

AN EVOLUTION OF HOUSE FORM

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
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ABSTRACT

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The house is a cultural artifact. The changes that have taken place in the house are the evolution of a specific phenomenon within the general evolution of culture toward higher, more complex organizations. In a sense it is foolish to ask why things change because we observe that they must change, have always changed, and will probably always change. Within this context, in order for something to stay the same, relatively, it must change. But we can ask - how do things change? What are the methods, the mechanics by which things evolve? Where can we stand to view the house from an evolutionary perspective?

In order to study the characteristics of the relationship between constancy and change, between stability and adaptation, we will compare four small houses, connected by culture and over time: an Anglo-Saxon Cruck House, Early American Farm House, Nineteenth Century Tradesman's House and 'Contemporary Suburban' Cape. How can we best discuss these houses and the transformations that have occurred between them as products of a larger evolutionary course?

Evolution is explored as the progression of an organism-environment system - ultimately with man as the organism and the house as an important element of his environment. We can then trace the evolution of the system, and trace the evolution of our houses within that system.

In this manner some conclusions have been made about the evolution of the two major elements of our system - the human individual and the house, and about the interactional relationship between these two. The cultural segment of our model is clearly at the leading edge of change, while the remaining elements and subsystems of this model (being more conservative forces) adapt to the evolution of the cultural environment. The relatively constant biological constraints of man, in particular, force the house to stabilize the home environment of the individual in the face of change in the cultural environment.

We attempt to diagram these conclusions within a series of individual-environment system diagrams and, in this way, return from an evolutionary voyage to the perspective of the individual; returning, in the process, from a perspective which, like the universe, has no center to the individual as the center of his universe.

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INTRODUCTION

My intentions in this thesis are to explore the evolution of a house form by beginning, not directly with the house itself but, with the concept of evolution. These are the major prejudices I bring to this work - that any and every thing has come about through a process of continuous change. Change and the emergence of new objects or phenomenon can best be understood in relation to the tendencies of the entire universe toward change - and toward change in certain directions. While the nature of the universe will never be fully comprehended, I perceive evolution as an all-comprehensive process of which human existence forms a part and in which the house can be placed.

Evolution is not an explanation, per se, of the cosmic process but a generalized statement of the method and results of that process. If it is possible to advance an explanation of any thing or event with respect to evolution it seems then that things and events could be related to each other via the mechanics of evolution. I propose with this intent to look at a particular evolution of house forms - a string of houses which appear to be connected over time - in the perspective of an "all-comprehensive" process. This exercise, I hope, can begin to set a conceptual framework with which the house can be connected to other related human phenomenon.

I seek a kind of map, for myself and in a way that may be understood and used by others and based upon the observed universal tendencies for change and flux, in which to place the house (and eventually anything). This map will not really attempt to reproduce or evoke reality, only to give a convenient and useful representation of the primary features of observed realities into which new observations can be placed.

I don't ask that my initial biases be accepted, but that the reader determine how well they might work in an explanation of house forms and changes in

the house. The house carries its history, plainly stamped on and in it. If the history further behind is less easy to read, we shouldn't say that because we can't clearly discern it that therefore no history is there. I've gone through stages myself in which it seemed to make pragmatic sense to explain things in existential terms. The frustrations of these attempts made me see that any existence is unaccountable and unexplainable till we see that it has come about through many intermediate stages. Particularly with human phenomenon; attitudes, values, traditions can only be understood with knowledge about their pasts. The practical value of something is as much a product of its past as its use in the present.

Theories of the universe as being in constant directional change have appeared at least since the ancient Greeks and Heracleitus of Ephesus. Evolution became a scientifically acceptable explanation of the origin of present biological species in the nineteenth century, although speculations concerning the extension of biological progression into inorganic or cultural systems have necessarily remained as mere intuitions. Any such extensions cannot be proven (neither can Darwin's theories) but may be accepted in order to gain a perspective of the world which perceives all things as being connected, related and descended over time.

Among the definitions of evolution listed in Webster's Third New International Dictionary are two which I find useful; 1. evolution as "a series of related changes in a certain direction" and 2. evolution as a "process of continuous change from a lower, simpler, or worse condition to a higher, more complex or better state". There is an important distinction between the two. Everything can be seen as changing in a direction - a direction which can usually be characterized as either growth or decay. We could in these terms discuss the

evolution of particular objects; of the earth, a city, a house. The first definition can be applied to changes that occur to all things while the second follows from observations about the universe from which we can deduce that over time there has been a tendency of organized entities to attain a higher level - to progress. I will use the word 'progress' in this context, making no judgement yet as to whether higher levels are better. It is difficult to define exactly what we mean by a higher level though we certainly think of man as higher and more complex than the other primates; a suburban home as more complex than an Anglo-Saxon cruck house; a democratic political state as higher, more complex than a monarchy. But comparison is meaningless unless we realize that in each case there have been many transitional forms between one state and the other and that while there are many potential forms or states and potential directions for change, true progress - the capacity for advance in an evolutionary sense - is rare and unpredictable. These potentials in our time depend on complex interactions of changes between elements in the content of our cultures and ultimately to the progression of culture in its evolution. Democracy is only better in a culture in which there has evolved a certain level of education, where some quantity of information is available to all the people. This in turn relies upon a level of technology; the abilities to communicate, to print and distribute books, transmit and receive electromagnetic waves, etc. Similarly, the suburban home is only higher or more complex in a culture which exhibits the differentiation of labor necessary to build and maintain that house.

Evolution has a dual character ¹ which we shall call specific evolution and general evolution. Both are separate aspects of the same process. Specific evolution tends toward diversity and divergence as new forms differentiate from

old. It is the adaptive descent of forms with modifications. Advance with respect to specific evolution means the thing or event maintains or betters itself in the face of change in environment or is able to exploit the same environment more efficiently. It is phylogenetic, adaptive, diversifying, specializing.

General evolution is the emergence of higher forms, stage by stage - successive levels of all around progress. The difference between higher and lower forms is not how efficiently energy is used but how much. Moving from lower to higher forms means higher levels of integration - greater all around adaptation, greater energy exploitation.

One of my main beliefs is that the specific changes which fall under the category of specific evolution can always be related somehow to the more universal tendencies operating in general evolution. In a socio-cultural context the flux of energy through the culture may be synonymous with the economy. We can observe in our economies the need for continuous growth in order to maintain even a constant standard of living. If the GNP does not increase in this country (GNP might be interpreted as the total flow of energy through the economic structure) then we are in fact regressing. In our culture, consumerism is a necessary method by which the energy flow has been maintained and increased. The form of the suburban home is a result-partially-of its function as a product to be consumed and of the way it forces the consumption of energies.

These are the kind of relationships I am trying to make with regards to house form. It is clear that the nature of these requires an interdisciplinary study of a breadth far outside the scope of this paper, but a goal of this work should be to at least identify relevant disciplines and place them into

a framework in which they may communicate in recognition of common goals, values, and purposes represented by that framework.

Histories of architecture and the house have not presented a perspective which gives their presentation a sense of unity with the emergence and advance of cultures. Culture is man's adaptive mechanism. "Culture provides the technology for appropriating nature's energy and putting it to service, as well as the social and ideological means of implementing the process. Economically, politically, and in other ways, a culture also adjusts to the other cultures of its milieu, to the super organic part of its environment. Cultures are organizations for doing something, for perpetuating human life and themselves. Logically as well as economically, it follows that as the problems of survival vary, cultures accordingly change -- culture undergoes phylogenetic, adaptive development.²" (Culture is the complex whole which includes language, technology, economy, knowledge, belief, art morals, law, custom and other capabilities and habits acquired by man as a member of a society - those things which are man made and exist outside of and free from the individual human.) I am reminded of a history of ancient civilizations which did no more than give accounts of successive cultures, rulers, wars, discoveries etc. when it seems that the fascination of any history is in the fact that in the process of evolution, man is constantly facing new problems and needs brought about by the progression of new and higher cultural levels. "...progress is the total transformation of energy working in the creation and perpetuation of cultural organization. A culture harnesses and delivers energy; it extracts energy from nature and transforms it into people, material, goods and work, into political systems and the generation of ideas, into social customs and into adherence to them. The total energy so transformed from the free to the cultural state, in combination perhaps with the degree to which it is raised

in the transformation (loss in entropy), may represent a culture's general standing.³" This adheres to a perspective which transcends the actual events. A good example is the American Civil War, which may be understood best as the result of a widening gap between separate evolutionary levels. A 'backward' feudal agricultural system inevitably had to be regressed to a point where it could then progress to accomodate a rapidly expanding industrial economy. This sounds like a gross simplification yet it forms a framework by which the actual events can be explained. Clearly the goal of such perspectives is to illuminate unavoidable conflicts and to search for the least damaging solutions to them.

This perspective hints at a certain amount of inevitability, a certain constancy upon which variables are free to act. It is this sort of perspective I would like to use to deal with the house. While the implications of the house do not seem as drastic as war and famine, we can observe conflicts between individuals and their home environments; the best examples being some public housing projects, that have been tragic and damaging.

Conflict, though, is inherent in the evolutionary perspective as that perspective depends, at the same time, on constancy and change - or in the vocabulary of evolution - stability and advance. "The nature of man and his institutions contains elements of both constancy and change which affect the subject of built form and can be considered in relation to the biological nature of man, his perception and behavior. ⁴"

The strength of this perspective may lie in its ability to identify constraints and variables, and the rates and degrees with which an individual's environment can be changed without inducing stress, pain, or discomfort. While we stressed previously that everything changes, in a practical view of the

present some things change so slowly that they can be considered as constants. We know for instance that the solar system is evolving; the sun will eventually burn out. But this system changes at a rate that is slow enough that we can consider it as stable and constant. It wasn't too long ago, however, that the earth and nature were thought to be a stable system on which man had been placed. These beliefs have led to severe changes in the properties of the geographic and organic environments. There seems, in fact, to be a correlation between the relative age of a phenomenon and its stability or rate of change.

"The evidence with regards to man's biological nature is much more strongly in favor of constancy than is the case for perception and behavior. It seems clear that man has changed little in body and psychology since his beginnings...

There is some evidence for the view that perception and behavior are culturally linked and therefor changeable and for the view that they are in-born and hence constant. However, rather than try to decide in favor of either one or the other, it may be suggested that there are both constant and changeable elements.⁵"

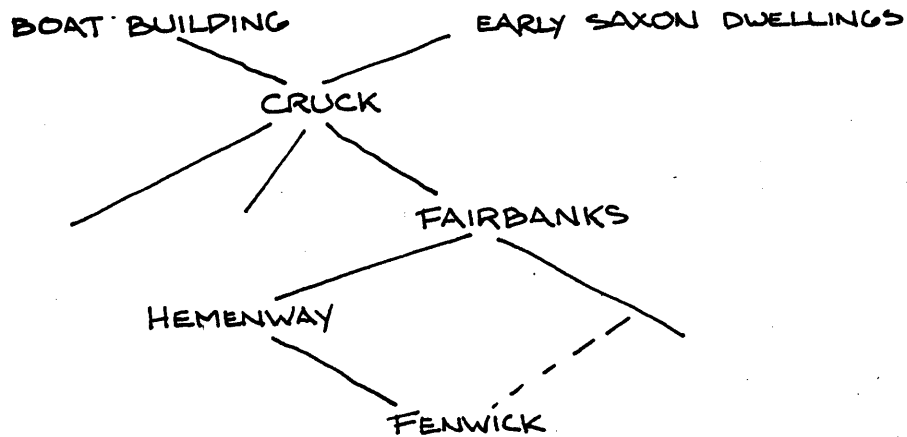
To draw a brief analogy we might ask 'of what value is gold?' An answer is 'so many dollars per ounce' or 'that it is very precious, and rare', but the significance of gold is not in the element itself but in the fact that at some level of cultural progression it was mandatory that something have a value in which everybody agreed so that it could be used as a predictable and reliable replacement and storage of perishable objects of 'real' value; food, clothing, labor, time. What is important and constant is not gold itself but the function it serves in the cultural organism. The fact that various cultures have used different objects for the same purpose may be proof of this view.

It is my hope that we can discover similar truths with respect to the house. But what approach do we take? I believe a useful course will be to test the perspective on four examples of houses which represent successive steps in the history of common house forms in a particular culture. Through these houses we can begin to see how the house changes and how it stays the same in response to changes and constances in its environment. How does it adapt to change? How does it stabilize itself in the threat of change?

Before describing these houses, it seems necessary to remind myself and warn others of the vocabulary which seems to accompany discussion of evolution. Because I use these words frequently I begin to think I know what words like energy, information, and culture mean, when actually they are symbols for intuitive ideas that mean everything and nothing at the same time. Energy is a word that has come to mean the primal stuff of the universe which has been stored in ever more elaborate forms. These forms, by nature, hold and transmit information. A tree for example begins with a genetic code which 'tells' it how to take energy from its environment (electromagnetic rays from the sun, and matter from the ground and air) to structure its complex cellular form. A human culture may be seen as a very complex array of information which 'tells' how the tree can be cut and shaped into a two by four. This two by four, assuming an ability on our part to interpret its information, can tell us much about the capabilities of the culture, the tree from which it was formed and perhaps something about the nature of the universe.

This is a brief indication of how these words will be used in the following pages.

FOUR HOUSES



Having lived in New England all my life, I've selected as examples four houses which, I believe, represent examples of the evolution of Anglo-American timber and wood frame dwellings. These seem to be by far the most numerous type of dwelling to be constructed in their time and respective geographical areas. I associate these houses with the individual or family of the most predominant economic status. This status is usually indicative of a common level of ability in taking part in the productive capacity of the respective cultural level. Early American colonial culture is characterized by the family harvesting food, fuel and material directly from the surrounding natural environment. This is very different from the way the 20th century family is described in relation to production.

The diagram above is an educated approximation of the possible descent of these forms, but is not the result of detailed study. Its intent is to show that the evolution of these forms is in no way a linear, closed system of advance. Every house has subsequent variations. Of these, one seems to have appeared from time to time as the most suited and most adapted to the level of cultural progression by virtue of its construction, maintenance,

arrangement of spaces, functions, image projected and many other possible reasons.

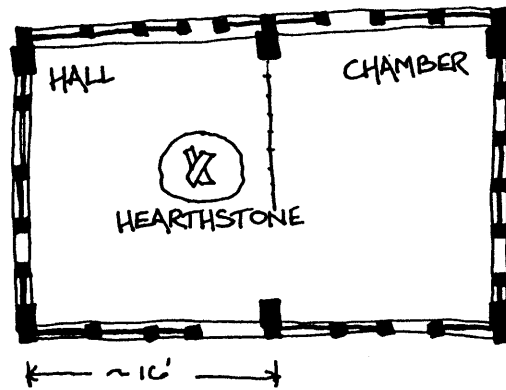
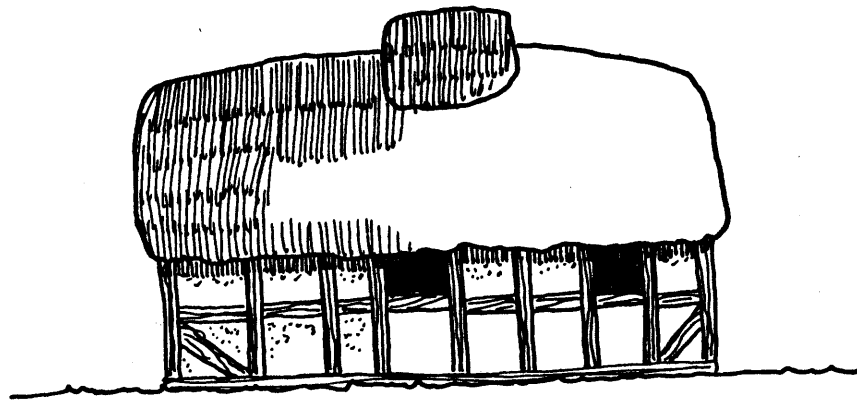
CRUCK HOUSE - Anglo-Saxon

c12-13th Century

The cruck house ⁶ is a predecessor of timber frame construction. Its form moves the Pre-Saxon cob house; a more primitive stick, mud and thatch dwelling, in the direction of the rectangular Norman stone halls. There are three layers of structure in the house; ¹ crucks, ² timber and stick intermediate framing, ³ thatch and wall infill. Crucks are the pairs of half trunks with a natural curve which form the main structural members of the shelter. Two pairs support a ridge beam at their intersections. At one time rafters had stretched from the ridge beam to the ground and a ground sill which ran between the base of the crucks. Eventually, to make the house roomier, a side wall was erected which rose vertically above the sill to a wall plate resting on the ends of lateral tie beams. The tie beams added rigidity to the crucks and had been extended beyond the crucks for the purpose of supporting these wall plates. The rafters, then, came down only to the plate. The spaces between the sill and wall plate were filled with timber studs, infilled with rubble wall or wattle and daub.

Pictured in the sketch is the latter; panels of woven reeds or sticks covered with one of the common plaster-like materials - mud, clay, mixtures of straw, clay, sand, cow dung—all covered with a lime wash to protect and preserve it from the weather.

Spaces in the walling were framed and left open for door and windows. The door was planked and swung on pin hinges. The unglazed window openings may have been screened with lattice work and could be closed by wooden panels



'SIMPLE CRUCK' HOUSE

in bad weather. The floor was clay or sometimes stone covered with straw. Roof rafters and purlins were thatched.

The house pictured has an added thatched covering over the smoke hole above the fire and hearthstone; a large slab of stone on which the fire was kept.

The typical distance between crucks was about 16 feet and many houses had more than one bay - perhaps two or three were the most common despite the fact that taxes were assessed on the number of bays. This particular example has two bays in order to separate the inside space into the working/cooking hall and a more private storage/sleeping chamber. A loft above the chamber was used for either sleeping or for storage. The house could be extended by adding bays or a thatched shed on the side for cattle and other livestock.

Construction of the cruck house is a fairly simple process. While the emerging middle class may have been able to hire numerous craftsmen to build their houses and approach the methods of construction of the church and wealthy land-holders, the common farmer/laborer was just barely progressing above the level of doing all of the building of his dwelling himself. The cruck house required timber wrights and some social cooperation to do the cruck and heavy timber framing, but the dweller must have certainly done the lighter work himself.

The ground is cleared. The hearthstone is dragged and laid. The cruck blades meanwhile are cut and split. "Selecting the oak tree, felling and then cleaving in one operation its huge trunk and lower branches and finally working the two halves into exact pairs of cruck blades must have required age-long experience and skill. There is evidence that oak was cultivated in order to provide crucks... 7" The A-frames are assembled on the ground, then reared one

by one into a vertical position so ridge purlin, side purlins and wall plate can be dropped into the sockets, and tie the frames together.

"The cruck arch is designed precisely for the process of rearing and this demands not only exceptionally massive timbers but a special jointing technique. 8"

The side walls are framed; the secondary members for holding the wattle and daub panels. Finally the roof is thatched and the walls filled. The floor is finished, interior partitions set and a fire lit on the stone.

As in most primitive vernacular dwellings, the image for the cruck house was one of the only ones available to the people in this area of England. The farmer (usually, though sometimes a craftsman) assumed the common image when planning his house and adjusted it according to size, additions, wall and roof materials with respect to his needs, skills and materials available.

All of the materials were readily available from the local natural environment. Some tools and specialized skills were required to cut and shape timbers but the majority of techniques were within the common knowledge needed for daily existence.

Maintenance. In this agrarian culture, cruck houses and poorer cottages were the typical house of the farming family and an integrated part of family existence. Maintaining and repairing the impermanent materials, keeping a fire for heat were part of everyday life and work - hardly separate from the storage and preparation of food and clothing. Patching walls, whitewashing, rethatching, supplying water and fuel, cleaning out ashes and straw and storing food and fuel were part of the cyclic nature of life, done daily, monthly or yearly.

The peasant family, being fairly self sufficient, was the primary economic unit of production. The farmer usually works his own piece of land and brings

in food and fuel from the land. But he must also work the land of his lord in exchange for 'protection' and other services. Any excess production goes to the land owning noble or church to support the political structures they represent.

The cruck dweller may have had some excess above the satisfaction of his basic needs, and could then trade for reciprocal material or skills in the market. Certainly this possibility was increasing. As it increased through advances in the technologies of reaping free energy; food, fuels, and materials from the land, the peasant farmer gradually increased his independence from the wealthy.

The placement of the house in its group of dwellings reflects the economic and political state. Each house faces a road or path leading to local church and manor and lies between that path and the common fields behind. The land surrounding the cruck may or may not have actually belonged to the dweller, as any structure raised on common land between sundown and sunup was generally recognized by "squatter's rights". Crucks were frequently raised hurriedly during the night. In any case, while the family assumed some responsibility for the area around the house, access to the fields was left between the houses.

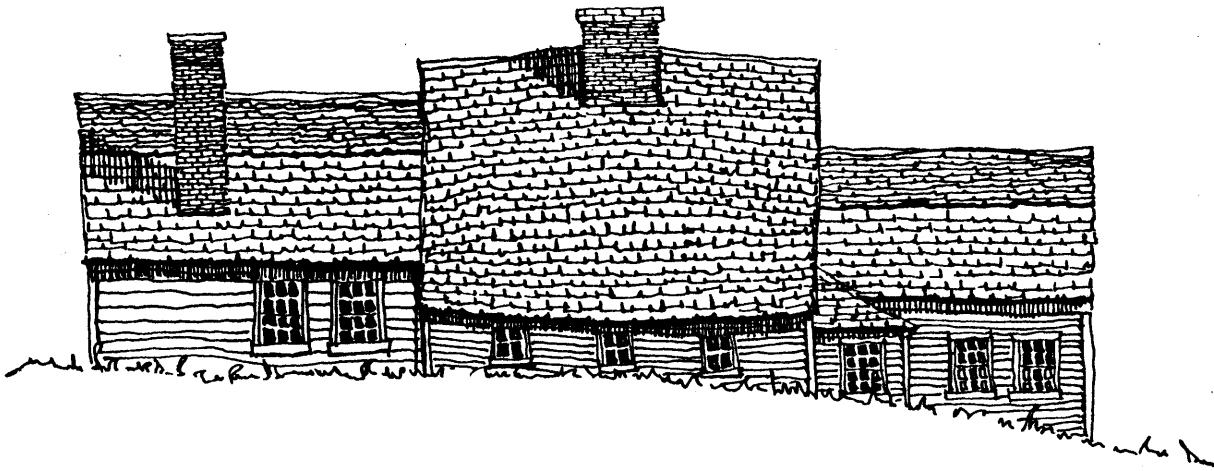
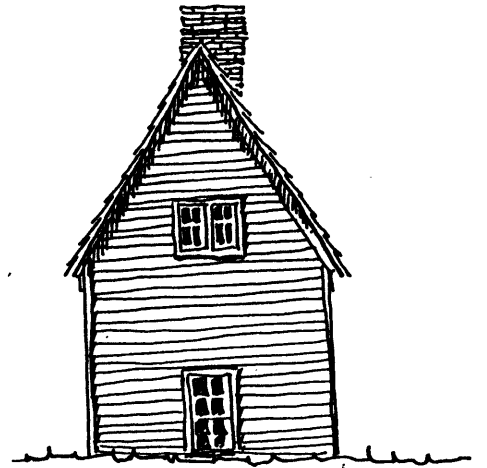
Compared to present standards life was crude and difficult. The house was cramped and uncomfortable. In general, the peasant family possessed little more than it could produce itself, so there were few furnishings other than the tools and supplies for survival. Beds, for instance, were no more than rolls of straw - near the fire on cold nights, and the sleeping area often shared with the animals.

FAIRBANKS HOUSE - Dedham, Mass.

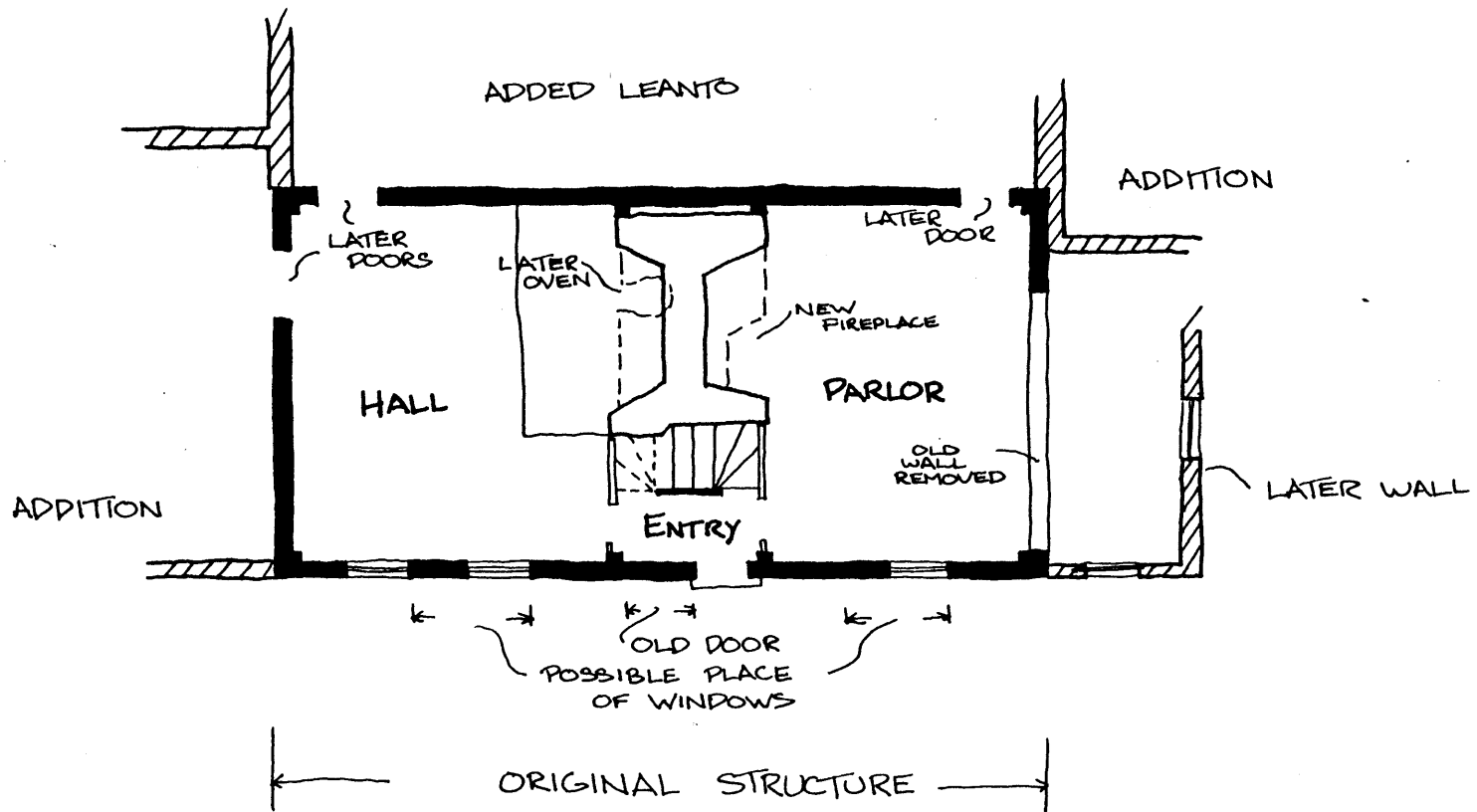
c. 1638

This house is a good example of the wide spread type of Early American dwelling in New England. ⁹ This type also demonstrates the transmission of an image of house from one cultural setting to a new situation, to a colony of that culture; in this case the English colony in New England. At first there seems to have been quite a regression in form with respect to the English traditions. Most of the very early houses (1620-30) were as primitive as pre-cruck dwellings; being little more than holes and burrows in the ground covered with stick frame, straw, mud, or thatch. By 1630, as the colony stabilized and progression accelerated, framed post and beam houses had become common although their simple form is reminiscent of the cruck house; rectangular, steeply pitched thatch roof with a central fire, though by now the fire had been contained in a large central chimney and fireplace. While relative scarcities of wood in England had directed the progressive images of the house in other directions, the colonial regression emerged using the same ancestral form but adjusted to a new economic situation, more than abundant wood and a different array of skills. Wood was used not only in the framing of the house but as clapboards for siding and protection from the elements. Clapboards were often used inside as well as out, although wattle and daub - lath and clay were also used extensively for interior walls. A standard form emerged in New England, typified by the original section of the Fairbanks house, built sometime after 1636 and perhaps as late as the early forties.

The oldest part of the house, as shown in plan, consisted of two rooms on each of the two floors. Compared to the cruck house we might say that the



FAIRBANKS HOUSE



FAIRBANKS HOUSE
DEDHAM, MASS.

FIRST FLOOR
1/8" = 1'

hall of the cruck house has become differentiated into its working and social functions; into a hall for the domestic activities and a parlor for formalized and ritualized social activities. The chamber has moved upstairs into the 'loft' and separated into more private, individualized spaces. This development had been dependent, of course, at some time upon the channeling of the smoke from the fire which then allowed a complete and enclosed second floor.

As in the cruck house the central element is the fire, as it serves for heat and cooking. The hearthstone has evolved into a stone chimney, eliminating some of the smokiness of the cruck house. The spaciousness of the early American fireplaces certainly derives its size not only from practical considerations but also from its descendancy from large open hearths.

The chimney of the Fairbanks house holds four fireplaces, and, though originally built of stone, has been bricked over and made smaller several times in its history. At the time of construction the roof had been thatched, but thatching was a practice not generally continued in this country after about 1700 so we might assume that this roof was first shingled sometime during the late 17th century. If not originally glazed the windows may have been at first oiled paper.

As comparatively primitive as the New England colonies were in 1630 we must still remember that the mere ability to colonize successfully in the New World relied from the beginning on world wide ocean travel and trade. The American house and community were tied economically to the larger, sea vessel oriented economic sphere. In comparison with the cruck house there are actually only minor advances in technologies, knowledge and tools which result in obvious changes in houses like the Fairbanks house. Techniques in

binding stone have allowed large chimneys which add strength and rigidity to the structure; in a sense replacing the structural significance of the crucks and permitting the rest of the framing members to be smaller.

Advances in metal working have led to better hardware for connections and tool making. This, in turn, meant that wood could be cut more uniformly and straight. Siding boards could be thin and of even thickness. These tools also meant that connections in the framing members could be stronger and more efficient.

Construction. Fairbanks arrived in Dedham sometime in 1636 and we may assume he began building this house soon afterward. His images of house are taken from English models and adjusted to the physical and economic setting as well as his place in that setting. The model that developed in New England was a common one that Fairbanks adjusted and adapted to his needs and situation. He first builds for the barest necessities. The chimney and foundation are constructed from stone abundant on the immediate site. The wood for framing is cut by hand in pit fashion, by two men (one up, one down) and a saw. The clapboards are split from radial lengths of logs. The house is framed around the chimney, the flooring, thatch and siding applied, then the finish work inside; lathe, clay and boards.

The construction of this house lies in both social and economic spheres. Some community effort is involved in the raising of the frame and craftsmen are hired for their particular skills. The dwelling family still does much of the work themselves, making decisions within the constraints of the model and organizing the construction process.

Metabolic Maintenance. Inhabitants of this house in the 17th century were probably farmers, although most families, while working the land,

specialized to some extent at a craft or skill which they could practice during spare time - which came especially in the winter. The family is fairly self sufficient for the essential satisfaction of needs but the farm and home industries produce more than can be used, an excess that allows the family to become part of a larger economic unit/system. The harvesting of material, food, fuel and energy from nature takes place primarily at the house, either by domesticated plants and animals on the homestead or by capturing and collecting wild animals or plants. New technology increases the efficiency of this process. This has infrequently meant that the same amount of production is done more efficiently, a contradiction of our hypothesis that progress moves toward the gathering of greater amounts of energy. Instead, more is produced. The more excess that the family produces at the house, the more that family and household can accumulate stuff from outside the house.

We should keep in mind that while the little excess the cruck peasant produces he must turn over to the powerful norman lords, the political economic climate of the American colonies allows the Fairbanks dwellers to use most of that excess for their own accumulation of wealth.

The satisfaction of family needs depended not only on what they could exploit directly from the natural environment but increasingly on cultural products. This is reflected in the house which derives its forms, furnishings and construction techniques increasingly from the products and knowledge of the cultural-economic world.

Fuel, water and food are carried by the inhabitants into the house. Wood is still used for heat and cooking, light is provided by pine knots, candles, and eventually animal fats and oils. Water is always kept hot in

a pot over the continuously burning fire. Roasting is done in spits over open flame; baking in stone or brick ovens behind or beside the fireplace. The original stone fireplace in the Fairbanks house had no oven though a brick one was built later when the size of the fireplaces were reduced. Food production is the most important manner of energy exploitation and takes place around and through the family house. The most important activities to take place in the house and outbuildings may then have been the preparation and storage of food for winter and lean years. Most houses had a smoke room as part of the chimney for curing meats and some vegetables. Foods were also dried and stored in the house or kept over in a cool cellar. Barrels of beer and cider, the most common drinks of the day, were kept in every cellar. The house also sheltered the tools and machines for domestic and economic productions - looms, spinning wheels. Each household also produced much of its own goods and supplies - clothing, candles, perhaps a large quantity of wooden products. Tools, hardware, cookware, weapons, and in fact, most of the metal artifacts required a cultural system of mining, refining and transporting ores. The Smiths⁴, black, copper, silver, - may have been the most important production functions existing outside the house.

That a social life is expanding in the home (perhaps related to the expanding cultural-economic ties) is demonstrated by the parlor, a space primarily for social functioning. Separate bedrooms indicate a greater degree of privacy than we saw in the cruck house (at least for the adults) and a growth in the idea of individuality.

Because the house is a focus for the output of food, clothing, and other domestic supplies, there are strong connections between family, house, and land. It was assumed that modifications in any one of these would result

in changes in the others. The self contained quality of the house, isolated it on the piece of land from which resources were gathered.

Change and growth in the family was recognized as an essential part of its metabolism and of the maintenance of the house. Many changes and additions were made to adjust the house to the number of people; relatives, children who married and stayed, as well as for economic reasons. The lean-to at the rear of the house was probably added relatively soon after the original structure as were the small additions to the ends of the house. The two larger and later additions at the ends are practically complete houses in themselves, so possibly three related families shared the entire house, attaining greater efficiency in food and energy consumption.

Certainly, when compared to the cruck house, the Fairbanks house has become a more permanent structure, needing fewer constant repairs. It had to be rethatched regularly until it was shingled, and then reshingled occasionally. Of course it had to be painted and cleaned; ashes and waste removed. The house was more comfortable than the cruck house but still cold in winter, hot in summer, and probably smokey a great deal of the time. It was better furnished as the family could build and afford furnishings, beds, and tables. Excess domestic production, in essence, assured the family of acquiring possessions of cultural manufacture.

HEMENWAY HOUSE - Framingham, Mass.

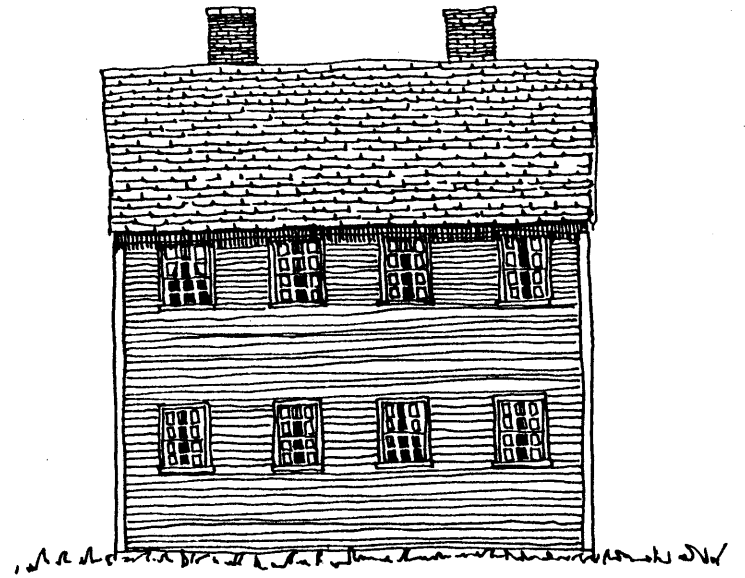
1832

The Hemenway house is typical of the early nineteenth century New England house. ¹⁰ A fascinating period in this town for even though the house carries over many of the formal characteristics of the colonial period it stands on the threshold of change, of technical and economic innovation which will affect its functional aspects. The house bridges the transformation of the town from an agricultural to an industrial economy. The pre-conditions for this change in Framingham were its further incorporation into a larger economic sphere by advances in transportation which came about at the beginning of the century. In 1810 a turnpike was completed between Boston and Worcester, which passed through Framingham Center, within a few hundred yards of the site of this house. This greatly increased the town's commercial and industrial potentials. These potentials were further increased with the railroad connection to South Framingham in 1835, about two miles from the house. Better roads and the railroad made conditions possible for mills to produce wool, cotton, wood and other products whose markets could be extended beyond the local ones and naturally led to growth in the population. This house is one of the many built during this period in Framingham as a result of these progresses.

It was constructed in or about 1830 by Adam Hemenway 2nd and as he was also married at about the same time we can suppose that he built in order to house himself and a new bride. Adam was a carpenter and so did much of the work himself. The number of men listed as carpenters in Framingham at this time suggests that there was a large amount of building. Perhaps this work

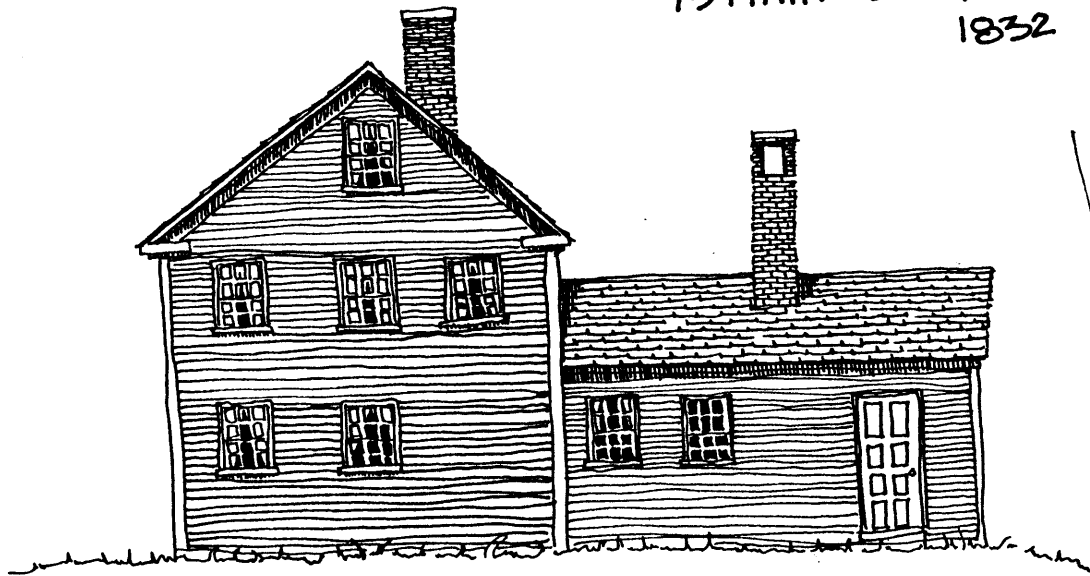


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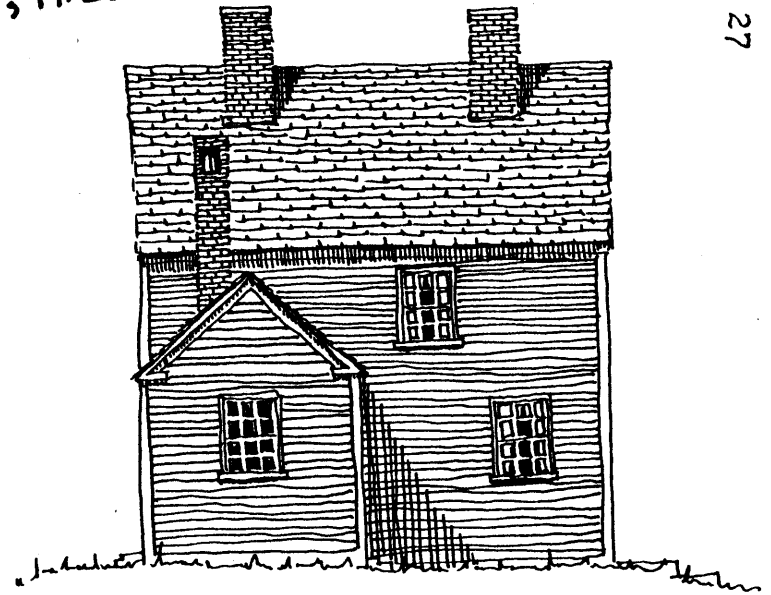


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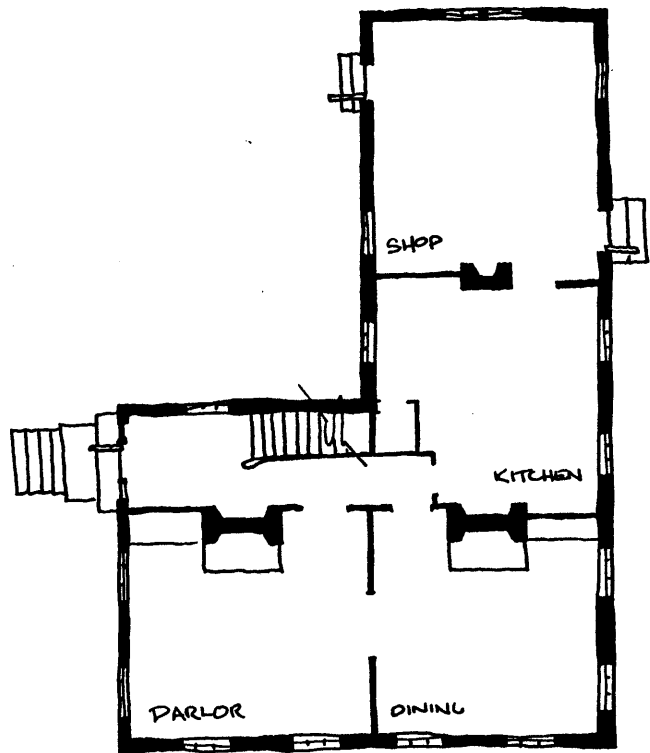
73 MAIN ST FRAMINGHAM, MASS.
1832



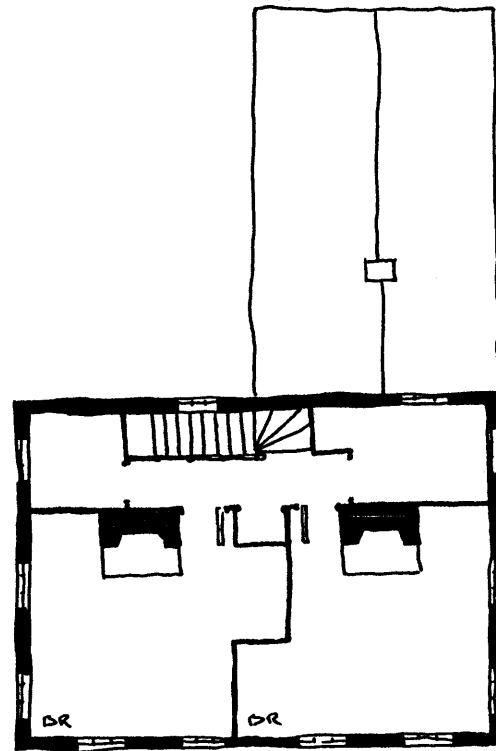
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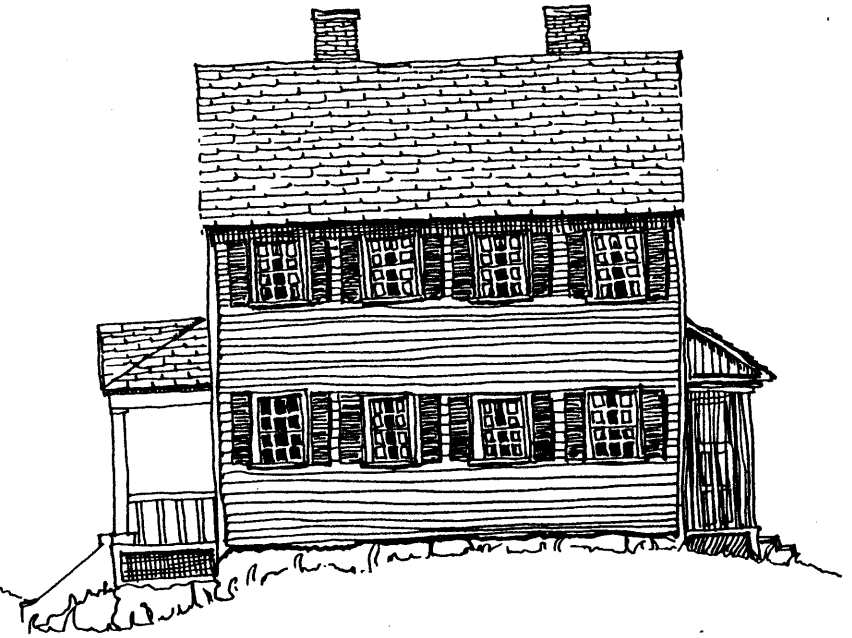
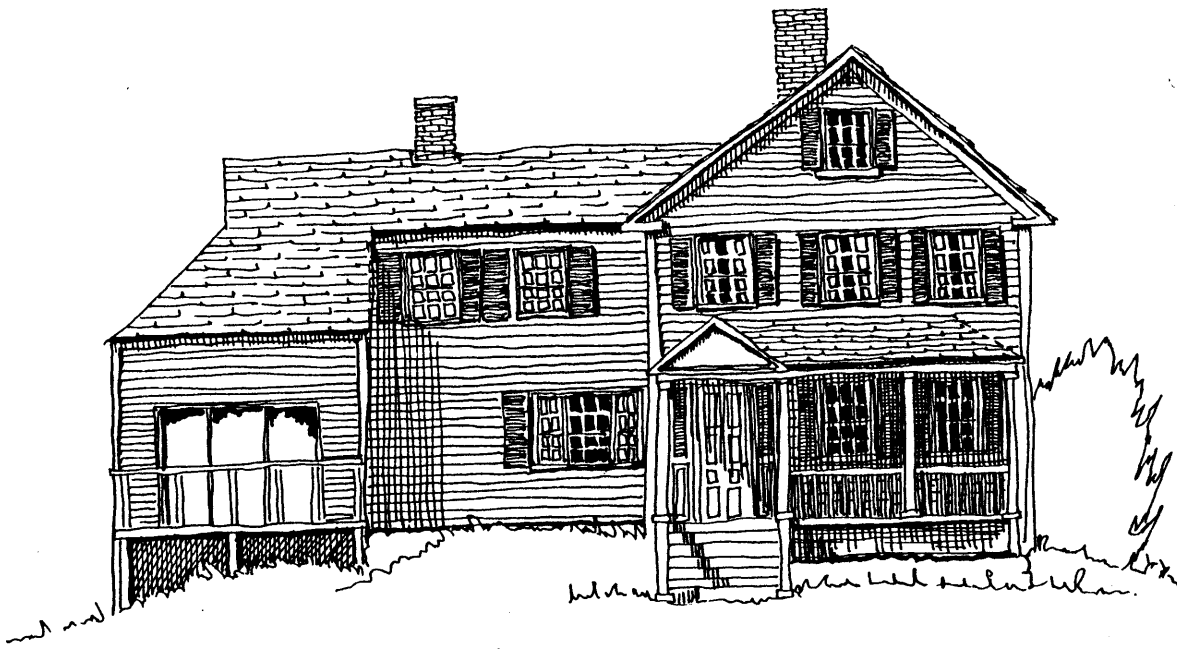


GR. FL.

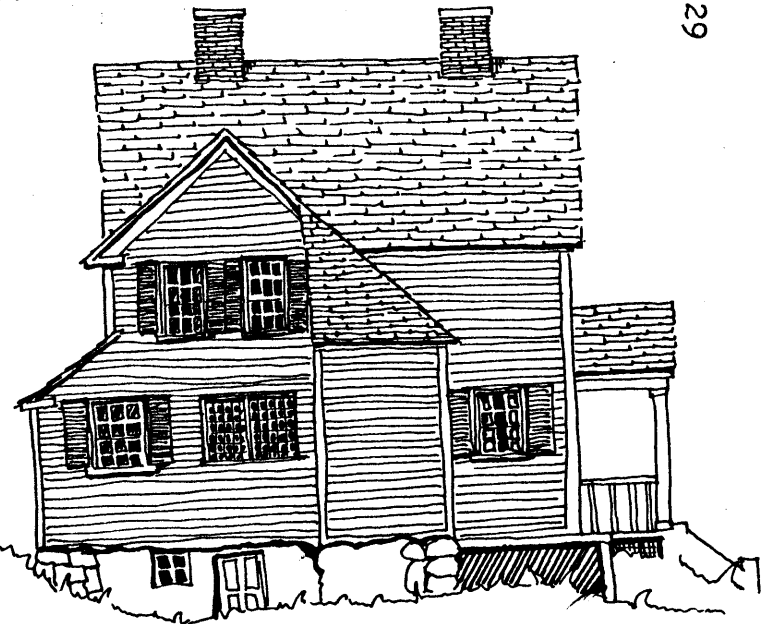
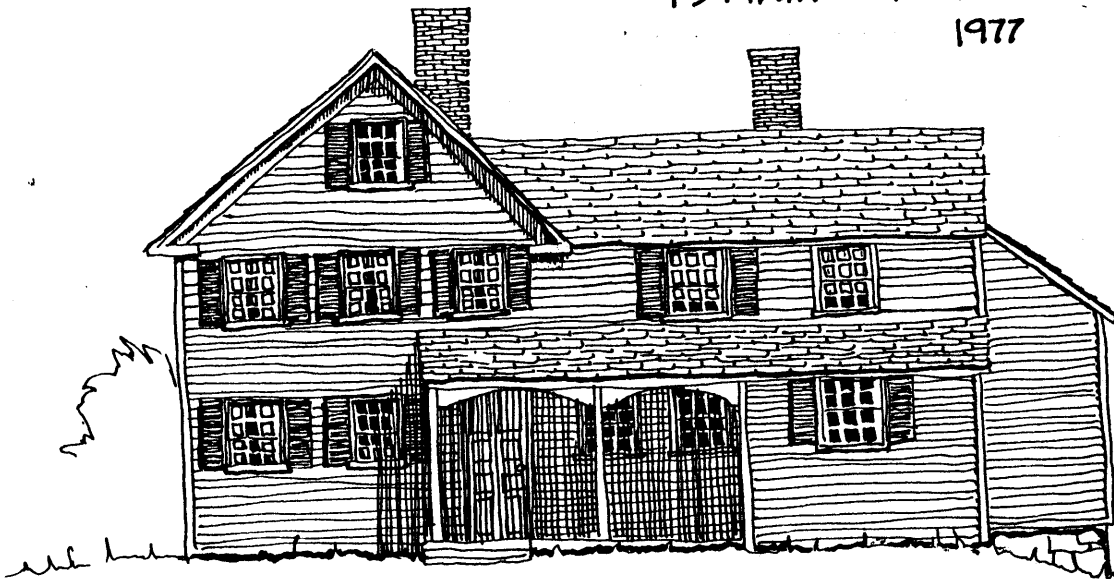


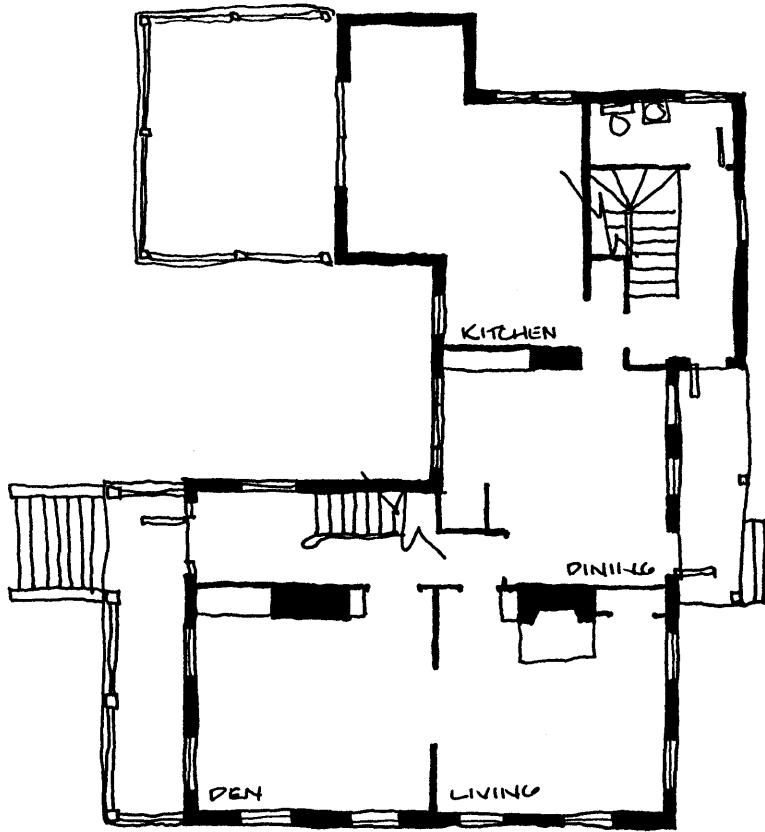
2ND FL.

73 MAIN ST. FRAMINGHAM - 1832 $\frac{1}{16}'' = 1'$

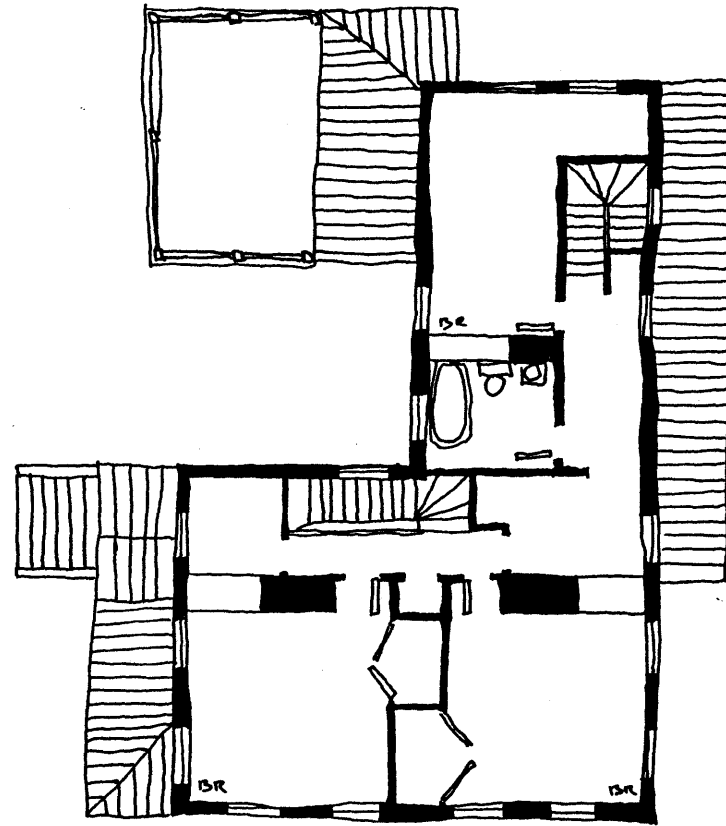


73 MAIN ST FRAMINGHAM, MASS
1977





GR. FL.



2ND FL.

73 MAIN ST FRAMINGHAM - 1977

$\frac{1}{16}'' = 1'$

was often part-time in nature for the family maintained livestock, a garden and supplied much of its own food and products, but Adam's craft, and work outside the home was necessary to maintain an accepted standard of living. We see in this house, for the first time, the separation of work and production from the rest of the family space. The workshop is in the house but differentiated from domestic production. As cultural production moves away from the house, more and more energies necessary for the maintenance of the house and family must come from outside the house. Smaller amounts of food and material are exploited directly from the house and surrounding land by the family. In this process there begins the separation of cultural production - usually performed by the male, and domestic production - performed by women and children. Carpentry was a skill that was common in Adam's family and though he built much of this house himself we must consider his work as a cultural factor rather than individual behavior.

We can imagine Hemenway using the common and still simple images of house which surrounded him, and in which he had lived and were a part of him, as a model with which to plan and envision his particular dwelling to fit his particular needs and desires. The plan of the house is straightforward and reflects the life of its inhabitants. The models for its form and layout were well known images shared by the community adjusted to the site and constructed by processes typical still of the preindustrial era. Variations to the common image were probably also induced by the fact that the house was to face the river to the east as well as Main St. on the north.

If we picture this house as an enlargement of the Fairbanks model, the further differentiation of space has demanded that the central fireplaces and chimney be split up into three smaller chimneys so that every room can be

heated. The working areas all have been broken down into separate spaces for home industries and tools, and for the kitchen, cooking, pantry, and storage. The social spaces (parlor) have been differentiated into a sitting room and dining room as the formal patterns of social activities have grown and become a more important part of the life of the family. There is also more space upstairs for private rooms. The children may be obtaining individual bedrooms.

The increasingly dominant social lives demanded the enlargement of the front parlors, so that while keeping the width of the house to a manageable scale the fireplaces are set back, leaving room for the hallway and pushing the domestic work spaces into an extension of the main rectangle at the rear. These may be viewed as modifications of the simple colonial plan with an internal kitchen and central hallway, onto which similar extensions had been added.

Foundation stones came from the site, or were certainly obtainable within a short distance. Brick for the chimneys and fireplaces may have been fired locally but were more likely made in or around Boston and stored at a local brickyard. Wood was milled at one of the several sawmills in Framingham at the time and may have come from trees cleared from the site. The potential for building materials to be part of a wider trading and transportation system comes with the railroad, though that potential was not fulfilled until much later with the depletion of locally obtainable materials. A great majority of the objects which were to become part of the house were entirely local processes and products with the possible exception of glass and some hardware. There is a certain division of labor developing in the construction process. Although the dweller is guided and constrained by available skills and

materials and economies and by cultural models which insist on the basic forms, he takes part in the process. The orchestration of energy, information and materials is understood by the dweller, whose energy is responsible for the inertial ordering of the house.

The structure of the house though post and beam uses smaller, more frequent framing members and has become more similar to conventional stick building. The methods of joining the members of the frame hasn't become drastically different, but much less wood can be used to obtain the same structure. The major differences in construction between Fairbanks and Hemenway is the refinement of tools, which in turn refines detail, the uniformity and fit of parts, straightness and finish. The foundation is stone. The cellar has a stone and packed dirt floor. Brick has replaced stone as the popular chimney and fireplace material. The fireplaces are smaller than in the Fairbanks house as wood has become a more valuable commodity and must be burned more efficiently. The roof is shingled, the exterior walls protected by clapboards. Interior boards and lathe and clay have evolved into wainscotting and plaster walls; which are smoother and more finished. The windows are double hung and glazed.

Metabolic Maintenance. Maintenance and life style is similar to that in the Fairbanks house. There is an increasing reliance on the cultural connections for metabolic essentials. Larger quantities of foods and other goods are obtained through trade in the markets, although the house is still used to preserve and store food. As the dweller's work no longer goes directly for the exploitation of energy from nature, I think we may say that energy is being consumed. The dweller uses his production to pay for fuel, light and heat that must be imported. The need to transport fuels alters the desirable

qualities of those fuels, and changes consequently took place in the methods of heating and energy use. The fireplaces were bricked over and replaced with air tight iron stoves, with adjustable flues which burned wood much more efficiently than the smaller fireplaces. Wood was soon replaced by coal as the main fuel for heat. Cooking was done over a stove which burned wood and then coal also. Light was provided by candle and oil, although later in the century, petroleum oil products replaced animal oils. For the first time in our examples water could be hand pumped into the kitchen.

Fenwick St. Cape, Framingham, Mass.

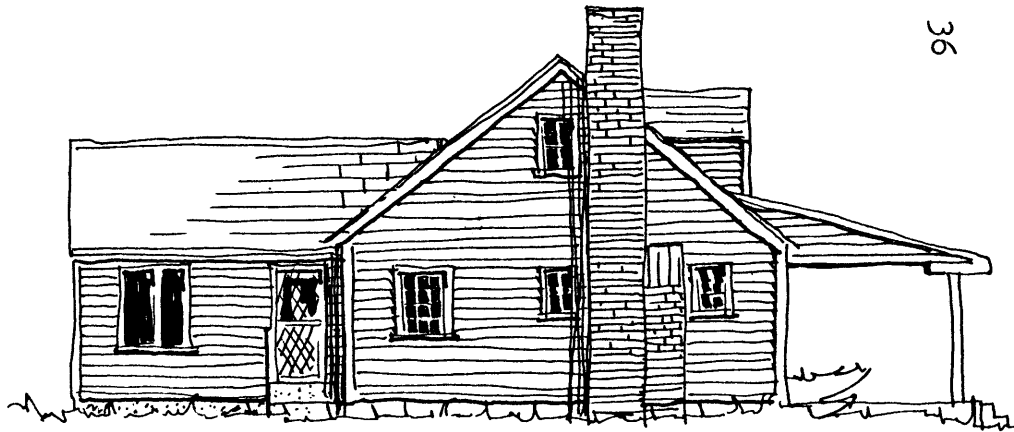
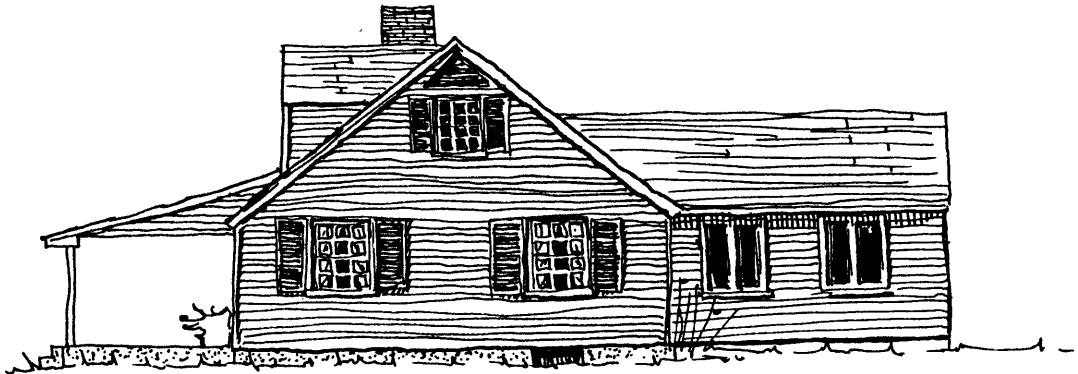
1947

After the second world war, hundreds of these houses were built in Framingham. All or most were built speculatively by corporations developing many lots simultaneously, using a standard form with variations in plan, details and amenities. It would be a little foolish to note all the differences and changes that have taken place since the construction of the Hemenway house. Many will be merely generalized and grouped under broad categories.

For the first time in our examples, the house is not built for a specific person or family, but for a general category or type of person or family. Variations in plan and appearance among the houses in the vicinity of our particular example are often a marketing ploy which widens the base of appeal to the largest number of prospective buyers for the least cost. The house has become a part of a cultural market system; a consumer product. As such it is built for appearance, convenience, and economy. (What does the buyer get for his money?)

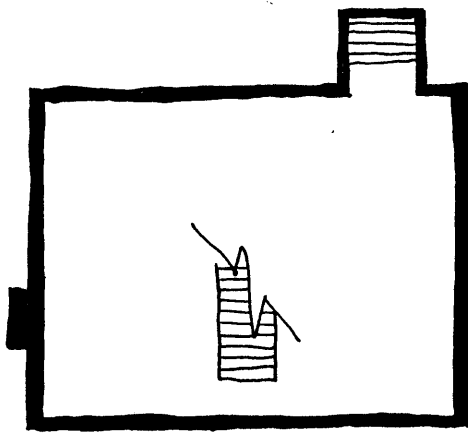
We should ask then - 'where does the image for this house come from?' It is a well proven, popular image - a traditional image that represents certain values and tell us something about life-styles. Even though the owner no longer builds his own house, the house he selects reflects popular goals and ideals. The house is intended in an indirect way for this purpose. It conveys the American idea of the single family, freestanding house; small, conservative but representing a middle class image. But this is a complicated issue and really shouldn't be discussed in such general terms.

Not surprisingly, the outward image is not so very far removed from the

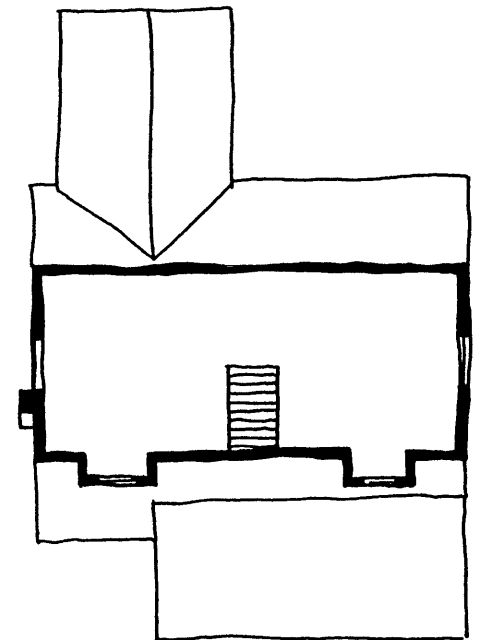
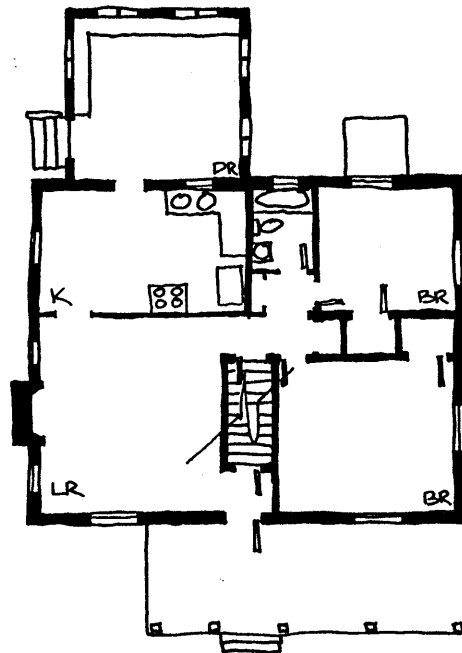


36

FENWICK ST. FRAMINGHAM
1947



BASEMENT



2ND FLOOR

Fairbanks house. The "cape cod" style is a remnant from colonial forms.

The foundation and basement are concrete. The above ground structure is wood framed, stud wall construction with sheetrock interior and clapboard exterior. There is a central entrance and hall on the first fload leading to a livingroom, kitchen with an added dining room at the rear, two bedrooms and a bathroom. The upstairs has been left unfinished but provides space for two more rooms. The basement holds mechanical equipment, inputs from water, oil, electricity, as well as the oil storage tank, fuse boxes, water heater, and furnace.

The house faces a well travelled street but is otherwise surrounded by similar lots and dwellings, some within about thirty feet. The lot is small; a change that has been brought about by the automobile. In our previous houses transportation, other than by foot, had been by horse, back or carriage. To own your own transportation meant having a stable or barn, and grazing area. with the required land and outbuildings, it would be just as practical to have a few chickens also and other livestock. No more; the horseless carriage allows its owner to have a small piece of land and private transportation, and has done much to alter the situation of the house.

Along the same line, there is no longer a need or space for the many outhouses-privy, wagonshed, chicken coop, well-house that would have been found with the Hemenway or Fairbanks houses. Even in these houses the outbuildings which were a vital part of their operation have long since disappeared.

Construction

As we have noted, the construction of this house is based on a standard plan and carried through by a complicated system of financial and building

industries. The contractor builds with a comparatively industrial process. Many houses are built simultaneously using many standard size pieces, particularly the framing members, which are joined by inexpensive metal connectors; nails. Concrete has replaced stone as the foundation material, just one indication of the number of different tradesmen and specialized skills which contribute to the house. The mechanical and energy systems, unlike the previous houses, demand the most specialized labor; plumbers, electricians, heating system experts, not to mention the carpenters, roofers, finishers, cabinetmakers, excavators, concrete and foundation men. And these are yet part of a complex labor and union system and deal only with the finished product. Where a piece of framing timber in the Fairbanks house was hewn and cut, raised and joined by the same people, many people now take part in the processing of a two by four to be used as a stud in the Fenwick St. house.

Above this, the entire construction process is regulated by a set of codes and regulations governing the practices of the building trades.

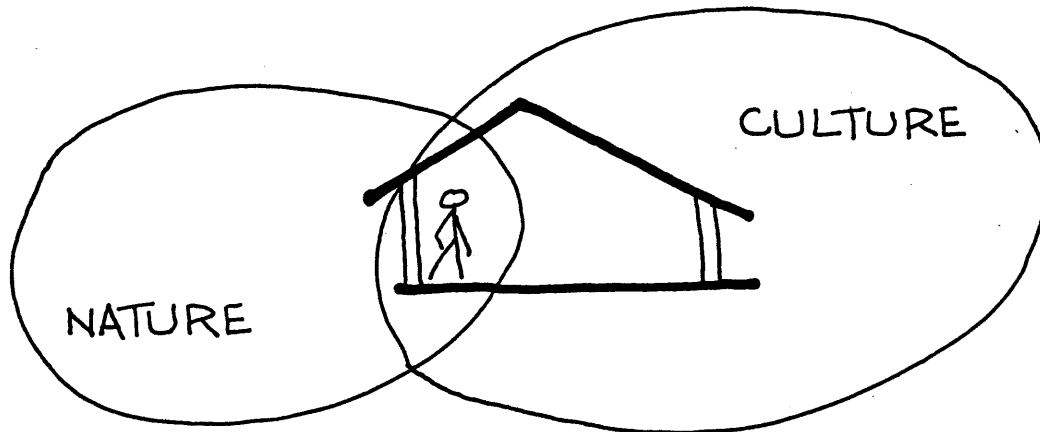
Metabolic Maintenance

Production is moved entirely away from the house. Tools, fuel, clothing, materials, goods, supplies and furnishings must be entirely imported by cultural systems. In retrospect we could say that throughout our houses, production of excess grows. At some point, efficiency (and hence more energy) makes it necessary to move the entire production, energy transformation process away from the house. This was not a sudden change, although the most rapid rate of change in this respect occurred about the time of the Hemenway house, and has been completed by the time we come to the Fenwick St. cape. This house might be said to 'live' on its own. It is tied to and inseparable

from its energy and water supplies. These connections represent vast cultural systems that allow the dweller to have much more direct physical freedom from his house than previously. The central heating system is removed from the living areas to the basement (which in the Fairbanks and Hemenway had been a 'cellar' for storing food and other supplies) and is fired by oil. Heat for cooking and light is powered by electricity, completing the separation that has been developing between the location and fuel for cooking and heating. Water is piped into the house as part of a municipal supply system and waste water had been sent to a cesspool on the lot until the mid 1950's when it, too, flowed into municipal sewerage systems.

Through telephone lines, the house is connected to an immense communication system and the house is the primary location for the use of radio and television for receiving information from cultural networks. The implications for these on the inhabitants and house are, of course, enormous and perhaps far beyond analysis.

ORGANISM - ENVIRONMENT MODELS



The major assumption or hypothesis of this paper is that, at present, general evolution may be characterized by the transformation of energy from a natural to a cultural state. 'A culture harnesses and delivers energy; it extracts energy from nature and transforms it into people, material, goods and work, into political systems and the generation of ideas into social customs and into adherence to them.'

General evolution occurs in conjunction with the increase in the amount of energy so transformed into the cultural state. The subsystems of that culture most undergo mutations in order to maintain themselves in relation to the increase in energies. Our background model contains a culture and natural world or environment with some sort of interactions between them. Into this very generalized picture we want to place the house and the individual or family. The natural world and the human individual are the result of evolution and contain a set of needs which represent constants in our model. These

constants constitute a locus around which the individual and house adapt to changes in the cultural-natural system.

We are interested in two things; our particular described houses as a background for differences in the house in evolving cultural mutations and as evidences of the way in which things change; and the development of an overall perspective of change in our world and the individual's place with respect to these changes.

The crucial question is, then, how do we deal with our houses to help develop a perspective as to how things change? (At the same time how they stay the same). We can begin by noting that we have been suggesting a model of a reality in which we can identify a number of elements that are intimately connected to each other; man (individual or social group), the house, a physical or natural world and a cultural milieu.

The natural and cultural are defined as divisions which together make up the entire environment of the individual. The House is an important part of this environment. Environment is a complex idea and is not easy to define except in a specific context. Environment may be the entire immediate physical surroundings, or the sum of the elements, events, and ideas that are inputs or contribute to the life of an individual organism. In an approaching world, culture, for example, my environment includes Saudi Arabian oil wells, South American coffee plantations and increasingly so - the entire planet. It is only my belief that there are patterns and directions to change in our environments that makes me confident we can make observations and generalization about the infinitely complex relationship between an individual and his environment.

Changes in the house are changes in the individual's most important

physical and conceptual environments and, in fact, are changes in the individual himself. I would like to visualize the connections of the house to the individual and to the rest of his environment - to make connections between changes in the house and other elements of the environment. I have found that in order to make these connections a useful conceptualization is a system which can approximate a model of the individual in an environment.

A system is a complex of interacting elements. It is dynamic. The interactions between the elements are as important, if not more so, than the elements. "The condition of an element or interaction is dependent upon the condition of all other elements and interactions. A change in one element or interaction produces consequent changes in other elements and interactions. The condition of all elements and interactions at a particular time describes the system. 11"

The set of interacting elements we select to define a system depends upon the questions we are asking.

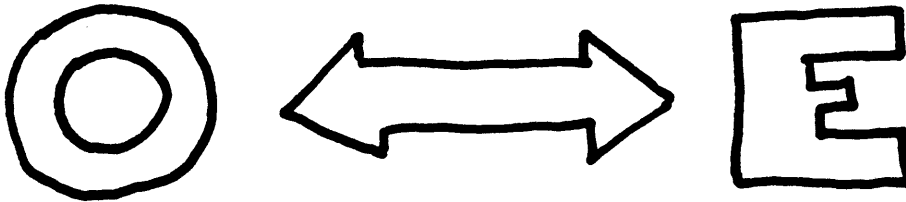
We could in these terms compare the cruck house, as primarily an extension of an individual or family system, to the modern cape, as an extension of the cultural system, by noting that cruck house construction comes about for and by the satisfaction of the family's needs and desires. In fact, the family may not exist or be complete without their particular house. The construction of the cape occurs as the result of very complex initiatives within an economic and political structure which only indirectly reflects the needs of an individual or individual family.

Our system allows us to talk about separate and distinguishable objects and their interactions, and then permits us to talk about all of these together as another form of identity. The basic idea of the system model is interaction,

connectedness. Nothing is independent. It is a way of connecting or compromising different views of the world. When system is used as a framework for explaining the interactions between an organism and its environment relatedness is emphasized, organism and environment are inseparable; both are part of the same process.

I am going to examine the evolution of these house forms as a particular result of the evolution of an organism-environment system. Organism and environment have come to be seen as separate entities which can then be related to each other to create a new entity. An organism cannot be thought of as existing without surroundings, and conversely the idea of surroundings does not exist without the organism. It would be an interesting exercise to trace the history and emergence of the concept of an environment. We could imagine that, as in science and philosophy in the 18th and 19th centuries, the concepts of life, living organizations, and individuals emerge, so does their apparent opposite; all that which lies outside of the organism - its environment. This has been just one of the many dichotomies created by man's ability to be aware of himself and his environment. We cannot communicate without making separations between things and processes, but at the same time these separations remain conventions and we should not forget that things cannot in fact be separated. This is a problem. The greatest and most important problems are all unsolvable. They must be because they express the necessary polarity inherent in humans as in every self-regulating system. There is no solution of the polarity - only compromise. That which our evolutionary progress has demanded we distinguish conceptually; an organism and its environment, can be thought of holistically within the structure and vocabulary of a system while still maintaining the discreteness described by the words and thoughts.

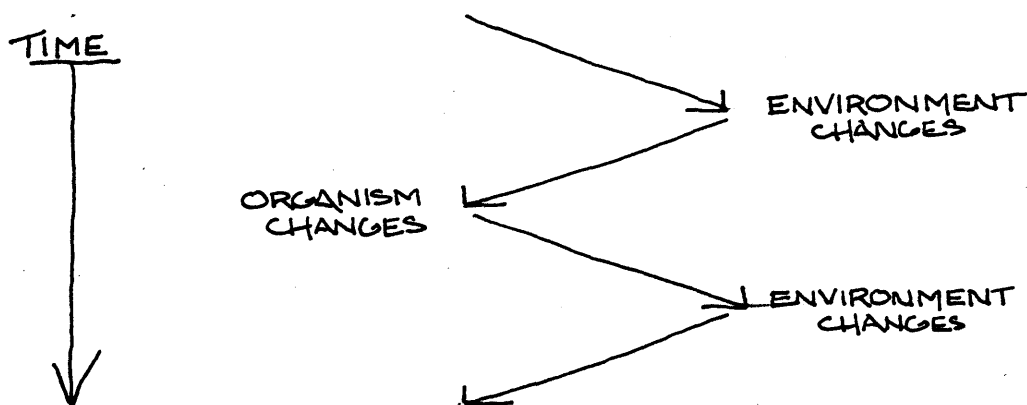
This seems to be a good start for we can reduce the elements of our diagram to their simplest form as a system consisting only of an organism and its environment.



This makes sense in our evolutionary vocabulary as general evolution is perhaps best characterized by the progression of higher organism in a constantly changing interaction with an environment. Most theories agree that, on Earth, living organisms evolved from complex molecular organizations. Life has developed through more complex levels of organization from single cell animals to man. Each and all of the organisms in this chain have grown and been maintained by a flow of energy through it which may be the only way to define life. Humans, like most animals, are maintained by an intake of foods and oxygen which are restructured molecularly to produce physical structure, work, heat, and waste materials. Clearly the existence of any organism results in changes in its environment by the nature of its existence as energies which constitute that environment change forms as they are used by that organism. There are certainly some overall balancing effects but there has never been and probably never will be an equilibrium between living organisms and their exploitation of their environments. The evolution of plant life, for instance, drastically altered the surface and atmosphere of this planet, creating an environment, as it were, for the emergence of more complex organisms.

In the course of general evolution I can see a continuous interaction

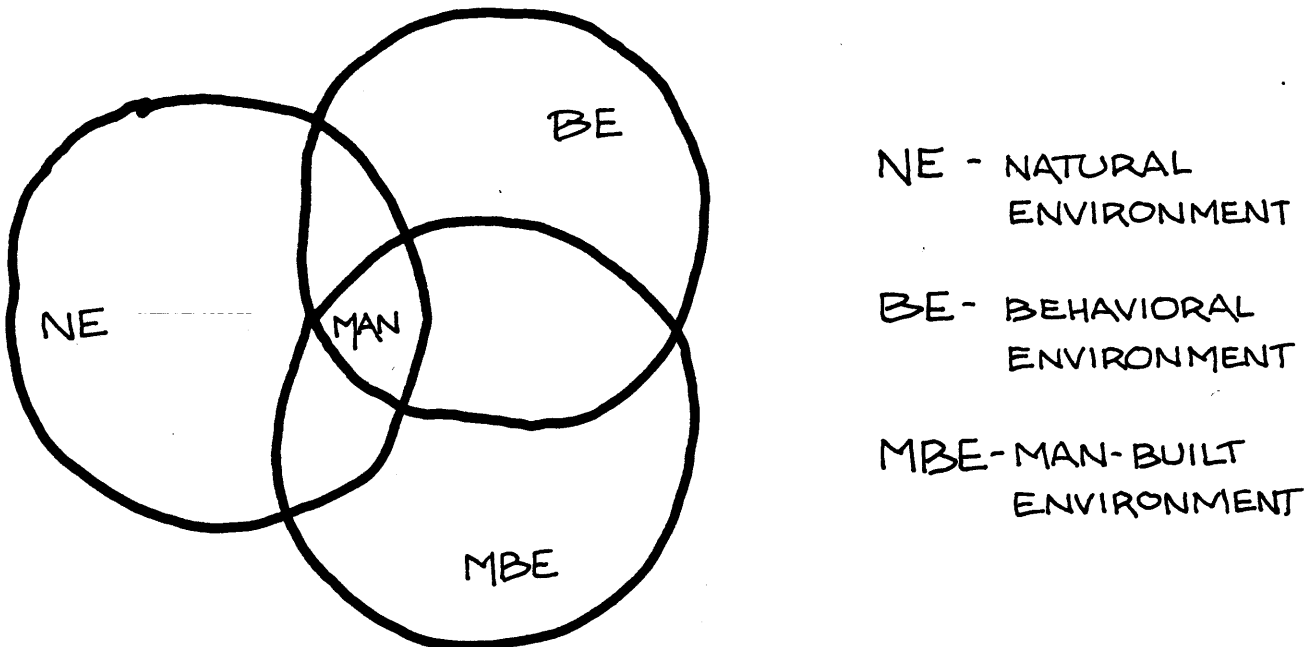
between organism and environment (not a specific organism - a level of organization, a species perhaps) which is characterized by constant change. In the specific organisms attempt to adapt to the changing environment, new, higher levels of organization occasionally emerge. A higher level being defined only by the organisms ability to survive in the 'new' environment. This may mean simply that the organism has more control over its environment than previous levels.



More advanced forms of life become a new part of the environment for old forms, and old forms naturally form a part of the environment of new forms. Without getting to farfetched we might say that every new level of organization automatically and necessarily creates the environment of a potential newer level.

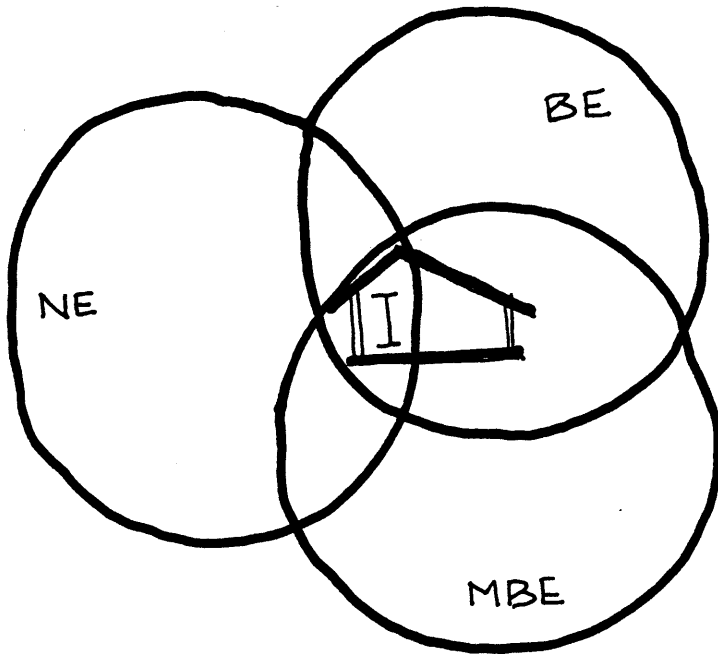
Here is the new wrinkle brought about by man. From the human perspective the environment can be divided into those parts which evolved before man and his cultures and those which evolved through man. A substantial part of the human environment is a human product, and needless to say this part is what makes man human. The individual only exists as part of a socio-cultural

organism which has come to be the most important part of his environment. This division of the environment is symbolized by the distinction between discovery and invention. Old forms, though previously unknown are discovered, while the synthesizing of new traits in the adaptive process is called invention. This division is only meaningful, though, from the individual human perspective. In an evolutionary perspective there is only a continuous change connecting all levels of organization through time. And at the level of highest general evolution the entire organism environment system evolves; not only the organism, but also the environment and the interface between the organism and environment.



Let's take our organism-environment model and make the human individual the organism. We can then divide his environment into natural and cultural. The cultural divides further into behavioral and man built environments. The cultural environment is that part of the new diagram which has the greatest

rate of change, and the individual, as well as everything else in the model, finds himself adapting in fact to an environment of his own collective creation.

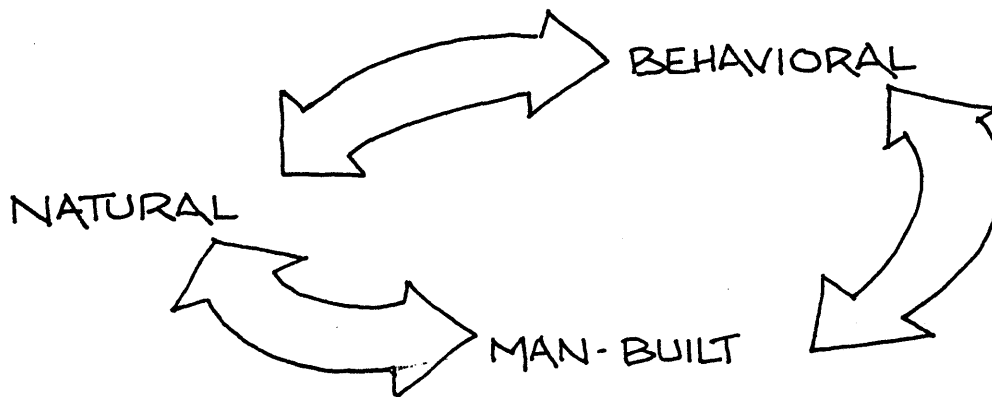


The house is an institution created for a complex set of purposes and is a particular portion of the individual's man built and behavioral environment. We can place it roughly in the diagram. Scanning our four houses we can surmise that over the span of some four or five hundred years there has been little or no change in the physical or psychological structures of the individual dwellers, but, at the same time the dweller of the cruck house is a very different person than the owner of the modern cape. What has changed is the cultural milieu into which these people are born. The leading factor of change seems to be the evolution of the cultural system.

Inherent in this evolution is conflict between rates of change, between

change and constancy and between the individual organism and the environment.

We can revise an earlier diagram by showing how change affects the individual-environment diagram.



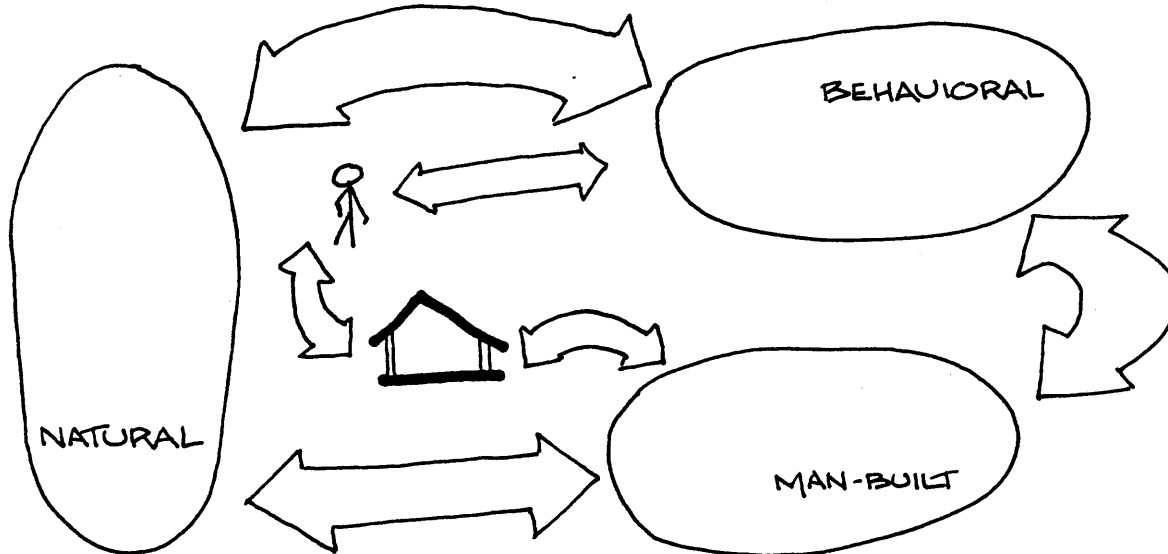
Change in any one of these environments may create change in the others.

A constant in our system is the need for the individual to maintain a certain range of body temperature in order to survive. One function of the house is to temper the climate of a small portion of the environment in order to control that environment to guarantee a safe body temperature despite harmful fluctuations in the natural environment. We can, in illustration, trace changes in the methods and mechanics of heating in our houses in response to changes in the other members of our system. The central fire in the cruck house provided for both cooking and warmth. Besides the dangers of an open flame and the inability to always provide warmth, we can suppose that there had always been a desire to eliminate the everpresent smoke which must have been at best a necessary annoyance. The set of house building technologies eventually acquired from wealthier stone houses the ability to economically

shape elements of the natural environment; stick and mud first, then stone, into a chimney to convey the smoke to the outside. This development required the ability of the peasant or farmer to pay for specialized labor and so produce excess. This created an obvious transformation in the form of the house (MBE) and in some of the habits of the dwellers as the new structural component of the house (illustrated in the Fairbanks house) began a separation of cooking from other family and house functions (BE). The use of wood for fuel in the time between the Fairbanks house and the Hemenway house altered the supply of that fuel in the Natural environment - an example of behavioral and built environments affecting change in the natural. Subsequent relative scarcity of wood as well as behavioral factors have made the fireplaces smaller and more efficient and have differentiated the heating and cooking functions of fire into separate spaces. The Main St. house went through the entire range of the subsequent changes in which even more efficient iron stoves eliminated the fireplaces altogether. These stoves, discoveries in the natural environment, and the advancement of complex transportation networks led to the replacement of wood for fuel by coal. Further efficiencies and the properties of coal (dusty, dirty) and its method of delivery, caused the heating functions to be centralized to a coal fired system in which hot water was piped through the house. In the Fenwick St. house the use of oil for heating replaces coal with electricity for hot water and cooking while the fireplace emerges again for aesthetic, emotional purposes. The related behavioral changes are enormous; from an almost constant tending of the fire in the cruck house to never having to see or deal directly with fuel or flame in the modern cape, with intermediate stages of participation in these mechanical functions. The affects on

house form are substantial as well as those on the natural environment.

In the interest of forming a systems diagram we will separate the elements of our diagram to emphasize more clearly the interactions between them.



The house is a combination of individual action and expression, and of behavioral and built constraints. We might generalize by saying that the diagram has evolved primarily from left to right and that degrees of constancy increase toward the left side and degrees of change toward the right. Energy originates from the left side and is increasingly stored on the left.

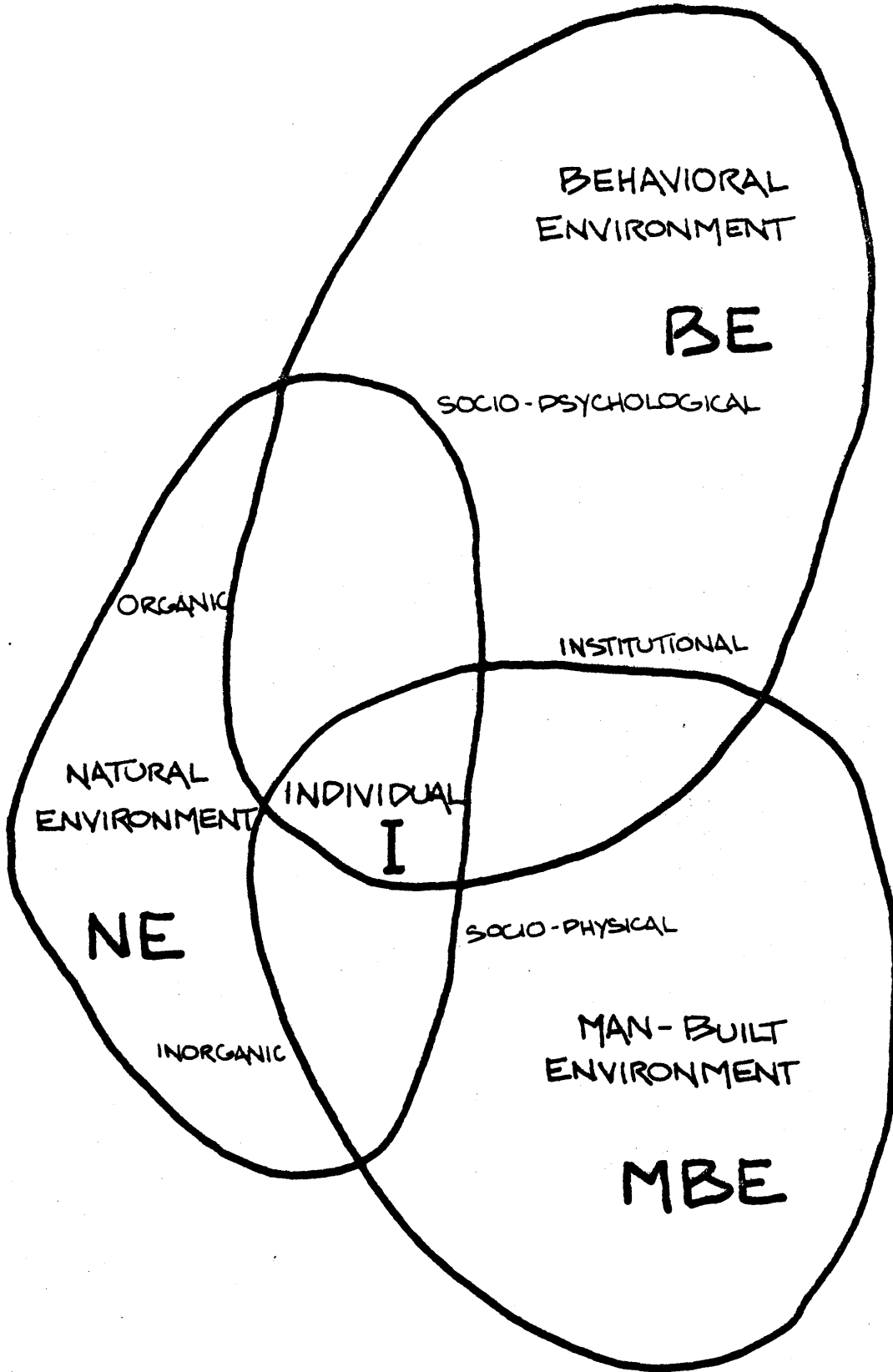
To help us understand the evolution of these house forms, we may take several tacts. We could place our houses into the diagram and observe differences in the elements and interactions. We could trace an individual's effect on his house and environment, or trace the evolution of the cultural features to see how other elements change. We will be using all of these in some form.

INTERACTIONS

Obviously, as in any model, our system is a conceptualization of a reality that requires divisions and categorizations of that reality. There must be boundaries or intersections between these divisions. The nature and condition of these boundaries are extremely important to the perspective the model gives of the world. Many things and events exist, for example, as part of both the cultural and natural environments and therefore have characteristics of both. Usually when this occurs, the thing or event in question will be a part of the transaction between those environments. Domesticated animals bridge the gap as a method of converting energy from the natural for cultural purposes. Human individuals often fit into this category also.

Although our intent is to focus on the transformations of the house in our individual-environment system, pressures and forces are exerted on the house from conditions and changes in conditions in other elements. These influences make it difficult to separate and isolate any one element. We will attempt now, before considering specific examples, to consider only the interactions- the manner in which they shape and are shaped by the nature of the house, individual and other elements of our model.

The general evolution of the organism-environment system is concurrent and inseparable from the evolution of the interactions within the system. These interactions have tended over time toward greater control by the organism over its environment. Greater control has usually meant a greater amount of interaction; increasing amounts of energy in any of its forms flowing between the organism and environment. This control modifies the environment in some manner. It modifies its resources and potentials and creates an environment suitable for



I

NATURE

CULTURE

UNCONSCIOUS

CONSCIOUS

NON-VERBAL BEHAVIOR

(BEHAVIORISM)

E

(NEURO-PHYSIOLOGY)

ACTUAL

EXPERIMENTAL

(BEHAVIOR CONTINGENT DESIGN)

LANGUAGE AND ARTIFACTS

E

BIOSOCIAL

CORTEX

CONCEPTUAL

(ECONOMICS)

SUB-CORTICAL

SOCIO-CULTURAL

(MEDIA COMMUNICATION)

EXPERIENTIAL

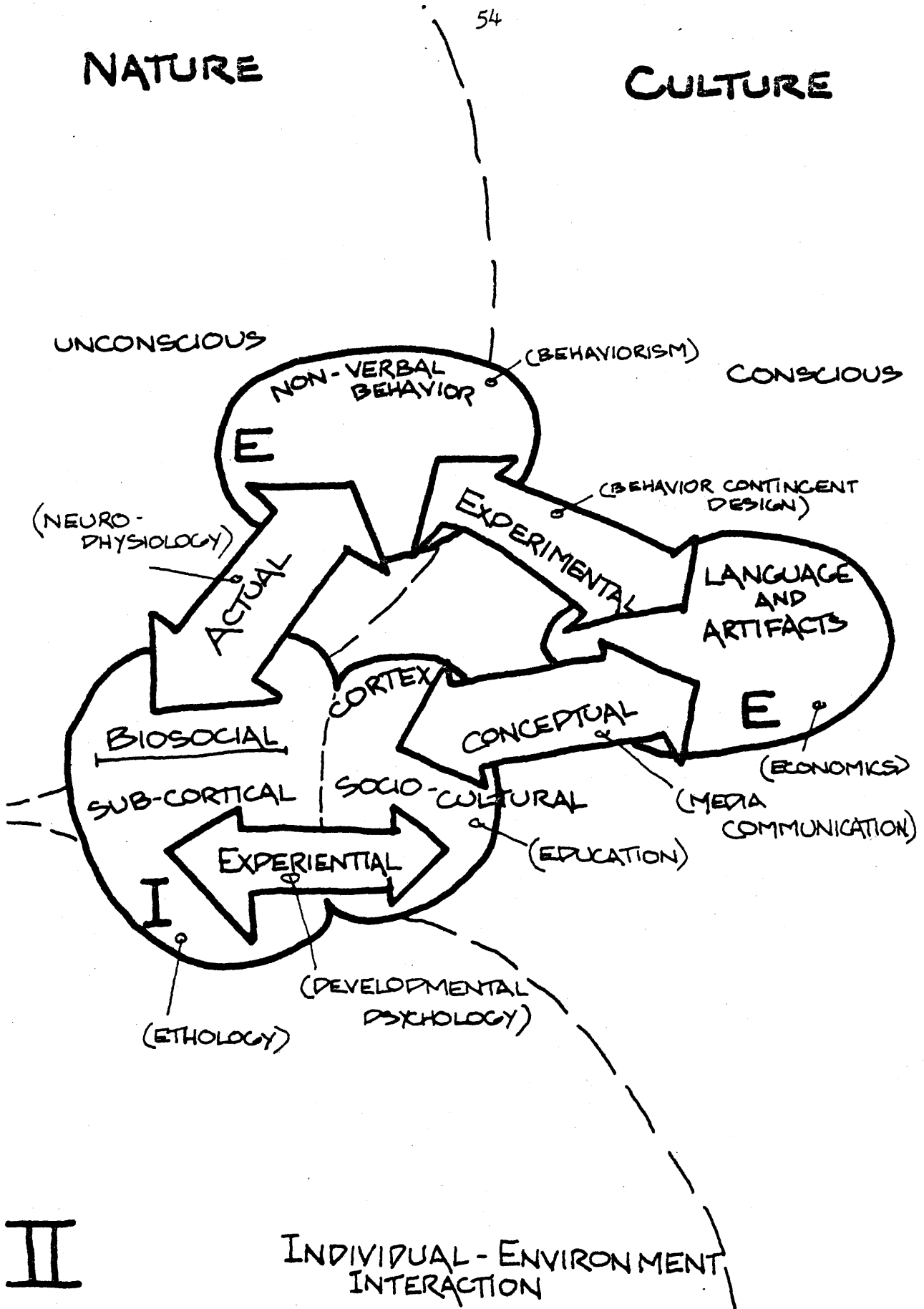
(EDUCATION)

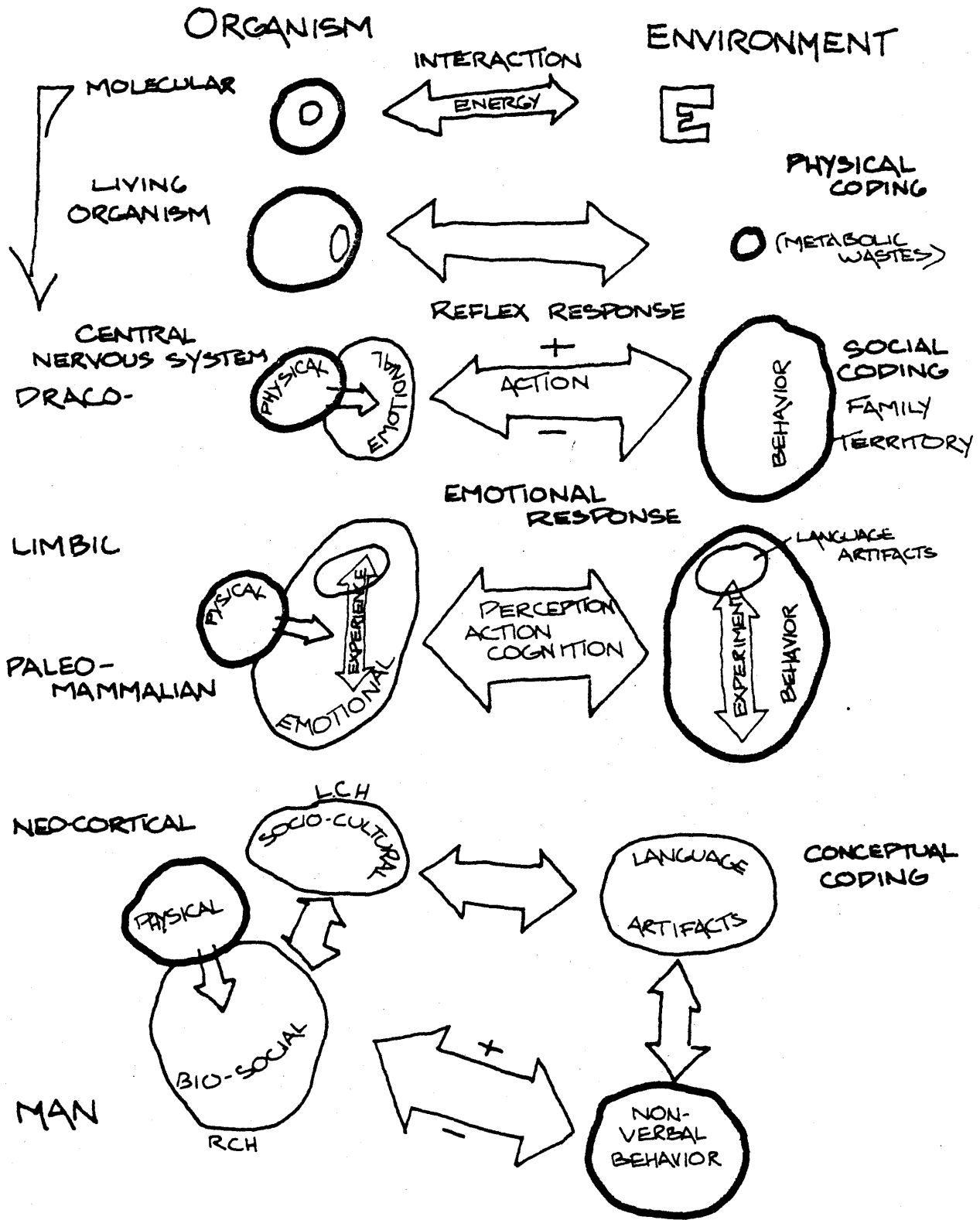
(ETHOLOGY)

(DEVELOPMENTAL PSYCHOLOGY)

II

INDIVIDUAL-ENVIRONMENT INTERACTION



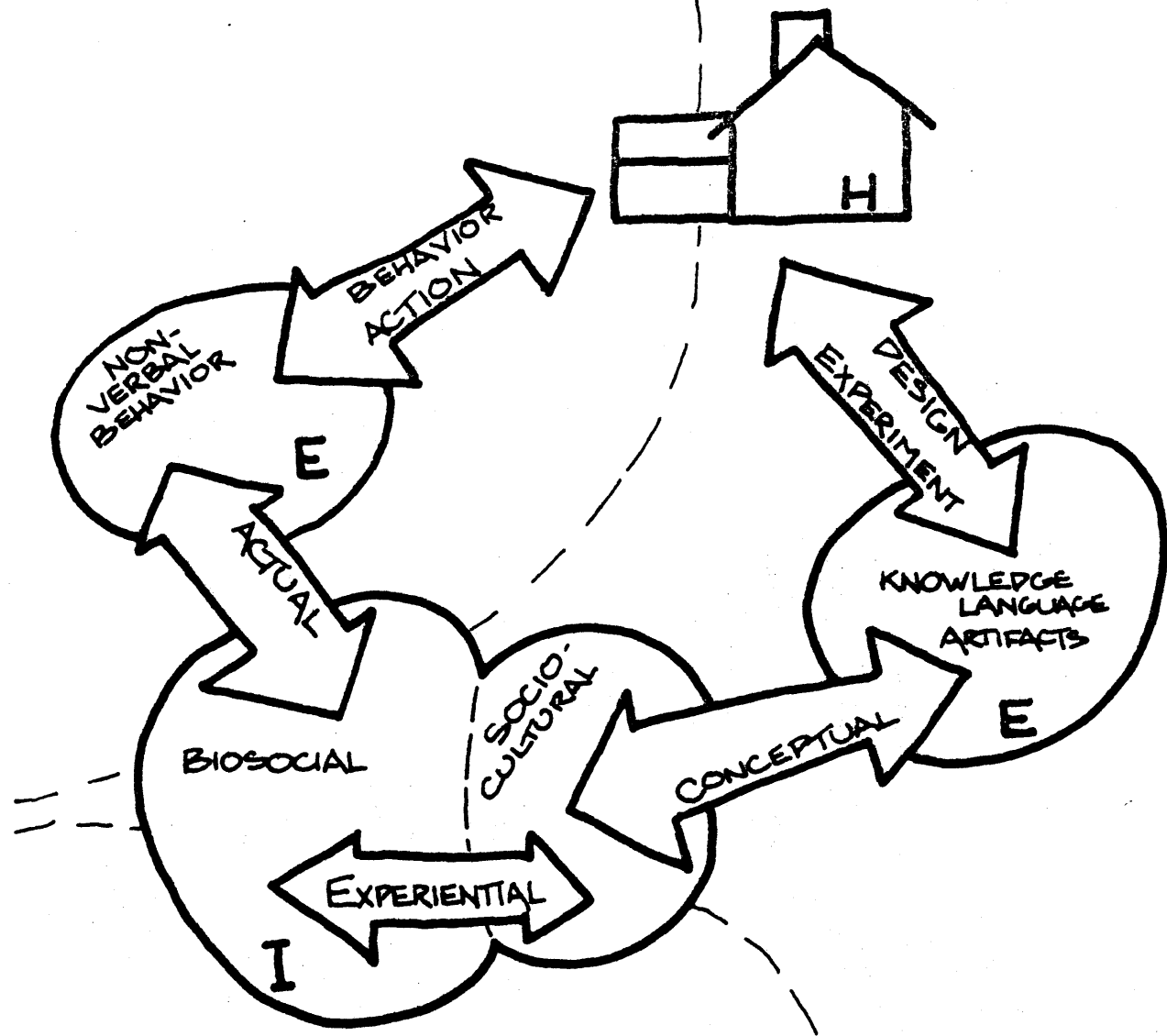


III

PROGRESSION OF ORGANISM-ENVIRONMENT INTERACTION

NATURE

CULTURE



IV

INDIVIDUAL-HOUSE
INTERACTION

new, more advanced, more controlling organisms who respond to these potentials.

Diagram III gives a simple idea of how these interactions have progressed in organic evolution and represents some major steps in the evolution of the organisms response and control over its environment from molecular organizations to human systems. New abilities 'continuously' emerge as better ways of controlling an environment. A response that has come to be called emotion may be the most easily understood. Investigators have concluded that the function of emotion is to enable an organism to respond selectively to its environment. It makes selections by evaluation, by judgements as to the agreeability, disagreeability, pleasantness, unpleasantness, of satisfaction or dissatisfaction with an environment or objects in it. Emotion allows animals to form social groups—families, packs, to develop status hierarchies and a greater range of memory storage and recall. In this way the organism, now group of organisms, has a better ability to structure or control their environment. Our response to our environments are primarily emotional and spontaneous. Each of us, however, by nature of our evolution have the whole range of modes by which we react, respond to and interact with our environments. These correspond to some degree to the levels of response and control exhibited by the range of organisms through which we developed.

If we are to look now at the present condition of interaction, diagram I¹² breaks down the external environment into the three main categories named previously; all of which contribute to the functioning of the individual human. While, as architects, we are concerned for the most part with the man-built environment and its structure, we cannot ignore its intimate connections with the rest of the environment. Some of the contents of these environments are:

1. Natural Environment

- A. Cosmic forces- climate, inorganic resources, minerals, metals, geographical features, soils, natural mechanical processes; combustion, radiation, gravity, natural laws.
- B. Living organisms- microorganisms, parasites, insects, plants, animals, organic energies; reproduction, growth, decomposition, assimilation, excretion, etc.

2. Man-Built Environment

- A. Buildings, houses, inventions transportation systems, communication systems, equipment, tools, all man-made artifacts, heating and cooling, mechanical systems, etc.
- B. Plants and animals used or cultivated as the basis for food, clothing and shelter.

3. Behavioral Environment

- A. Socio-psychological- values, attitudes, expectations, customs. traditions, information, decision-making.
- B. Institutions- economic, political, educational, ethical, aesthetic, collective laws, rules, knowledge, collective values, expectations etc.

Diagram I ,however, is a man centered diagram. If we place it into an evolutionary perspective we might arrive at something similar to diagram II¹³. The environmental sets of I have been separated and then connected by their modes of interaction. The cultural environment grows out of the natural through the individual. The elements comprising the environment are labeled as are the areas of the model which correspond to particular fields of study.

Diagram IV places the house into the model of the individual-environment system of II. The house fits well into the system. It shapes and is shaped by human behavior and is at the same time a cultural artifact. It is both a man-made structure and a pattern of behaviors. The forms, functions and images of house are imbedded in the cultural milieu. They may be modified by individual or collective behavior and behavior may be shaped by them. New forms arise by the variations of existing images which can then affect the total cultural collection of images (MBE). Innovations enter the cultural element through experimentation.

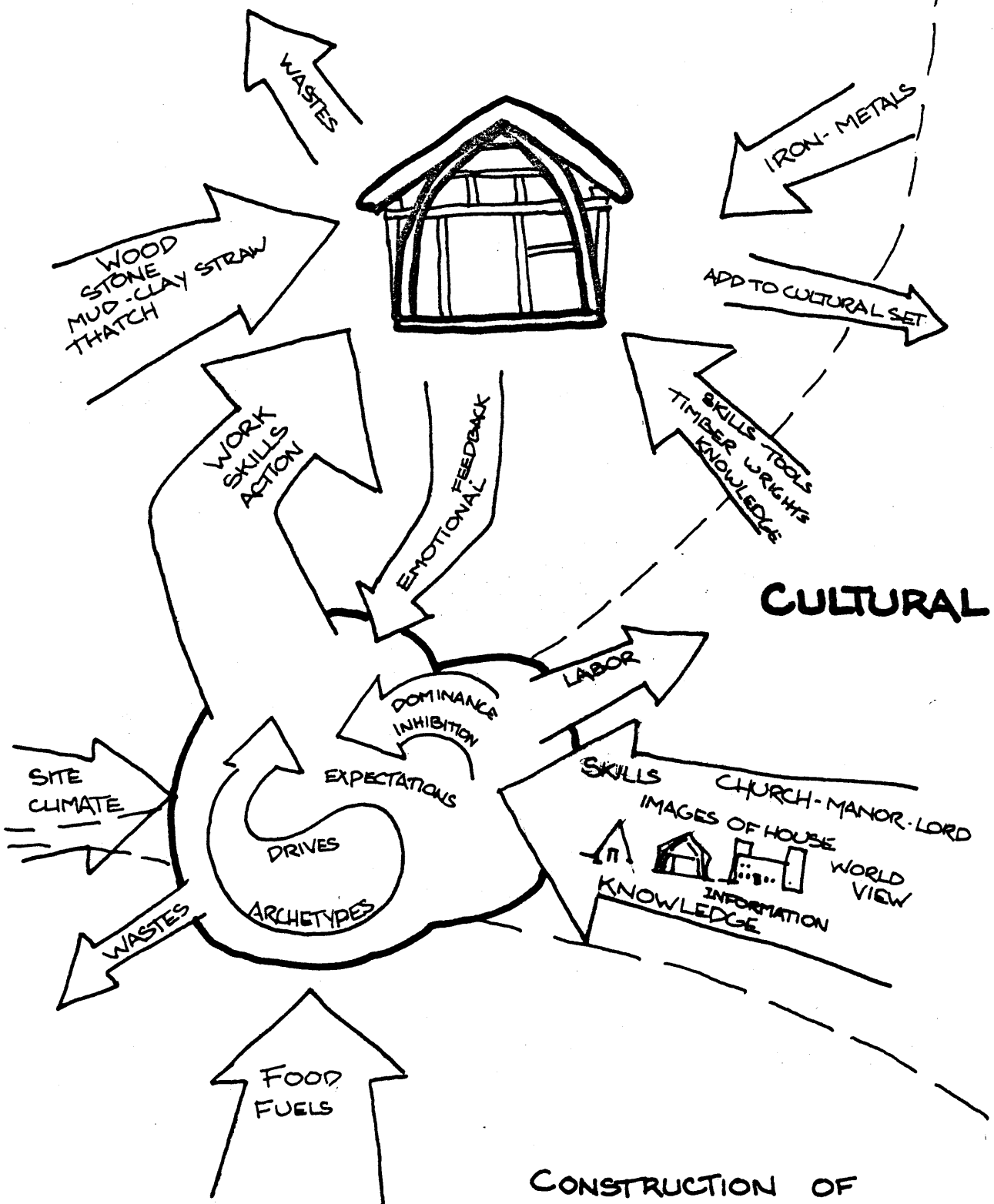
The different forms taken by dwellings are a complex phenomenon. Both the individual and house are formed by complex interactions with the environment. These interactions are inputs or outputs that can be characterized as one or a combination of the following:

1. Energy
2. Materials
3. Information

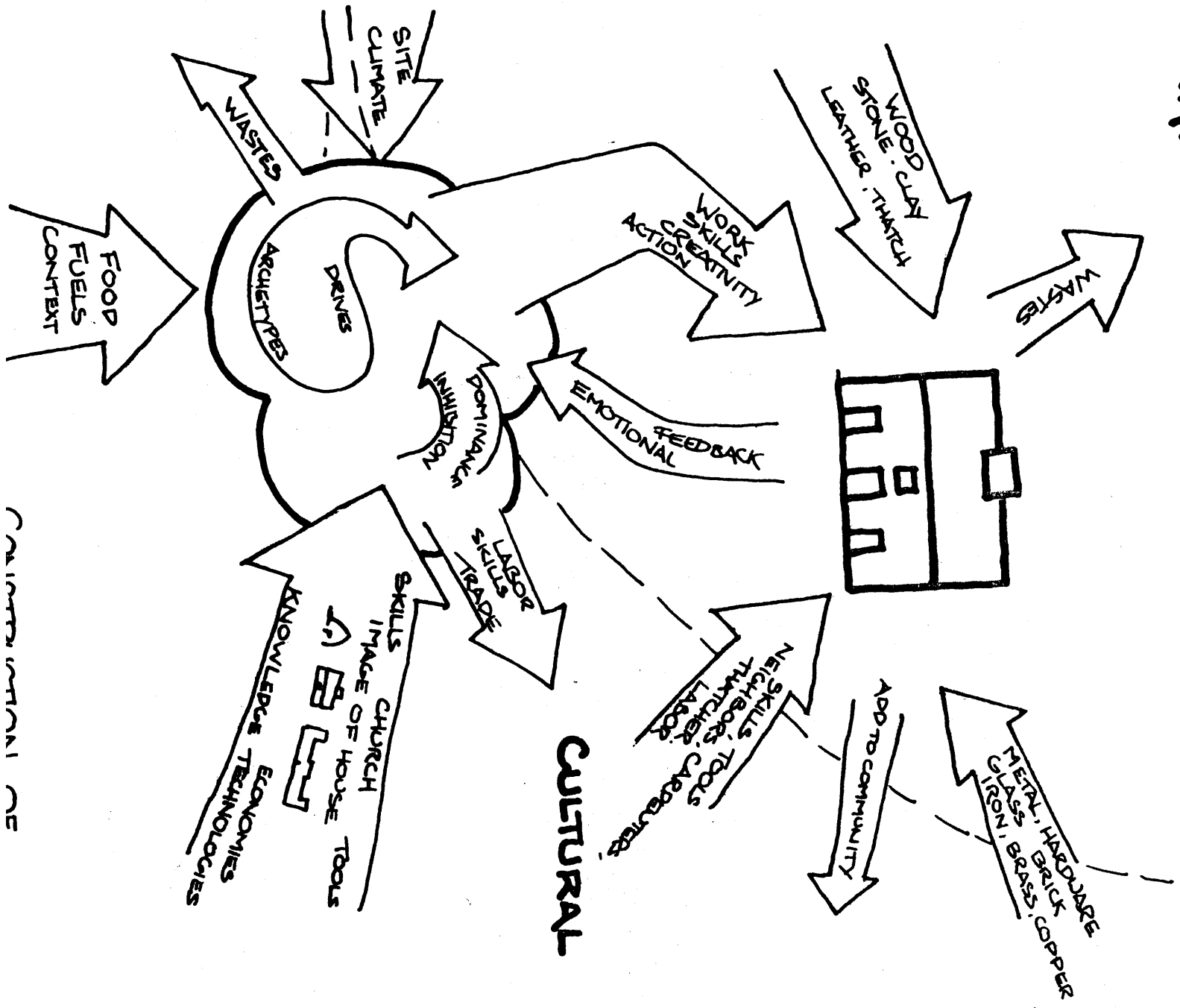
The flow, transformation and transmittance of these should be adequate to describe any interaction. If a person is too cold and wishes to make his house warmer (a mild conflict with the environment), he transmits this information to the heating system by restructuring it (turning up a thermostat). The oil burned in the system is a natural material, an input to the house, where the energy captured in the molecules of the oil is transformed to heat by a restructuring of those molecules. The heat is an energy input to the house and man. Waste gases and heat are inputs to the natural environment.

At any given time the system has a certain structure, which may or may not be identifiable. In any case the formation and maintenance of the house is initiated within the system , while the structure of the system organizes,

NATURAL

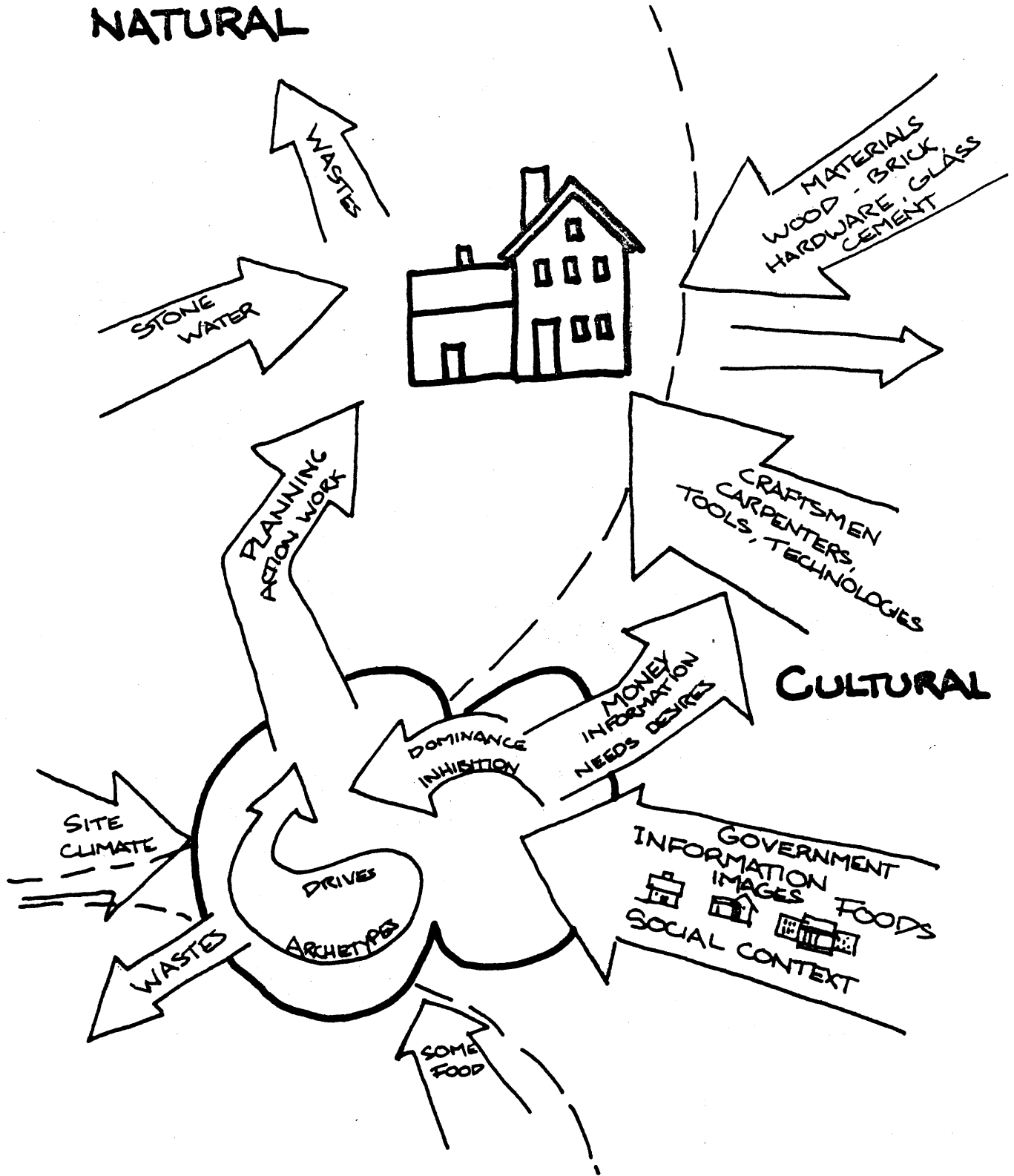


CONSTRUCTION OF CRUCK HOUSE



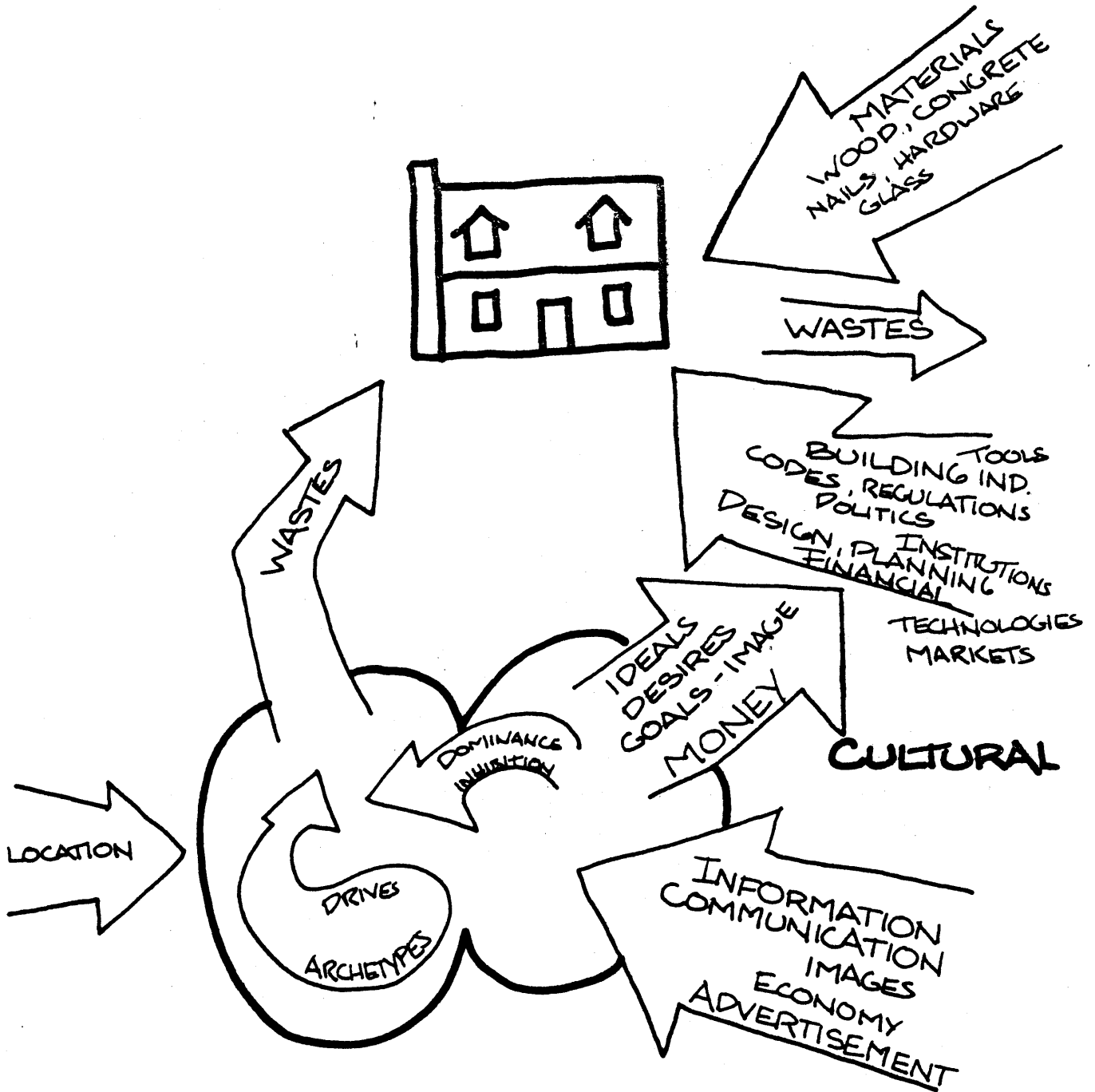
CALIFORNIA NATIONAL NE

NATURAL



CONSTRUCTION OF
HEMENWAY HOUSE

NATURAL



CONSTRUCTION AND
SELECTION OF FENWICK ST. HOUSE

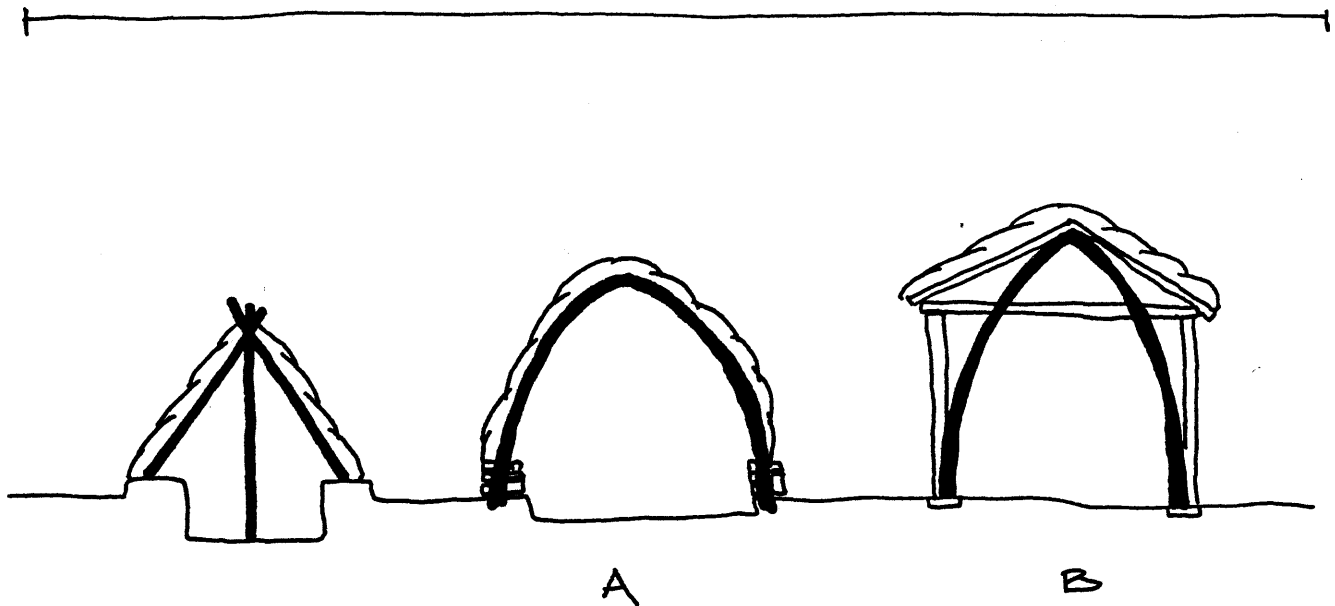
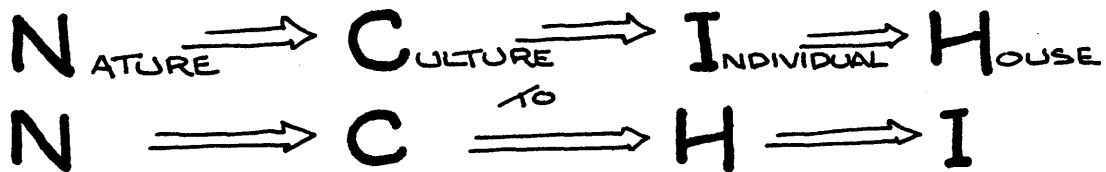
directs and controls the flow of energy, materials and information. This structure determines the paths, qualities, quantities of transactions which direct the realization and metabolism of the house, Inertia for these processes may come from the individual, from collective behaviors, or institutions in the cultural environment.

Diagrams V-VIII approximate the direction, content and quantity of the interactions which contribute to the construction of our houses. We see that energy may flow through any number of routes to effect the construction of a dwelling. The nature and paths of this flow have tremendous implications for the individual and his ability to interact with and control his environment, and to give meaning to that environment- particularly his house. At the extremes are the entirely clockwise and counterclockwise flows; the individual forming and determining his environment and the environment determining the individual respectively. In clockwise flow the organism is nurtured, developed, educated by the cultural element. Internalized patterns result in actions and behaviors which create a dwelling for that individual. The dwelling then becomes part of the cultural milieu. In counterclockwise flow the man-built environment includes dwellings which affect and control the behaviors of the individuals who are so structured to contribute to the cultural whole.

These extremes aren't very realistic for in reality there are numerous feedback loops between the elements and accompanying any transaction, so that the flows are moving simultaneously in both directions. But there are moral implications to the tendency of a system to lean toward one or another of these extremes.

That which we have called the cultural environment has assumed increasing responsibility, in our series of houses, for the construction and maintenance

of the house at the relief or expense of the dweller. Along with input during construction, constant input and interaction is required just to counter the conservative influences, inputs and forces of nature. If we compare the flow of energy, material and information comprising these various inputs we discover that between the earliest and latest examples the overall flow has shifted from:



DEVELOPMENT OF CRUCK FRAME

" These pairs of poles, one at each end of the hut gradually assumed more importance and became part of a definite design- so that instead of straight struts, naturally bent timbers were used, each pair formed from the split halves of the same tree trunk.... As cruck construction developed and buildings increased in size the division between the wall and the roof became more definitely marked by the angle of the curves of the crucks."

POTENTIAL

The idea of potential is an important, though fairly illusive concept in the relationship of an organism with its environment. As the environment changes- evolves- it encourages and nurtures certain variations in characters, subsystems, structures, abilities, or behaviors in the organism. The function of these variations in helping the organism adapt to its environment can be said to be its potential. We can see the imminent difficulties in the use of the word. It may mean practically nothing except in a retrospective viewpoint. We could say that a feature or variation has potential, but that prediction would depend on certain changes or modifications in the environment. Anything may have potential. It is dependent upon its environment to establish the proper conditions for that potential to be realized.

In the evolution of a species, man, a culture or a house form, variations in function or form(no matter how small and apparently inconsequential) have the potential for increasing the entities adaptation to or use of its environment.

With man's use of tools, those tools became a part of his environment. These relative newcomers to the environment encouraged bipedal motion in the individual and eventually upright posture. Looking back we could say that in quadruped locomotion there is a potential for two legged creatures. Potential, however, usually resembles the old relationship between the chicken and the egg- it is perspective dependent. One could also say that bipedal motion created the potential for the use of tools.

Similarly, in house construction, the simple cruck system of building preceded our example of the cruck house. The step to a wall and roof system

outside the main structural system is a potential or variation brought about by the conception of a vertical rising from the ground sill to intersect with a horizontal extension of the lateral tie beam. There are other environment conditions which must be present to encourage this advance.

Any ability, function, or structure has potential. That potential must be fed by the environment. While potentials exist everywhere, I think it would be correct to say that the most powerful potentials exist in new sources of energy- in new ways to exploit energy from the natural environment. Potential is a dynamic condition or state that exists mutually between an element, a system, organism, and its environment. Modifications have to be made or variations must arise in order to take advantage of those potentials. In this way 'new' things emerge or are differentiated from old.

CONFLICT

The apparent paradox is- there must be conflict between an element and its environment in order for that element to advance. Conflict is necessary to give a feature of that element greater adaptive potential in order to resolve that conflict.

In man, this conflict would have been between motion and the carrying or use of tools at the same time. In the house, the conflict had been between the methods of obtaining structural stability and the restrictions on headroom and useable space in the house. With respect to the evolution of culture, " a highly balanced culture lacks that friction between individual and environment-

that flexibility and freedom in unceasing attempts to readjust which is the very life and essence of higher, advanced cultures.¹⁴ "

Conflict is an unavoidable consequence of evolution, because it is a necessary part of change. Conflict between old and new is continuously causing tensions. Life is full of vital tensions- tensions rooted in our histories and the process of evolution- tensions between old forms adapting , or trying to adapt, and their changing environments. Old forms often succeed in adapting , but often not and then they pass away into extinction. But if they do succeed, the vestiges of the struggle are often left behind. Humans have certain physical problems; sinusitis, lower back stress and pain, and hernia, which result from our development from simians. Our upright posture and use of hands created for us a new environment, but also created tension with the older characteristics of physical structure. Tension and conflict are a necessary part of existence.

In the event of conflict with the environment, the human individual's response is made in terms of his ability to act on that conflict; to control himself or his environment. What becomes important are not so much the properties of the environment or the inner state of the individual but the paths of interaction by which the individual can assimilate or accomodate, adapt actively or passively, consciously or unconsciously to his environment, There is no problem as long as the individual has the skill and knowledge and potential to alter himself or his world - to adapt to change and reduce conflict. Survival has often meant the power and control to act on conflict and to overcome that conflict.

In its broadest sense, the house is a control over an environment. It structures a segment of that environment and controls the flow and interaction of energy, material, and information within that segment.

Each individual seems to have a hierarchy of conflicts which correspond closely to his set of needs. As the most critical are resolved and brought under control, others become the critical conflict.

CONTROL

People carry around with them complicated sets of assumptions and expectations, so that the transactions between an individual and his environment involves an incessant matching process between that set and actual configurations in the environment.

When the properties of the environment do not meet the expectations, do not match the internal structures of the individual, he has several choices. If he finds the discrepancies to be important enough to affect normal behavior he can alter the environment until it conforms to those expectations or alter the internalized expectations. Assimilation is referred to as the process by which the individual changes the environment so that it can be taken in. Accomodation is the process by which the internal activities are changed to accomodate the realities of the environment. Emotion is the mechanism which interrupts ongoing behavior when the expectations of the individual do not conform to realities of the environment.

Assimilation and accomodation demand some control over the environment or internal activities. People control by their outputs. Each of us wants to favorably affect the flow of energy, materials and information to reduce conflicts perceived conflicts, and to avoid possible conflicts. This may be as simple as working to earn money to pay for food to avoid starvation.

Energy, and materials come ultimately from the natural side of our diagram and are generally shaped and controlled for our purposes by the cultural configurations. The house (as well as individual and other cultural artifacts) is shaped by constraints or controls in the flow of energy, material, or information available for its construction and maintenance. Whether something is a constraint or a control depends on the perspective involved. An organism controls by its outputs and is constrained by the available inputs. The individual controls his environment by adding to it; by his behavior and by applying symbols to the things and events in it. These are his most important outputs. He controls things by giving them names.

Dogs and other animals control their environments by making sounds, by visual cues and information and by leaving odors and body wastes at the boundaries of their territories. It is not surprising that, as dogs structure their environments mainly by odors and sounds, smell and hearing are more sensitive.

In our houses we can discern an evolution of subsystems with controlling features over the form of the house. These features are generally the most critical- that is to say, because they are the only way or one of only a few ways of performing their function, fulfilling a purpose, or satisfying a need that is critical to the family. The primary purpose of the cruck house is to shelter food, the fire, and the dwellers from the natural environment. The controlling elements are the cruck blades as they are the only reliable way known to build a stable a permanent structure. The cruck is constrained by the available tools, skills and technologies in the culture. As a matter of fact, the cruck tradition died with great difficulty because many people refused to believe a wood frame house would stand without the solid 'A' frame. It took years of observing post

and truss dwellings in some locations before folks were convinced otherwise.

In the Fairbanks house the structural wood framing is less critical. It may be varied in several ways using the same basic pieces. The controlling element is the chimney and fireplaces; its use for heating and cooking as well as its structural capacity. It controls the arrangement of space and use of space inside the house. Framing members are aligned with it. The fireplace controls the size of the house. No area can be more than a certain distance from it and be adequately heated. Similarly, the fireplace helps to determine how additions may be built, because large additions will need to have their own chimneys.

In the Hemenway House the need for a larger house and the separation and specialization of social space, work and domestic production may be said to be the critical feature. The chimneys still exert some control but that control is diminished as they can be made smaller and more numerous. Their control is then modified by these other factors.

With the cape we begin to run into complexities. Neither structural or mechanical system are particularly critical. The stud construction is able to follow more elaborate contours of plan. The central heating can be placed almost anywhere and heat piped by various routes through the house. A controlling force may be economics; using industrial, repetitive peices in accomodating the complex needs of the modern family in a relatively small space, on a small lot and surrounded by similar houses. Or the controlling factor may be an expression of social status and standard of living, or of traditional images of ideal house applied to a contemporary culture.

Clearly though with the evolution of our individual-environment system (with the evolution of culture) constraints have shifted over house form from nature to culture- The cruck house is constrained by climate, technology, materials, traditions and a lack of economic surplus. Constraints on the cape are

density, population, economics, institutionalization of controls, codes, regulations, zoning requirements, requirements of banks, mortgage authorities, insurance, planning bodies and in the case of this particular house, political forces, veteran financing etc.

Likewise, the house moves from controlling natural stimuli and phenomenon (rain, snow and weather) to controlling cultural stimuli (privacy from intrusion, noise, etc.).

As we have noted earlier, the control of the flow of energy, materials and information in the construction and maintenance of our houses moves from the individual and family to the cultural system. A great deal of this difference has to do with the differentiation of the labor force. The cruck is built by the dweller, social cooperation and timberwrights, the Fairbanks house by social cooperation and a few tradesmen, the Memenway house by a number of specialized tradesmen and the cape by a contractor/developer controlling the numerous activities of many workmen working on many houses at the same time.

Primitive builders accept and respect the qualities of their materials because they are one of the major constraints in which they must work. They treat the influence of time and weather as allies rather than enemies. This understanding is due to direct emotional feedback to the dweller or builder in the construction and maintenance process. "Primitive builders are able to conserve their materials because they have detailed and precise knowledge of the behavior and characteristics of materials not just in terms of climatic response and construction but also in regard to weathering; how the materials and building fabric will stand up to the ravages of time and weather. This understanding tends to lead to clear and straightforward solutions to the problems caused by gravity and weathering.¹⁵"

The absorption and evaporation of moisture by thatch in the cruck house for example, avoids condensation problems in the house, But sensitivity to materials does not necessarily mean greater control. Thatch very easily catches fire and was eventually outlawed in many places as less flammable materials became available.

The house is primarily a means of structuring the environment to control the stimuli to reach the individual. The house keeps out wind, rain, cold, noise, other people, and keeps in heat, light, noise, and possessions. The inhabitants of the Fairbanks house had absolute control over the machinery and operation of the house, but didn't have modern man's ability to control the environment. The house is cold in winter, hot in summer, dark and smokey. The individual trades direct control over the house for better control over stimuli. The 1947 cape demonstrates the highest degree of freedom from the natural environment, but the systems and machines which grant this freedom are not controlled ultimately by the inhabitants. Increased control over the natural environment comes from the increase in available cultural materials and information. From variations in these the most satisfactory (in terms of economy and performance) can be used, Throughout our houses we see that the house is being formed initially from materials within a short distance of the site and that area increasing steadily. In the cape, including the machines that perform major functions in the house, the materials come from all over the world. It is impossible to separate the house from the transportation, information/systems of the cultural environment. The same can be said of energy input and information. We move from wood burning and verbal traditions to oil, electricity and the modulation of electromagnetic waves.

The cruck house, the Fairbanks house and, to an extent, the Hemenway house are constructed by the dweller. The house accomodates changes in family or en-

vironment which give rise to conflict with it by the dwellers ability to expand or alter it to accomodate these changes. Our illustration of the Fairbanks and Hemenway show the kinds of expansions and alterations that have occured over time. The cruck house can grow easily by adding bays in either direction and it was common for sheds for animals to be attached to the sides of the house. In contemporary examples the house is generally selected, based on present or perceived future needs. The house is built with appearance, economy, and convenience with little understanding on the part of the dwellers of materials or tactual communication. The tendency, then, is to move when the family gets too large or if the family can no longer afford the financial arrangements that go along with the house. These tendencies are related to the lot sizes, the controls and constraints governing the housing process and the mobility of the American family.

Through all of this we can see that the cultural environment does a better job of controlling the house environment. Until central heating with coal or oil it was often difficult to keep the house warm. It is not uncommon to read accounts of the early colonial period of water and ink freezing inside the house. Similarly, a constant and reliable supply of food requires a complex cultural system of storage, transportation and preservation. So that while this was one of the main functions of the individual family and house in the cruck, Fairbanks and Hemenway houses it serves only as a small determinant of the function of the Fenwick St. house.

PRODUCTION

To reiterate for a moment; culture takes energy from nature, processes that energy, and converts it into a cultural state. Evolution is characterized by the increase of the production of energy in this manner. As the total energy transformed from the natural to the cultural state increases, differentiation of functions (due ultimately to the limited capabilities of people) is necessary to deal efficiently with this energy. With increases in energy transformation there are many more subsystems, more specialization of parts, more effective means of integration and communication between parts, The individual and house must adapt and adjust to these changes in their environments.

The cruck and Fairbanks houses, like most of the houses of their time, were centers for the production in the economy of their cultures. As such, the most complex machinery may have been in the house; machinery necessary to produce, store, and preserve food, to make clothing, house-hold materials and other supplies. There was some specialization of crops and skills, but they remained a part of the activities of the house. For this reason the house was occupied nearly continuously, and its operation demanded continuous monitoring. As one of the nuclei for domestic and community production the house and family could withstand periods of isolation and self sufficiency. An essential part of any production is storage. All parts of the house and outbuildings were used for this purpose; cellars, smokehouses for curing, halls and upstairs for hanging and drying. There is an important relationship between dweller and house when production and house are synonymous. Production is at a scale that may be controlled by the individual. The house and its maintenance are inseparable from the production process so the individual has control over them as well.

As the transformation of energy from nature to culture increases, the exploitation of free energy in nature moves away from the house to centralized and specialized locations.

The Fenwick St. cape has nothing to do with production. In fact it is, by zoning law, separated from sites of production. It has instead become a center for consumption. The dwellers spend less time in their houses as they must leave to be 'productive' and the house needs to be maintained free from the action and attention of its dwellers. It is therefore connected to a series of cultural systems; plumbing, sewerage, electricity, fuel supply, electro-magnetic waves - all of which keep it running. There is a very different relationship between house and dweller. It is a much more static relationship. The paths of interaction, which act freely when associated with production as in the previous houses, no longer operate. Interaction between house and dweller tends to be consumptive rather than productive.

DIFFERENTIATION

Differentiation is an important method by which adaptive change can be observed to occur in specific evolution. Peasant and primitive societies (represented by the cruck house) demonstrate, in retrospect, a typical lack of differentiation in thought, in the use of space, in labor and in most other areas of life. Mental life reveals a limited differentiation of subject and object, perception and pure feeling, of idea and action. Concrete thinking and conceptual activity operate in unity with motor, perception and imaginative processes.

There was at first little separation among man's life work and religion, a lack of sharp boundaries even between man and nature. Mythical thinking and the origin of language marked the beginning of the differentiation between subject-object, reality and symbol. Only when symbolism arises does experience become an organized universe, past and future exist and by their symbolic images become manageable. Mythical thought eventually gave in to the symbol being entirely separated from the object and only standing in for it. " In the Middle Ages both sides of the human consciousness, that which turned within and that which turned without, lay as though dreaming or half awake beneath a common veil. The veil was woven of faith, illusion, and childish prepossession, through which the world and history were seen clad in strange hues. Man was conscious of himself only as a member of a race, people, party, family or corporation- only through general categories. It is in Italy that the veil dissolved first; there arose an objective treatment, and consideration of the State and all things of this world, and at the same time the subjective side asserted itself with corresponding emphasis. Man became a spiritual individual and recognized himself as such.¹⁶"

Clearly the change in production away from the house and in the technology which caused or accompanied it, or put another way, the change of the house with respect to production is reflected in the view man has of his position and of himself in the world. " Our different view of time, involving a strong sense of its linearity, progress, historicity, replaces the more cyclic time concepts of primitive man. As a result, modern man, particularly in the United States, stresses change and novelty as being of essence. The clear hierarchy of primitive and vernacular settlements is lost, reflecting the general loss of clear hierarchies within society and all buildings tend to have equal importance. The desanctification of nature has led to the dehumanizing of a relationship with the land

and site. Modern man has lost the mythological and cosmological orientation which was so important to primitive man or has substituted new mythologies in place of the old. He has also lost the shared image of the good life and its values, unless he can be said to have the shared image of no image. Forces and pressures are also much more complex, and those links among form, culture and behavior are more tenuous or possibly just more difficult to trace and establish¹⁷!"

I don't have to say much about today's level of specialization and differentiation in the life of the individual. Complex social differentiation demands that each of us assume various social roles every day. The ability to do so is an adaptation we've all made to the complexities of the cultural environment.

The cruck house is indicative of the individual's participation in a larger social group- family, tribe, community, and of the shared value system and image of the world. The house is a traditional model shared and used by everyone in this group and adjusted to the satisfaction of particular needs and desires. There is little specialization within the group , only a diffuse knowledge of everything by all so that in fact the people in the group~~are~~ perhaps very similar and see themselves as such. In primitive culture , the notion of self as individual, separate from the social group is barely perceptible.

Through the progression of cultural transformations, the self as individual is further separated from the natural environment and the direct exploitation of energy from it. The house is still a cultural artifact, more so in fact, as it is generally realized without the direct interaction of the dweller. He comes along later and uses the cultural form on which to express his individuality as best he can. The Fenwick St. cape expresses the dweller's ambiguous search for uniqueness. Although the house is nearly identical in structure to those around it, originality is stressed; neighboring houses are never painted the same color. The dweller, we may say, sees himself as part of a larger group, but that group is

any network of friends, relatives, fellow workers, from a club, place of employment, church etc. and only rarely has anything to do directly with the setting or neighborhood of the house.

The process of differentiation of individual functions in the culture is clearly paralleled in our chain of houses. The cruck house is primarily one room, with adjacent storage or possibly sleeping space- with man and domesticated animals frequently sharing that room. There is only slight separation of work/living space with a storage/sleeping space. This is evidence for and consistent with a view of life and level of cultural complexity. In the Fairbanks house space is further divided into living/working, social parlor and sleeping. Further additions may separate particular production and storage activities from domestic and kitchen production. The Hemenway house demonstrates further specialization of 'cultural' work, domestic work, dining/living, social parlor, and private/sleeping. This arrangement has stabilized somewhat in the cape, although some of the activities have been taken out of the house, as we have seen.

The differentiation and specialization of space in the house is connected to differentiation in the cultural environment "outside" the house. The cape has particular activities, machinery and furnishings for each space; a phenomenon that may follow from its consumptive functions. The cruck, in comparison, has one large area in which most of the productive activities of the family take place.

The names of rooms and areas reflect these changes. Chamber, hall, parlor depict particular places, but no particular function as does diningroom, bedroom, bathroom, etc.

We can picture these changes as a result of adaptation to the natural and cultural environments. Changes in the house act to stabilize the family in the face of change and do much to reduce stress, for instance, from increased populations. " The erection of private rooms (Fairbanks to Hemenway) within the

family territory of the home permits an elaboration of personality which can free man from the constraints of the animal collective.¹⁷" The elaboration of conceptual space is necessary in order to live with large populations and leads to an increasing diversity of roles and a corresponding diversity of value systems. "There is reason to believe we are reaching a point at which the variety of value systems exceed the capacity of the human cortex to handle it, without periodic retreat into familiar group space.¹⁸"

CONTINUITY

I have been trying to construct images of the individual and house that are not self contained entities but are dynamic processes rooted deeply in evolutionary pasts and are in continuous adaptive interactions to changes in the physical/natural and cultural/conceptual environments. At all times the individual and house are torn between principles of stability and adaptation which ensure respectively, continuity and advance. I believe we can observe that people are almost consistently conservative, changing only enough to remain as much the same as possible in adapting to the environment.

Throughout the preceding sections there has been an undercurrent of dichotomy between adaptation and constancy. The difficulty in expressing an evolutionary perspective is that change, in fact, is constant and for something to remain the same it must continuously change. Adaptation is toward stability. The family and home territory can be considered constants, so it follows that they

must adapt to evolutionary change. We will see that the structure of the house has changed consistently to maintain itself as a viable constant. As it has adjusted to its environment some of its features have remained remarkably the same. The low criticality of 1940's house construction has assisted in a persistency of traditional house image. The image of an appropriate and 'ideal' house is still the rectangular, free-standing plan, pitched roof, a single central entrance. Each house is isolated on its piece of land, even as the necessary densities have placed neighboring houses as close together as possible.

A good example of the continuity of house form is in the transporting of house image to a new setting. The image is an integral part of the stability and maintenance of the transplanted culture. The Fairbanks house shows the persistency of house form in a colonial culture. Despite adjustments to a new environment, the basic form and support for a traditional way of life is maintained. The slightly colder climate of Massachusetts encouraged the use of weatherboards, instead of wattle and daub or other method of infilling the frame, as a better way of keeping out the cold. Weatherboard was also used because of the abundance of wood and the relative scarcity of brick; one of the common infill materials in England. The house must make adjustments; but these are adjustments toward continuity. Interestingly, these adjustments led to parallel but distinct successions of house forms in the U.S. and England.

One thing we can look for are the vestiges of old forms, of old controlling features which have maintained their traditional value despite losing the purposefulness of their original use. The Hemenway house has, for example, become too large to be heated efficiently with fireplaces and wood. These inefficiencies created an environment conditioned for the use of stoves, coal and finally central heating. The heating function then becomes a very non-critical determinant in

the house. In a house like our cape, where the fireplace is ornamental, there is evidence that a fire in the fireplace actually draws heat out of the house while other sources of heat are being used, making the primary heating system less efficient. Many old critical features become ornamental. The curved braces on early post and beam houses were imitating the curve of the crucks they had replaced. Shutters on the cape are symbolic of the kind of imagery that is necessary to preserve the sense of continuity that people need in order to make the house a home. The only explanation for many of these phenomenon is the need for symbols as the basic transformers of psychic energy from the natural to the cultural state.

SYMBOLIC INTERACTION

Man has been called a symbol forming animal. This ability was necessary phylogenetically to create a conceptual and man-built environment and is ontogenetically necessary to plug into and become a part of this environment. People structure their environments by adding to it a constant supply of symbols about it and thus bring it under control. The existence of symbolic capability gives man and his systems purposeful behavior and enables them to evade explanation in strictly mechanical terms. I will try to initiate some ideas about the house as a symbol. Since symbols are often personal, there is a danger in carrying a discussion of symbolism too far. The word HOUSE actuates images and memories in

English speaking people. Within a culture there will be similarities between images of house, but they would also be unique for every individual.

Symbols serve a culture by making its ideals and feelings concrete. Individuals grow within these symbols- using them and being constrained by them. The house is a physical expression of the 'genre de vie' of a culture and much that is common among and between people. This is its symbolic value.

Of course the size of the house has always been a symbol of the wealth of its dwellers, but this is not particularly useful in our houses. There are many other activities which take place in the construction, and life of the house which are symbolic in their ritual value. Many mythologies (and present rituals) represent historic conflicts between man and his environment that were resolved by the controlling action which is symbolized in the ritual. In buying a house, much of the initial work; painting, repairing, personalizing, may be symbolic of the construction process. These are all creative acts which express territoriality and control over that territory. There are many cultures in which building a house is symbolic of the beginning of a new family. This may have been true of the cruck house.

We have already suggested the symbolic nature of the Fairbanks house. It and other New England houses were symbolic of the 'home' country, symbolic of a culture and a way of life in a new setting. Many immigrants bring their architecture with them and persist in its use rather than adopt native styles. In many cases, even though that architecture is inappropriate to the new area.

I picture the symbolism of the modern cape as representing the center of activities of life which were once an undifferentiated mass but have been divided now into separate categories; living, work, play, entertainment, religion etc. The house becomes the center for the garden, hobbies and other activities that are vestiges of older ways of living, when the house was the place for production.

Symbols are thus the real energy transformers in psychic events. Symbols have at the same time expressive and impressive character - expressing internal psychic happenings and having been transformed into images through its meaningful content influence the same process. Giving the house meaning is a need, especially " as other areas of life and work become increasingly more remote from the personal control of the individual and more depersonalized, the need becomes greater in the house.¹⁹ "

EMERGENCE

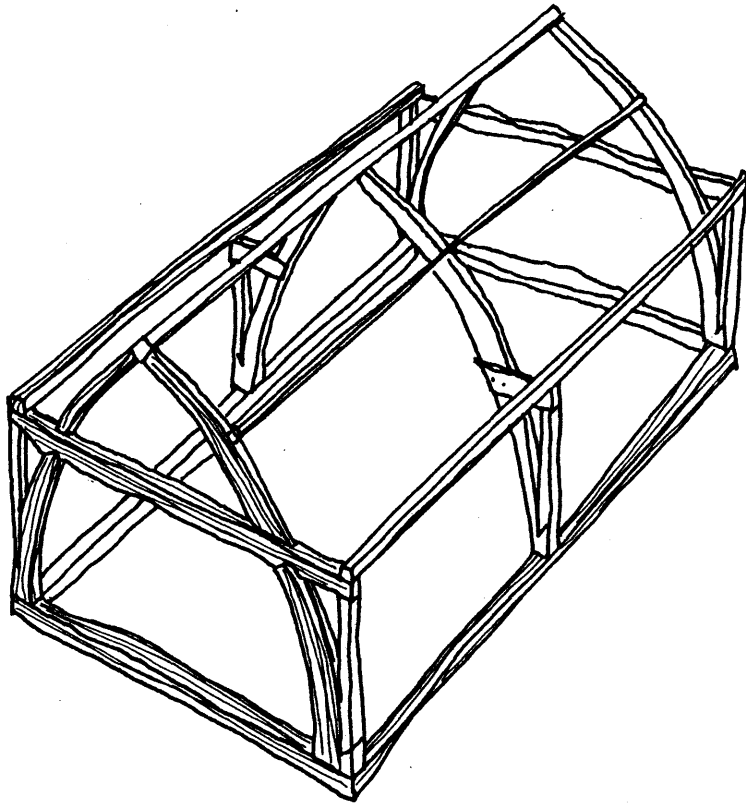
Emergence is an important notion in the methods of advance or adaptation. New levels in biological evolution arise from the expansion of adaptive functions and capabilities which emerge in response to changes in the environment.

In our houses , new structure emerges from potentials in previous forms. While the overall, basic image may remain fairly constant , these potentials are acted upon; realized in response to technological, social or economic changes in the cultural milieu . We have already seen how the tie beam and

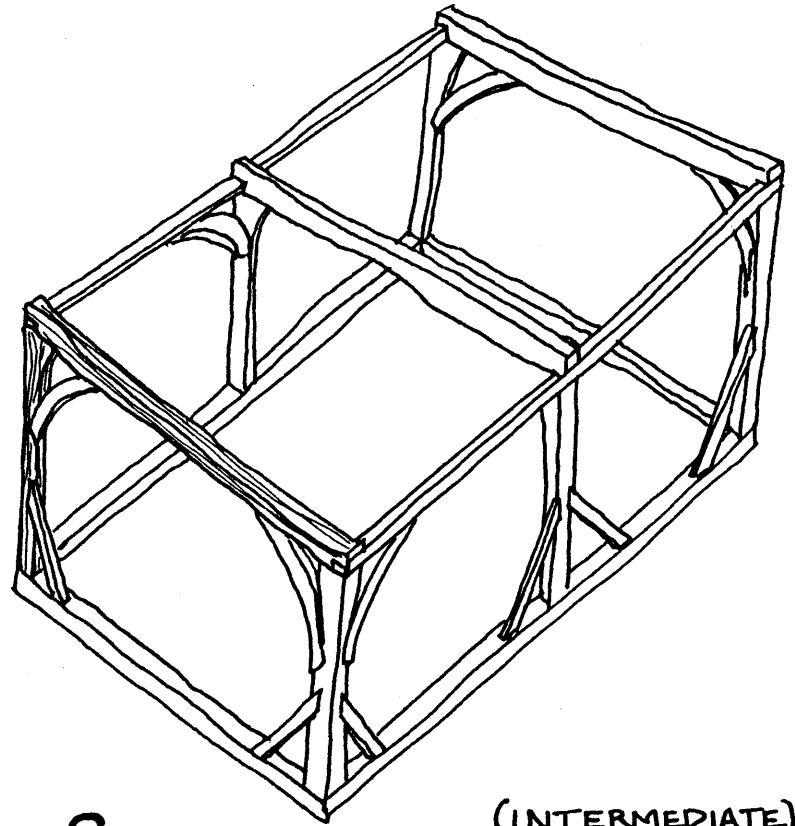
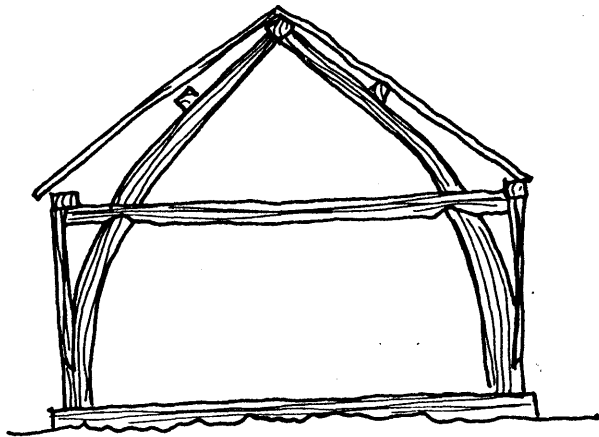
vertical extension of the ground sill moved the skin of the cruck house outside the main structural frame. We can continue this line of structural evolution throughout our examples. (fig. A-E)

At no point does the image change drastically, but there is a constant emergence of secondary structure into a dominating function, or subtle combination of function into a single element. As the ability to cut squared and straight lengths of wood develops in the cultural system, the horizontal tie beam and vertical posts become the major elements of a post and truss house in C. As carpentry techniques improved and supplies of suitable timber for the large curving crucks diminished, there was a general tendency to use lighter timbers. Cruck building may have continued, but the oak and elm which had been the predominant wood in this construction became relatively scarce and led to the use of poor and spindly members. The crucks dwindled to mere bracing struts on the right angle 'square' frame. Clearly, we see the preference of the cultural environment for straightness and squareness-conceptions adaptable to its evolution. The 'natural' shape of the cruck remains only in the curve of the brace in C. and then disappears.

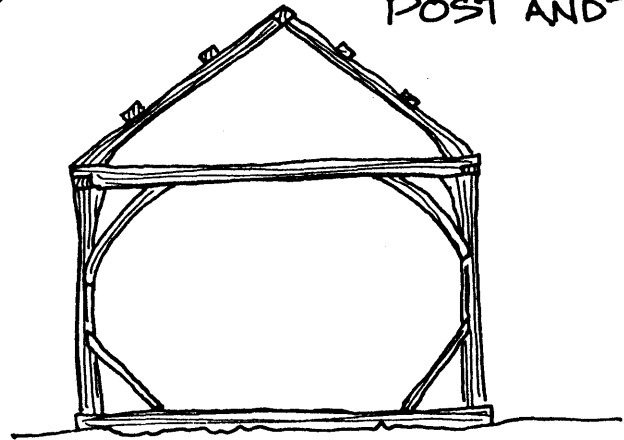
Heavy timber framing continues in the Fairbanks house, with the framing members hand cut and fit on site. The Hemenway still uses a post and beam system, though the members have become smaller and slightly more frequent. The next big step comes with the emergence of the non-structural studs as the main structural framing in balloon frame construction used in the cape. The balloon frame has been said to have been invented. I prefer to say that it emerged in the Chicago area in the 1830's as a response to the industrialization of house construction. The framework of posts mortised into plates with notching

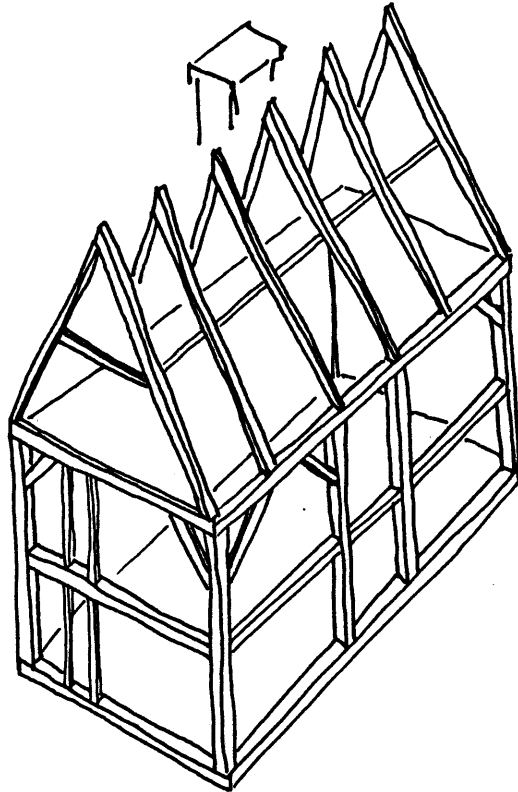


B CRUCK FRAMING



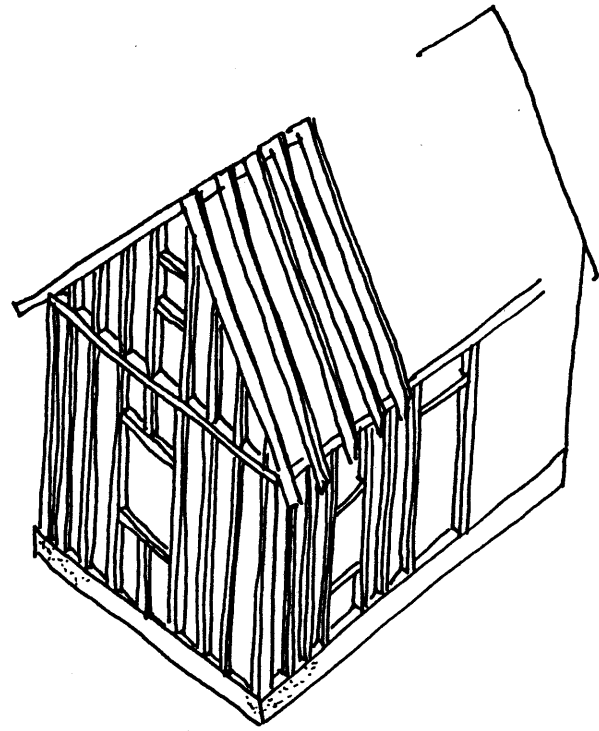
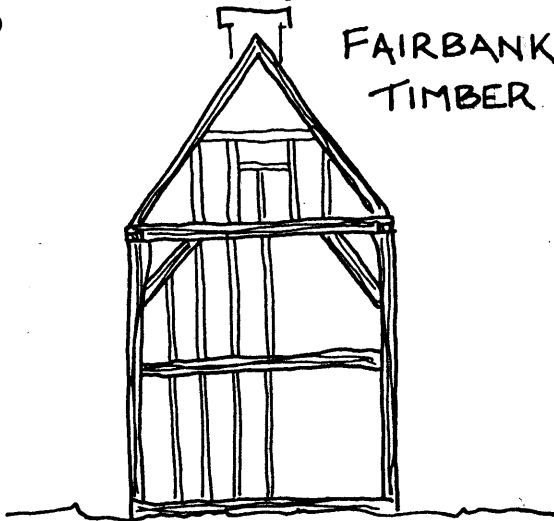
C (INTERMEDIATE)
POST AND TRUSS





D

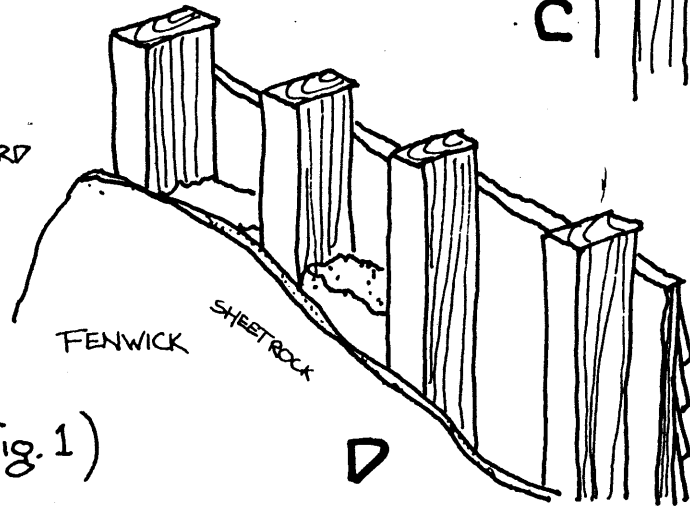
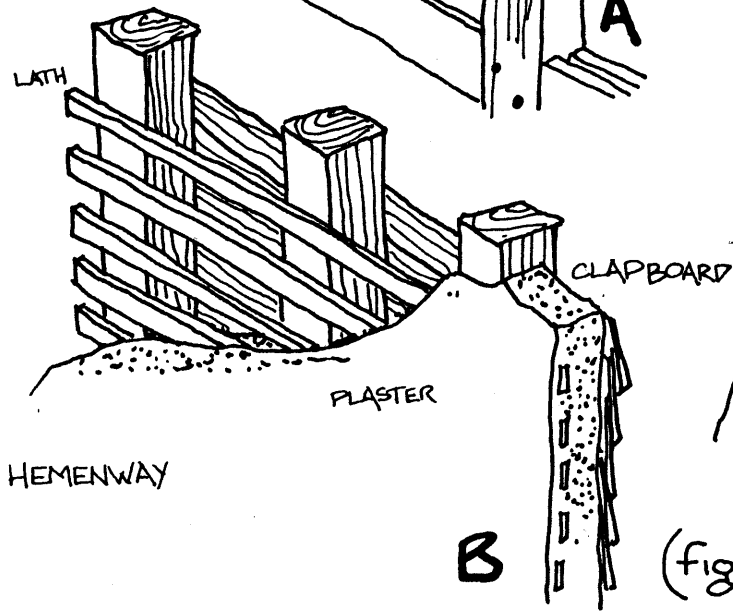
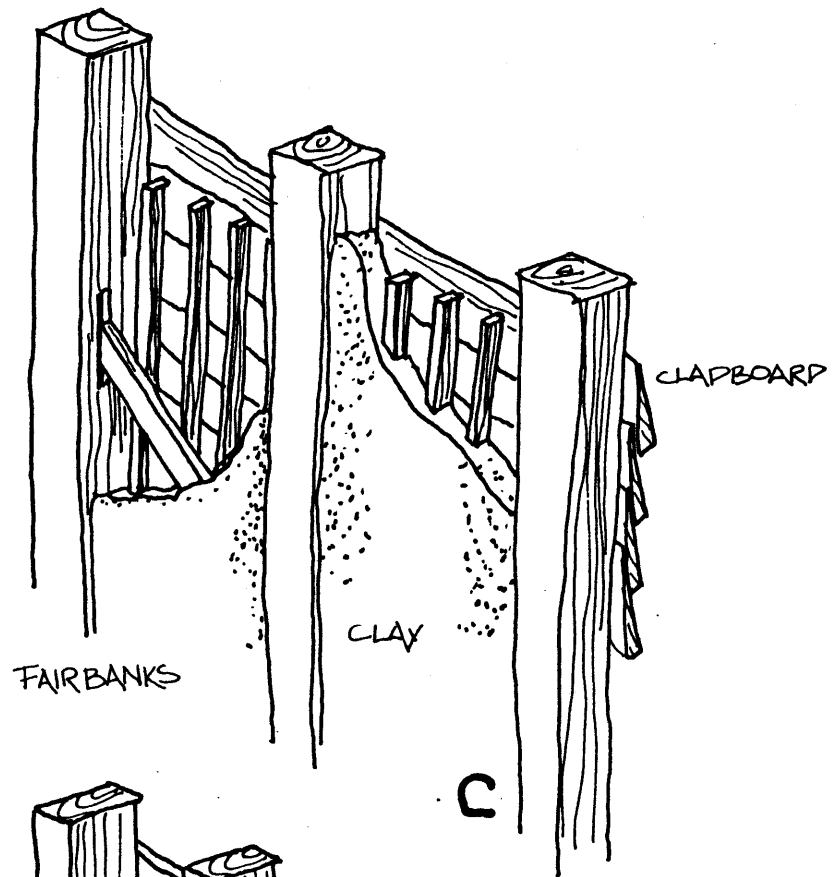
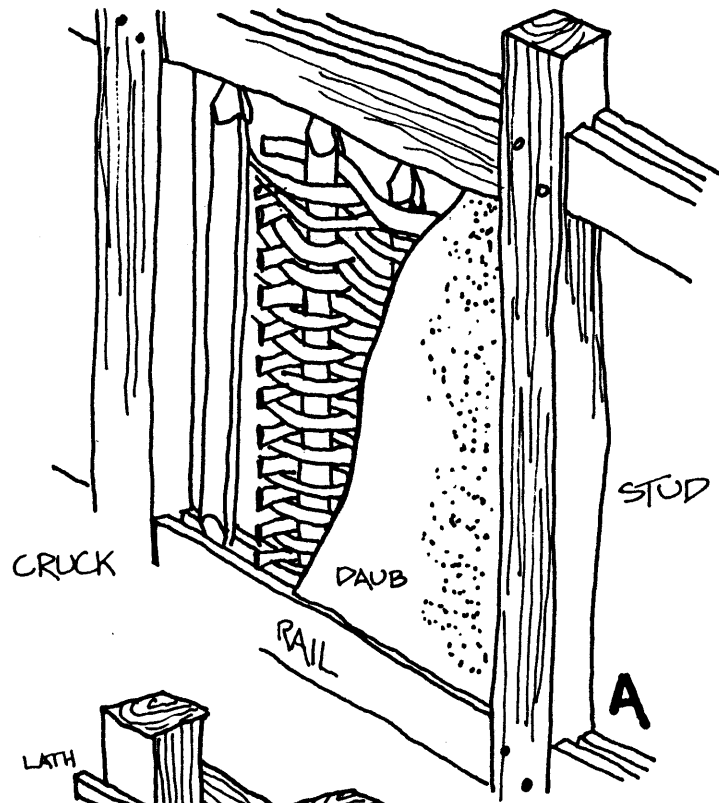
FAIRBANKS
TIMBER FRAME



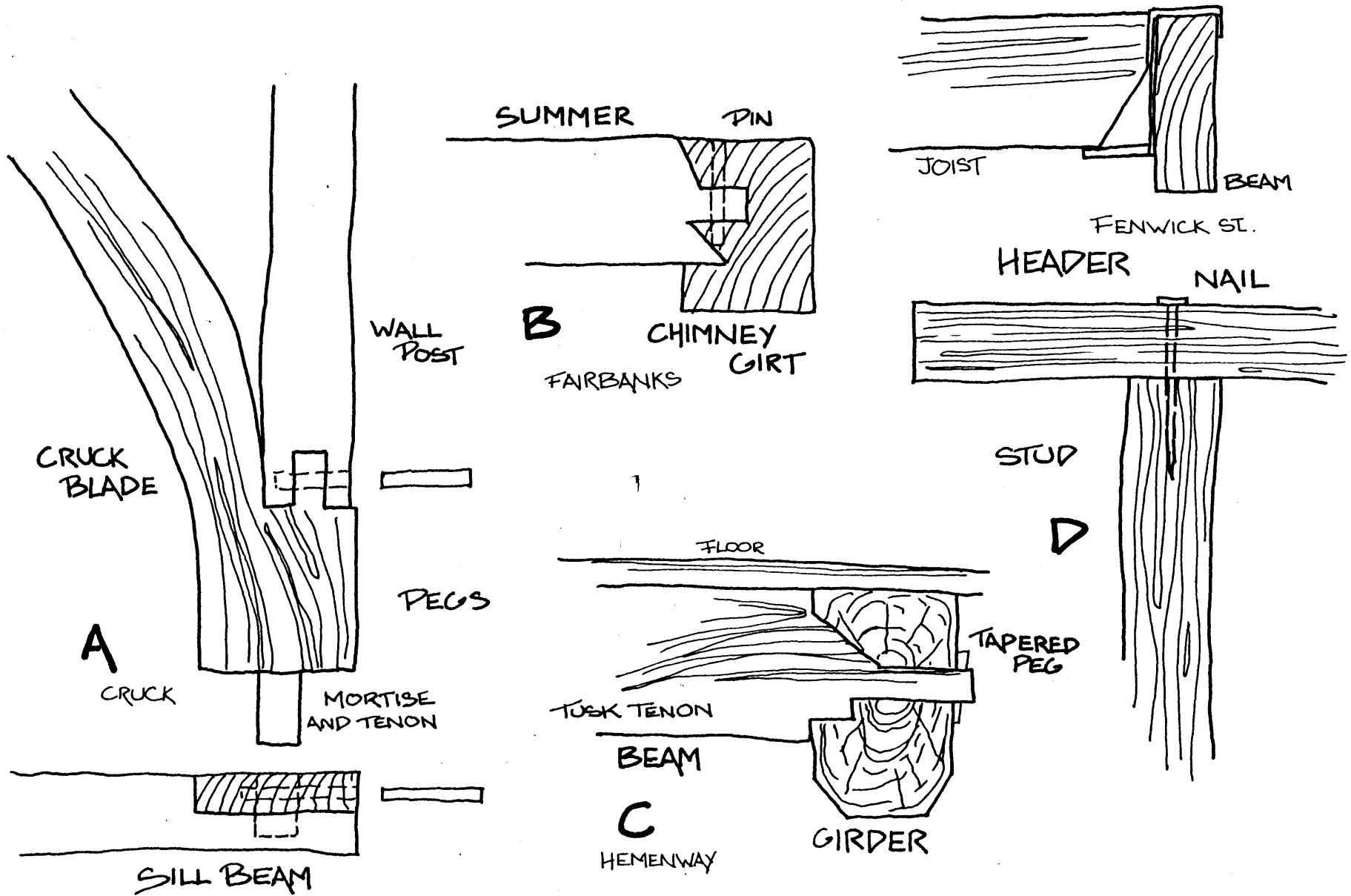
E

FENWICK ST
STUD WALL





(fig. 1)



(fig2) JOINTING

and halving of braces is abandoned and replaced by regularly spaced vertical studs. The studs had been there previously but only as a way of applying the walling material - clapboard or plaster. They were encouraged and nurtured by the availability of machine made nails in the 1830's. Hand made nails had been expensive and were used sparingly, mainly to fix boards in floors, doors and shutters. The industrial mentality, which blossomed at about this time, encouraged the use of many uniform members. Studs could be cut to length, marked and numbered at the saw mill, delivered to the site, ready for erection. Cheap nails at the same time encourages more numerous, less skill dependent and time consuming joining of members.

There are two major emergences in this sequence. The square frame out of the non-structural skin framing, and stud wall construction out of the staves of wattle and daub wall infill. We can illustrate the latter more clearly. (fig. 1)

These changes are adaptations in construction techniques that make the house form possible in a new condition in the cultural environment. It is not obvious that any one of these methods of making a wall and creating a boundary in space, is better than any other. What is better in their progression is their economic potential for making that boundary in a different environment.

Aiding these transformations is the adaptation of jointing technique - the methods of connecting two pieces of wood in the frame. Again, there is nothing inherently 'better' in this line of progress except with respect to the state of the cultural and natural systems. Jointing moves in this sequence from lashing, pegging, halving, mortising to nailing and other metal connectors.

(fig. 2)

CONCLUSION

In a general sense, this thesis ~~has been~~ concerned with the relationship between an organism and its environment; the very complex flows of energy, in any form, between a living being and its world, physical or conceptual. These are the interactions which make, maintain and define life. In fact, these are so complex that at a given moment it is only as a matter of convention that we can establish a boundary between any organism and its environment, a practice which in itself has only been meaningful since the rise of modern science. We cannot forget that any organism, its environment, the complexities of their relationship, science, the universe itself, for that matter, are products of a process of evolution. An organized, ordered body can, by the nature of the universe and its evolution of increasingly complex systems, be placed in the hierarchy of these systems. Its position in the hierarchy in many ways determines and is determined by its ecological relation to its environment. Certainly, as the complexities of organization increase along the evolutionary scale, the

nature of the interaction between it and (an organism) and the environment changes. We can easily observe the tendency for organisms to increase the flow of energy through their systems and in order to do so, increase their control and manipulation over the environment.

We are well aware of Cultural Man's ability to manipulate His environment; an ability which has its foundation in the desires of individual man to manipulate his environment. With his unique abilities man shifted his biological evolution to his inventions, tools, symbols, and they (Man, Mankind, Culture; whatever term used for the collective power and knowledge of the social organism) accelerated the progress of evolution, greatly increasing its powers to mold and shape the world. Now, lost in the complexities of an environment created by his initial desires, man (the individual) has, at best, only replaced the once perplexing natural world with an equally perplexing one of his own collective making, and is perhaps losing any power of control he may have had over his environment. This powerlessness is a common concern in our time, reflected in statements like "society is, if not hostile, a grey, unpenetrable, opaque entity. It is 'The System', that cannot be affected by us nor does it have affection for us either. 3a"

As architects, cultural agents of design within this cultural system and constrained by the economies of energy flow through the system, we face the danger of portraying this hostility and disaffection in the designed environment that the system often displays to the individual. To avoid these tendencies we need to develop a philosophy which recognizes the importance and complexity of give and take between the human organism and the environment.

"In the past there has typically been a concern for the unidirectional

causes when considering organism-environment relationships. Either the organism was viewed as determinably shaping the character of the environment, or the environment was emphasized as the principle factor responsible for shaping both the organism and its behavior. It is not difficult to see the predilection toward conceptualizing the animate and the inanimate and the primary relationship between them as being entirely consistent with the dichotomous philosophical notions which have plagued us for so long; free will versus environmental determinism. 34"

Similar dichotomies pop up continuously and have appeared frequently in this thesis. The nature of our awareness and hence our very existence is dichotomous, and these apparent contradictions are being stretched to the point of breaking us or forcing us to appreciate and balance the tensions they create; tensions which are the dynamic potentials of our universe. To control ourselves and our environment we need to control these tensions, to unify them within transcending philosophical structures.

A philosophy of design needs to understand the interactions between the organism and its environment, and in doing so to appreciate their mutual dependency and definition. In order to play down the dichotomies in this relationship we must allow free exchange of energies, recognizing, of course, that this freedom is only possible within wisely constructed constraints.

In considering now the interaction between the human organism and his world we must remember that the ability which made man more successful than other animals is his ability to symbolize, to create conceptual images which exist outside of the individual being and which increase his memory by holding and communicating information and meaning. At the individual level the unique

factors in the organism-environment exchange are symbolic interactions; the creation and existence of a conceptual universe.

The theory has been advanced that one of the primary functions of the brain is to filter stimuli, to structure the immense amounts of information constantly bombarding us in order to make it meaningful and useful. Otherwise we would be overwhelmed. One point of view, and a useful one at that, is that the house is a structure that parallels this function of stimulus control to shut out insults from the outside world and regulate the nature and intensity of information the individual receives. We use the house to relax our internal controls, to 'be ourselves' some might say. The concept of privacy is neatly contained within this idea. If the screens/barriers/forms - the quality and quantity of boundaries we construct in our psyches to control stimuli - are the way we define a self, then we can properly say that the house (depending on our ability to structure and control it) is a symbol of that self in its closeness in matching with our psychic boundaries.

The importance of an evolutionary perspective is that it allows us to step outside ourselves - to get a better grasp on who we are and where it is we might be going (without interference from the "who we think we are and where we would like to go" of the individual perspective). It is a cold and lonely vantage point, very much like standing at the top of a high peak, tired, hungry and facing the cold biting wind. We get a different, broader and more meaningful look at our world, but we can't stay there long without returning to our more comforting every day worlds. We come back, however, with a new perspective, a new image of our world. In our case we

can go back to our individual perspective, having learned, in our absence, a great deal about where and what this perspective is.

It is a perspective based in the polarity of the individual system. A polarity between inside/outside, nature/culture, control/constraint, outputs/inputs. The house, within this perspective, must be a combination of cultural constraints and individual freedoms and control. There is often a fine line in the balancing of these poles. It is an irony of life that we learn who we are by having to achieve and maintain these balances, frequently at the expense of painful struggles. Eliade touches upon this when he says "all this seems to show that man can only live in a sacred space, in the 'centre'. We observe that one group of traditions attests the desire of man to find himself at the center without any effort, whilst another group insists upon the difficulty and subsequently upon the merit of being able to enter into it. 35"

Freedom and constraint give meaning to each other and only exist in some relation to the other, just as nature and culture each exist only in terms of the other, as do both parts of every dichotomy in the individual perspective. Freedoms are chaos and confusion without constraints. Constraints are tyrannical without freedoms. The goal of each of us and particularly of designers of our environments should be to balance the poles of existence - to get the most out of both sides by realizing the need they have for each other. One way we have tried to see how this balancing may be done best is by exploring an evolutionary perspective, by finding which phenomena are relatively constant and which are changeable; and to use these constants as a framework of constraints by which to structure our environmental freedoms.

NOTES

- 1 From Sahlins, Marshall D., and Service, Elman R. Evolution and Culture
- 2 Ibid., p.24
- 3 Ibid., p.35
- 4 Rapoport, Amos, House Form and Culture, p.78
- 5 Ibid., p. 79
- 6 References, Henderson, Andrew, The Family House in England pp.18-32
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- 7 Charles, F.W.B. op.cit., p.17
- 8 Ibid., p.18
- 9 References, Bemis, A.F. The Evolving House
Isham, N.M. Early American House
Gould, M.E. The Early American House
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and Early Republic
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- 10 References, Temple , History of Framingham
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Kimball, Fiske Domestic Architecture of the American
Colonies and Early Republic
- 11 Campbell and Roark, Man-Environment Systems , p. 89
- 12 This diagram borrowed from Morrison B.M. The Importance of a Balanced
Perspective in Man-Environment Relations
- 13 Parts of this diagram borrowed from Esser, A , Transactional
Structures in Man-Environment Relations
- 14 Searles, Harold The Non-Human Environment in Normal Development
and in Schizophrenia

- 15 Rapoport, Amos House Form and Culture p. 105
- 16 Bertalanffy, Luwig Von in Psychology and the Symbol p. 60
- 17 Rapoport, Amos House Form and Culture p. 126
- 18 Greenbie, Barrie B. Design for Diversity p. 82
- 19 Rapoport, Amos The Personal Element in Housing: An Argument for
Open-ended Design p. 300
- 33 Preisser, Wolfgang Psyche and Design p.5
- 34 Ibid., p. 33
- 35 Eliade, Mirceau Images and Symbols p. 55

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