Settlement house with range of social & educational programs	Lakeview; Multi-ethnic & wide income/class range	New educational focus, youth employment, satisfying program to bring seniors and teens together
Self-Help Action Center	Linking family farmer producer cooperatives with city consumer co-operatives	West Englewood, Auburn-Gresham, most other S. Side communities; Multi-ethnic and low-income	Food for distribution in ongoing program; energy savings at headquarters; program cost reduction; youth and senior job creation
Voice of the People	Rehab and tenant management of multi-family buildings	Uptown; Appalachian, Native American, Black; Low-income	Crop income; cutting energy costs; developing marketable skills
1st Presbyterian Church	Socially minded church, programs in food distribution & outdoor gardening	Woodlawn, Hyde Park; Black & White, mixed income	Crop income; expansion of existing greenhouses for community use; work opportunity
North River Commission	Commercial revitalization, housing management; neighborhood development	Albany Park and other North River area communities; multi-ethnic and mixed income	Crop income; rehab existing greenhouses for community use; work opportunity

This article is reprinted from "Ten Neighborhood Solar Greenhouse Projects," Center for Neighborhood Technology, 570 West Randolph Street, Chicago, Illinois

Figure32:Milestones in the Evolution of Solar Greenhouses in Chicago

Period	Project/Program/Event	Description
1966-present	Christian Action Ministry	CAM is a community organization supported by a coalition of churches which carries out community development, education, and health programs in Chicago's Westside
1972-present	Operation Brotherhood	a multi-purpose senior center serving the elderly on Chicago's Westside
1974-present	18th Street Development Corporation	a housing development corporation formed to do rehab in Chicago's Latino Pilsen neighborhood
1975-1977	CAM Health Action Task Force	the Health Action Task Force was created by CAM and Northwestern's Center for Urban Affairs to take actions to eliminate the causes of community health problems
1977-1980	CAM Rooftop Greenhouse	health task force proposed greenhouses to solve nutrition problems. Commercial greenhouse installed on CAM office roof. Hydroponic gardening.
1977-present	Center for Neighborhood Technology	Bernstein, one of leaders of CAM greenhouse project, with community support creates CNT to provide technical assistance to community groups in implementing neighborhood technologies
Nov. 1977-1978	Operation Brotherhood Greenhouse	CNT holds workshop in November at which Operation Brotherhood greenhouse is constructed. CNT later restructures and helps maintain greenhouse
1978-1980	Citywide Solar Greenhouse Demonstration	CNT receives $90,000 from Chicago Dept. of Human Services to assist community groups in constructing five additional solar greenhouses
1978-1979	Pilsen Attached Greenhouse	18th Street Development Corp. and CNT jointly construct an attached solar greenhouse on a bar/community center in the Pilsen neighborhood

Figure 37 , continued

1978-1979	TARP Impacts Project	CNT takes lead in assessing and mobilizing opposition to City's Deep Tunnel and Reservoir Plan (TARP) for storm water control
Nov. 1978-1981	Neighborhood Technology Extension Service	CNT with ACTION funding initiates a training program in neighborhood technology development for VISTA volunteers
1979-1980	First Presbyterian Church Solar Greenhouse	Church approaches CNT after its community garden is closed because of heavy metals for assistance in design and construction of large two story attached greenhouse

charismatic black woman, Belle Whaley, in a low-income, predominately black area of Chicago. It carries out the following programs for the elderly: hot meals, a coop food store, a minifarm where senior citizens grow their own food, a transportation service for the elderly and a thrift shop and clothing center.

3. The Eighteen Street Development Corporation, a young community development corporation carrying out housing rehabilitation, employment training and neighborhood improvement programs in the predominately Latino Pilsen Community of Chicago. ESCD has rehabed four buildings (eleven units), is completing three more (ten units) and has plans for rehabing another twenty units. As part of this rehabilitation effort over 50 youths from the area have obtained construction training.

The Center for Neighborhood Technology was created in 1977 when Scott Bernstein, then a researcher at Northwestern's Center for Urban Affairs working on the CAM rooftop greenhouse, called community group leaders together and proposed the idea at a technical support center for neighborhood groups. Besides the solar greenhouse demonstration project, CNT also (1) publishes a biweekly resource magazine, The Neighborhood Works, (2) runs a neighborhood technology extension service for training VISTA volunteers for neighbrohood work in Chicago, and (3) develops policy options and studies for implementing smaller scale alternatives in Chicago.

Nature of Innovations

The difference between a "solar" greenhouse and a regular greenhouse is that a solar greenhouse has (1) two layers of glazing (and may have insulating panels for night), (2) an insulated north wall, and (3) some thermal mass, usually drums of water for heat storage at night.

The greenhouse installed in the CAM building in 1977

was a commercial kit rather than a solar greenhouse because some members of the CAM Board would not give support to the project unless a kit was used; the newer greenhouses, however, are solar in design.

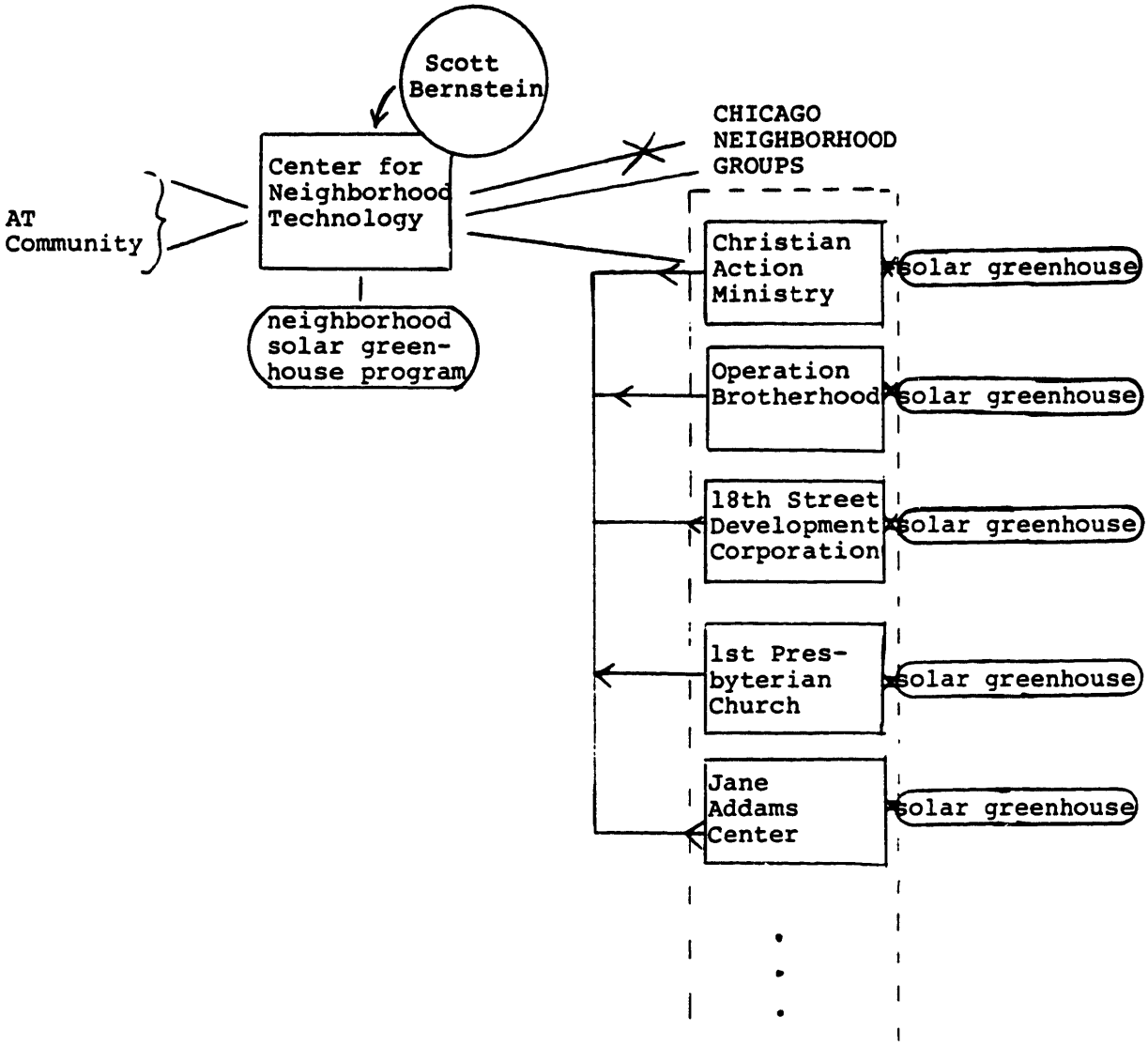
A number of the greenhouses were to be constructed on roof tops or the upper floors of buildings like the CAM and Operation Brotherhood greenhouses. Others were to be attached to the sides of existing structures, like the 18th Street Development Corporation and First Presbyterian Church structures. Some of the roof top greenhouses, e.g. the CAM greenhouse will grow plants hydroponically rather than in soil.

The Innovation Process

All of the greenhouse projects are intended to be cooperative ventures with the various community groups supplying labor for building and maintaining the greenhouse and the Center providing technical support. Figure 33 shows a diagram of the general innovation/transformation process. The projects have varied widely in the degree of initiative and interest that the corresponding community groups have taken in the project. The initiation and progress as of 1980 of several of the projects is described briefly below:

The idea for the Christian Action Ministry greenhouse grew out of a joint CAM/Northwestern Urban Affairs Center task force exploring the causes of poor health in the CAM target areas. One of the main reasons for poor health was found to be poor nutrition so CAM decided to build the roof top greenhouse to supply the elderly with fresh vegetables. A team coordinated by Scott Bernstein, then a researcher at the Center for Urban Affairs, provided technical assistance for the project. Initially a lot of senior citizens participated in gardening in the greenhouse but after the technical support group that built the greenhouse departed, the greenhouse fell into disuse. In '79 the greenhouse was being maintained by

Figure 33: INNOVATIVE PROCESS FOR SOLAR GREENHOUSES IN CHICAGO



a VISTA volunteer.

The Operation Brotherhood greenhouse was the Center's first major project. Bernstein approached Operation Brotherhood's director Whaley with the idea and she was strongly supportive since it fit naturally into the Center's existing activities. The greenhouse was originally built as part of a weekend AT workshop led by Malcolm Lilly White of the Domestic Technical Institute in Denver, Colorado. The original greenhouse didn't get enough light so more of the roof had to be torn off and replaced with glazing. Even so the greenhouse continued to be plagued with technical problems. The roof leaked. There still wasn't enough light in the back of the greenhouse. The wrong kind of tomatos were chosen for greenhouse growing. The greenhouse became infested with insects.

Originally, Whaley was one of the Center's strongest supporters. In fact, the Center at first used Operation Brotherhood space until Board members objected. Because of all the technical problems, however, Whaley became sceptical about working with the Center in the future. She planned in 1979 to build a bigger greenhouse at Operation Brotherhood's urban farm site but may develop her own technical support for the project.

The 18th Street Development Corporation's greenhouse was built on the side of a bar/community meeting place. Like the Operation Brotherhood greenhouse it was plagued by technical and organizational problems but was completed in '79. Originally Bernstein approached 18th Street Development Corporation about doing the project and they agreed. The project, however, was a low priority for the Development Corporation staff most of whose time was taken up with housing projects. As a result CNT and Bernstein had to take the lead in getting community people together to carry out the project and according to the director of ESCD, Bernstein was too pushy perhaps a little

as a result
and did not establish a good rapport with community people.

The First Presbyterian Church greenhouse was just in its planning stages in late 1979 but appeared likely to be fairly successful. In this case the Church itself approached CNT for technical support and is paying teh Center a consulting fee for designing the greenhouse. The need for and interest in the greenhouse arose when it was discovered that a large community garden next to the Church had a heavy metal problem because of sluidge donated by the City. The greenhouse was being built by and for thus people who want to continue to garden but can no longer use the community plot. The person designing the greenhouse for the Church, Bill Becker, was a professor at the University of Illinois, Circle Campus and had already designed and implemented several other greenhouses.

The Jane Adams Center Hull House greenhouse was completed but in 1979 there was still a lot of tension between Hull House and CNT. I was not able to find out exactly why the tension existed.

The Crysalis Learning Community greenhouse was delayed because of problems with getting building permits. Originally, they intended to build a hydroponic, roof top greenhouse but they could not get the necessary building permit because of strict Chicago fire codes. In 1979 they were trying to obtain a vacant lot to build the greenhouse on.

As of late 1979, not much was happening with the other proposed greenhouses listed in Figure 33. These projects had either been abandoned or were in a stage of hibernation.

Community Impacts and Lessons

The Center for Neighborhood Technology staff was the key catalyst and transformer for the greenhouse projects. The Center also provided the technical support for the projects. According to some

of the community groups involved, the Center staff was not very effective in developing a rapport and trust with community people. They were sometimes characterized as being too pushy and as wanting things done their way too often. Also, community groups complain that too little education and training of community people went on. A few community groups, e.g. Operation Brotherhood and ESDC, were also unhappy with the quality of technical support given by the Center, complaining about problems with design (leakage, not enough light, etc.) and operation of the greenhouses (wrong plants, people don't understand or like hydrosporics). The Center seemed to have, however, learned from these pioneering efforts, and appeared to be better able to provide technical support in the future. One problem with these demonstrations was that the budget at $90,000 was inadequate to provide the kind of technical support necessary.

As of late 1979 it was too early to tell what kind of impact the greenhouse projects would ultimately have. The two that were completed, Operation Brotherhood's and CAM's, had been plagued with technical and organizational problems. The CAM greenhouse may be discontinued because CAM is moving to another building. The Operation Brotherhood greenhouse yielded some food but not as much as was hoped for and there had been not the desired level of community participation. There may have been a slight negative impact in that some participating community groups had become disillusioned with the greenhouse projects (and perhaps with AT in general) because of technical and organizational problems.

The Chicago greenhouse projects suggest the following lessons: (1) ATs, while they are simple compared with some more large scale technologies, are still complicated and require a lot of technical sophistication to design and implement effectively; (2) neighborhood

technology projects are more likely to be successful if the initiative comes from the neighborhood and is in response to an immediate need and/or ongoing activity; (3) a good AT/neighborhood technology transformer needs to be sensitive to community needs and feelings and flexible enough to change with community desires; (4) a good deal of community education organizing and training is needed if these projects are to be successful.

LOCAL CASE III: PLANNING AN INTEGRAL URBAN AT DEMONSTRATION IN EUGENE

In 1979 the Whiteaker Community Council in Eugene, Oregon received a $100,000 planning grant from the National Center for Appropriate Technology to develop a detailed plan for an Integral Urban Demonstration which would implement and integrate many AT's in the Whiteaker Neighborhood. Figure 34 lists the major milestones in the evolution of the Whiteaker Integral Urban Neighborhood Technology Demonstration.

The Whiteaker neighborhood is an area of Eugene bounded on the north by the Willamette River, on the east by the Ferry Street Bridge, on the south by the 6th and 7th Avenue commercial strip and on the west by Garfield St. A significant part of the population is below povery line and 37% of the housing is substandard. There is also a large alternatives/ voluntary simplicity population in the neighborhood. The total population of the neighborhood is approximately 6,000. The Whiteaker Community Council grew out of the Whiteaker Community School and was chartered as a neighborhood organization by the city of Eugene in 1974. The majority of the leadership of WCC comes from the alternatives community.

Nature of Innovations

The innovations planned under the IUD planning grant fall into five categories: food, energy, recycling, housing, and health. Proposed innovations under each of these areas are enumerated below:

Energy: Under energy WCC proposed to set up an energy conservation and development program which would include community education, retnal weatherization, energy conservation, and alternative energy development, and a community energy services business.

Figure 34 : Milestones in the Evolution of Whiteaker Integral Urban AT Demo

Period	Project/Program/Event	Description
1974-present	Whiteaker Community Council	neighborhood organization which does land use planning, outreach, economic and housing development, health and AT for Eugene's Whiteaker Neighborhood
1978	Lane County Office of Appropriate Technology	Lane County (in which Eugene sits) creates first county OAT then dismantles it in October because of political controversy
1978-1980	Oregon Appropriate Technology, Inc. (OAT)	private non profit group created by ousted staff of Lane County OAT
1978-1980	Project Self Reliance	WCC obtains block grant funds for Project Self Reliance which includes AT workshops and demos, energy library, tool library and small AT grants
1979-1980	WCC Integral Urban Demonstration Planning Project	WCC and a coalition of Eugene AT groups receive NCAT's first Integral Urban Demonstration Planning grant to plan an integrated neighborhood technology program

Recycling: WCC proposed the following recycling activities: source separation of recyclables, organic composting, and the salvage of lumber for housing projects.

Housing: Under housing WCC proposed to work with the city of Eugene to establish housing cooperatives and integrate these cooperatives into the other IUD programs.

Health: Finally, WCC proposed the following health-related activities: medical self-help, i.e., educating residents in preventative and home care techniques; a standing neighborhood committee on heatlh and a pre-paid health plan.

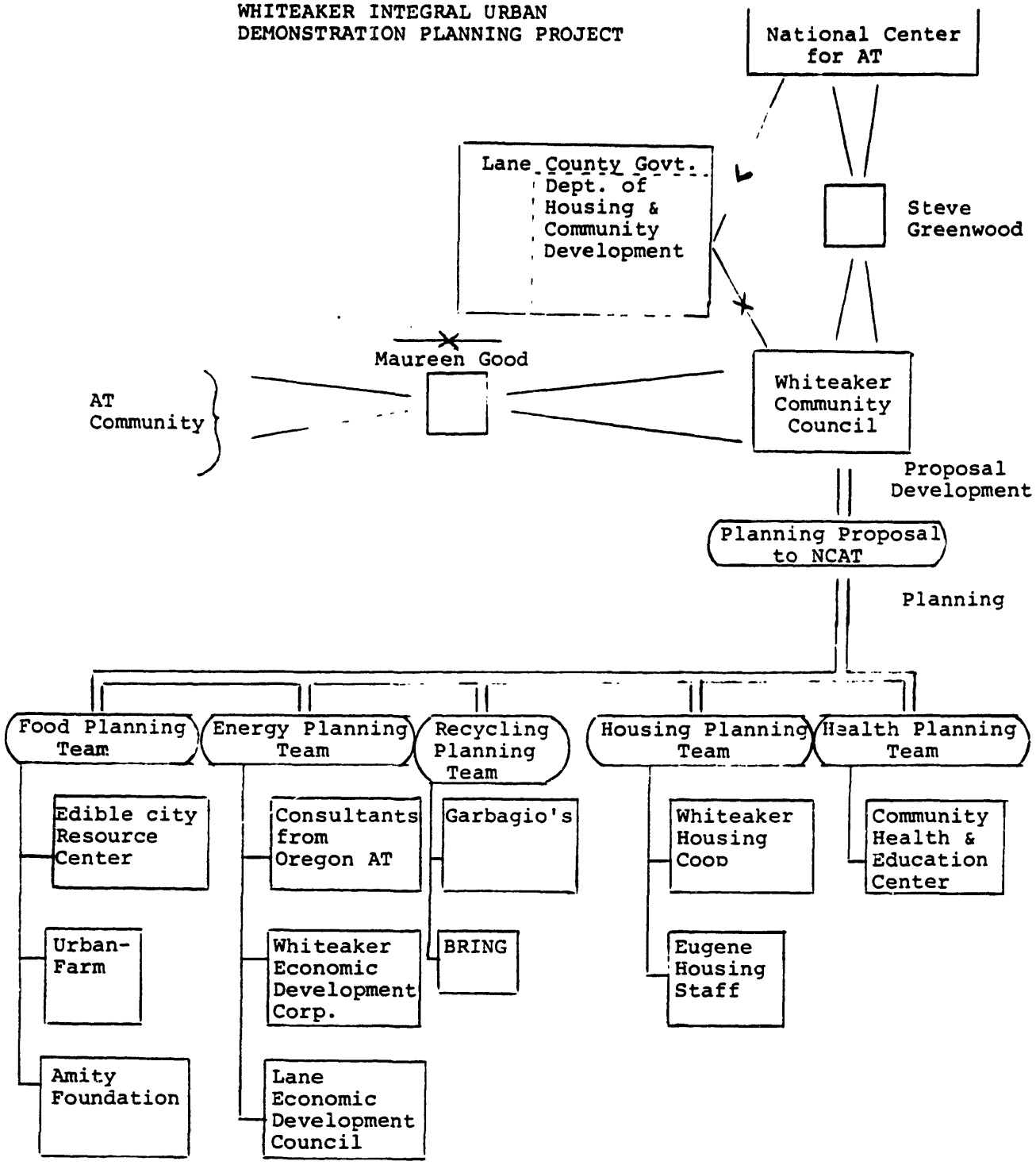
As can be seen by this list, WCC emphasized the mundane and possibly more practical technologies over the more exotic and also emphasized process and program innovation over hardware innovation.

The Innovation Process

Figure 35 shows the process of initiation and implementation for the Whiteaker IUD planning project.

The IUD planning process was initiated by a Request for Qualifications from NCAT. This RFQ was sent to the Lane Dept. of Housing and Community Development, the local Community Action Agency. Steven Greenwood, an economic specialist and AT supporter at DHCD convened a meeting of interested parties in Lane County at which it was decided that WCC was the logical entity to apply for the grant and that other AT groups would support WCC in the planning process.

Figure 35: INITIATION AND IMPLEMENTATION OF WHITEAKER INTEGRAL URBAN DEMONSTRATION PLANNING PROJECT



In order to develop a proposal to NCAT, self-selected teams were created to develop program ideas in each of the following areas: food, energy, recycling, housing, and health. A WCC staffer chaired each team. Each team developed a proposed program for their area which was then reviewed and modified by the WCC staff. The WCC staff accepted most of the team's ideas except for deleting the more exotic ideas. Greenwood pulled together the team proposals into a unified proposal which was submitted to NCAT.

The NCAT planning grant was for 8 months and was completed in Spring 1980. The WCC then attempted to obtain funding for implementation of plan developed under the NCAT grant, but this was difficult at the time, because the new Reagan administration was terminating or drastically cutting the funding for Federal agencies solar and AT programs.

Community Impacts and Lessons

Maureen Good, the director of the IUD planning project, appeared to be an effective AT transformer in interfacing the AT community with the WCC and the Whiteaker Neighborhood as a whole. Steve Greenwood was an effective translator in interfacing between the WCC and NCAT and the Lane County Government during the development of the IUD proposal.

In '80 it was too early to tell what impact the IUD planning project would have on the Whiteaker Neighborhood, given there might not be funding available to implement the plan. It did, however, already have a positive impact for WCC, allowing it to hire some staff to continue or expand programs it was already interested in and increasing its credibility with the City and County government.

While it was too early to drawn any definite conclusions about the Whiteaker IUD, it seemed in 1980 a promising start and merited further watching. If it

ultimately proved to be successful it would suggest the desirability of: (1) working through established community groups in implementing AT, (2) integrating separate AT projects into comprehensive programs (3) focusing on less exotic AT's, at least initially, and (4) a trickle down approach in which the alternatives/ecological community is mobilized first and then utilized to reach out to the traditional poor.

LOCAL CASE IV: THE INITIAL PROJECTS OF SEATTLE'S NEIGHBORHOOD TECHNOLOGY COALITION

The innovative Neighborhood Technology Program in Seattle was jointly sponsored by the City's Department of Community Development and the Neighborhood Technology Coalition, a consortium of twelve community organizations. The project received $167,000 in City Block Grant funds in 1979 to support a series of neighborhood demonstrations and a similar amount in 1980. Figure 36 lists the major milestones in the evolution of the Neighborhood Technology Coalition.

There are three types of organizations involved in Seattle's Neighborhood Technology Program: (1) Seattle's Department of Community Development which provides the block grant funding for the program; (2) the Neighborhood Technology Coalition which selects projects for funding and provides technical support and encouragement; and (3) the neighborhood organizations which actually carry out the projects. These organizations are described briefly below:

Department of Community Development: The Seattle Department of Community Development is responsible for the City's housing development, neighborhood planning, economic development, and landmark management programs. It acts as the Community Action Program (CAP) for Seattle and also administers the City's block grant funds. When Darel Grothaus became director in 1977 he hired a number of consultants to develop ideas for projects and programs in AT related areas, such as, urban gardening and alternative energy.

Figure 36 : Milestones in Evolution of Seattle's Neighborhood Technology Coalition

Period	Project/Program/Event	Description
1974-present	Ecotope Group	an AT research and consulting firm. Projects included a methane digestor for a prison dairy farm and a parabolic greenhouse for aquaculture
1977-1978	Ecotope Community Outreach Program	Ecotope with funding from NCAT/CSA starts community resource center and outreach program and a greenhouse business feasibility study
1977-1978	Grothaus becomes Director	Darel Grothaus, a supporter of AT, becomes director of Dept. of Community Development, hires consultants to do reports on potential of alternative energy, urban gardening, etc.
1978-1981	Neighborhood Technology Coalition	NTC formed by DCD consultants, AT advocates and community leaders. Receives $167,000 in block grant funds in 1979 and more in 1980 to support community AT projects including a solar greenhouse, solar collector workshop and thermal shutters.

Neighborhood Technology Coalition: In 1976-77 a loose coalition of people interested in appropriate or alternative technology held meetings to discuss possible community based AT projects in Seattle. Nothing much materialized until the consultants hired by Grothaus suggested the group apply to the City for Block grant funds. Then the group was formalized as the "Neighborhood Technology Coalition" and expanded to include more low-income community representation. The group decided to use the YMCA Metro Center as its base of operation. When block grant money came through two staff were hired to operate the program: Lucy Gorham, program coordinator and Bob Dickson, outreach worker.

The members of the Coalition include the Wellington, Capitol Hill, Madrona, and Mt. Baker Community Councils; the metro center and People Power which work citywide; Neighborhood House, a CSA funded community organization; El Centro de la Raza, a Spanish advocacy group; the South East Effective Development, Inc.; and Ecotope and the University of Washington's Social Management of Technology Program which provide technical assistance. Each group has one representative on the Coalition's board.

Participating Community Groups: In the first year, seven community groups were given funding by the Coalition to carry out specific projects. These groups were from low income communities, many having large minority populations. The initially funded groups were: the South Park Redevelopment Committee, a group of senior citizens working out of a senior center; the Madison Jackson Economic Development Council, a non-profit organization working in Seattle's Central District which has the highest concentration

of low-income, minority and elderly residents; Active Mexicanos and El Centros de la Raza, two groups which work with the low income Hispanic community in Seattle; the Hillman City Action Group, a group of low income families in the Hillman Community, the Duwamish Peninsula Community Commission; and the Bulk Commodities Exchange, a farmer's produce market in Seattle.

In selecting projects to support the Coalition stresses the following criteria:

* innovativeness: new ideas, alternatives and creative ways to use existing community resources
* small scale, low capital cost techniques which are easy to understand and use by non-technicians
* community participation in both planning and implementation
* relevance to basic needs: lowering the cost of food, energy, housing, waste disposal; providing employment

Nature of Innovations

The seven projects funded by the Neighborhood Technology Coalition in its first year (1979) are described briefly below:

South Park Solar Greenhouse

A 170 sq. ft. solar greenhouse was to be built by community people at the South Park Community Center. Senior citizens will use the greenhouse to grow seedlings for their community gardens. The greenhouse will also be used to provide heat to the attached Community Center.

Madison Jackson Solar Hot Water Workshop

The Madison Jackson Economic Development Council was to construct eight solar water heaters on low income homes with the help of community residents. Four types of systems were to be constructed and monitored

for efficiency: (1) Ecotope's flat plat collector with pump, (2) Ecotope's flat plate collector with thermosyphon, (3) SolarRoll collector with pump, and (4) SolaRoll collector with thermosyphon.

Active Mexicanos Windowbox Greenhouse and Insulating Shelters

Active Mexicanos was to train a youth employment crew in the design and construction of a windowbox greenhouse designed by Ecotope. The crew in turn was to conduct twelve windowbox greenhouse construction workshops for the community. In addition Active Mexicanos was to conduct community workshops to construct approximately eighty insulating shelters for community residents.

Hillman Rat Control

A group of southend residents was to produce and distribute a number of garbage can holders which will keep cans from falling over and attracting rats.

Flood Control on Downsmish Peninsula

The Downsmish Peninsula Community Commission was to develop a number of ditches and small scale drainage techniques in a one block area to alleviate flooding.

El Centros de la Raza Furniture Recycling

El Centros de la Raza was to start a furniture recycling center where residents will be able to buy inexpensive furniture and use the shop to repair their own under skilled supervision.

Farmers Market and Video Documentation

Local produce markets were to be set up in the Madrona and Ranier Vista neighborhoods which would be operated by neighborhood youth. The organizing steps will be documented on video tape, to show other neighborhoods how to do the same.

Innovation Process

The key steps in the evolution of the Neighborhood Technology Program through 1979 were as follows:

1. The Ecotope Group, an AT R&D and consulting firm created in the mid 1970's carries out some preliminary neighborhood technology projects including a neighborhood AT resource center (with funding from NCAT) and conducts a feasibility study for Neighborhood House on solar greenhouse enterprises.
2. A loose coalition of AT advocates meet to discuss community based AT projects but no concrete projects materialize.
3. Grothaus becomes director of Department of Community and hires six consultants to develop new ideas and alternative strategies in energy conservation, urban gardening, youth and minority employment, and community technical assistance. A number of these consultants are AT advocates and incorporate AT ideas into their option papers.
4. Susan A ppell (urban agriculture consultant) and members of loose AT coalition develop idea of using block grant funds to support community AT demonstrations in Seattle. Grothaus is supportive of idea.
5. Leaders of loose AT coalition form core of new "Neighborhood Technology Coalition" which is formalized to apply for community block grant funds. Neighborhood Technology Coalition is expanded to include more low-income, minority, and community representation.
6. Neighborhood Technology Coalition applies for and receives $167,000 in community block grant funds for 1979. Lucy Gorham

is hired as staff coordinator and Bob Dickson as outreach worker. Deborah Bowles is hired by Department of Community Development to work with coalition.

7. Coalition develops criteria for selecting community projects to fund in program's first round. Emphasis placed on low income communities, high community involvement and projects which can show demonstrable result within six months.

8. First round of proposal solicitation. Coalition members actively solicit AT related programs from community groups they are familiar with. The South Park Solar Greenhouse, Madison Jackson Solar Hot Water and Active Mexicanos Window Greenhouse and Insulating Shutters Project are funded. Coalition leaders participated heavily in the development of these proposals.

9. Second round of proposals funded. Coalition members even more active in soliciting project ideas. Fund projects which are more mundane than those typically thought of as AT, e.g., rat control, farmer's markets, furniture repair and recycling, because these are what the community groups are really interested in.

10. Coalition provides technical support as projects are initiated. Receives second year funding from Community Block Grant funds.

Thus, we see that in this effort, the process through which the Neighborhood Technology Coalition selected and funded neighborhood demonstrations can be described as mutual adaptation between Coalition leaders interested in supporting innovative AT demonstration and community

groups interested in dealing with immediate problems like flooding or rent control. In 1979 and 1980 the process went quite smoothly, in part because the Coalition wasn't doctrinaire in what constitutes AT, supporting a number of projects which AT enthusiasts might not consider AT, but which nevertheless address real community problems in innovative ways.

Community Impacts and Lessons

In 1980 the program's first seven demonstration projects were still underway or just completed and it was too early to tell what impact they would have on their communities.

The leaders and Council members of the Neighborhood Technology Coalition, who act as transformers between the AT and alternatives community and the Department of Community Development and low-income community groups in Seattle, had been quite effective in translating AT ideas into community projects and modifying the AT notion to fit community needs and interests, but the real test would come during the implementation and utilization stages where community participation tends to break down unless carefully organized. The Seattle model in which community groups rather than an outside group receives the actual funding to carry out the project but are provided support by a central coalition (NTC) may overcome some of the problems AT activities ran into in other cities, e.g., in New York and Chicago.

Seattle's Neighborhood Technology Program appears to be a promising model for supporting neighborhood based AT development. It would suggest the desirability of community participation in project selection and of focusing on mundane problems rather than exotic hardware. Also it suggests that local governmental support and localized funding may be important factors contributing to the success of neighborhood technology experiments.

5
Some Tentative Generalizations and Lessons about Neighborhood Technology Development

In 1981, based on my preliminary observation and study of the pioneering neighborhood technology development efforts in New York (Decker, 1981) and the four additional efforts discussed above, I made an initial attempt to address my twelve research questions and to make some tentative generalizations and conclusions about the nature and potential of neighborhood technology development as a poverty reduction and/or community development strategy. Below I will summarize the tentative response I made to each of my twelve guiding research questions at that time (adapted from Decker, 1981). Then, in the concluding section of the chapter, I will briefly suggest how this preliminary functional assessment could subsequently be expanded into a more complete cultural analysis of these pioneering local efforts, using the concepts and methods of the coevolutionary approach I developed in Chapter 1.

1. Does Neighborhood Technology Development Work? That Is, Do Neighborhood Technology Development Experiments Show the Potential for Alleviating Poverty?

The experience with neighborhood technology development to date as described in the previous sections certainly suggests that neigborhood technology is not a "tech fix" for poverty, that is, poverty is not alleviated simply as a result of the introduction of an appropriate or neighborhood technology into a low income community. Neighborhood technology innovations, while being competitive or in some cases somewhat less expensive than current technologies, are not cheap enough to reduce service delivery cost and hence alleviate poverty in and of themselves. Neighborhood technology experiments have taught new skills to a number of low-income residents but have not as yet created significant new jobs or job opportunities for low-income residents. The dream of creating new

community based industries around AT is becoming less likely as bigger firms move into the solar, energy conservation and AT field. Furthermore, neighborhood technology experiments have not yet significantly enhanced the capacity of low-income communities to bring about change by creating new organizations, enterprises and infrastructures. Many of the most promising experiments have created promising embryonic organizations, such as the 11th Street Movement or the People's Development Corporation, only to have these organizations collapse because of internal conflicts, or conflicts with other organizations or the sheer pressure of trying to do too much too fast. Finally, neighborhood technology development has not as yet led to broader networks or coalitions to press for social/technical reform, there was a little coalition building around solar energy in the late 70's but it never jelled into a strong social force.

To offset this generally gloomy picture we must say that there have been some success stories, such as the San Bernardino Westside CDC's breadbox solar collectors and the Seattle Neighborhood Technology Coalition and that some of the later neighborhood technology development projects (e.g. in San Bernardino, Eugene, Seattle) seem to have overcome at least some of the problems and conflicts that undermined earlier projects (e.g. in New York City and Chicago).

A key to neighborhood technology development making a "small" contribution to community development and the alleviation of poverty appears to be seeing it not as some new strategy or program but as a useful addition to existing and ongoing community development activities. Too often in the pioneering experiments in New York "AT" or neighborhood technology was seen as something "magical" or very powerful which could turn communities around. It seemed to work best where it was incorporated into

existing community development projects and programs where the technologies complemented what was already going on, such as the solar projects the San Bernardino Westside CDC added to its ongoing rehabing and vocational training programs, or the addition of weatherization in the rehab of 519 E 11th Street or the boiler repair project of the People's Development Corporation's Energy Team.

In summary, it appears that neighborhood technology development may be a useful addition and make a small positive contribution to community revitalization and the alleviation of poverty when utilized as part of a larger community development process which combines strong indigenous leadership and community participation, sound technical support and wise and sympathetic stewardship by local, state and Federal agencies. Technical change must occur side by side and be part of a larger social/political reform process.

2. <u>If Neighborhood Technology Development Does Contribute To Alleviating Poverty, How and Why Does It?</u>

Technological innovations have traditionally contributed to social progress by "doing something better." Neighborhood technology innovations appear to contribute most effectively to community revitalization when their introduction allows existing community development organizations to do some aspect of community development "better." There are many ways in which the addition of neighborhood technologies could enhance ongoing community development activities:

(i) they might enhance service delivery or reduce service cost, such as through including energy conservation in sweat equity programs (although, as noted above, these improvements will usually be marginal rather than substantial)

(ii) they may stimulate participation or enthusiasm, such as the various solar collector projects (some CD projects tend to be dull and livening them up is a benefit as long as the introduction

of neighborhood technology doesn't detract from the original mission)

(iii) they may become important symbols of community achievement, such as the 519 E 11th Street windmill or the San Bernardino neighborhood solar system (this is fine as long as the symbol is used to motivate activities leading to real, concrete results)

(iv) they may give participants some new skills which may lead to some new job opportunities in the future (e.g. if the solar installation market picks up), such as the skills picked up in the sweat equity rehab programs in New York and the San Bernardino Westside CDC's solar vocational training program.

In summary, neighborhood technology development tends to work best when its introduction allows community development within a neighborhood to work better.

3. What Is the Relationship Between Neighborhood Technology Development and Community Development?

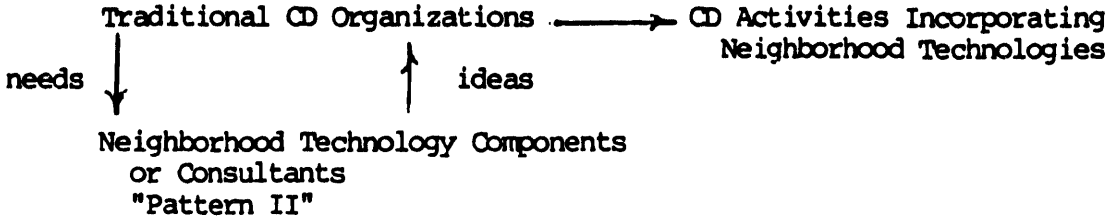
Promoters of appropriate/neighborhood technology and many sponsors of neighborhood technology development experiments have too often seen neighborhood technology as a substitute or alternative or advancement upon traditional community development activities. Too often neighborhood technology was seen as a "tech-fix" for avoiding or by-passing the hard organizing, conflict and struggle that characterizes community development activities in low-income communities. As a result, neighborhood technology development was often carried out by new or embryonic organizations created around neighborhood technology projects with no or little interaction with existing ad organizations in the community, resulting in the following pattern:

Traditional CD Organizations ⟶ Traditional CD Activities

New Neighborhood Technology Development Organizations "Pattern I" ⟶ Neighborhood Technology Experiments

This pattern is, however, changing in the newer neighborhood technology

experiments, drawing on the lessons of pioneering experiments, towards a pattern in which neighborhood technology development is more subordinate to and integrated with ongoing CD activities:



Examples of neighborhood technology/community development projects characterized by this second pattern include the San Bernardino Westside CDC's solar projects, the projects of the Seattle Neighborhood Technology Coalition and the Whiteacker Integral Urban Demonstration.

4. What Are Alternative Models, Approaches, or Processes for Neighborhood Technology Development?

The alternative approaches or processes for neighborhood technology development suggested by the diagrams in Figure 25 above -- community control, transfer, top-down, linkage, and full partnership — do appear to characterize many of the actual neighborhood technology experiments we've studied while others tend to be hybrids of one or more types. Experiments can also be categorized according to whether they reflect Pattern I or Pattern II above (a "tech-fix" or "integrated" approach).

5. How Should Current Neighborhood Technology Development Experiments Be Evaluated?

There are three big problems in evaluating current neighborhood technology experiments. First there was very little good data on the actual impacts or cost-effectiveness of current experiments (e.g. how much energy was saved by a solar collector). This data was just not being collected in a

systematic way. Second, it was too early to tell what the long-term and second-order impacts of the experiments would be (e.g. will greenhouses be maintained or abandoned, will a solar trainee get a job in the future). Third, even if better specific data was collected and experiments are studied over time, it's likely that the impacts of the experiments on community development and the alleviation of poverty in the community as a whole will be marginal and hard to separate from other CD activities and dynamics. These three limits suggest that it may be desirable to evaluate NTD experiments not in terms of their ultimate impact on the neighborhood, but rather in terms of the extent to which they facilitate or stimulate ongoing CD activities in the community.

6. What Improvements in Service or Goods Delivery, If Any, Resulted from the Experiments?

In general the improvements in concrete service or goods delivery resulting from the experiments have been disappointing. Some of the simpler innovations, such as the insulation and weatherization carried out as part of sweat equity rehabs, sweat equity rehabs themselves, the San Bernardino breadbox collectors and the People's Development Corporation's Energy Team's boiler repair business have resulted in concrete service improvements or cost reductions. At the other extreme, certain exotic innovations like windmills, commercial active solar systems, and aquaculture systems have not resulted in any service improvements because they are as or more costly than existing alternatives (e.g. heating with gas or buying fish at the corner market). In the middle are innovations that may or may not lead to service improvements or reduced costs depending on how they are implemented and maintained. In this category are things such as passive solar walls, solar greenhouses, composting operations (like Bronx Frontier Corporation's) and recycling centers.

7. What "Capacity Building" and Other Indirect Benefits Resulted from the Experiments?

Most of the neighborhood technology experiments seemed in their early stages to have the potential for contributing to capacity building in the neighborhood in that they stimulated interest and community participation, taught skills, created powerful symbols of neighborhood achievement and often resulted in new organizations (e.g. 11th Street Movement, Lower Eastside Environmental Action Coalition (LEAC), Peoples' Development Corporation, Bronx Frontier Corporation) being formed. Whether this promising potential was actually translated into capacity building depended on whether the organizations and individuals promoting neighborhood technology were able to sustain themselves in the neighborhood for a long enough period of time to become an "institutionalized" or "routinized" part of the neighborhood infrastructure. This seldom happened because either the organizations collapsed within one to three years because of outside pressures for results, internal conflicts and/or poor management (as in the case of the Peoples' Development Corporation) or key individuals were forced to leave the organizations because of internal or neighborhood conflicts (as in the case of East 11th Street Movement, LEAC and Adopt-A-Building). The only New York neighborhood organization that was able to sustain itself without a major collapse or staff turnover was the Bronx Frontier Development Corporation. The activities of the BFDC, especially its educational activities and the Open Space Task Force, have contributed somewhat to enhancing the capacity of the South Bronx, but since BFDC sees itself mainly as a technical development organization rather than a community organization, its effect on capacity building has

not been as great as say the solar activities of the San Bernardino Westside CDC, where the solar projects have clearly enhanced the influence, prestige and capacity of the CDC and its members.

The Integral Urban Demonstration in Eugene, while relatively new, appears to have enhanced the capacity of the Witeaker neighborhood and the Witeaker Community Council to carry out ad programs and attract outside funding. The solar greenhouses implemented in Chicago don't seem to have significantly enhanced the capacity of the community groups implementing them as yet. The projects funded by the Seattle Neighborhood Technology Coalition appear to have the potential of enhancing the capacity of the neighborhood organizations implementing the projects because they appear to be practical responses to specific highly visible neighborhood problems (e.g. rat control or flood control or rising furniture costs).

8. Which Neighborhood Technology Development Experiments Appear to Have Been Most Effective?

In 1981, it was too early to do a systematic objective assessment of which neighborhood technology development projects had been the most effective and successful, as many of the efforts I was studying were still underway or just being completed. In Figure 37, however, I've made a rough preliminary ranking of eighteen of the neighborhood technology projects I'd observed (drawn from those listed in Figure 22), based on my own subjective impressions from my initial site visits. Also, in Figure 22, I've rated each of these projects, high, medium or low with regard to the following six criteria, which seemed to me at the time, to be some appropriate measures of the relative success of projects:

1 - Results: the experiment has resulted in one or more visible products, e.g. an installed solar collector, a community garden, etc.

2 - Participation: the experiment has stimulated neighborhood interest and participation.

Figure 37: Rough Subjective Overall Ranking and Rating of Success Criteria for Eighteen Selected Pioneering Neighborhood Technology Development Projects

Rough Rank	LABEL:Project*	Success Criteria Ratings** : RES	PAR	STAB	APPR	FAC	IMP	Comments
Highly Successful:								
1.	SBW2: solar breadbox	H	H	H	H	H	H	most impressive overall
2.	SB4: PDC energy team	M	H	M	H	M	M	simple tech, educ. capacity building
3.	SBW1: neighborhood solar	H	M	H	M	H	M	ambitious, tech too complex
4,5.	LES2: 519 11th St. rehab	H	H	M	M	H	M	first highly visible NTD project
	SB2: PDC solar rehab	H	H	M	M	H	M	similar to 519 rehab
6,7.	SNT1: solar greenhouse	M	?	?	H	?	?	promising approach
	SNT2: solar workshops	M	?	?	H	?	?	too early to evaluate
8.	EUD: integral urban demo planning	?	H	?	H	H	?	impressive planning process, too early too evaluate
Moderately Successful:								
9.	CNT1: CAM greenhouse	M	M	H	H	H	M	good model project
10.	CNT2: Operation Brotherhood solar greenhouse	M	M	H	M	M	?	problems in implementation
11.	SB2: BFC composting project	H	M	H	M	M	M	compost for urban gardens produced at central facility
12.	LES3: CUANDO/LEAC solar wall	M	L	?	M	L	L	appropriate tech but inapprop site, low group particip.
13.	SB3: BFC large windmill	H	L	H	L	?	L	impressive high tech, overly complex for community/ needs
Less Successful:								
14.	SB5: PDC integrated BESS project	L	M	L	M	L	L	impressive concept but never fully implemented
15.	LES1: Charas domes	M	H	M	L	M	L	high participation, but tech limited
16.	SB6: Open Space Task Force projects	L	M	L	M	L	L	large budget but poor implementation
17.	LES4: 11th St./LEAC projects	M	L	L	L	L	L	conflict, poor impl. limited tech
18.	LES5: Charas/LEAC recycling center	L	L	L	M	L	L	low community int & participation

*'LESx'-Lower Eastside project; 'SBx'-South Bronx; 'SBWx'-San Bernardino Westside CDC; 'CNTx'-Chicago Center for NT; 'SNTx'-Seattle NT Coalition; 'EUD'-Eugene IUD.
**RESults, PARticipation, STABility, APPRopriateness, FACilitation, IMPact; all rated High, Medium or Low.

3 - Stability: the experiment and the organiztaions involved in it are able to sustain themselves over time and are relatively stable.

4 - Appropriateness: the experiment and its technology and process are appropriate to the needs, resources and interests of the community and organizations involved.

5 - Facilitation: the experiment contributes to and facilitates ongoing community development activities and organizations in the neighborhood.

6 - Impact: the experiment has a demonstratable positive impact on service or goods delivery and/or other indirect benefits (e.g. new jobs).

As with my overall ranking, these criteria ratings are based on my very subjective first impressions of these projects. Thus, both my overall rankings and my ratings on my six measures of success should be viewed as a very tentative first cut at assessing the relative success of these different projects.

9. What Design Factors Are Most Important to the Success of Neighborhood Technology Development Efforts?

As with assessing the relative success of different projects, it was still too early in 1981 to determine which design factors and variable most influenced the success or failure of these projects. Below, however, I've described my first impressions about which of the potential contributing design factors or variables listed in Figure 24 (by the seven typical components of NTD efforts) seem to be the most important, based on my initial site visits and analysis.

Technological Factors

Technological design factors seem to be quite related to success. Specifically, the simplicity (T1; projects with simple or intermediately complex technologies tend to be more successful than some with relatively complex technologies) and the cost-effectiveness of the technologies used (T2) and their relevance to community problems, needs, skills and resources (T3) seem to be related to project success.

Community Factors

Community characteristics seem somewhat related to success. Projects tend to do better in neighborhoods where there is a mix of traditional and voluntary poor (alternative types), if these groups can get along, and where there is a good deal of ongoing community development activities (especially if the experiments can be integrated into these activities).

Process Factors

I suspect that process factors may be the most important among determinants of experiment success. In the eighteen neighborhood technology projects I visited and roughly ranked in Figure 37, it seemed that experiments characterized by community control, linkage, and partnership tend to be more successful than those characterized by transfer (P2); also, that those characterized by an integrated approach ("Pattern II" above) tend to be more successful than those characterized by a "tech-fix" ("Pattern I" above) approach; and, finally, that those characterized by community control, linkage, or partnership and an integrated approach tend to be the most successful.

One might ask whether community control or linkage/partnership tends to be a more successful model for neighborhood technology development. My rough preliminary data isn't very conclusive here. I would suspect, however, that a community controlled experiment is difficult to realize in practice because the technical sophistication required usually dictates a linkage or partnership arrangement except in special cases like the San Bernardino Westside CDC (and even they are now moving towards a partnership approach).

Another crucial process factor is the effectiveness and skill of the transformer(s) in the experiment (P3). He or she often seem to be the key to the success or failure of experiments. A good transformer, as we would expect, seems to have both a strong client/community orientation

or empathy and the technical sophistication to communicate with AT developers and turn ideas into proposals and plans.

Other important process factors appear to be the orientation and quality of the leadership (P5; indigenous leaders seem to enhance success) and the degree of community participation in the experiment(P4).

Organizational Factors

The nature of the implementing group and its maturity appear to be important factors in experiment success. Experiments initiated and carried out by mature community-based community development organizations with a track record of achievement in the neighborhood are more likely to be successful than those initiated by embryonic organizations organized around appropriate or community technology (CD1, 2 and 3). The quality and relevant experience of the technical support staff/group (TS3) also appears to be relevant to success. Experiments seem to function best when the technical support staff is either subordinate to the CD group (community control model) or works in partnership with it (linkage or partnership model).

Sponsor and Institutional Factors

Experiment success does not seem to correlate with the amount of outside funding for a project (S1). Quantity doesn't necessarily lead to quality. The percentage of support going to capacity building (management, planning, community education) versus hardware does appear to influence success(S3). Thus experiments with significant support for capacity building (e.g. the Witeaker Integral Urban Demonstration, the Seattle Neighborhood Technology Coalition and the Bronx Frontier Corporation) tend to be more successful than experiments where funding is only available for materials and labor. Also, good relationships or partnerships with local governmental

agencies and other local institutions, such as, CAAs, universities, and labor unions, seem to enhance the likelihood of success.

Subsequent to this preliminary assessment of relevant design factors, I sought to condense these important design factors/variables into a small number of branching design themes that would characterize and summarize the most relevant variations among NTD projects. This resulted in the following six important alternative or branching design themes:

i- Technology: Alternative levels of technological complexity:
- ia. simple: relatively simple technologies used.
- ib. intermediate: technologies of intermediate complexity used.
- ic. complex: relatively complex technologies used.

ii- Community: Nature of community project implemented in:
- iia. poor: very poor, ghetto-like minority community.
- iib. mixed: moderately low income with mix of race/ethnic groups and some alternatives people.
- iic. alternative: large % of counterculture/alternatives people.

iii- Initiative/Process: Alternative types of initiation/process:
- iiia. community control: initiative and control in community cd group.
- iiib. transfer: initiative from outside at or ts group.
- iiic. linkage: joint initiative by cd and at or ts groups.
- iiid. partnership: shared initiative by cd, at/ts, and sponsoring groups.

iv- Transformer: Alternative types and quality of project transformers:
- iva. at: at type transformer of good, moderate or low effectiveness.
- ivb. cd: cd type transformer of good, moderate or low effectiveness.
- ivc. ts: technical (but non at) transformer of good, moderate or low effectiveness.
- ivd. at/cd: transformer, having both at and cd background, of good, moderate or low effectiveness.

v- Organization: Alternative types of implementing organizations:
- va. est cd: a mature, established cd organization
- vb. new cd: a relatively new cd group or organization
- vc. new at: a new community/appropriate technology group
- vd. new cd/at: a new community group emphasizing both cd and at.

vi- Sponsor: Alternative approaches to and levels of sponsorship:
- via. tech transfer: federal, local or neighborhood sponsor emphasizes tech transfer/fix approach.
- vib. cd facilitation: federal, local or neighborhood sponsor emphasizes cd and capacity building
- vic. cd partnership: federal, local or neighborhood sponsor actively participates in cd/at partnership.

The chart in Figure 38 characterizes the eighteen pioneering neighborhood technology projects, tentatively ranked in Figure 37, according to these six key design themes/variables. Looking at the typical features of the more highly ranked of these projects, suggests that the design themes most correlated with project success are likely to be: (1) initiative/process (community control and partnership projects tend to be most successful); (2) transformer (projects with good ts or at/cd transformers tend to be most successful); (3) organization (projects implemented by established cd organizations tend to be most successful); and (4) sponsorship (projects with cd facilitation or cd partnership of sponsors tend to be most successful). More rigorous data and analysis, however, would be needed to really test these hypotheses suggested by Figure 38.

10. How Can Effective Neighborhood Technology Development Systems and Partnerships Be Created and Maintained?

I cannot stress enough the importance of seeing neighborhood technology development as part of a broader process rather than as a separate or autonomous process onto itself. Accordingly, its useful to think in terms of local, regional and national neighborhood technology delivery systems.

We have to move away from the notion that neighborhood technology experiments can be completely self-reliant and autonomous towards the idea of interdependence and partnership in which the neighborhood and its institutions maintain a good deal of control over the experiments but there is also room for stewardship and good advice from sponsoring organizations and technical assistance groups and consultants. Local and community leaders interested in initiating or facilitating neighborhood technology development should first assess what parts or potential parts of a local neighborhood technology delivery system exist and identify gaps in the system where new components or linkages need to be added.

Figure 38: Important Design Factors/Variables for Eighteen Selected Pioneering Neighborhood Technology Development Projects

Rough Rank	LABEL:Projects	Projects' Design Features: Tech	Commu	Initiativ	Transf	Organ	Sponsor
1.	SBW2: solar breadbox	simple	poor	comm control	good ts	est cd	n cd facil
2.	SB4: PDC energy team	simple	poor	comm control	v good at/cd	new cd	n cd facil
3.	SBW1: neighborhood solar	complx	poor	comm control	good ts	est cd	fn cd facil
4,5.	LES2: 519 11thSt. rehab	complx intrmd	mix	transfr	mod at	new cd/at	fl cd facil
	SB2: PDC solar rehb	complx	poor	comm control	good at/cd	new cd	fl cd facil
6,7.	SNT1: NTC solar greenhs	intrmd	mix	partnr	good at/cd	est cd, tsg	ln cd partnr
	SNT2: NTC solar workshp	simple	mix	partnr	good at/cd	est cd, tsg	ln cd partnr
8.	EUD: integral urban planng	simpl intrmd	altern	partnr	good at/cd	est cd, atgs	fln cd partnr
9.	CNT1: CAM greenhouse	intrmd	mix	link	good ts	est cd	n cd facil
10.	CNT2: Brotherhood green house	intrmd	poor	transfr	mod at	new at, est cd	l t transfr
11.	SB2: BFC composting	intrmd	poor	transfr	mod at, ts	new at, cdgs	f t transfr
12.	LES3: CUANDO solar wall	simple	mix	transfr	low at	new at, new cd	f t transfr
13.	SB3: BFC windmill	complx	poor	transfr	low at	new at	f t transfr
14.	SB5: PDC BESS project	complx	poor	link	good cd	new cd	n cd facil
15.	LES1: Charas domes	simple	mix	link	mod cd	new cd/at	n t transfr
16.	SB6: OSTF projects	simple	poor	partnr	low at	new at, new cd	fn cd partnr
17.	LES4: 11thSt/LEAC projects	intrmd	mix	transfr	low at, cd	new cd/at	f t transfr, cd facil
18.	LES5: Charas/LEAC recycling center	simple	mix	transfr	low at, cd	new cd/at	fn t transfr

Leaders should also identify parts of the system that aren't functioning well for one reason or another (e.g. a breakdown in communication between neighborhood technology groups and community development organizations) and develop strategies for overcoming these problems.

Building stable local partnerships for neighborhood technology development will not always be easy. The three principle members of such partnerships -- community groups, technical groups, and sponsoring organizations -- are bound to have different perceptions, objectives and priorities. The experience on the Lower East Side and in the South Bronx as well as in Chicago shows us that tension must be expected to arise between these potential partners. The realization that a partnership may be desirable and perhaps necessary, however, may serve as a stimulus to the parties to work at working their differences and disagreements out. In the past too much of the myth and ideology surrounding neighborhood technology suggested that community groups could do it all by themselves while in reality appropriate technologists and other technical experts tried to do it all themselves. The experience with neighborhood technology development to date suggest, however, that all three components are necessary -- a strong CD group, a quality technical support group, and a sympathetic but realistic sponsoring organization. Newer neighborhood technology development efforts (such as the Seattle Neighborhood Technology Coalition) appear to be moving toward creating stable local partnerships and viable local neighborhood technology delivery systems.

11. What Type of Local Technical Assistance Infrastructure Is Needed to Support Neighborhood Technology Development?

The Energy Task Force in New York City and the Center for Neighborhood Technology in Chicago have played positive roles in promoting neighborhood technologies and providing technical assistance, but they have tended to push their own ideas on what communities need (transfer model) and have often had to do most of the work in implementing "their" technologies. A more positive approach seems to be offered by the Seattle Neighborhood Technology Coalition in which community groups design their own projects (often with some assistance from the Coalition) and then get a grant from the Coaltion to carry out the project themselves. Technical assistance is provided by consultants to the community groups funded by subcontracts in the grants. The Coalition often plays a matching function matching up community groups with technical assistance consultants that match their needs.

Another issue concerning technical assistance is the quality of the assistance. Too many of the early neighborhood technology assistance groups (e.g. the Center for Neighborhood Technology in its early days) were not competent and experienced enough to provide community groups with the quality technical assistance they needed. Part of the problem was that technical staff for neighborhood technology experiments were often CETA employees or VISTA volunteers, so that just as they began to develop the necessary technical skills and expertise to provide quality technical support and advice, their time in the CETA or VISTA slot was up. Ways need to be developed to support technical staffs over a sustained period of time. One promising option would be to draw more on the technical expertise of local universities and R&D organizations. These are a promising local resource for neighborhood technology development

which have gone largely untapped.

12. What Is the Appropriate Role of Various Local, State and Federal Agencies in Facilitating Neighborhood Technology Development?

As stated above, local, state and Federal agencies should be viewed as potential partners in local neighborhood technology development partnerships. Too often Federal and local agencies have seen themselves simply as funders of neighborhood technology experiments with no other responsibility than to provide money up front. This is too limited a view of what a sponsor's role and responsibility should be in a neighborhood technology development partnership. A sponsor should play a positive role of active guidance, oversite and stewardship in neighborhood technology development experiments. The sponsoring staff should realistically assess how much the community group can do and in what time period. Too often Federal agencies have thrown money at embryonic neighborhood technology experiments which have succeeded on a small scale but then collapse when the funding and expectations are scaled up too fast (as was the case with Peoples' Development Corporation's and Adopt-A-Building's Urban Homesteading Demonstrations. Also the sponsoring staff should be sure that the community group gets the right kind of support. Federal agencies have tended to adopt a "tech-fix" view of neighborhood technology, providing funding only for materials and labor and modest tetchnical assistance and not enough support for planning, management and community education which are essential ingredients in most cases.

Beyond the role of stewardship and oversight, sponsoring agencies should play a networking and technology transfer role -- disseminating information on neighborhood technology and successful experiments to other relevant local, state and Federal agencies. Agencies should view themselves as part of local, regional and national neighborhood technology

delivery systems and develop strategies for making these systems work better.

It appears that local or state agencies may be able to play such a stewardship role more easily than Federal agencies because of their closeness to the neighborhoods. This suggests the desirability of more joint Federal/local sponsorship of neighborhood technology experiments (such as the Whiteaker Integral Urban Demonstration) and more use of community block grant and other local funding to support neighborhood technology experiments (such as occurred with Seattle's Neighborhood Technology Coalition).

EPILOGUE

As one of my advisors,Sharon Traweek,pointed out,the present dissertation contains the nucleus of two books,which I now hope to produce in the future. One would refine my embryonic 'coevolutionary' approach and apply it to a number of cultural movements,quests, and transitions in America. The second would be a more readable and less theoretical account of the evolution of the AT movement. Thus,like many quests in literature,this dissertation represents both the end of one intellectual cycle in my development and the beginning of a new one.

CHAPTER NOTES

Prologue

1.See Kevles' The Physicists (1978),p341-366,for a discussion of the debate over the Bush Report and the subsequent creation of the National Science Foundation along the elitist lines outlined by Bush.

2.On the criticism of and efforts to reform American science and technology in the 60's see,for example,Carson's Silent Spring (1962),Roszak's The Making of a Counter Culture (1969),Reich's The Greening of America (1970),and Primack and Von Hipple's Advise and Dissent (1974).

3.See Roszak's The Making of a Counter Culture,Reich's The Greening of America,Goodman's The New Reformation,Chapter 1 (1969),and Bookchin's "Towards a Liberatory Technology"(in Bookchin,1971).

4.See Devall and Sessions' Deep Ecology (1985) for a discussion of the roots and evolution of the 'deep ecology' notion and movement.

Chapter 1

1.These six questions were inspired in part my advisor Sharon Traweek's list of the four components of a thorough ethnography:
i.the description of the culture's cosmology or worldview,ii.the description of the ecology the culture exists within,iii.the description of its social organization,and iv.the description of the development cycle of individuals in the culture.

2.Especially relevant has been the work done by Barnes,Edge and others in the Science Studies Unit at the University of Edinburgh (e.g. Barnes 1974 and 1977,Edge and Mulkay 1976).

3.I was introduced to the interdisciplinary field of design studies through Donald Schon's ongoing seminar on design research at MIT.

4.The term "contemporary cultural studies" was coined by the Birmingham University Center for Contemporary Cultural Studies.See Hebdige,1979 and Willis,1978,for examples of the research done by this group.

5.Also Turner's related notion of people's 'root paradigms' and

Wallace's similar concept of 'mazeway reformulation' were relevant to my third question on leadership and creativity.See Turner,1974, chapter 2 and 3,and Wallace,1956.

6.My introduction to the interdiciplinary field of America studies was through my advisor Leo Marx and his seminars at MIT.

7.Also useful in this regard was my advisor Hayward Alker's work on political cognition,scripts and story grammars.See Alker,et.al., 1984.

8.I was introduced to the recent work on cognitive and creative life studies through Robert Kegan's seminar on cognitive-structural development and Howard Gardner's seminar on creativity studies,both at the Harvard School of Education.Also useful were Seymour Papert's seminar on learning environments and Hayward Alker's course on cognitive modeling in the social sciences at MIT.

9.On the role of metaphors in science,see Turner,1974,chapter 1; Schon,1979;and Gruber,1974.

10.I suspect that such 'metaphor shifts' are quite common in the social sciences as a researcher searches for the right metaphor or framework for making sense of the phenomina he or she is studying.

11.Futurists Joseph and Vary Coates were important mentors for me during this period.

12.When I first came to MIT,Eugene Skolnikoff,Harvey Brooks and George Rathjens were important teachers and advisors in the area of science,technology and public policy.

13.Early on I thought of comparing Technology Assessment (TA) and Appropriate Technology (AT) as two alternative approaches to technology reform.

14.For related definitions,see Blumer,1951;Ash,1972;and Toch,1965.

15.I also looked at clashes and factions within the movement,drawing on the literature on interest group politics (see,for example,Riker, 1986;Gusfield,1963;Edelman,1971).

16.The debate over structural/functional versus interpretive approaches is currently a hotly contested one in the social sciences.I've tried in my current coevolutionary approach,not to view them as mutually exclusive but rather as complementary perspectives and modes of analysis.

17.This model of AT innovation was inspired,in part,by the work of Rogers (1962),Havelock (1969),and Berman and McLaughlin (1978) on innovation.

18.These courses included Leo Marx and Ken Keniston's seminar on technological criticism in America;Sharon Traweek's seminars on laboratory cultures and scientists and engineers' lives;Sherry Turkle's seminar on computer cultures;and Everett Mendelsohn's seminar on contemporary social history of science.Also useful was Peter Berger's seminar on theories of modernity at Boston College.

19.On science and technology as 'culture',see Latour and Woolgar, 1979;Traweek,1988;Turkle,1984;Marx,1964;Willis,1978.

20.See Lemaine,et.al.,1976 and Mullins,1973,for the typical stages in the evolution of new scientific and technical disciplines.

21.In addition to the 'pastoral' quests,other varieties of quests include the 'legendary' or 'epic' quest,such as,the Arthurian quest for the Holy Grail;the 'religious' or 'allegorical' quest,such as, Prince Sakymuni's quest to become the Buddha;and the 'quixotic' quest,such as,the sallies of Don Quixote.

22.Also useful were Jung and his students interpretations of myths and quest tales (Jung,1964;Whitmont,1969;Hillman,1983);Lowry's study of the meaning of myths (1982);Propp's morphological analysis of fairy tales (1927);Petty's structural analysis of Tolkien's Lord of the Rings;and Levi-Strauss'(1955) and Terence Turner's(1969) analyses of the Oedipus myth.

23.See Turner,1974,chapter 1,for a discussion by Turner on how his work evolved over time.

24.Through Schon's seminar,I was also introduced to the work of N.J. Habraken and Larry Bucciarelli,who were active in the seminar.See Schon,1979,1983;Habraken,1982,1985;and Bucciarelli,1986,for examples of the work coming out of this research community.

25.Here Marx uses the term 'cultural symbols' for the 'pastoral ideal' and the 'machine',but I feel the term 'cultural themes' fits these notions also.

26.Many years ago,while studing computer science,I did some research in 'artificial intelligence'.I was reintroduced to the recent A.I. and cognitive science research of Schank and Abelson and their students and its relevance to the social sciences through Hayward Alker's seminar on cognitive modeling in the social sciences at MIT.

27.The themes and designs in figure 12 were abstracted from Smith's descriptions of the origins and evolution of a number of Wright's key notions and designs in his book Frank Lloyd Wright:A Study in Architectural Content (1966).

28.While Jencks doesn't explicitly use the term 'ecologies' for his schools of modern design,this notion is implicit,I believe,in his 'evolutionary tree' diagram shown in figure 13.

29.See also Wasserman,1983;Schlesinger,1986;and Spiller,1955 for cyclic theories of American history,politics and literature.

30.Toynbee's theory of history was basically cyclic,but also had the potential for being view more broadly as a helical theory (Toynbee,1947).For Thompson's helical theory of history as evolving 'cultural ecologies' see Thompson 1971,1981,and especially 1985.

31.I tend to think,however,that Wasserman's last two cycles-'global decline' and 'collapse/rebirth'-might be more properly seen as one cycle in his scheme.

32.Also relevant here is Turner's work on the polar nature of cultural symbols (Turner,1967).

33.Also useful were Petty's structural analysis of Tolkien (1979) and Lowry's book on the meanings of myths (1982).

Chapter 2

1.This cultural ecology model was also inspired in part by Leo Marx and Ken Keniston's seminar on technilogical criticism in America,in which they compared the pastoral themes and movements of the 1840's with those of the 1960's.

2.see Marx's The Machine in the Garden (1964) for a discussion of pastoral and AT related themes in the thinking of Jefferson,Emerson, Thoreau and related thinkers.

3.This and the following section on the 30's and 40's adapted from Decker,1978.

4.This and the following section adapted from Decker,1978.

Chapter 3

1."Hermetic" formula,here,refers to an alchemical theme or formula,the God Hermes or Mercury being a central symbol in alchemical literature.

2.See Schumacher,1973;Illich,1973;Bookchin,1971;Bateson,1972;Brand, 1975;and Thompson,1971,1977,1981,1985.

3.For a description of the New Alchemists' Costa Rican projects,see William McLarney's article on the New Alchemy Costa Rica farm in Nancy Todd,ed.,The Book of the New Alchemists,1977.

4.See Bennett Berger's complementary study of ideological 'tensions' and 'work' in a contemporary countercultural commune (1981).

5.See Laing,1969 and Jacobs,1984 on the myths that families socially construct about themselves and Berger and Luckmann (1966) on the social construction of reality in general.

Chapter 4

1.This section adapted from Decker 1979a.

2.This case study of the evolution of NCAT is based on extensive interviews,tapes and notes of NCAT planning and Board meetings and NCAT proposals and other documents collected by me from 1976-1980.

3.The term 'Community Action Agencies'(CAAs) is a general term refering to both 'Community Action Programs'(CAPs) and 'Community Development Corporations'(CDCs).

4.These four local case studies adapted from Decker 1979.

5.This section adapted partly from Decker 1983.

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