AN OUTLINE OF HUMAN DEVELOPMENT FROM CONCEPTION TO THE EMERGENCE OF ORGANIZATION AT THE SOCIAL AND INTERPERSONAL LEVEL

by
William J. Rowe

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.....Anthropology, sociology, indeed social science in general, is notoriously weak in the discovery of effective consistencies. This weakness, it seems, is not unrelated to a fatal fallacy with regard to the objective reality of social and cultural patterns defined impersonally.

Causation implies continuity, as does personality itself. The social scientist's world of reality is generally expressed in discontinuous terms. An effective philosophy of causation in the realm of social phenomena seems impossible so long as these phenomena are judged to have a valid existence and sequence in their own right.

Edward Sapir, Psychiatry, I, p. 12

If, therefore, anyone wishes to search out the truth of things in serious earnest, he ought not to select one special science; for all the sciences are conjoined with each other and interdependent; he ought rather to think how to increase the natural light of reason, not for the purpose of resolving this or that difficulty of scholastic type, but in order that his understanding may enlighten his will to its proper choice in all the contingencies of life. In a short time he will see with amazement that he has made much more progress than those who are eager about particular ends, and that he has not only obtained all that they desire, but even higher results than fall within his expectation.

Descartes

Research...teaching...application; these constitute the heart of scientific progress. Separate the elements of this triad--remove the benifits of research and application from teaching, cut the bonds between application and the laboratory--and we weaken, thereby, man's organized fight to make his world a better place in which to live.

T. Duckett Jones

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INTRODUCTION

This paper attempts to trace the unfoldings of human developmental processes as they evolve and elaborate from conception to the beginnings of organization at the social and interpersonal level.

As such the attempt is made to engage not in original research in a primary sense but to deal with the problems peculiar to the task of constructing frameworks adequate to accomodate the ever-growing body of information accumulating from many fields and sources on how human beings develop and become what they are.

This task of secondary or integrative research is closely reflected in the focus upon organization and application, as expressed in the intent for the degree of Doctor of Education. In this sense it denotes an attempt of the student to pull together into a functional relationship a stock of knowledge from various areas hitherto fragmented and idiographic, that is, seemingly unique.

'Pulling together' knowledge and fact into a consistent and functional relationship is the logical and indispensable counterpart of the task exemplified by the degree of Doctor of Philosophy--that of basic research. The latter is essentially a task involving intense focus, an attempt to chip out a small piece from the unknown. Characteristic of the former is the effort to gather the many pieces into a coherent picture. One is primarily analytical and inductive;

the other is synthetical and deductive. Through one the attempt is made to diagram the 'hows' within a relatively narrow class of relationships; through the other an effort is made to extend insight and enhance meaning by assigning fact a niche within a total or at least larger process.

While the analytical-synthetical effort represents an ideal approach it is of course never really maintained over any extended period in the course of scientific development. The history of progress seems, rather, to reflect a cyclical alternation, with emphasis now upon one aspect of the process of inquiry and at another period upon the other. The Middle Ages tended to reflect a stress upon the extensive theoretical construct, intensive deductive effort high-lighting the early decades of the 20th century and continuing to the present in certain forms within psychology and anthropology (neobahaviorism and ethnography, as examples).

The causes of these shifting balances are many and they need not concern us here. Changing approaches tend to indicate the current ends towards which the scientific process is being applied and these ends emerge as an integral part of social and cultural history.

It is a temptation, however, to compare the past to the present by interpreting the former in terms of relatively static or slowly emerging discoveries and scientific accumulations, in contrast to the modern period in which science must function where about the only long term consistency seems to be change itself.

While this is an exaggeration, perhaps, it is hardly an overstatement of the case to say that we have passed the period in which so many building blocks were missing, causing progress to be very slow and pronouncement perhaps excessively theoretical (and mystical) at times. With rapid and far-reaching industrial change, with slowly accumulating basic orientation points from which to erect more functional systems, and finally from the tremendous impetus given to science through newly created demands research efforts have increased tremendously.

One only has to reflect upon the total scientific activity of 100 years ago and then guess as to the geometric increase in research laboratories, hospitals, universities, social agencies and institutions for facilitating transmission and communication of ideas. The total number of scientific periodicals of a hundred years ago, for example, would fall short of the journals within almost any one branch of science today.[1]

The importance of past work of course cannot be overemphasized but we must admit that the pace and the accumulations of insight were necessarily slow with fundamental insight so lacking. New increments, we would guess,

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[1] Consider, for example, the journals in sociology in the English language alone: American Anthropologist, Agricultural History, The American J. of Sociology, American Sociology, Philosophy of Science, Social Forces, Southwestern Social Science Q., and Rural Sociology

came slowly and from widely separated research centers, and then could be pursued and analyzed at leisure. One probably did not have the frustrating experience of feeling overwhelmed with new reports of progress--to say nothing of attempting to integrate them into one's approach. Up to the time of Francis Bacon Aristotle was apt to constitute the last word--and on any subject.

Apparently the task of modern science, however, is not merely one of discovering what we know already amid the deluge of incoming and existing findings and discoveries; it seems saddled also with a responsibility to aid man in his present confusion, of his situation within a modern, complex world (a state of affairs which science itself has played a leading part).

From the tremendous structures erected by the scientific giants of the 19th and early 20th century the comfortable little frontiers as seen through earlier conceptions have simply disappeared into myth. But the brash faith of some that if we only knew enough facts about a phenomenon (i.e., the 'hows') the 'whys' would fall meekly into place has so failed man in his hours of need that a strong resurgent swing towards theoretical systematization has set in again, and taking the researcher far beyond his scientific store of facts.

Modern physics, many aspects of medicine, anthropology and psychology are operating pragmatically, well in advance of validation by conventional scientific procedures. To insist that we wait for experimental effort to catch up would be in effect to deny the use of atomic power, many forms of chemical- and psychotherapy and working conceptions of man within the setting of his physio-cultural world.

In applying science in a fashion hardly conceivable even 75 years ago one notes an almost desperate use of it as a source of guidance and faith[2] and causing one to speculate thereby as to how means can ever be made to replace ends in a search for security and understanding.

Science, we would argue, can never be a fountain for faith or a provider of values but it can as Max Weber pointed out do the next best thing: it may properly be utilized to test the consistency of value positions and also serve to delineate clearly their meaning and implications. In this sense, properly ordered, scientific method may be useful to achieve some measure of relationship and order (prediction) over the vast range of stimuli that is active around modern man.

This seems to be a task calling for construction and synthesis--organizations of knowledge around real needs, with scope determined by the range of phenomena at hand.

This seems to suggest that besides insight from separate scientific disciplines--physiology, psychology, sociology, economics, etc.--what is needed urgently is insight into the unified bio-social nature of man, and this from the over-all

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[2]Joseph Spigelman, "Can Science Make Sense", Harper's, 5-'51, pp. 54-59

perspective of the relevant physical-social context he finds himself within.

One such unity within this larger area is in the story of how children grow and develop--of the patterns, interactions and of the kaleidoscope of subtle factors which from all angles play upon the way they become what they are --healthy, sickly, socially constructive, neurotic, delinquent, happy.

Depending upon its scope and level of specificity, synthesis and interdisciplinary effort may provide a kind of periodical table upon which we may predict along a broad, many-leveled front that with exception process will proceed thus and so. Synthesis becomes a conceived fictional (analogus) construct of total process from which one may draw upon as a basis for more adequate modes of adjustment or reorganization. Within it, as within a narrower theoretical focus, fact takes on meaning it could otherwise not have.

> When we, as scientists, speak of 'only facts' we mean a product of omission, selection and inference. Here indeed 'matter-of-fact' is nothing but an abstraction.[3]

This process of synthesis connotes an attempt towards approximation. The broadest or most basic constructs attempt to define relationships at a generalized level. They span a whole continent but because of their scope would exclude minor surface features. To the extent of their

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[3] A. Whitehead, "Modes of Thought", Harper, New York: 1938, p. 25

ability to 'face the damn facts', and to the extent of their predictive value, the broad, general construct offers a foundation for more detailed and more specialized syntheses. From these, in turn, the bases are laid for more sharply defined approaches at the level of application within specific areas--education, social service, etc.

If one accepts the holistic nature of living processes and of their operating within larger areas of interacting levels of organization, then it would seem important to proceed from a conception which is consistent within a larger framework of reciprocating systems. While culture and environment do not constitute a super organism (as some early sociologists conceived it), interaction and change proceed interrelationally, as well as intrarelationally, and this expressed not as a single action from singular cause to effect but as a process becoming manifest from an organization of vectors <u>within a many-leveled dynamic field</u>.

Thus while an incident of human behavior may be analyzed most profitably at the psycho-social level, it is an example directly or indirectly of process and interaction at physical, physiological and perhaps geographical levels as well. From the point of view of application, explaining behavior at a neuro-cortical level may have little immediate utilitarian value. In the long run, however, insight at more basic levels feeds back and enhancing and deepening insight at almost all levels--up to and including application.

Syntheses may be organized many ways but basically they are constructed in one of two directions, these depending upon the purpose to be served and on the nature of the subject matter to be covered. One may wish to diagram vertically, i.e., developmentally, either phylogenetically, ontogenetically or historically. Synthesis may also be constructed with the primary emphasis being horizontal, to map a field of interaction in which time is not the primary factor. Whether longitudinal or horizontal, any synthesis may contain aspects of both. Further, depending upon scope all approaches will comprise (ideally) the achievements of many separate disciplines utilized through some inclusive pattern of organization which is consistent with the differing foci and methodologies of fields crossed.

In this paper the attempt is made to outline many of the significant but often widely scattered contributions to the field of human development and to do this within a framework which suggests the great sweep and unity of growth and particularly of the meaning, underlying dynamics and complex antecedents of consciousness and social behavior.

The effort is projected primarily as an experimental or trial run. A total, detailed synthesis for a topic of this scope is an impossibility obviously. To attempt to pull together what is known already of this developmental period would require perhaps the efforts of many specialists working in harmony over a very long period of time--and then one could not help but note that such an effort would be dated before it was even completed.

But again, any such task is one of approximation and to attempt to perceive a total process constitutes an important contribution, one justified in itself, no matter how imperfectly our present understanding may serve us. This attempt to trace developmental processes up to late infancy is also to search out and experience the difficulties and obstacles inherent in the synthetical approach, and to provide the background, thereby, for future more detailed frameworks in which to spin theory around taleless and silent fact. It is inevitable, needless to say, that such an attempt cannot but help to reflect the personal equation, of the particular interests and limitations of the author(s) towards certain areas, perhaps to the omission or slighting of other aspects of importance.

Theoretical and Organizing Assumptions. While eclectic in that knowledge is incorporated from widely separated disciplines, the attempt is made to organize these contributions within a framework based upon largely holistic-dynamic assumptions. Many contrasting approaches seemingly--the differences between Behaviorism and dynamic psychology, for example--upon close scrutiny tend to reflect more a differing emphasis, focus or level of analysis than as opposing views locked around the same issue. And one cannot help noting that much of the seeming disagreements stem to some extent from differences in terminology and methodology, rather than in any lack of common elements and overlaping fields of interest.

The plan to order data and primary theory around holistic-dynamic conceptions carries with it the usual element of danger which must accompany commitment to any over-all theory: that new research may place an approach completely or partially in disrepute. It is felt, however, that the preponderance of recent evidence from the physical, biological and social sciences is largely in consonance with such an underlying organizational framework and that at present it constitutes the most inclusive and consistent general approach from which to attempt to organize the great welter of heterogeneous knowledge. Perhaps more realistically disagreement may subsequently emerge less as to the validity of basic holistic-dynamic postulates than as variation within what is presently very tentative and often vague general structure--with additional insight effecting modification towards a greater degree of precision, approximation and continuity.

The following postulates constitute the series of basic ordering points from which materials drawn from physics, physiological-psychology, psychology, sociology and social anthropology, and of many variations within each discipline, will be ordered. These are stated generally and are considered to be of application at all levels, whether organismic, interpersonal or cultural.

1. Man as a manifestation of holistic process. That man, as with all forms and levels of life, is organized as a closed, self-dissociative and reconstructive, on-going unity

or whole of a series of pyramiding levels of lower forms of organization, in which the whole is different than the sum of the parts.

2. Man as a manifestation of living process striving for unity and self-consistency. That life processes--at all levels of evolution, ontogenesis and maturation--denotes the constant effort of self systems to adjust within fluctuating internal-external balances, to maintain homeostasis, organismic equilibration and integrity and the realization of potential process and elaboration.

3. Phylo-ontogenetic patterning as a vector and resultant of environmental and hereditarial interaction. That man at all levels of development--germinal, fetal, postnatal--and at all levels of organization--cellular, multi-cellular organismic, psychological-interpersonal, social-cultural-evaluative--represents the continual and inclusive integration of environment and life process-- that the latter indeed has no existence or meaning apart from the former.

4. Phylo-ontogenetic patterning as a manifestation of increasing environmental mastery. In ontogenesis through energy levels organism is engaged in a drive towards increasing mastery of its environmental fields-- this within its adjustive, equilibratory efforts to mediate constantly changing internal-external balances and relating in the process to greater ranges and levels of environment.

5. Approaches to ontogenesis. That to attempt to under-

stand life processes or the significance of certain facets--reproduction, delinquency, physical growth, consciousness--it becomes necessary to understand these within a framework of adequately inclusive theory of total self and relevant environmental organization; that man must be approached as a unity operating within an all-encompassing field; that it becomes necessary to employ synthetical and deductive effort along with analytical and inductive forms of research and inquiry.

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CHAPTER I

SCIENTIFIC APPROACHES TO HUMAN DEVELOPMENT

> No matter how important the tools of methodology and classification may be,.we shall always stray into dilettantism if we made them alone, apart from the testing power of monographic research, the object of scientific thought. . . . Dilettantism, indeed, is constituted more by illusion about depth of problems than by ignorance of methods, and naive optimism about this depth is therefore most characteristic of the dilettante. In the long run the frontiers of a science are never defined by methodological claims alone, for these bear the same relation to creative research as the mere rehashing of books does to the hand-to-hand struggle with Nature for her secrets.
>
> Ratzel

The questions of how we know, of means and ends in the field of human development present a greater perplexity of problems than one would expect to encounter in child psychology, the sociology of childhood or from any other single approach. That synthesis of child development should prove of greater difficulty than tracing developmental processes through one restricted area is expected of course. Yet, as experience has indicated repeatedly the qualities of true synthesis are still more difficult to achieve than previously estimated. In this chapter we shall attempt to sketch some of the more basic epistemological considerations at the disciplinary and synthetical levels.

Several issues need emphasis or tend otherwise to extrude themselves in the form of confusion. Certainly one important problem, one suggested already in the introduction, is that of the limitations of scientific tools and methods in solving problems and in pointing a new way. The distinctions made earlier in the 20th century between means and ends, and of value statements versus factual statements need also to be examined as recent insight has tended to indicate the very close relationship between means and goals and the almost cultural bias of scientific foci.

The role of values and supposedly neutral concepts, assumptions and techniques need to be explored, not only to the extent of their cultural or a-cultural properties, but also in terms of the internal consistencies of their frames of reference. The thought expressed in the quotation from Ratzel (page 1) needs to be pushed one point further: namely, not only is methodology not the heart of a science, but misused to what extent may it wag the dog, to determine the focus and level of inquiry within a field?

Through a brief consideration of some of the main underlying problems encountered at the disciplinary and interdisciplinary levels, the last part of this chapter is devoted to a summary discussion of some of the larger remaining gaps in our knowledge of human growth and development and some of the possible trends and steps which may lead more directly to a faster rate of progress in the task of constructing a central unified framework and conception to accomodate insight already available and to act as a searchlight upon pressing problems remaining.

FUNDAMENTAL PROBLEMS AT THE DISCIPLINARY LEVEL

The Role of Science--An Emphasis Upon its Limitations. The transition from philosophy to social science is symbolized by a growing ability to distinguish between existential knowledge, i.e., knowledge of what 'is', and normative knowledge, knowledge of what should be. Social science is more importantly the realm of the first, philosophy being the realm of the latter.

To the extent that a distinction is possible, and within the limits of a cultural framework, the task of an empirical specialized science or discipline can never be to provide binding norms and ideals from which directives for immediate practical activity can be derived. "This is not to deny the existence (or subsistence) of such Truth; it is just not within the scientific range."[1]

> . . . The scientist does not seek for Truth. His task is not to inquire into the 'Why'? of things, but into the 'How'? "Why should there be a cosmos"? is not a scientifically answerable question. "How has the cosmos changed throughout determinable time"? is certainly a large order, but the attempt to answer it does not carry us beyond the confines of science.[2]

The question, therefore, of the means for achieving a given end is undoubtedly accessible to scientific analysis. We may, when the possibility of attaining a proposed end appears to exist, determine (naturally within the limits of

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[1]Howard Becker, "Through Values to Social Interpretation," Duke U. Press, Durham: 1950, p. 124

[2]*Ibid.*, p. 124

our existing knowledge) the consequences which the application of the means to be used will produce in addition to the eventual attainment of the proposed end.

Thus the scientific process may provide the ability to weigh and compare the undesirable as over against the desirable consequences of any action. It may make known that all action--or inaction--imply in their consequences the espousal of certain values or the rejection of others. The point standing is that for the cultural and psychological sciences the act of any choice is ultimately one of a value position derived from the nexus of the culture itself.

The meanings, the values or goals assigned to child development, are determined out of the beliefs in the validity of local cultural values imputed to life itself. In the last analysis, therefore, the <u>science</u> (used in its strictest sense) of child development cannot, by itself, say what should be done. In practice this distinction is possibly blurred but the proposition remains essentially and substantially correct: a scientific postulate is 'true', i.e., valid, only to the extent of the 'hows', that it permits us to make correct inferences or predicitions from a given relationship.[3]

The extent of the value of a science of human development need not be limited, however, to means. Science is

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[3]Herbert Goldhammer, "An Outline of Social Science Methodology", U. of Chicago Press, Chicago: 1947, pp. 4-8

also a technique or means by which to treat value judgements themselves, that is, a means to analyze empathically desired ends and the ideals which underlie them. In a sense also, from this view, it may judge them critically.

> This criticism can of course have only a dialetical character: it can be no more than a formal logical judgement of historically given value judgements and ideas, a testing of ideals according to the postulates of the internal consistency of the desired ends.[4]

Logically distinguished, then, scientific process denotes a system of inquiry which is concerned with ordering and prediction within consistent and known categories of relationships; it represents a search for the reoccuring patterns and of the nature of the elements and structures within the field.

The process is more than purposeless concatenation. It reflects the attempt to order the seemingly idiographic or unique phenomena within broad classes of general propositions. In this sense, it may be applied not only to external, seemingly factual phenomena but applied equally to an examination of the consistencies of subjective or value positions themselves.

Underlying Approaches to the Study of Child Development. In a first analysis all sciences must cope with the most basic problem--the epistemological headache of how do we know. While this is certainly a very abstract and fundamental question both the nature of the final product and the range

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[4]Max Weber, "The Methodology of the Social Sciences", Ed. Shils & Finch, Free Press, Glencoe: 1949, p. 54

or scope and level to be investigated are directly dependent upon how one sees this issue as resolved. Indeed there is perhaps no single problem in the fields of human development today more important than this question of when is a fact a fact and how is it so proven.

We shall attempt to trace the issue as it has evolved, and beyond that, to try to indicate how a particular avenue may determine the nature of the ends themselves.

a. Via Introspection. During the first thirty years of this century a rather curious argument was waged over method and the scope of incuiry within psychology and the conflict had direct implications for all the social sciences. Initially it was between the Structuralists and Behaviorists. Following the example of Wundt, Titchener insisted that the subject matter of psychology is "experience dependent on an experiencing person.....the world with man left in."[5] Although the Structuralists strongly objected to directing research effort towards anything that smacked of a utilitarian or applied nature, they were insistent in their scientific zeal that man was a fitting instrument to receive objectively experience--that when properly trained he is capable of experiencing 'pure' reception, free from all acquired meaning, "purged of human interest."

Thus the instrument of research was man--trained man, to be sure, for the great enemy of the Structuralists was

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[5]E. Heidbreder, "Seven Psychologies", Appleton-Century, New York: 1933, pp. 122-123

'uncorrected' or phenomenological 'common-sense' observation --and the method that of introspection. All phenomena, henceforth, were to be subject to direct observation.

If we did not know anything of the history of this school from its position as to how we may know the area of inquiry seemed limited only by the height of the sky. One might expect, albeit a disinterest in applied research, a frontal attack upon the tremendous central problems around mental organization--of the psyche, consciousness, memory, and the like. Whether as Kohler suggested, it implied a lack of faith in their own methods, Structural psychology became immeshed in ponderous trifles which soon bored all but a narrowing circle of disciples. Instead of being concerned with the existing gaps in the knowledge of growth and development the Structuralists filled volumes describing what happens, for instance, during a single comparison of two ones or colors.

b. Via the Calibrated Instruments. Overriding, in part, his Functional training at Chicago, Watson after the turn of the century developed a powerful new school of psychology which was bitterly opposed to the idea that direct experience may be anything but subjective. If psychology is ever to be a science, it must follow the example of the physical sciences and especially physics. The methodological implications of all this was that the units of measurement were to be taken out of man and externalized in the form of mechanical instruments and gauges, thus returning psychology to a status of an 'exact' science. Because Behaviorism sought to make psychology objective it insisted that the notion of mind be unequivocally discarded. Evidence was not to be so considered <u>unless</u> it was the results of observation through an external filter, ie., a measurement determined independently from the subjective human system, freed from all direct experience and open to easy consensual validation.

It is immediately apparent that to the extent that the Behaviorists insisted upon their epistemological principles they limited the depth of their field of inquiry to an explaining level, i.e., they did not try to account for (or admit the existence of) behavior in terms of subjective states, and more particularly purpose or intention.

For the Behaviorist, anything that we may say about 'A' (subjective state of an organism) is known only through its projections (speech, actions, etc.); likewise, anything we know about 'B' is known only by imputation through behavioral manifestations. The relation A-B, therefore, is always in correspondence with the relationship between the behavior of both--call it 'a' and 'b', and nothing has been gained in making the imputation. The Behaviorist, then, does not relate any instance of behavior to another order of events, i.e., he fails to treat such evidence as being meaningful in terms of, say, his own background or field of awareness.[6]

c. <u>Via a Slight Regression to Common-Sense Experience</u>.

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[6]Hebert Goldhammer, <u>op</u>. <u>cit</u>., p. 24

Rising in rebellion against both schools the Gestaltists attacked first the position of the Structuralists. While agreeing that immediate experience was valid, factual data, "not a shade more questionable than the raw data of the physical sciences," they objected to the restrictions and limitations Structuralism imposed upon direct experience--the laboratory attitude of 'corrected experience'--and insisted that naive perception of common sense had a right to a hearing in psychology.

The real target of Gestalt psychology, however, was Behaviorism. Structuralism was already gasping its last in the rare atmosphere of its own formulation. The Gestaltists rejected the idea that consciousness was less justifiable logically and epistemologically than the physical world or the electrical properties of the neuron.

> Objective experience depends upon physical events outside my organsim and upon physiological events in it concurrently. As depending upon physical events outside my organism, objective experience leads to the construction of the surrounding physical world; as depending upon physiological events in my organism, it gives me hints about these processes. *There is no reason at all why the construction of physiological processes directly underlying experience should be impossible, if experience allows us the construction of a physical world outside, which is related to it much less intimately.* (Italics Kohler's)[7]

For this school of thought objective-subjective experiencial dichotomies are completely justified. Direct experience in contrast to the Behaviorist's position is

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[7]Wolfgang Kohler, "Gestalt Psychology", Liveright, New York: 1929, p. 60

objective in so far as it depends upon the processes of the physical organism as such, and becomes subjective when it is not itself "a directly experienced property, but a relationship which we ascribe to 'objective' experience after we have learnt to regard it as the outcome of organic processes and, therefore, as distinct from the physical reality external to organism."[8]

d. Via the Alter Ego. Finally we may speak of another approach--one while not derived functionally from Structuralism and Gestaltism, seems in part, a logical extension of their positions. For want of a name we may term it a clinical-qualitative approach, since it emerged within the areas of application largely (therapy, education, etc.) and since too it deals so largely with affect, feelings, attitudes and other so-called qualitative facets.

Basically it rests upon the assumption that it is entirely possible to perceive objectively direct experience. Here, along with the Gestaltists and Introspectionists, it must clash diametrically with unmodified Behaviorism. But the ultimate justification of the qualitative approach carries beyond the positions of the former schools and must stand upon additional postulates.

At this point it is necessary to note a difference in levels of analysis between the various sciences contributing to the story of human development. We note that both

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[8] Ibid., p. 24

physical and social scientists may and do employ a mode of expression that involves reference to events independent existentially to the observer. And to the extent that each confines his analysis to an explaining depth, that is, to the extent that they do not try to account for behavior in terms of subjective states, all sciences operate within essentially a common framework. Behaviorism would be circumscribed within this latitude.

> At this point, however, a difference emerges. When the social scientist makes the assumption that other human organisms experience fields of awareness of the same general character as that which is immediately "given" to him the problem arises of subjecting these alter-ego experiences to scientific description and analysis.[9]

A physiologist, for example, is not interested primarily in a fellow worker's experience-field. He is interested in his colleagues protocol but this will speak for itself--its validity or worth being independent essentially of any subjective personality factors of its author. Likewise, his subject, the machinery of the body, is directly accessible and any misunderstanding of motivations or intentions towards it is unimportant and almost irrelevant. The physiologist's conclusions will speak for themselves and are generally open to consensual validation.

The social scientists may choose to go no further, as is the case in a Behavioral approach. They may wish, however, to study not only behavior, but also to use it in order to 'get at' the psychic states that such behavior may reflect.

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[9]Herbert Goldhammer, *op. cit.*, p. 23

This may or may not be synonymous with the epistemology of the Structuralists and Gestaltists. One must put the statement so simply because neither school has indicated any extensive interest in the affective, personality-integrative areas.

At this level, presumably, an hypothesis--a guess as to the possible motive behind an action--is validated, first, in that any action represents an act of choice, while other ways of acting are in principle equally possible. Furthermore, an individual (or group) can report on how and why he made his choice and he may also comment on the mental state which is its antecedent or concomitant; finally, he formulates certain states of consciousness as specific socially sanctioned aims.[10]

At a third level, and developing as an outgrowth from the second, the social scientist may try systematically to place himself, so to speak, in the same circumstances as his subjects, observe himself and impute (with modifications based on various other considerations) his experiences to his subjects.

Even more so at this level, of course, the scientist seemingly exposes himself as the chief target of behavioral attack--that of introspection. As Nadel has suggested, however, the term is hardly as formidable and dubious as it is sometimes made out to be, and one may, with Kohler, speak of

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[10]S. F. Nadel, "The Foundations of Social Anthropology", The Free Press, Glencoe: 1951, p. 68

direct experiences, since all we do when we introspect is to observe what is most directly and immediately given in any form of experiencing--including that which underlies physical observation or measurement. Broad[11] has termed the process merely inspection, i.e., a scrutiny of data in our awareness which, again, proceeds in precisely the same manner and with the same validity as the empirical scrutiny of the so-called objective data of the physical world or of behavioristic experimentation.[12]

> There is . . . no clear differentiation in one's awareness between the 'subjective' perceptual process, on the one hand, and the 'objective' perceptual stimulus, on the other which can be formulated only as a system of cognitively apprehended relationships. Instead, there is a reciprocal interplay between stimuli and responses; or, as one might say, a feed-back system exists. As the perceptual process progresses, the apparent stimulus affects the response, and the response affects what appears to be the stimulus.[13]

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[11] C. D. Broad, "The Mind and its Place in Nature", Dutton, New York: 1937, pp. 259 et seq.

[12] K. Lewin ("The Conceptual Representation and the Measurement of Psychological Forces", 1938) is representative of the attempt to use 'noncommittal' symbolism to overcome the inadequacy and private use of our linguistic summaries. It would seem, however, that the replacement of subjective phraseology seems unwarrented since the important, compromising step lies in the admission of consciousness and in the diagnosis of its forms and states. Once diagnosed, these must be given a name which reflects the phenomenal characteristics by which they were judged. To do otherwise, to use quasi mathematical symbolism, seems like a mere circumlocution.

[13] John Money, "Unanimity in the Social Sciences with Reference to Epistemology, Ontology, and Scientific Method", Psychiatry, 12, 8-49, pp. 212-213

--See also: Herbert Goldhammer, op. cit., pp. 1-12

To the extent that the perceptual stimulus does not enter one's awareness as a discrete entity[14] but must be defined operationally, it is necessary that it be broken up into samples or 'operators'--amongst which the reciprocal relationships may be discovered.

The choosing of samples, constituting foci in a 'feed back' system, obviously may be arbritrary. Many different hypotheses as to what constitutes a sample or operator may be proposed. But the test will be whether or not the hypothesis can be put to the test of the rigorous, conventionally accepted procedures of science. And once operators are determined in this way, then a feed back system can become in itself a phenomenon of scientific investigation and can be treated <u>as if</u> it exists independently of the perceiving organism.[15]

Apparently subtending the process of inspection--or introspection--(and perhaps in many cases also, but in unrecognized form, in so-called empirical and explaining observation) is the capacity to empathize, that is, to perceive objectively recognition of the nature and significance of

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[14]The neocortex serves as an associational area and since it is capable structurally and active even before birth, it never operates from a 'blank', without previous impressions to associate, bind, or feed back. Apart from external experience, the cortex is also constantly receiving stimuli via the cerebellum and mid-brain which mediate bodily processes from lower centers, cortex reacting to these and synthesizing them with higher process.

[15]The concept of the 'feed back' is discussed in detail in: Norbert Wiener, "Cybernetics", <u>Scientific American</u>, 36, 536-544

another's behavior through emotional contagion or communion which exists outside communication through the usual sensory channels.[16]

From these assumptions, the scientist attempts to induce dynamic laws and functional relationships from essentially non-quantitative object selection. This activity represents generally a great extension of introspective techniques as visualized by the Structuralists and Gestaltists, for the level is limited no longer to analysis of relatively isolated and static aspects, but attempts to order phenomena at a dynamic ego-integrative and interpersonal scope.

This position is almost the logical opposite of Behavioral psychology; and even more so than for the Structuralists the instrument of research is man, and in this case not man describing perception from a seemingly neutral position,

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[16]Harry Stack Sullivan, "Conceptions of Modern Psychiatry, The First William Alanson White Memorial Lectures", The William A. White Psychiatric Foundation, Washington: 1947, p. 8

--Jules Masserman, "Principles of Dynamic Psychiatry", Saunders, Philadelphia: 1946, p. 274

Actually, future research may prove empathy to be qualitatively similar in every respect to ordinary reception, i. e., perception and organization through the usual sensory channels, utilizing associational or feed back mechanisms. The difference may prove to be one of degree of sensitivity to a range of stimuli ordinarily so weak as to fall within subliminal scope, being accessible only to hypersensitive systems (this under non-stress situations; the point being that the capacity may be latent even within non-hypersensitives, demanding only an emergency to produce it). From this, one might expect those best able to receive a larger range of cues individuals who developed a greater sensitivity and lower threshold through the adjustive maneuvers of childhood; harmony predisposing towards insensitivity.

but man as a reacting system analyzing man by feed back and participant observation.

That man is able to operate at this level has been the subject of age-old philosophical debate. Perhaps in the final analysis subtending all argument in favor of an introspective approach at this level are these two points: (a) That all men share essentially similar neuro perceptive-re ceptive structure, and hence at least potentially capable of receiving stimuli within comparable levels; and (b) that within social groupings (that is, within relatively homogenous cultural ranges) there exists a sufficient similarity within a common range of symbolic systems to enable a necessary level of communion.

> . . . that reality as recognized by mankind is a kind of social convention which men agree upon because their perceptual experiences have certain basic similarities. These similarities owe their existence, no doubt, to the fact that perception is mediated through the central nervous system which is more or less similar in all mankind. Thereby it permits people to act as if things have an existence independent of the mind perceiving them, and with certain intrinsic qualities of their own.[17]

From this a corollary seems to follow logically: perception, reception, projection and introjection are objectively knowable to the extent that the observer is aware of his own self dynamism (i.e., to the extent to which the observer is capable of accounting for the real reasons underlying his behavior and specifically of those defensive mechanisms which imbue feeling and perception with private (parataxic)

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[17] John Money, op. cit., p. 211

meaning.)

For the researcher who possesses a rather thorough understanding of his security systems a methodological possibility emerges which allows him to reach a level of dynamic insight that exists beyond the reaches of traditional empirical techniques. Specifically, by virtue of a trained mind, of a quality of sensitivity and empathy to underlying meaning and intent of behavior, the researcher or analyst is in a position to evaluate a phenomenon and determine its nature and relatedness to larger process by its effect upon his own system and with only a minimal danger that he will react and interpret in a distorted fashion.

Thus by using himself as a relatively known quantity within a relationship with others--these unknown--the scientist is able at times to adduce and formulate, after the collection of concentrated evidence, and after checking its effect upon himself, certain conclusions which he feels are significant to the extent that they warrent generalizing within certain bounds in ontogenesis or horizontal process.

> Yet in so far as it is also true that even the observation of facts already entails omission, selection, and emphasis, that is, a first, inevitable interpretation, the observer's personality cannot be permitted such lattitude.
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> The remedy seems clear: if such subjectivity is unavoidable, it can at least be brought into the open. Which means that the reasoning underlying observation and description must be clearly formulated, its premises explicitly stated, and its operations shown step by step. . . I am not certain whether this rather special form of personality-examination (psychoanalysis) is the most useful one, but some form of psychological testing seems imperative. It need not be regarded as a basis for selection only. It will offer, to the fieldworker

> himself, the necessary knowledge of his personal equation. Perhaps training in psychology would prove adequate, and this too has been advocated. By such means the anthropologist will more readily appreciate his unconscious bias and will be enabled to guard against the pull of forces he has learned to evaluate.[18]

Means and Ends and Culture.

a. Behaviorism

This has been a rather austere and perhaps excessively theoretical consideration of the various avenues and byways to 'how we may know'. It has long been known that traveling different avenues--while they all get us somewhere--may take us to very different places. The task remains to tour the routes to the kinds of pictures of child development each brings us to.

The contributions of the Structuralists may be dismissed almost at once simply because the school, as we mentioned previously, seldom concerned itself with mundane problems at the level of application. Perhaps one must follow their contributions through their insistence that the mind was a fitting instrument by which to perceive knowledge. Yet, as has been pointed out so often, even a highly trained mind does not live in a vacuum. What, for example, could reception, freed from all acquired meaning, "purged of human interest" possibly be? The mind is not something 'inside' and the culture 'out there'. And unless one has lived in a sealed tube, one is of the other, man is of the culture and

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[18] S. F. Nadel, op. cit., p. 50

the culture nothing apart from him.[19] The study of child development as in any other field of interest is, first of all, concerned with a problem or series of problems and the power to acquire predictive insight. There is no such thing as gathering the 'essence' of how a child grows up apart from the context and influence of cultural values and bias, ahd the limits and selectivity or focus these set.

But beyond ends, the Structuralists, as do many scientists today, tended to operate under the delusion that means themselves may somehow be a-cultural, correct through all time and through all the universe--neutral and 'above'. A field needing study, perhaps, is to trace the development of values which lead to and/or influence the invention and utilization of scientific techniques. Techniques afterall are not virgin-born and evolve and develop within a contex of specific problems determined at all points from complexes and unique characteristics of the culture.

Behaviorism (using the term here to denote a methodogy, as contrasted to a psychological system) is, of course, an approach which has exercised a tremendous influence. Although in its earliest and purest form it is somewhat dated, its methodology, like college entrance requirements, has had a powerful hold upon the academic and non-academic world up to the present. To understand the products of behaviorism it is helpful to trace the forces active around its early

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[19] N. Cameron, "The Psychology of Behavior Disorders, A Biosocial Interpretation", Houghton Mifflin, New York: 1947, pp. xix-xx

development.

The behaviorists were psychologists deeply aware of their science's philosophical past. To put psychology on its own feet as a true scientific discipline, it became necessary, they felt, to divest it of all allegedly metaphysical, subjective attributes. The leitmotif was revolt and this is not absent even in more recent writings.[20]

To correct this behaviorists took as their methodological models the systems of German scientific psychology and classical physics.[21]

> Fechner himself was the first to copy _adult_ physics when psychology was an embryo. He seems to have been convinced that measuring in itself would make a science out of psychology. We have seen the results: If flowers are impossible without a root and a stem, measuring, which is fruitful only as the most refined consequences of previous qualitative observation and experimentation, necessarily becomes a dead routine without it. Hundreds of thousands of quantiative psychophysical experiments have been made almost in vain, because no one knew just what he was measuring or what were the processes upon which the whole procedure was built.[22]

This has been the story largely of Behavioral psychology. To take over blandly the techniques developed from the inter-

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[20]Thus Clark Hull still finds it necessary to stigmatize the "medieval" and "theological" outlook in psychology (see Mind, Mechanism, and Adaptive Behavior, _Psychological Review_, 44, 12-13).

[21]One must be careful not to suggest the idea that such was limited to psychology alone: "Much of the vogue of sociological 'experiment' is explicable in terms of--vogue. The natural science most popular at the moment provides the modal. . ." Howard Becker, _op. cit._, p. 104

[22]Wolfgang Kohler, _op. cit._, p. 41

play between problems and data from another area could only lead to a relatively profitless quest. The psychologists who want to construct their science along lines presumably preordained by some other science are, as Becker remarks, very much like the modern Thomists who assume that all phenomena are necessarily amenable to interpretation a la the dictates of right reason.

> 'Orthodoxy is my doxy, and heterodoxy is your doxy.' Such essentially a priori methods of approaching the varigated, kaleidosopic mosaic called the empirical world are barren.
>
> Any science must develop from the interaction of the scientist's mental processes <u>and</u> the data involved. Disregard of the data leads to disregard of science in favor of uncontrolled speculation. The scientist is certainly more than a mere empiricist, but he must be empirical.[23]

From a methodology which insists that we can know only that which may be measured from a position external to the observer, an approach to social science phenomena has developed which, from discipline to discipline, bears a strong stamp of similarity.[24] Generally speaking, behavioral or similar approaches will emphasize observation and descrip-

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[23] Howard Becker, <u>op</u>. <u>cit</u>., p. 104

[24] It needs to be said, however, that, accurately speaking, Behaviorism is not the catch-all or only framework for researchers committed to this type of methodology, for many workers subscribing to behavioral techniques essentially do not accept necessarily the tenants of Behavioral psychology. We would offer the speculation, however, that the work of Behaviorists will show a strong mark of similarity corresponding to the systems and constructs of other disciplines --tending to indicate the importance of methodology in relation to ends. This seems true especially in any comparison between Behavioral and dynamic psychology or sociology.

tion, while minimizing the importance or necessity of explanation and theoretical constructions. This may be due to the vast disparity between the complexity of psycho-social phenomena, on the one hand, and of the limitations of purely 'objective' research techniques, on the other.

At first glance it would seem that a limitation of method in the face of a problem would serve as a stimulant to the development of constructs and theories (and in those instances where an accompanying philosophy does not forbid the use of such concepts as consciousness, this may be the case) but behaviorism, at least in its earlier forms, was committed to a mechanistic and additive philosophy which demanded that the links all be mapped in terms of a limited methodology.

Such approaches, accordingly, may emphasize the gathering of fact,[25] and/or will stress the importance of sharply focused analytical, descriptive research.[26] In the field of child development, for example, Dewey, Jersild (especially in his earlier works[27]), Leonard Carmichael, Wayne Dennis, Arnold Gesell, Harold Jones, Pratt, Munn, V. Jones and McCarthy among many others, devote their main effort towards

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[25] P. Radin ("The Method and Theory of Ethnology", 1933) will say that tangible results of importance can always be obtained "if enough factual material has been collected *in the right manner* (italics mine), p. 31. But surely the proviso "in the right manner" is the crux!

[26] As example: E. Hilgard & D. Marquis, "Conditioning and Learning", Appleton-Century, New York: 1940

[27] See: "Child Psychology", Prentice-Hall, New York: 1933

detailed descriptions of the anatomy, physiology and onset of functioning (which may be demonstrated at the descriptive level) of extroception, introception and reflex activity. Ontogenesis in any area--memory, for example[28]--is generally treated quantitatively in terms of norms for different age levels.[29]

From these and similar researchers[30] one may see the careful and painstaking attempts to classify and describe behavior of the organism--or, more often--of certain parts or organs of the system as they are stimulated to react within controlled but artificial, laboratory conditions. Generally also in the absence of holistic-dynamic theory the subject will be approached and conceptualized atomistically as well as mechanistically, with an overall focus and concern upon the part rather than the whole.

Behaviorism as a school (as contrasted to simply methodology) has undergone considerable change--or perhaps, more precisely, elaboration--since the early days of Thorndike and John Watson and the great preoccupation with basic reflexes and S-R. Neobehaviorism of the stamp of Clark Hull,

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[28]A. I. Bryan, "Organization of Memory in Young Children", Arch. Psychol., 24, No. 162

[29]In its purest form this may be seen in the work of A. Gesell. See, for example, Gesell and Ilg, "The Child From Five to Ten", Harper & Brothers, New York: 1946

[30]C. Buhler ("The First Year of Life", Day, New York: 1930) perhaps characterizes a transitional position at which the attempt is often made to utilize quantitative and normative materials as a basis for limited organizational hypotheses.

E. C. Tolman, E. Hilgard, J. Dollard, F. Marquis and Millard (and in anthropology and sociology of Chapple, Coon, G. Murdock and Robert Lowie) has extended its focus of inquiry somewhat but still the attempt is made to account for higher mental processes--moral behavior, values, reasoning, etc.--in terms of elaborations of basic reflexes which are organized into chain sequences through conditioning.

Characteristic of the neo-behaviorists is the inclusion into consideration of reasoning and insight. One must ask, however, if such concepts are accepted--if Miller and Dollard, for example, will attack the psychoanalytical concept of the unconscious[31]--would it not seem to follow that they must admit by implication the existence of mind and consciousness? How else can one react to a monographic description such as the following by Dr. Tolman?

> In planning and analyzing them (rat experiments) I am openly and consciously (sic!) just as anthropomorphic about it as I please. . . casting (my) concepts into a mould such that one can derive from one's own human, everyday experiences, In my future work (I) entend to go ahead imagining (sic) how, <u>if I were a rat</u>, I would behave.[32]

Despite such obvious lapses the neo-behaviorists, whether psychologists or in other areas of the social sciences, present conceptions of child development which emphasize those aspects patently amenable to their methodological

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[31] N. E. Miller & John Dollard, "Social Learning and Imitation", Harper, New York: 1941

E. C. Tolman, "The Determinants of Behavior at a Choice Point", <u>Psychological Review</u>, 45, 24 approach. As Mead said: "There remains in human conduct a field of inquiry which behaviorism cannot reach; the behaviorist simply did all he could to minimise the difference."[33] Ritchie put it more unkindly:

> The mistake of behaviorism is not so much refusing to take account of consciousness as refusing to take account of any facts except those revealed by a special kind of laboratory technique. The evidence attained by their methods is biased and incomplete and resembles too much confession of crime obtained by torture.[34]

This has been primarily a methodological consideration and it does not necessarily follow that behavioral findings must bear a stamp of being untrue or dated. But we would argue, first of all, as Kohler protested, that much of such research is of limited value or help towards the task of laying down the primary framework of a conception of human development. Behavioral psychology has little to say towards penetrating the mysteries of the problems recognized at present as constituting the real frontiers. These are problems of the organization and dynamics of self and of interpersonal and cultural processes. Needed are working theories and as we will attempt to sketch under problems of synthesis the precise but narrowly focused behavioral findings may serve in a larger scheme as detail and manifestation of underlying process. In a last analysis they may

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[33]George Herbert Mead, "Mind, Self, and Society", U. of Chicago, Chicago: 1934, pp. 8-9

[34]A. D. Ritche, "The Natural History of the Mind", Appleton Century, New York: 1936, p. 277

constitute the 'damned facts' of which a holistic construct must properly account for.

In summary, the case against Behaviorism (and related research effort) appears to center about two points: First, that the very grave error was committed of allowing means to become divorced from ends. Secondly, the school developed in isolation from a larger reality which had much to contribute as to the depth and scope of man's unknowns. From its myopic point it could see little else than the trees.

As of the first point, by wedding itself to an essentially foreign methodology--one achieved in another science and only after a long process of growth and evolution in the face of distantly related problems[35]--Behaviorism was forced gradually into a position of allowing itself to perceive the nature and scope of its field and problems through method itself. One is reminded of the lines of Franz von Sichingen:-

> Show us not the aim without the way.
> For ends and means on earth are so entangled
> That changing one, you change the other too;
> Each different path brings other ends in view.

The fate of Behaviorism was to be perverted to a study of certain simple mechanisms occupying a small corner within a field of infinitely more complex and dynamic phenomena.

Secondly, Behaviorists suffered, as have others, from the 'ivory tower' disease. In saying this we are not drawing condemnation upon so-called pure research, certainly far

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[35]Wolfgang Kohler, _op_. _cit_., p. 41

from it. But a distinction--and especially in the social sciences--needs to be made between aimless research, research in a vacuum--and reality, the patterns and levels of organization relavent to it. One cannot with profit ignore constantly and deliberately a larger world of relationships by attempting to study a phenomenon 'as if' it were or could be utterly torn apart from a larger organization from which it takes its meaning, function and very excuse for existence. Further,

> . . .every fragmentary science needs at least a minimum of assumptions about the nature of man in order to house the particular propositions and records of events which belong to its selected domain.[36]
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> The point is that behavior is a story with a plot, and the main duty of the psychologist is to discover that plot and objectify it and fit it into the scientific scheme. Otherwise, if we insist upon dealing with isolated incidents only our role becomes that of mere photographers and mechanics. Since the latter course concerns itself only with superficial details, naturally it is not attended by the difficulties and uncertainties which go with the larger task of explanation. But as a matter of fact we have no choice but to perform this larger task.[37]

b. By the Middle Road.

It remains to point out the obvious, namely that the social (or biological) scientist will by no means fit necessarily into the fold of one school or the other in his

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[36] Edward Sapir, "Science Versus Man", From: Selected Writings of Edward Sapir, Ed. David Mandelbaum, U. of California, Berkeley: 1949, p. 580

[37] Prescott Lecky, "Self-Consistency, A Theory of Personality", Island Press, New York: 1945, p. 30

approach to a field. Behaviorism denotes a polar extreme from which, as in French politics, many positions of groups or individuals extend in varying degrees towards the center where in this case the importance of theory and dynamic process becomes progressively more important.

This is the trend towards an opposite pole--one for want of a name we have termed clinical--in which as one proceeds towards it the subject matter exhibits a change from a Dewey- or Carmichael-like interest in random reflexes, sundry mechanisms and quantitative correlation studies of such phenomena, towards a central position, one highly eclectic and diversified and occupied by researchers concerned with such problems as the organization of perception and behavior and problems of integration and maturational dynamics, and often to many aspects of subjective experience itself.

This broad but poorly defined area includes the overwhelming bulk of workers in and around the field of child development. If the dynamic elements loom large the importance of supporting studies and quantitative evidence is still important.[38] This is a methodological difference essentially and it centers in the admission of a somewhat wider range of research techniques--specifically of the inclusion

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[38]Consider, for example, the differences in approach to analyzing drawings as projections of underlying meaning and inner self dynamics by Alschuler and Hattwick ("Painting and Personality", U. of Chicago: 1947) with its quantitative treatment and limited conclusions, on the one hand, and the highly clinical approach with its broad generalizations and highly introspective evidence as exemplified in Machover's "Personality Projection" (Thomas, 1949), on the other.

of limited empirical methods. Even a Freudian contribution well aged by time may receive consideration. It seems almost typical that many scientists within the middle area incorporate or build theoretical systems around certain dynamic findings that have been developed through the clinical approach but that the source has been in the process overlooked conveniently. Thus the situation may exist of a scientist condemning certain, say psychoanalytic tenants, yet ignoring his own debt to them or the fact that his own approach is based to degree upon contributions from that area.[39]

For all their revolutionary tendencies, the Gestaltists established a position much like that of the Federalist party after the American Revolution. Springing from this school or being in sympathy towards it, however, one may find such scientists as Heinz Werner, Lashley, Hebb and Lewin who each in his own field and way has carried this approach further by his interest in the dynamic-organizational aspects of process and nature of organism. Lashley, for example, is concerned primarily with mental activity in terms of neural structuring and ontogenetic process. Werner is interested in the organic approach (as contrasted to the mechanistic) towards Gestalt problems of schematizing

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[39] Shaffer in his work "The Psychology of Adjustment" (Houghton Mifflin, New York: 1936) utilizes the Freudian concept of the unconscious and then proceeds to state that "the psychoanalytic concept of the unconscious has no place in objective psychology" (p. 417), indicating, perhaps, an ambivalence to a methodology while accepting an idea.

perception at the descriptive level, and Hebb of both the physiological and psychological problems of the mental aspects of the organization of behavior.

It is necessary again, in attempting to characterize this very large middle group, that the distinction be made that it differs from both extreme right and left, not necessarily in terms of the degree of acceptance of dynamic or holistic conceptions, but for the careful distinction that is made between theory and evidence, and of the importance and type of the latter. Thus, while ranging often far beyond the confines of 'objective' and empirical research (as necessarily would Hebb and Lashley in terms of the problems they have set for themselves), they generally accept, nevertheless, its governing postulates and are aware fully of over-stepping these bounds into theory (and to the extent that they are consistent, of the points at which they do so). In the main they adhere to objective, quantitative evidence for their epistemological justifications but to the extent that clinical approaches meet these standards these also are admissible as sources for valid evidence.

In general, researchers avoiding the extremes play a close game between gold plated evidence and blind excursions into the varied-plains of the unknown. One may be surprised occasionally to see, for example, a 'right middle-of-the-roader' (and often as not out and out rightest) such as Arnold Gesell, suddenly introject amid quantitative material a statement that an infant has a racial inheritance, or from a more eclectic Earnest Harms, a statement that an infant has a biological urge to be raised by his own biological parents![40, 41]

The respect for empirical evidence is much the same in all fields at the point of the basic premise. As in the case of everyone believing in democracy, each field has its own ideas of what practices constitute good research standards. In synthesis this is a strong obstacle.

One may type this middle group as the stablizing influence within the fields. In it fact and theory tend to balance, with neither the almost nihilistic attitudes of behavioristic methodology, or the often theoretical excesses of the clinician holding sway. In cultural anthropology it is the difference between a strict enthnographic accumulation of facts or statistics of a Lowie, Boas or Radin, on the one hand, and a super theoretical and interpretative approach of a Roheim, Malinowski or Mead, on the other.

Characteristic of this middle group is the attempt to fashion fact and theory (insofar as one can make the distinction between the two) into a body of knowledge immediately useful at the level of application--be it in the areas of colonial administration, social service, education,

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[40]Arnold Gesell, "The Ontogenesis of Infant Behavior", From the "Manual of Child Psychology", Ed. Leonard Carmichael, Wiley & Sons, New York: 1946, p. 295

[41]Earnest Harms, "A Fundamental Concept of Analytical Psychology for Childhood", The Nervous Child, Vol. V, No. 2, 151

psychotherapy, or economic planning.

In effect, by the middle road a necessary compromize has been made between an overly rigid methodology and very inclusive but high-floating theory in the need to bring answers to problems waiting for solution. Under stress a pragmatic approach to validation is accepted, but otherwise the inclination is towards a more searching substantiation of theoretical premises.

c. By the High Road

The 'high road' is wide and smooth, it has no speed limits, and the vistas and horizons are unbounded. It is *sui generis* the road to constructs and theories of great sweep and dynamic tenor. Pushed to its extreme all phenomena may be subjugated eventually to their common elements--dreams, reflexes, delinquency, conception, death, reduced to the overwhelming interplay of more basic organizing levels, eventually perhaps to the level of energy itself. There is a little of its flavor and quality in the low road and more in the middle; but further up all stops are pulled and the sky becomes the limit.

It is a dizzy road to travel because one may see (too) clearly the artistic, the intuitive, the empathic heart of science in frightening clarity. On it hunches are given the right of way and the sticky impediments of methodology (in its overt and formalized forms) are, for the moment, pushed aside. Upon it fantasy of broad and even universal scope may be condensed highly into symbol and imagery and these are limited only by the minds that produce them.

There are other characteristics of this road. One rarely finds on it merely a view of this area or that. The view is generally too great and sweeping and the goal this road takes one to is seldom purely psychological, or sociological, or that encompassed within any other single discipline. Subject areas tend to lose their homogeneous quality and few who travel the high road continue to worry about taking the correct turn to avoid boarder conflicts; on the trail of an idea, one goes where it leads.

The efforts in the areas of child development from this highly theoretical approach are overwhelmingly multi-disciplinary, being composed often chiefly of elements from dynamic psychology and social anthropology. This would seem logical, of course, as the two account for the substance of the psycho-social nexus of child development. Seldom are researchers formally multi-disciplinarians, however--say psychologist-ethnologist--but rather they are those who in their search have found their fields too circumscribed to yield the answers to the types of problems each is at work upon. Thus Erik Erikson, Abram Kardiner, Karen Horney and Erich Fromm are psychoanalysts channeled into the social and cultural areas for answers not available within their own fields alone; likewise Harold Lasswell from law, Mullahy from sociology and Lippitt and Plant from psychology and psychiatry, respectively.

This area of the theoretical constitutes the frontiers of science, where problems are first stumbled upon and new relationships, and where more adequate integrations are forged empathically together. To the extent that one uses this road he is attempting to manipulate a panorama of stimuli around him towards a new integration, one often carrying him far beyond the level of previously available insight.

One may, if he chooses, concentrate upon the wild excesses which at times accompany this approach. But again it is also the fountain head from which ideas spring which may be refined sequently at the slower levels of application and detailed validation. This process is somewhat similar, to the role of the radical parties in American political history. One rarely votes them into power but left hanging around long enough many of their ideas are taken over and incorporated into the 'safe' platforms of the major parties --Bull Moosers, Greenbackers, Populists, Socialists, Progressives, all have contributed mightily to the structure of the American political and democratic complexity, where once their ideas were marked as crack-pot and dangerous (to the status quo).

The contributions of the clinicians need not always be viewed in retrospect but generally, because of their often advanced positions extending far beyond denotative and quantifiable methodology, their validity and consistency remain answerable largely in pragmatic terms--the thing, or idea, works. Further, proof exists in the vague feelings of harmony or its absence within the minds of those who formulate ideas and in those who attempt to retrace the line of internal reasoning.

In a very real sense this feeling of harmony is not, as we have tried to indicate, something fanciful and logical only in some schizoid sense. The thought process behind a theory is in the final analysis not a difference in kind from that which is employed in measuring with a brass instrument. To insist that a hunch or 'ah ha!' experience is one wit less logical is to condemn in effect, also all forms of scientific reasoning, for the former is primarily a tremendous condensation of the overt, analytical qualities of the latter.

What does this avenue lead us to in child development? It is concerned with the interactions of personality and the formation of the self dynamism, process at a subjective and organismic level. It is concerned with the synthetical task of covering a unified field of phenomena and of the analytical attempt to get at the underlying consistencies within a welter of seemingly idiographic and countering information. Above all, depending upon its initial perspectives, i.e., as being primarily physiological, psychological or social, it generally leads one to approach the child or society as one focus within levels of surrounding, interrelated phenomena. The clinical method, arising as it does from a relatively freer play of a subjective mind (but not necessarily carrying any connotation of inaccuracy for that) leads naturally to a scope of inquiry almost invariably intra- or interactional or dynamic and which in turn, funnels out quickly to the antecedents and secondary factors of different levels and wider spheres.

In the works of Deutsch (Psychology of Women, V. I:

Girlhood), for example, or in Issacs' (Social Development in Young Children), Erickson (Childhood and Society), Plant (Personality and Cultural Patterns), Riesman (The Lonely Crowd), even of Allen (Psychotherapy with Children), here we see the efforts to cope with what confronts us quite obviously as enormous areas of unified, interacting process and which present a bewildering array of motion and change. Behavioral or rigid empirical methods, alone, are obviously almost totally inadequate as yet to arrest sufficiently the tremendous movement and current of such a kaleidoscope in order to isolate elements and snap a picture, and from thence to attempt to deduce.

From the clinical method what scientists have attempted basically is to get at the characteristic patternings and qualitative nature of certain logical foci--human nature as one--from larger Gestalts or areas of organization. Such an approach means riding a current, of attempting to view a tremendous amount of motion and interaction, without being able to isolate or control variables at will.

Whether we like proceeding from such a field of change or not we really haven't much choice, human phenomena exists in such an environment and we have to take it as we find it. As Lecky somewhere pointed out, we must forge answers and theory to fill an intolerable vacuum; and even a bad theory, if it meets some conditions, if it gives us some predictability, is better than no theory at all, or a collection of mere atomisitc facts.

PROBLEMS OF SYNTHESIS

> . . .one must abandon any hope of completing at once the theory one is in process of building, clearly understanding that only successive approximations can bring one to the desired goal. . .Only a presumptuous ignorance can insist on an exactness that a science of the concrete cannot attain. The terms of such a science must correspond to reality, but that is possible only within certain limits.
>
> Pareto[42]

One need not strain for profoundness to put his finger on the main obstacle towards a synthesis of human development. In truth this hurdle has been one largely of omission --of the scientist having made the journey so seldom. This difficulty has emerged through the actions and fortunes which have proclaimed that social disciplines would divide up the areas of human development each for its own exclusive exploitation.

This, as in the emergence of political boundaries, may not have been so disastrous if man had had time to discover what all had in common and of how each was related to the other and the whole. Just as man is man before he is a Frenchman or German, so sociology and psychology deal with the same species, man, a unity of many facets.

History and early division have sliced a pie, but the unfortunate aspect has been that no one really knew of what the total looked like and of how his share contributed to

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[42]Quoted from Howard Becker, op. cit., p. vi

the whole.

Another major difficulty is that we do not know enough even were our resources mobilized in the most comprehensive fashion. One does not have to probe for the gaps in our knowledge of child development; they are not like tiny islands amid the charted seas, but the reverse: our patient accumulations of insight exist like reefs, sometimes connected, more often not, within a sea almost as uncharted as the Atlantic in 1491.

We are implying that, not only are we not far enough advanced, but quite literally that we do not really know what we already know![43] That is to say, our store of knowledge remains unassimilated and unintegrated to a surprising degree within any larger organizing framework. Our efforts have been so overwhelmingly analytical and deductive that we lack organization from which to pigeonhole the wealth of old and new material sifting around us. Actually the development of relatively inclusive frameworks is a recent phenomenon and the multi-disciplinary approach of even more tender age. We have borrowed heavily from the political area for analogies and cannot resist noting the similarity between these recent efforts and those of the nations of the world towards a federation if not a united system.

It is no reflection of credit to one in pointing out the slow progress in this area of coordinating effort: the problems of synthetical constructions and multi-disciplinary

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[43]A statement by Dr. Lois Barkley Murphy

effort are patently difficult. Given a very limited methodology and an inadequate background of knowledge, progress in both tasks must of necessity remain slow if growth is to be sound and if what we build is not to be torn down in the future because of haste and mistakes of the present.

In this discussion there is a need to consider further the nature of synthesis, some of the present barriers, and possible roads towards a more positive approach.

The Attributes of a Scientific Synthesis. The attributes of a synthesis are impossible probably to specify beyond certain generalities, indicating its essentially artistic nature, or simply, that the logical processes which must go into its construction are beyond the overt and still clumsy efforts of implicit and denotative reasoning. One can analyze--after the fact--the features of a good painting, but one feels that in a last analysis something remains beyond, something seems to be left unsaid. Many of the attributes of a good synthesis must be described in artistic terms. Pullings things together is a matter of 'selection', first of all, and then of 'balance' and 'proportion', indicating that there is no methodology which can answer qualitatively the questions of scope, inclusion, relationship, ratio or outline. Furthermore bound up in any criterion are questions of purpose and intent, and ultimately of cultural values and subjective or private motivations.

In approaching the task of synthesis there are certain characteristics which while not saying very much are, nevertheless, essential form for the elaboration to follow.

In stating these we are not beyond consideration of the structure and organization of any analytical or specialized theory yet their inclusion for consideration seems necessary for reason which will follow.

In the first place, but one which has apparently not always been so obvious, one must proceed from a clearly formulated problem. The lack of clearly stated goals and of an adequate analysis of their nature has lead to the rather frequent occurance of elaborate and prolonged research efforts which, as in Behaviorism and Introspectionism, have degenerated to little more than a play (with variations) on a theme by method. It is tempting, for example, to become intrigued with mathematical symbolism as in some types of typological sociology and psychology and somewhere along the way become so amoured with the resulting impressive form that all awareness of purpose and all consideration for the law of parsimony become lost--in effect the world, the thing one is investigating presumably is left out. The typologist needs to understand clearly the problem he is attempting to solve, the answers he is looking for. One must consider to what purpose is it to compile elaborate diagrams, symbolic systems and the like for an answer the man on the street can rattle off in five minutes.

From the precision of a clearly identified gap or unknown all else follows and takes its form from the nature of particular attributes of the problem at hand. A synthesis for what? For a foundation from which to project a more adequate program of social service in a high delinquency or illegitimate child birth area? Perhaps for a new approach to formal education at a primary level? Or perhaps for a survey of developmental and maturational processes? Obviously determination of the problem and its implications is important in determining what is to follow. Two of the examples given are at a level of application, i.e., designed to facilitate directly a program for some practical purpose, while the third example is addressed to a more basic problem and related to the first two in that it may constitute an area from which more specialized projects may be developed. The first two would tend to be more detailed, the latter, because of the scope of ground it must cover, general and primarily longitudinal.

From this one can then be concerned with the internal consistencies: "Given these assumptions and postulates, we propose to show that such and such follows and that its elements are logically related." Peculiar to the synthesis rather than to a more one dimensional approach, a theory needs also to account for a varied-level range of phenomena which has existed hitherto seemingly parallel, idiographic or fractionated.

This would be <u>the</u> essential factor in a synthesis of human development as contrasted to an ontogenetic study of physiological and physical maturation, or of the psychology or sociology of human growth. A synthesis of human development in its ideal form and while in progress is no longer sociological, physical or genetic, but a total focus upon human development--this constituting a field or division of effort in itself, comparable to sociology, enthnology or what not. Depending upon its scope and the developmental period, a synthesis may utilize and cut across any discipline it needs in order to adequately cover a total process. Discounting an inevitable ethnocentrism towards one's own field, it would lean logically upon no single approach (whether intra- or inter-disciplinary) except in terms of a field's relative potential contributions. To the extent that it is successful synthesis represents an arrangement of elements different from a linkage of its parts. It is precisely because it is not a mere concatenation of component elements into just any pattern but an arrangement yielding a new level of integration, that makes the synthetic effort so difficult.

Some Barriers to the Synthetic Process. Synthesis denotes a restructuring of the structured. The habits of scientists until recently, however, has been largely an effort to divide off and then subject their dominion to a searching, minute analysis. It is almost typical, for example, of the confidence during the early 20th century that when confronted with the mystery of dementia praecox the answer was to be sought in terms of even more intense cytologic micro-sections of the brain. In many cases the thinking was that the answers lay within the confines of one narrow focus. And when an analysis fell far short obviously of the needed solution it was apt to be interpreted by many scientists that either the problem was a philosophical issue, belonged in somebody else's bailiwick or was ignored through some process of selective inattention.

The suppressed, of course, like the memory of an unadmitted murder, has a way of reasserting itself and forcing science to take another look. One may see still--and often with great vividness--the effects of a past great faith--that at last we have the 'feel of the fur itself'. Many agencies and other organized efforts still carry the scars and reflect a past shallow approach to what are recognized now as complex problems in their almost pitiful present inadequacy of design and provision, this solidifying through time into institutional rigidity.

A practical-minded public may yield finally the task of finding an answer to a social problem to the scientists who, in turn, go forth armed with swords for a job that calls for a machine gun. The outcome of such naiveness on the part of both groups, of an originally skeptical public and an overeager and over optimistic science, is to tighten an original circle of impatience, misunderstanding and distrust of both groups towards each other. One need only look at the school with its not always too late, but with its often too little.

If the public is frequently indifferent towards large areas of problems to the extent that it frequently makes only half efforts, difficulties also have existed within the confines of the scientific world itself for, of course, the one is never really separate from the other. We have already mentioned the early presence of over optimism, the frequent presence of clanishness and the lack of coordinated effort among the disciplines. This latter characteristic has laid the foundation for much of the present difficulties in our attempts to establish multi-disciplinary and on-going efforts. Isolation, whether political, social or scientific rapidly breeds differences in language, customs and tradition. In this case those struggling presently with the task of organizing integrated approaches are discovering daily the differences in terminologies, research methods and criteria, as well as the accumulation of rust which manifests itself when ever an attempt is made to combine resources towards a seemingly common problem.[44]

Curiously interlaced within the difficulties of synthetic effort--perhaps symbolizing them--are the almost intangible personality factors. These seem to assume undue importance as researchers from various fields are drawn together in common projects. One is forced to note with general disappointment the results obtained from the still all too rare opportunities when sufficient support exists for such combined effort. Perhaps in visualizing the gains that might be made, one allows his fantasy to think along the erroneous terms that a comedy show will be twice

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[44] This has emerged frequently as a chronic problem in one form or another in universities and research centers attempting to organize interdepartmental committees for the study of broad problems requiring multi effort--city planning, human development, social thought, etc. One may see often a shift into opposing factions.

as funny if, for example, Milton Berle teams up with Jack Benny on the same show. "Just get the boys together", and, "All we need is the money" might be the hopes and reasoning in both cases. As with comedy the situation is not as simple as it seems. There remains the confoundedly difficult task of integrating and coordinating skills towards a larger total. These difficulties are analyzed out primarily in these terms, and as we mentioned earlier buzzing about very parataxically are the problems of interpersonal relations and communication at its many levels.

If the personal equation often looms large as an obstinate problem, it is small in comparison to that of providing the financial security and continuity necessary for continuation of research. Study in the areas of human development and cultural dynamics is extremely expensive, time consuming and requiring the maintainance of large and well trained staffs. The public, again, is generally aware of a need for research in, say, cancer, at the threshold, perhaps, of seeing a need for study of rheumatic fever, but still far from being convinced in terms of shelling out substantial funds for research in, say, racial and religious prejudice, or in how children grow and mature to become happy and desirable citizens.

In passing one must note also the present lack of central clearing agencies--such as the recent Rorschach Exchange--for coordinating and channeling experimental effort. This theme will be developed further in the next section.

Towards a Positive Approach. Perhaps the greatest need at present is to discover a framework or conceptual schema broad enough to house or tie together in a synthetical fashion the present largely parallel or idiographic efforts of not only different disciplines but from different intra-disciplinary schools. How to utilize the contributions of methodological approaches often contrasting or openly antagonistic is a pressing problem since the bulk of present approaches to human development lean too heavily in one direction or the other, often totally ignoring potentially enhancing findings from differing schools and areas.

It may not be desirable to attempt to compromise the methodologies of say 'objective' techniques with those of a more typically empirical or clinical approach, but what may be attempted legitimately is to organize the findings of diverse schools of approach. We are saying that largely because of methodology, various foci actually operate upon different levels of phenomenal process and that these may be synthesized possibly upon a much larger scale than is attempted generally at present.

This may be illustrated by a three ringed circle (see figure 1) in which the outer circle corresponds to findings at the behavioral and quantitative level primarily; a second circle, standing for a freer use of theory and empirical methods, leads to limited dynamic and organizing insights beyond surface phenomena; and finally an inner core refers basically to highly theoretical and empathic techniques which frequently furnish insight of underlying consistencies and processes of integration and organization within highly dynamic and holistic scope.

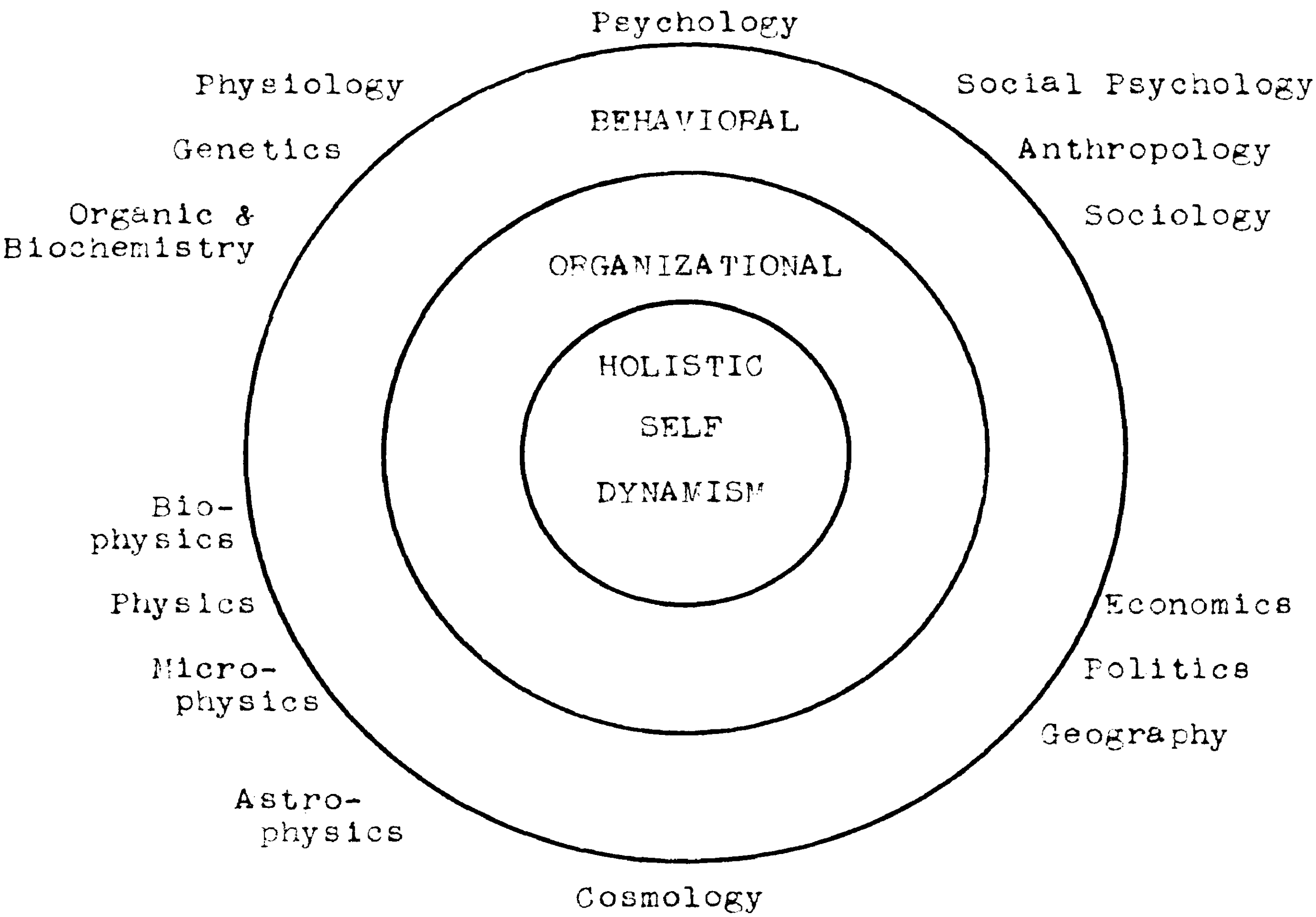

Figure 1. A conception of utilizing the findings of differing methodological approaches.

In developing more adequate insights towards the total of the growth processes, we visualize a science of human development as functioning primarily at a level of secondary research, between primary research in necessarily specialized areas--physiology, genetics, etc.--and a tertiary level of application--education, social service, colonial administration, and so on. Its justification would rest presumably upon not being committed, so to speak, to a near-sighted examination of any limited area, but rather constantly with a focus upon the whole, and operating by gleaning out from the respective fields that which will add light to a total process.

A scientist in this field, accordingly, would possess necessarily the qualities of competence and familiarity within a cluster of related fields and the ability to focus upon those from the context of the over-all scope. His task would be one uniquely of scouting and synthesizing; further, we may see his role as a stimulus towards coordinating and ordering research, throughout the various research institutions. In many instances those agencies specializing in the broader field of human development would act as clearing and exchange points, and further serving to encourage projected efforts into badly needed areas.

There are certain methodological procedures which may be emphasized in the positive approach. Perhaps ideally, physiological research will be increasingly multi-disciplinary, emphasizing the high degree of interrelationship between the soma and psycho-cultural-geographical influences. Seemingly this would connote the attempt to gather and order data from a wider area, including the differing cultural and geographically determined patterns in diet, rest, and the host of man-made provisions for pregnancy, infancy and childhood which directly or indirectly contribute to or influence physical development.

Recent efforts towards fighting the serious diseases of childhood also have indicated the complexity of the tasks ahead and of the need to establish long-term projects of broad scope and with provision for a high degree of coordination over specialized effort. The study of cancer and its etiology seems to be an especially apt example.

Research into the causes of mental and neurological defects--cerbral palsy, Mongolism, etc.--which appear at birth may require placing special emphasis upon the need to formulate studies in which possible causal or contributing factors may be tested to limits greater than is possible with human beings, while other variables are held constant. Integration of extensive animal research within the larger interdisciplinary and longitudinal framework may allow a systematic analysis of the various factors in pragnancy--nutrition, endocirne variations, temperature, vibration (noise), strong emotion, etc.--as they contribute possibly.

Direct research into the nature of personality has proven extraordinarily difficult. This second great area is a reflection of the constant efforts of the organism to maintain itself within constantly changing internal-external balances and fields of forces and it proves extremely difficult to establish any controls and constants. All seems to be motion, change and interaction.

To focus upon personality directly or by itself now seems a barren task and meaningless almost. Encouraging are the developing techniques which allow observation upon interpersonal processes and the larger aspects of the interaction between the organism and its environment. From this broad bio-social approach the possibility emerges that many aspects of self not seemingly reachable via frontal assult may yield through analysis of the interactions between particular children and their particular environments. Insight into personality in this sense emerges almost as a by-product.

These objectives seem to call for extensive effort to observe children of differing cultures or socio-economic classes as they develop through time. Through the comparative technique many of the inherent obstacles centering around the manipulation of variables are weakened. With the wealth of cultural variations and environmental conditions, the most promising trend in child research may be to utilize the child in his world as the research laboratory--a far cry from the harness, puzzle box and galvanometer.

One may reflect, parenthetically, upon the scope of the problems in social research by noting the continuing presence of the difficulty of translating qualitative findings into some kind of quantitative terms whereby they may be utilized effectively. It may prove insufficient and unrealisitic, however, to insist that human behavior and its underlying, organizing dynamics can be reduced to quantitative terms in the same sense that one may analyze the mineral contents of a rock, or the structure of a receptor organ.

<u>The Major Gaps in Our Knowledge of Human Development</u>. It is often impossible--although at times perhaps desirable--to limit and set the researcher upon the trail of a specific

problem. To some extent a scientist must be allowed a margin of freedom to explore in the direction his bent and curiousity seem to lead him and as a further selective factor, into those areas where his modus operandi or methodology seems most applicable. That a serious necessity exists, however, to order investigation is quite apparent from the fragmented and discontinuous state of present understanding. As Sapir stressed so pithily, the pressing need is to develop insight leading towards the discovery of the continuities and unifying dynamics in ontogenetic and cultural processes.[45]

It is hardly an exaggeration to state that at present we do not really know with any degree of adequacy and from a dynamic and holistic-integrative prospective how children develop normally. The over-all need is to identify qualitatively the nature of those processes at the bio-social levels which are important and positive (ego-tonic) in the development of healthy bodies and stable (and democratic-prone) personalities.

There is nothing in all of this of any connotation that, this being so, Behavioral or minute and surface (essentially quantitative) research, is not needed or of real value. In the last analysis facts are the stuff from which theory may be projected, and obviously the more facts or specific insights we have the more adequately theories

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[45]Edward Sapir, "Why Cultural Anthropology Needs the Psychiatrist", Psychiatry, V. I, No. 1, 12

may be developed and the more consistent they will have to be. But it must be noted also that it is only from some kind of referent that one may focus upon any phenomenon, to even recognize it and raise it to the status of 'fact', and that without an adequate conceptual framework such a fact is next to worthless. The inductive-deductive approaches in some sense, then, are closely reciprocal and complementary processes and research only suffers from a prolonged over-separation in favor of one or the other.

a. Physical and Physiological Unknowns. It is from the 'lowly' soma, we need remind ourselves, that all the wonder and poetry of human life emerges. The mind acting as a focal point between an organic system and a socio-physical world is the mediating or ego-integrative activity between, for practical purposes, two separate planes. Of course any insight that will push back the frontiers of the mysteries of life itself are of greatest value obviously. Of more immediate concern, however, is the task of forging the links between essentially physiological or organic levels of organization and their ultimate manifestation--psycho-social phenomena.

This is the great gap and, except for promising but extremely theoretical constructs--those of Hebb, Lashley, Kemph and Bailey among all too few others--there is almost complete darkness. That branch of science known as physiological-psychology, unfortunately, has seldom ever faced the task that is logically and uniquely its own.[46]

Ascending many steps from the ultra theoretical towards areas of practical concern, physical development, both prenatal and postnatal, must command a significant share of future investigation. Primarily from recent research, we have some evidence to indicate that the foundation for healthy personality is laid long before birth, but we have little definitive knowledge as to scope or detail. From this vast problem further answers for questions of relationship between mother and fetus stimulates the hope that greater techniques and insights will result enabling us to reduce the number of infants born with mental and structural defects through better prenatal care.

In these problems, of initial concern to the practicing physician, it is to be hoped that such research will incidently serve to throw further light upon the nature of the ordering and coordinating processes of growth. This vast area of tropisms and systems of precocity and hierarchy has only been touched upon through the pioneering efforts of such scientists as Coghill, Wetzel, Schneider, Hoagland, Child and Spiedel. Their discoveries have been amazing enought to tease the appetite at what are actually aspects of the inner characteristics of living process itself.

At present also we have only tentative and somewhat con-

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[46] If we are allowed to take Morgan's excellent treatment of the field ("Physiological psychology", 1943) as a criterion, it would seem that we are still hardly passed insight at the level of intro- and extro-ception and problems of neural conduction a la neo-behaviorism.

fusing evidence on the possible relationships between constitution (so-called) and personality differences. Our knowledge is fragmented even more as to the subjective (integrative) experiences which derive from variations in energy levels or of differing sensory and reactive patterns. What implications do these qualities, present very early in the prenatal phase, carry for future personality development and the types of care needed? It would seem important also to understand the adjustive implications of the infant facing life with physical handicaps and of the steps which might be taken to moderate undesirable effects.

The whole area of diet and development remains sketchy. One task still remaining is that of establishing definitive relationships between diet and the control of the wide prevalence of dental carries or of the long-range effects of various culturally or class accepted diets upon health, energy levels and freedom from disease.

b. Of the Vast Psycho-social Field. At the socio-psychological level it is embarrasing somewhat to say that at present we still do not possess sufficient understanding at a detailed, functional and comprehensive level of the dynamic structure and scope of healthy personality. There is a great need, especially at certain neglected age-levels, to attempt to follow emerging patterns of personality development and for taking a closer look at the patterns of interaction between the child and contrasting specific cultural practices within the interpersonal areas, and beyond that, of the effects of institutions, objects and artifacts.

Beyond classification at a level largely static and descriptive and of the presence of certain class or group-bound norms, we have almost no understanding of how the various needs of the individual are projected and in turn met by his environment. At present, therefore, to a surprising extent we cannot say how children grow up to be desirable citizens. If we can point with greater functional insight to the kinds of experiences which aid and support the child's efforts to achieve security and balance within himself we will be projected much further along in our attempts to reduce mental illness, juvenile delinquency, and towards giving children a greater and deeper understanding of themselves and of their world about them.

Many workers feel that it is critically important that we be able to identify the nature of the core of healthy personality, and many would like to know also the relative importance of the early stages of development of self as contrasted to later stages of growth and of the extent to which the experiences and achievements of one may over-ride the other.

From such research may come greater insight into the intellectual and emotional nature of adjustive (integrative) processes. At the intellectual level how are experiences organized--what is the nature of abstraction, of symbolic and conceptual processes, and of emerging autonomy and will? At the emotional level, what are the conditions under which personality will select one complex of adjustive patterns, particularly those of a positive and constructive approach, as against some other--perhaps self defeating and destructive. Such insight would be of extreme importance in meeting the needs of children living under the pressures and confusions of a modern world. Why typically do some children develop contrasting modes of adjustments to basically the same reality problems, aggression as against withdrawal, projection as against self punishment? How may we better provide for socially constructive outlets for aggression, of letting off steam, and for encouraging children to turn their conflicts outwards in such a way that we may be of aid to them?

Of importance to the field of child development will be further insight into the processes of how children often grow out of difficulties and conflicts seemingly and the nature of this adjustive resiliency.[47] From this understanding less would be blocking the way towards providing for the experiences by which children may become tough, viable and highly adaptive, while preserving a sensitivity and affection for democratic and human values.

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[47] A statement to the author by Dr. Lois Barclay Murphy

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CHAPTER II

THE PRELIMINARIES: THE BUILDING BLOCKS OF LIFE PROCESSES

> Between one form of animal life and another, patterns are interchangeable. Interchangeable also between animal and plant and the inanimate world.
>
> Aldous Huxley[1]

> The sovereign Alchemist that in a trice
> Life's leaden metal into Gold transmute.
>
> Omar Khyyam

The scientist is not guilty of pleading a hopeless relativism or of wandering far afield if he desires to begin the story of how we become human at the most basic levels of energy organization of which he is familiar. Indeed the mistake has been one too often of attempting to explain human behavior--its psychology and sociology--as if its underlying patterns, structures, and energy systems exist quantitatively detached, somehow apart, from the vast phylogenetic and organizational panorama which function as subsidiary to it.

Certainly no text is guilty--overtly--of creating such a picture. And yet by omission the beginning student, confused by a bewildering unsystematized conglomeration of psycho-social phenomena, may be forced to attempt to effect his own ordering lacking an insight into the continuity of life process and cut-off, thereby, from drawing upon the vast and

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[1] Aldous Huxley, "Eyeless in Gaza, Harper and Brothers, New York, From J. A. V. Butler, "Man is a Microcosm", MacMillan, New York: 1951, p. 88

actually related knowledge he already possesses. To ignore unnecessarily living processes as denotative of their apex position on a pyramiding system of energy levels is to permit a conclusion that human behavior, especially higher conscious process, is somehow different in kind, beyond the biosocial, perhaps being mystical.

Human behavior, or that of a lowly amoeba, for that matter, is complex, obviously. Further many of the links are missing. Yet the projections of a slime mold, a cat playing with a ball and a lawyer preparing a brief are equally, each in its own level, subject to a same basic set of holistic postulates. All this is in no way to minimize the phylo-, onto-genetic and cultural achievements of man. To the contrary, it evaluates man on his own relative achievements and adjustive capabilities as against those of other living forms, without recourse to magical appeal or differing non-continuous standards.

Further, to try to trace the great sweep of phylogenetic growth--despite the obvious gaps which as yet cannot be adequately talked around--is to serve the heuristic purpose of attempting to discover unifying continuums and common elements within physio-psycho-social phenomena which, if approaches atomistically and without sufficient reference points, only overwhelms with its bewildering complexity and seeming chaos.

The second part of any synthetical approach to ontogenetic study, the reverse side of the coin, is the environment, substrate, milieu. An exhaustive focus upon man alone is almost meaningless and obviously must fail in its purpose (although, as heaven knows, the attempt has been made often enough). Life process as a continuation of the environmental patterns of energy organization from which it becomes distinguished can have no meaning and, of course, existence, apart. The story of this constant dynamic interplay between the self system and the forces from which it becomes demarcated and from which it draws its organization is quite literally and simply the story of life itself. In the dithyrambic meter of Harry Stack Sullivan:--

> From a relative position in time and space, the environment flows through the living cell, becoming of its very life in the process; and the cell flows and grows through the environment, establishing in this process its particular career-line as an organism. It is artifical, an abstraction, to say that the cell is one thing and the environment another. The two entities thus postulated refer to some unitary thing in which organism and environment are indissolubly bound--so long as life continues.[2]

This chapter is concerned first with a cursory description of those levels of energy organization which while constituting the bases for life, are not, themselves living in the commonly accepted definition of that term. This is uniquely the level of the atoms and molecules and their complex electrolytic manifestations from which all forms of life are projected.

In continuing up to the cellular or zygotic stage, we

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[2]Harry Stack Sullivan, "Conceptions of Modern Psychiatry", The First William Alanson White Memorial Lectures, 1947, p. 14

we are at the point of holistic organization at which life properly commences, that is at the point at which organization becomes reconstructive. In a loose sense, in tracing life and its many manifestations through the various energy levels--pre-cellular, cellular and prenatal (multi-cellular), we are connoting also an approximate but incomplete reconstruction of the phylogenetic history of man. Less so morphologically is this so than functionally, but it is the latter which is perhaps most important.

In tracing the early ontogenesis of man our specific purpose for synthesis is in the task of attempting to reconstruct those facts which are denotative in the formation of self adjustment at the interpersonal and social level. Up from the atom what are the precursors, and deductively from early infancy what are the antecedents of that behavior we uniquely term human.

UP FROM THE INORGANIC: LEVELS OF ENERGY ORGANIZATION

Atomic-Molecular. We may be asked why start an attempted outline of living processes to the advanced social level with the characteristics of the atom and molecule. The atom is the basic unit for just about everything, living and non-living matter alike. Are we not, therefore, wasting time at a hopelessly simple and remote level?

There are, we feel, two closely related points which argue the importance of understanding the dynamics and on-going properties of the atom and molecule. First, not only does this level of organization form the known basis for all levels of process, but further, by understanding the adjusting properties of atomic function, we are able to see in great clarity and simplicity the basic activities of life at all levels.

Secondly, insight is derived in observing this operation, as to how life tends to increasingly build towards more complex levels of organization and, further, of the external laws governing this evolution.

One may hypothesize that initially the earth-system constituted simply environment, i.e., a relatively homogeneous patterning of inherent or derived energy organizations. Further, energy existed--from a position relative to life--in pure and accessible form (in contrast to the present trend in which the capturing of available energy increasingly becomes more difficult). This state is representative of the atom or molecule existing in relatively simple relationships in which the atom as yet has not combined to any extent with other atoms to form complex molecular structures.

If this highly theoretical reconstruction at all fits the facts, one must ask them how more complex compounds and other combinations of elements emerged, since to alter chemical composition at a molecular level--as contrasted to a physical change--requires a great amount of energy. One might, with Gerard[3], suppose the action of lightning, internal volcanic eruptions and the like as establishing the necessary available kinetic energy from which to force the oxidation and reduction of atomic matter. Then too, each atomic element exhibits a definite valence pattern, that is, a definite energy organization requiring, in turn, definite minimum amounts of energy applied from outside to induce atomic change and the formation of molecular systems. All these energy exchanges proceed according to definite laws--a given amount of energy being necessary to alter or combine any two given elements.

In the absence of explosive energy, however, the atom exhibits, depending upon its electrical structure and its intrinsic nature, a capacity to enter consistently into definite relationships with other atomic structures. Basic to the atom is its inherent, electromagnetic bisensimotivity[4]

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[3]R. W. Gerard, "Unresting Cells", Harper, New York: 1940 p. 21

[4]This is Kempf's term and which he defines as follows: "Bisensimotivity is adopted to include the inherent, dual,

manifested externally by its behavior in repelling bodies of like charge and attracting bodies of opposite charges. In the loss or gain of electrons through the application of external energy the atom is "disequilibrized, increasing kinetic energy and decreasing atomic energy and reversely, the equilibrating loss or gain of an electron decreases atomic kinetic energy and increases its potential energy."[5] Thus through an exchange a different energy relationship is established and secondarily different physical and chemical properties emerge.

> The atom, therefore, constitutes the first known level of organization of electrical energy, as a semiclosed, endlessly, internally and externally equilibrating, bisensimotive, reversible bidynamic reaction system.[6]

Thus through the formation of electrical (atomic-molecular) systems energy organizations are compounded into levels of complexity such as to distinguish them within (and not out of) the larger and relatively unorganized energy fields (environment); the latter represents essentially unorganized

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. . autogenous or self-determining and exogenous or adaptive sensimotivities of mutual attractions between positive and negative electromagnetic energies and mutual repulsions between positive and between negative charges. They do not exist in photic, thermal, or mechanical energy. No external energy can form an atomic or molecular chemical compound, or protoplasmic organization, without the autogenous bisensemotivations of its electrically charged particles. Hence these inherent, electromagnetic properties are primary, and the other exogenous activations are secondary, in all of the processes of nonliving and living reaction systems." E. J. Kempf, "Holistic Laws of Life", J. of Psychology Vol. 27, 81

[5] E. J. Kempf, op cit., p. 83

[6] Ibid., p. 83

random, energy patterns, guided only by the basic laws of motion. At the atomic-molecular level organization already exhibits an endless autogenous-exogenous behavior to lose or gain electrons "in the making and breaking of structurally and economically precise, molecular electromagnetic bonds, when interacting with different types of other atoms, constituting a second level of autogenous, bisensimotive, organization and internally and externally equilibrating, reversible bidynamic reaction systems."[7]

From a picture of these basic dynamic laws we need pause for a consideration of the immediate implications as well as potential elaborations which logically may follow. First it needs to be noted, parenthetically, that although the atom constitutes without doubt the most basic known unit of life organization, we in no sense have the 'feel of the fur' through such understanding, that in fact almost from the beginning we are perceiving life indirectly, not only by approximation, but by analogy. No one really knows what qualitatively the atom <u>is</u>, and to fall back upon the term energy is to confirm merely our ignorance. Thus molecular dynamics are interpreted analogously, second-handedly, quantitatively as the actions of qualitatively X systems.

In considering the ascendency of atomic-molecular organization we may see the transition from isolated, random energy phenomena to the level at which at some early point energy systems through external actions and through their own

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[7]<u>Ibid</u>., p. 83

inherent energy patternings have combined, and not merely summatively, <u>but at a first recognizable level of integration and synthesis in which the total becomes different than the sum of its parts</u>. That is, a consistent, semi-autonomous, semi-enclosed and on-going system has formed. Now at this point several questions emerge. Why, again, does a new system form and what are the laws underlying its nature? Why or how does it maintain itself, or continue to elaborate, or decline--why the 'will' of its unity? What new manifestations emerge? And finally, why stability in some patterns and evolution in others?

Elaborating upon an earlier paragraph, we note that systems develop within an environment when the simple energy patterns are in some form contiguous within the substrate such that through atoms interacting in their constant equilibrating dynamics new and more complex organizations are formed.

It is important to remind ourselves that such emerging extensions of environment represent types of synthesis from elements occuring within it and that the patterns of these integrations will in some form reflect upon the availability and qualitative characteristics of the basic components. This means that organization will emerge from constituents available, and further, from those which exhibit the proper ties (valence characteristics, chiefly) to combine within the many different combinations. Through empirical observation this proves, of course, to be so, for those molecules tending to evolve into still more complex levels of organization are centered around the elements of carbon, oxygen, nitrogen and hydrogen. All highly combinable or physically available, these form the main-stays from which almost endlessly pyramiding combinations and structures are built up. Boron and silicon also exhibit the ability to combine and endlessly synthesize into highly complex systems but we note that to do so they require unusual (artifical), laboratory conditions commonly not found in nature.

Here a second problem appears. How do these systems maintain themselves? This may be answered simply by stating that they are maintained by the consistencies and continuities within the environment itself, plus the internal strength of the new organization. Actually, of course, in a strict sense no exact system is maintained since nature does not admit of pure quantification or perfect equation of its energy transmitions. Although action and reaction are equal and opposite they can never balance completely since they do not act on the same object and the center of an interactive system is never equal to its surrounding field, periphery and external environment.[8] In effect there is a process of oblique and less than one-to-one action and resulting in 'wear' and 'tear'. Essentially, however, stability is relavent to the qualitative and quantitative nature of the environment.

In the establishment of a new level of organization a new environment is created, not only as a results of a two-

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[8] Ibid., p. 82

way interaction, but from an internal state of equilibration derived from the internal actions of the new system itself. Again, however, it must be noted that this new environment is related at all points to the larger, less differentiated organization (environment).

Next we need to consider the energy properties of a higher-level system. One may note that by the very nature of its growth it denotes a relative increasing ability to capture additional energy in the form of electrons, atoms and molecules from without. This it has to do in view of its new inherent and organized strength, and this is its 'will' to exist. Such a compound will resist disequilibrating or like-charge substrate and likewise tend to encorporate or be incorporated within complementary odd-charged materials. This process, increasingly built up, is impersonal, but as its complexity increases, as new facets emerge, i.e., as new and additional modes develop as to how this system is related (and reacts) to environment, as these happen, one sees corresponding startling and seemingly unrelated secondary manifestations emerge. This may be illustrated simply by combining in the presence of energy, oxygen and hydrogen--two gases--into a synthesis which exhibits properties entirely dissimilar to either the component elements or their summation.

The mistake may be made as one views an advanced level of organization to conclude that it exhibits a growing independence from environment. Of course this is patently untrue. Man, as an example, differs from the virus not in his relative 'independence'--which, of course, must be meaningless--but in terms of his greater bonds with larger segments of it. Further, as organization becomes complex the emerging system becomes sensitive to additional planes and levels of the all encompassing reality.

Thus in considering the transition from the simple element to the complex compound one notices a dual trend: On the one hand the reaction of a complex system would no longer be simple but may feature reverberatory and secondary internal actions and reactions, these reflecting synthesis, not concatenation. In turn, a synthetic reaction qualitatively different than its immediate internal and external environment is produced and is capable of new autogenous action upon its surrounding firld. Thus, in a limited sense, the pre-organism is capable directly of modifying the source and substances of its own existence.

Secondly, a complex substance no longer maintains a simple relationship to its substrate and environment. It begins to appear as a circle in which contact is maintained at all points of the surface. Thus interaction and future external-internal modification many proceed by geometric proportions, rather than at a one-to-one basis. One outcome of this state may be to capture tremendous amounts of electrons, atoms, and molecules in the process. In other words, hitherto unorganized, unenclosed, random energy is quickly taken-in within an organized, continuing, semi-enclosed energy network.

<u>The Missing Links: The Subprotoplasmic Organism</u>. From the complex organic molecule, or molecules, it is admittedly a frighteningly long jump over a region of unknowns, in which organization is compounded and recompounded, to the relatively visible ground of the primitive forms of unnucleated protoplasm. The increasing complexity between the structure of the simple organic molecule to that of a system which is capable of metabolism, orderly growth and reproduction must be fantastic. Yet we may note some features of an essentially quantitative emergence of structure and its corresponding reactive adaptivity. At the many unknown spots we may retreat from theory of dynamics to description of behavior.

As life proper is approached the phenomenon of transmission of energy and the determination of continuing structure need to be accounted for.

Obviously in a hypothetical primitive life form, at the level we are here concerned, will be an absence of apparent internal differentiating structure. Even under the super microscope all will appear as relatively homogeneous mass. Yet, somehow, in the contact between this lowly speck of 'plasm?' and its environment, organization must be present to maintain the total on-going dynamic process. Involved is a state of organization so structured that to maintain itself it must capture continuously limited amounts of additional energy, as oblique process exacts its toll against the internal electrical bonds.

Now obviously any such distributive transmission of supplies throughout the organizational network will not be mechanical as yet but simply a capacity for dynamic transmission of excitation. Thus we would expect that in all primitive pre-life forms--or in living matter, since who is there to draw the line--an excitation-transmission gradient would be established as a temporary reaction to any momentarily external stimulus at the particular contact point along the surface of the organism. This is essentially Child's concept and he argues further that it is the sole organizing phenomenon of the primitive life structure.[9] Thus if one visualizes a circle and an arrow effecting the circle at one point, one could expect the immediate establishment of a gradiency or hierarchy, highest at the point of contact (electron exchange) and progressively lower towards the furthest points. From this preexisting physiological axes and differentiation of different regions are entirely unessential.

What we seem to have initially is a reacting bit of homogeneous molecular organization deriving its equilibration from its position within the environmental mass. At a point of contact an electrical gradiency is established instantly as electrons are exchanged, first from points of greatest potential and then down progressively to those areas of least potential.

To this point life exists as tiny points of energy

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[9] C. M. Child, "Physiological Foundations of Behavior", Holt, New York: 1924, pp. 47-55

systems within levels of lesser, random organization. perhaps at this general level also by now higher levels of life exist within intermediate forms which, in turn, become part of the external environment. No doubt many times over process has emerged (and perhaps still does), only to be snuffed out as it reached a new level of synthesis which the environment could not support. For the infinitesimal number of failures--of the failures to maintain the oxidative--reductive process--we know, however, that other bits of organization survive and develop from level to level, each supported by additional sufficiently complementary environmental planes. The tendency in the on-going system, as in rapid combustion, is to continue to grow. Here we need to consider (at which point it is much easier to do so than later) why growth becomes limited, the why's of reoccuring patterns, and the phenomenon of reproduction.

As to limits upon growth and size, as to numbers themselves, the old dictum of Malthus' is as applicable perhaps as any other. Organization, like the growth of a population, or the size of a tree, is simply limited by the availability of accessible energy. In general the structure and size of any life form quickly will reflect this state. The smaller, or rather, the more primitive, the organism, the more completely it is dependent upon any immediate fluctuations in environment and the smaller the change need be. Those that survive at one level proceed into another more advanced, and so are able, proportionate to their evolutionary gain, to adjust within a wider field.

Now it may be from this process that we have a clue as to the underlying meaning of reproduction. In the complete absence of any functional theories as to the 'why' of reproduction (the why strictly in an operational sense, of course) one is forced, if he wishes to spin a bridge over a intolerable gap, to fall back upon a purely deductive process. Kempf, for all his attention to underlying dynamics, in the last analysis, remains in part descriptive. Likewise do Child, Sinnott and Ritter to a large extent, to name a few biologists concerned with the underlying organizational processes in this general area.

Instead of thinking of reproduction or reorganization of a molecular complex as newly developing process--in which case we are forced against an impassible barrier--might we not consider this manifestation as one of an initially reverse process? That is, because no on-going energy-capturing system exists at all points in perfect harmony within a dynamic, many-leveled field, because equations never really balance, advanced process soon reaches a level of organization at which decline subtilely sets in.

Here, before elaborating, we need to posit one more assumption--this, however, heavily varified from many sources--namely, that the latest of the pyramiding levels of organization would be electrically the least stable, the weakest, and hence the least established and the first to become disorganized. Accordingly, it would only be through further evolution that these outer rings of organization would, in turn, develop into greater permanence and bindedness with environment.

With this additional assumption, we may follow through by characterizing reproduction or division as essentially a regression to lower levels of organization, with the expected phenomenon of rapid growth and reorganization to follow. Growth would be rapid and along phylo- and onto-genetic patterns because of the close harmony between organization and environment, because of the latter's permanence and stability and because we might assume that in such a regression, as in schizophrenia or general psychotic withdrawal, the process is never complete.

In the face of an unfavorable environment, for example, man can never totally regress to the seemingly more satisfying patterns of some phase of childhood or infancy. Despite his attempts, he retains organization for his most advanced patterns of behavior and these, unlike the setting sun, do not disappear when the mode of dominant organization shifts. Likewise we would assume that in the regression of a simple life form some skeletal molecular organization exists for repeating the process.

Thus except in the case of an unusual environmental adaptation--in which case one would expect a minimal of evolutionary process--organization, reaching a point of decline, is thrown back upon early, established, stronger molecular patterns and structures which, in turn, bereft of their accumulated organization, reassert stronger, more basic molecular bonds to capture again tremendous amounts of easily available energy.

Perhaps we may make use of the virus to illustrate this. By the time process reaches this relatively complex level of organization, it presents a strong underlying internal-external molecular consistency, but this only at its vegetative level. Given an environment of available free energy (the weakened human system), it rapidly increases its metabolic rate, capturing a tremendous amount of molecular energy, reaching its outer forms of organization, and then dividing. But because of its relative limits towards achieving equilibration, a sudden unfavorable environmental change brings it back to a limited level and its rate of division decreases.

We must note also that environment can constitute no longer simply the relatively unorganized patterns of inert matter. Perhaps even at this level, therefore, (given the means) we might view already a highly structured ecological system of relationships. Man may have emerged from the substances and organization of inorganic matter, but he can no longer completely derive energy directly from it. He is vitally dependent upon intermediary levels of molecular construction and synthesis and generally speaking those of greatest benefit to him will correspond most closely to his own molecular protein complex--thus meat as a greater source of energy than plant life, soil compounds of greater value than simple mixtures or pure elements.[10]

As we have seen from Child's concept it is unnecessary that primitive protoplasm be organized into permanent structured gradiencies and areas of specialization.[11] Live matter is a high-level reacting and irritable substance and action may take place equally at any point. In approaching the highly structured and easily apparent morphology of the cell, it becomes obvious that while the entire cell retains its irritability and to some extent its general reactive capacities, certain structures are defined which perform specific functions. In the cell at any level, despite the capacity to regress and of one structure to take over the function of another, a division of effort is clearly active. Yet even as we approach the primitive beginnings of specialization and morphogenesis and attempt to explain or account for the formation of organs and internal heterogeneity, we are already almost helpless to shed light on the 'hows' and can go little further than the statements of Child or Freeman[12] that specialized form emerges because of the dynamic interaction of protoplasmic potentialities and the stimulating character of the surrounding field. Probably also there is no reason why Driesch's famous dictum that "the fate of a cell is a function of its position"[13] may not be applied equally to the more primitive forms.

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[10] R. W. Gerard, op. cit., p. 209

[11] See also H. Burr, "An Electrometric Study of Mimosa", Yale J. of Biology and Medicine, XV (1943), pp. 823-829

[12] G. Freeman, "The Energetics of Human Behavior", Cornell, Ithaca: 1948, p. 45

Both synthesis and breakdown of various substances are going on in protoplasm. If for any reason the rate of synthesis of certain molecules exceeds the rate of decomposition, or if the molecules once formed are relatively stable under the conditions within the organization an accumulation of these molecules will occur locally and it will become qualitatively, and if the process goes far enough, morphologically different from other areas in which decomposition keeps pace with synthesis.

Apparently just such differences as these occur at different levels of a physiological gradient.

> The different regions of a cell or the different cells along a gradient become qualitatively different by the appearance in their cytoplasm of different substances. It seems to be true, moreover, that cells which represent lower levels of a gradient tend in general to accumulate non-protoplasmic substances to a larger extent than those of higher levels. . .It is evident that as soon as qualitative regional differences do arise, or probably when the quantitative differences become sufficiently great, the basis for transportative or chemical correlation is established.[14]

These modifications denote the adaptivity of irritable semi-enclosed pyramiding molecular systems. The assumption follows that economy and greater external-internal consistencies are acheived within molecular systems when in the

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[13]From E. W. Sinnott, "Cell and Psyche--The Biology of Purpose", The John Calvin McNair Lectures, U. of North Carolina Press, Chapel Hill: 1950, p. 28

[14]C. M. Child, op. cit., p. 101

course of repeated stimulation of a kind at some point specialized reaction systems tend to become structuralized and semi-permanent. Schematically, certain molecules in virtue of their position gradually reorientate and maintain definite below general threshold efficiency patterns of reaction as electrons, atoms and even molecules are exchanged under the demands of swirling organismic activity. In time one may suppose new semi-specialized structures to become so strong electrically as to preserve their patterns under violent regression or reproduction. Further, a given level of organization will be maintained and prevented from shifting to another part of the system in view of the greater effeciency and less resistance in which energy or waste may be transmitted. New pattern or evolution will supervene only (a) as the external environment alters and/or (b) as a new environment emerges internally as a product of new synthesis.

We have been discussing in somewhat extensive fashion certain very theoretical approaches to basic organizational dynamics at the primitive level to suggest not only the essential continuity of life organization as rising along a continuum out from the inorganic, but to identify also some of the possible basic principles which seem to pervade all levels of life and which when pyramided and elaborated into new levels of organizational complexity establishes structure and substrate for adjustive process at the social and interpersonal level. Far below this level, however, the phylogenetic origins and beginnings of gradiency, morphology and coordination will appear as the zygote proceeds at an unbelievable rate to recapitulate its phylogenetic and ontogenetic heritage. It is hoped that the theoretical insights formulated at this precellular level may form a basis to interpret process when, at the germinal and embryonic levels, especially, the student of human development and biology in particular is confronted with perhaps the central problem of organization and internal coordination and relationship: "No particle or unit can be clearly understood or its behavior predicted unless its reactions with others are taken into consideration."[15] An understanding of how this organization is set up and maintained is the biological problem to which every other is subordinate and contributory.

By looking at the constant equilibrating, homeostatic activities of the relatively simple cluster of molecules, we have seen in effect life in the briefest bathing-suit she will allow herself to be viewed in. By mapping her physiognomy relatively free from the confusing curves of later development we can take heart that not only do we become able to make some sense of all her frills and elaborations, but that when one in the course of studying human life loses his mooring he can, so to speak, fall back upon certain defining trends known to be continuative and existing qualitatively even along an unbroken base line.

Since science is not immune to over-optimism, especially

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[15]R. Harrison, "Cellular Differentiation & Internal Environment, Publication 14, Amer. Assoc. Advancement Sc., p. 77

within the wake of some new achievement or discovery, it is not unusual that at times one or another worker feels that we are about within reach of the 'feel of the fur itself'. We do not agree with Huxley's optimistic prediction, made in 1933, that '"we were then on the verge of reducing the organizing powers of a living thing to a chemical formula and storing it in a bottle."'[16]

On the other hand, neither do we need to agree with Nils Bohr, for example. He is impressed with the difficulty of reconciling classical mechanics with the newer quantum theories and suggests that they may be parallel and complementary ways of looking at the universe. Each has its own laws, each provides an orderly system of scientific facts, but neither can be derived from the other. To derive life from matter, to regard it simply as a complex physico-chemical system, he is inclined to think is an impossible task or quest.[17]

Perhaps what can immediately be hoped for is to perceive this process of life by a closer and closer approximation through analogy such that we increasingly derive a system of constructs which parallel life closely enough and at enough points to receive functional manipulative and limited pragmatic varification to proceed _as if_ we do feel the qualitative nature of life in our hands. Schrodinger sees the

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[16]J. S. Huxley, "Man in the Modern World", Chatto & Windus, London: 1947, Quoted from E.W. Sinnott, _op. cit._ p. 38

[17]N. Bohr, "Light & Life", _Nature_, Vol. 131, p. 423

problem when he says "We must be prepared to find a new type of physical law prevailing in it."[18]

In any event, science must continue to look with great effort for answers to problems of this order, albeit their being beyond immediate range. The answers are around; we need only patience with our primitive tools. Perhaps of great importance is what McDougall called "the intolerably absurd state of affairs hitherto obtaining; namely, two sciences of the functioning of organisms, on the one hand mechanical biology, on the other psychology; two sciences completely out of touch with one another: the one ignoring the mental life of man and animals, the other trying vainly to relate it intelligibly to the bodily life."[19]

From such a synthesis there may emerge a few ideas useful in answering the many difficult questions which can be raised and which may constitute a base for future practical action.

Our basic thesis attempts to fathom for underlying consistencies to all this by asserting that the 'humanness' of man, his ability to socialize and all that this connotes, emerges as a crown or distillate atop a tremendous sweep of untold levels of energy synthesis, and that while for many practical reasons we cannot deal with social manifestations at any other than a psycho-social level, for the most part

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[18]Schrodinger, "What is Life?", Cambridge: University Press: 1946

[19]William McDougall, "The Riddle of Life", Methuen, London: 1938, p. 265

there is unlimited heuristic value in approaching constantly these mysteries of life at this or any level from the basis of the simple and underlying elements that compose it, and further, of the ontogenetic pyramid of syntheses and restructuring, the organismic inner unity of its processes, which are the antecedents.

In leaving the hypothetical primitve life form and jumping through eons of time-development to the human zygote, we are playing fast and loose with phylogenetic and probably ontogenetic processes as well. Our purpose is, however, not to attempt to recapitulate evolution, but to illustrate certain guiding or key processes in the dynamics of the movement of organization through the fetal stages to separateness and identity within a social world.

FIRST STAGES IN HUMAN DEVELOPMENT: THE ZYGOTE

Thus far in our framework we have drawn heavily from the findings of those scientists who in at least part of their travels have made use of the high road. From this height have been visualized certain processes which seem basic or fundamental to life at all levels. In the relatively simple and primitive virus or other prenucleated organisms, one can witness the continual action of a molecular energy system endlessly adapting, modifying and in turn being modified by its environmental field as it is propelled by its inherent energy patternings built through levels of energy synthesis. And from new energy syntheses come new and seemingly unrelated organismic equilibrating patterns and radically different qualitative manifestations.

Now organism is no longer a step removed from random energy but presents inherent consistency, continuity and environment of its own. It is now autogeneous, as well as exogeneous, capable of ordering to some extent as well as being ordered and formed by the levels of substance about it. In the process is the quality to capture additional energy, limited only by the availability of acquirable energy about it. Now inherent also are morphological patterns as from consistency organism structures and restructures until areas of specialization emerge--and at their more stable levels, become, under proper stimuli, reconstructive and semi-permanent.

Much of the mystery of life centers around the neglected aspects of the specific formative influences of the internal (and especially) external environment from which synthesis and design emerge.

> I may consistently offer my theory that the origin and evolution of protoplasmic life is essentially the unaccidental evolution of organization of the electrolytic life of water around precise ratios and interactive positions of special catalytic solutes and structuralizing precipitates, under limiting, supporting ratios of specific environmental activations.[20]

There is little we can say about environment, yet certainly any approach to phylogenesis or ontogenesis which attempts to assess its role is of extreme heuristic importance, this no matter how poor present effort must be. It will be of greatest value when scientists in the area of human development (at all levels of ontogenesis) are able to restructure theoretically the steps in growth with this obverse part of a unity equally in mind.

Whether at the sociological level or the cytologic, organism and its behavioral manifestation must be seen as a vector of synthesis between external and internal dynamics. To study psychology or the cultural factors of childhood without this constant attendance to both sides of a unified process is almost meaningless. The pioneering work of Child,[21] Jennings,[22] and Spemann[23] in attempting to evaluate

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[20] E. Kempf, op. cit., p. 90

[21] C. Child, "Cellular Differentiation & External Environment", Ed. F. Molton, The Cell & Protoplasm, AAAS: 1940

[22] H. Jennings, "Paramecium Bursaria", Biol. Sym., I, 1940

[23] H. Spemann, "Embryonic Development and Induction", Yale U. Press; New Haven: 1938

those forces around the cell are precious examples of what is needed. A great research task ahead remains to identify and evaluate the nature, roles and significances of man's physical, chemical and social world and to bind these trends and forces into consistencies and continuities. The textbook, the monograph and the organized didactics must employ deliberate techniques to make overt and primary this process of effect, reaction and synthesis.

There is much that has accumulated as to the chemistry and physics of the cell. Here, more than in the last section, evidence must be closely juxtaposed from all major methodologies of research. Again, where so-called objective and quantitative research fails to provide answers, empirical and clinical-qualitative techniques must be utilized Unfortunately, even by the most theoretical approaches, knowledge of underlying causal dynamics of cellular process in the most critical areas, i.e., in the nature and mode of functioning of the gene and enzyme, remain largely unknown and we are forced to leave almost complete gaps or revert to superficial description.

In this section we are concerned primarily with a first level of organization following conception. In so doing we have jumped through phylogenetic time, but for our immediate purpose the jump is one from the lowly mold to the nucleated cell--not necessarily the human zygote, but the animal cell of almost any level. To be sure there is a tremendous difference between the human zygote and just any cell, but the mechanics are closely the same and the differences are largely of potential.

In essence, then, the nucleated cell with its partially differentiated structure is the next logical evolutionary jump and differs from lower forms in the degree of specialization and in the extent of the cell's ability to utilize complex levels of environment and substrate to divide, redivide and evolve to more advance forms. This early division will be treated under the germinal phase; at present we are concerned with the nature of this first unit of organization of human form and which through organismic maturation becomes increasingly subordinate within larger cell systems.

This discussion of the zygote will include the preliminary mechanics leading to conception, something of the general structure and function of the nucleus, and an overview of the morphology, chemistry and physiology of the cytoplasm--of its ceaseless movements of atoms, molecules, of materials being taken in, broken-up, restructured, and of quite different products leaving the cell.

<u>The Preliminary Mechanics</u>. The syngamy of the haploid gametes sperm and ova is the onset of a new and revitalized organization of living processes, bringing together in a completely new combination the transmissible characteristics of untold evolutionary ages. Within the microscopic thread-like chromosomes are packed in a seemingly helter-skelter fashion an almost incomprehensible organizational complex

of asymmetrical molecules capable of acting in orderly sequence upon (or being forced to interact) suitable substrates and upon environments fashioned, in turn, by earlier teams of genes and appropriate 'simpler' environments.

The sex cells appear to serve little function in the economy of developmental bodily dynamics (this although they are set aside very early in the development of the future parents). In the female the cells undergo mitosis during intrauterine life but at birth or shortly after seemingly cease to divide. Millard and King[24] have reported a second view, only recently advanced, that oogonia proliferate as needed throughout reproductive life from a source on the epithelium at the periphery of the ovary. In any event, these large egg cells are released periodically beginning at early pubescence.

In the male the process seems more certain: during childhood and throughout life the testes produce by mitosis numerous generations of undifferentiated spermatogonia, although these undergo less frequent division than other types of body cells and receive a rich supply of blood nutrients.[25] At puberty the gonads increasingly become active and the sex cells commence to divide by meiosis, following a maturational sequence.[26]

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[24]N. Millard & B. King, "Human Anatomy and Physiology", Saunders, Philadelphia: 1945, p. 348

[25]Edwin Schrodinger, "What is Life?", Cambridge-Macmillan, New York: 1945, p. 23

[26]W. Greulich, "Physical Changes in Adolescence",

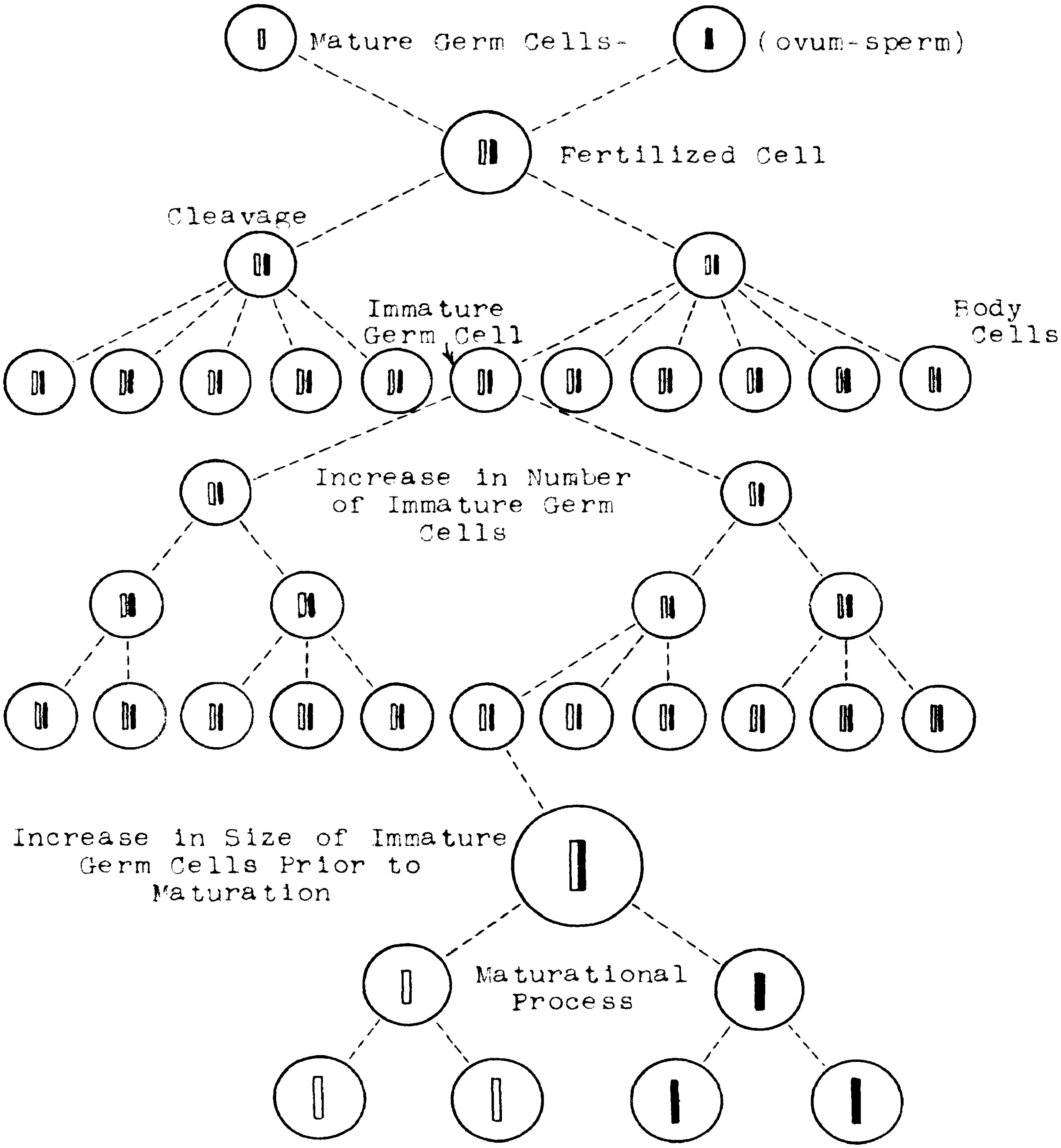

Figure 2. The relationship between germ cells and body cells. Adapted from Genetics, by H. S. Jennings, Norton, New York: 1935, p. 46 (From L. Carmichael, Ed., Manual of Child Psychology, Wiley, New York: 1946, p. 335)

Most basically, reproduction represents preservation of those strongest constellations of molecular organization--those patterns and attributes most effective in autogeneous determination. The processes of meiosis and subsequent hetersexual union of gametes acts as a further stress towards evolutionary progress by the arranging of cross fertilized chromosomal elements in the face of subsequent natural selection. Economy and effective organization towards equilibruim are further supported in that prior to conception the ovum is able to exhibit a selective process by virtue of the fact that thousands of sperms seek penetration and union with the ovum while theoretically only an abler specimen is able to overcome the cellular membrane barrier.

Kempf[27] summarizes evidence from many investigators that bisexual, chromosomal, gonadal and somatic differentiation reveal thermo-bidynamic origin and evolution.

> Although the ratios of specialized cytoplasmic qualities are adaptable to various, repetitious, environmental activations, heat, more than any other oxidative determinant, seems to be the factor in their bisexual differentiation.[28]

Theoretically, therefore, the egg or ovum with its greater (macroscopic) size, due chiefly to its storage of nutritive supplies, indicates a slightly decreased temperature below the level of anabolic-catabolic equilibration

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43rd Yearbook, Part I, National Society for the Study of Education, Chicago: 1944, p. 16

[27]E. Kempf, *op. cit.*, p. 98

[28]*Ibid*, p. 98

peculiar to the special human chemical constitution with an accelerated anabolism and decreased catabolism (A/c ratio).

In contrast, the reverse situation seems to exist in the sperm. In this case the emphasis upon catabolism (a/C) results in a greater expenditure of energy and work, with little storage of nutritive matter, this resulting in the great motility and vigor.

> Evidently the biochemistry of self-preservative viability which includes reproduction of parts as used, and of holistic reproduction, are inseparable although the latter involves duplication of parts to complete two wholes. Mating between bisexually differentiated, complementary, imbalanced gametes rebuilds an equilibrating holism with renewed powers of maintaining continuity against certain imbalancing environmental variations. Selective conjugation or fertilization is not unlike other nutritional selections for re-equilibration of viability and reproductivity.[29]

Thus gametic union involves mutual biochemical reequilibration through mutual autogeneous selecting and being exogenously selected. Phylogenetically, bisexual differentiation in interdependent gametes constitutes an initial advance in variability of autogenous determination of survival, over asexual reproduction.[30]

The Cellular Switchboard: The Nucleus. The emergence of structure and specialization is of utmost significance in the evolutionary process and in the ontogenesis of man--and through many levels of lower evolutionary forms--exists at the earliest developmental point. To the trained eye, and even to the untrained, this means that the zygote presents

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[29] *Ibid*, p. 99

[30] *Ibid*, p. 99

a complex pattern of structure and differentiation. Easily visible under the microscope is a cellular wall, nucleus and various other demarcated forms, chiefly among these being the large droplets of fats.

Probably primitive protoplasm was largely photo- and thermo-genic and entirely dependent on the external supply of substrates and upon external osmotic and isotonic pressure differentials for removal of waste. It therefore had minimal bisensimotive, adjustive capacity for the assimilation of metabolic wastes, and hence with a narrow range of exogenous adaptability.

The concept of cell and further, of internal differentiation, denotes a tendency of organization (based ultimately upon molecular electrical properties) to arrange in a semi-enclosed and structured system from an equilibrating and economical motive (probably reduction of electrical resistance). Cell then denotes the hierarchy of organization and specifically of a more effective ordering and controlling of environment and substrate.

The nucleated cell, as a continuation of this tendency, involves formation of allied positional linkages of various basic 'ordering' molecules (genes, catalysts) under repititious, selective pairing reproductions--in short the complex cell of paired chromosomal strings surrounded by a more extensive cytoplasm. With conception the nucleus is restructured with the diploid complement of forty-eight chromosomes, 24 pairs, and within each long string huge numbers of ultra microscopic genes which carry the specific phylogenic-ontogenetic potentials.

At the present state of research, the structure and function of the genes may be summarized with certainty but unfortunately with little operational understanding. Clearly, in the evolutionary process the provision for a specialized center to contain the total of organizational potential represents a tremendous advancement. The manner in which these giant protein or protein-like molecules function must be little short of miraculous. The molecules, probably less than twice 10^{-6} cm. in diameter[31], seem to operate in a fashion similar to enzymes, although here we are using one unknown to explain another.

Theory leads in somewhat the following direction. First, the gene represents a synthesis of organization, and now autogeneous as well as externally controlled, i.e., it has become a force in itself, capable of effecting a limited and specific modification given the proper substrates and external energy patterns and consistencies. Through untold time its patterns of synthesis have become structuralized and specialized.

Secondly, probably not all of the detail of human unfolding potential is incompassed literally within these big molecules, at least it is hard to believe this could be so. One would expect, rather, that gene function is primarily a

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[31] R. W. Gerard, op. cit., p. 394

series of guiding and ordering steps, of available molecules being drawn into new, specific combinations and of others being broken down as teams of genes react as catalysts. Like enzymes, they themselves do not seem to undergo change and do not lose their identity but remain relatively unmodified[32] and capable of autocatalysis and transmission to future generations.

The tremendous import of environment is indicated in that genes are activated, called into action, by the complementary nature of the environment and substrate and further that the order and combinations in which genes become active is probably closely related also to the changing electrochemical nature of external and previously developed or laid-down levels of organization. What we term maturation is seemingly "the net sum of the gene effects operating in a self-limited time cycle. In due course these effects will be manifested in the behavior morphology of the psychological individual who is latent in the constitution of the zygote."[33]

With conception the genes are exposed to an environment (cytoplasm and the extra-cellular state) similar to that which nourished primitive life forms. Gene action then proceedes to recapitulate inherited levels of organization.

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[32]Only relatively so, of course, since gene structure is in degree dependent upon the quality of substrate and environment. See Kempf: op. cit., pp. 90-93

[33]A. Gesell & C. Amatruda, "The Embryology of Behavior", Harper, New York: 1945, p. 23

Those genes acting first restructure available substrates. Succeeding waves of genes then are impelled, in virtue of their specific molecular properties, to react to what is now a new internal-external environment--different externally also since, again, succeeding levels of life organization link the organism to wider environmental ranges of stimuli and forces. And thus, theoretically, the amazing process continues.

Our newly conceived potential human life form remains at the unicellular state only a matter of minutes before beginning upon a prodigious plan of growth and differentiation. But here in such processes as gene action are the many basic and vital dynamics and activities of life and it will be well to hold back the movement of development a bit to continue to survey some of these major underlying processes.

We mentioned that functionally or operationally there is little that as yet can be said as to how genes and enzymes really work. Yet by analogy certain plausible theories have been developed which, if not strictly functional, allow us a comfortable feeling as to how these tremendously complex molecular organizations may possibly act to order and arrange surrounding substrate.

Perhaps most generally accepted is the 'coupling' theory of E. Fisher. Fisher's hypothesis briefly is that particular genes are drawn into activity by the existence of specific environmental and substrates conditions. Because of the electrical-molecular specificity of the substrate, certain catalytic molecules are electrically forced to interact. This may be explained through figure 3.

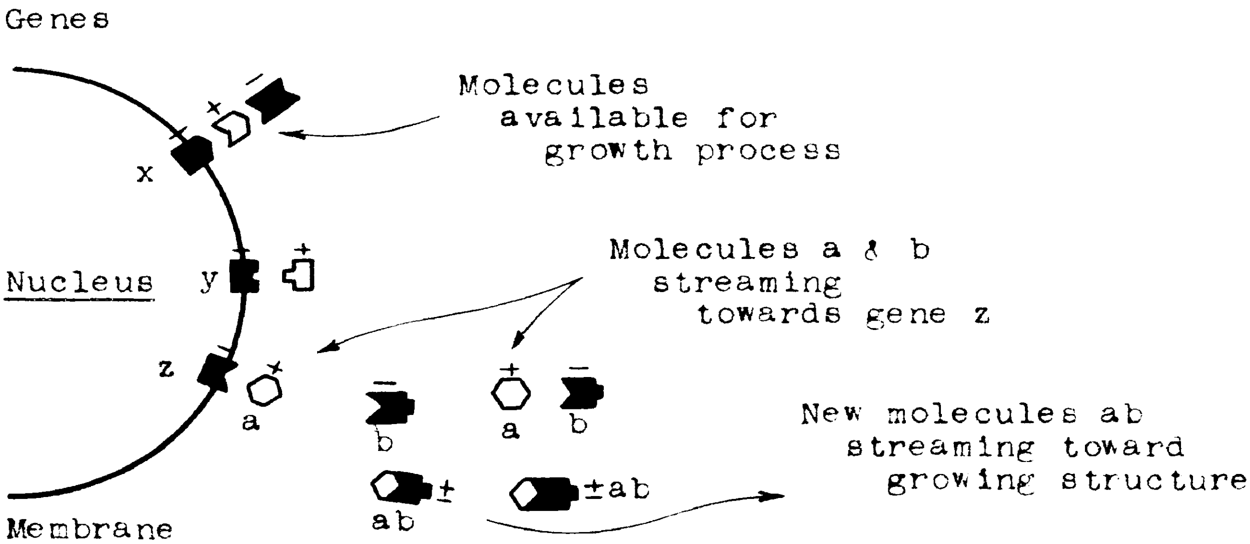

Figure 3. Molecular activity at the nuclear membrane. In Fisher's theory of gene function (see also J.A.V. Butler, "Man is a Microcosm", Macmillan, New York: 1951, pp. 59-61), genes of particular 'shape' and charge maneuver into contact with the extra nuclear substrates: thus negatively charged genes **x**,**y** and **z**. Molecules available in the cytoplasm also contain similar configerations and attracting charges and hence are attracted to the corresponding genes: in this case a, being positively charged, is attracted to **z**, and because of a residual positive charge a**z** attracts negatively charged b.

In these reactions the genes remain unchanged because they unite molecules which together form charges which then repel and free the gene. Thus minus **z** attracts and forms with plus **a**, creating in the process a residual plus charge. This union of za in turn attracts minus b, resulting in a union with a negative charge and thus repelling gene **z**. From C. B. Davenport, "How We Came by Our Bodies".

It is reasonable to assume that autocatalytic enzymes function and are activated in fundamentally the same fashion. In this case, nuclear asymetrical molecules act primarily to metabolize, that is, to break down and restructure molecules into forms which can be utilized by the cell for growth and repair. In this case also it would seem that the specific series of catalysts are called into action in virtue of certain existing disequilibrations and imbalances, although their ability to act is dependent upon mechanical and intra-external environmental means to supply proper substrates.

Permanence of Gene Structure: Quantum Mechanical Evidence.

> The arrangements of the atoms in the most vital parts of an organism and the interplay of these arrangements differ in a fundamental way from all those arrangements of atoms which physicists and chemists have hitherto made the object of research.[34]

The magic and beauty of life are locked within the tremendous complexity of the mightly molecules of the nucleus. Through eons of time-development, of a growing bisensimotivity to differing environments, unbelievably intricate aperiodic, asymmetrical molecular structures have developed, have been preserved and transmitted relatively unchanged. We know that organic molecules, as with others similar and less complex, are equally closely subject to the same effects from random or organized, accidental or controlled forces (as from disease). Under the tremendous energy of fire, life organizationtion quickly gives way and breaks down, charred and hopelessly oxidized.

Yet while we carefully protect life against extreme degrees of heat or energy, it is frequently subject to temperature fluctuations and change which from the point of

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[34] Erwin Schrodinger, "What is Life? The Physical Aspect of the Living Cell", MacMillian; New York: 1946, p. 2

view of classical physics would easily induce molecular change (either mutation or destruction). The evidence we have points to the bulk of the gene as consisting of only about 1000 atoms or possibly less. From a statistical viewpoint it is difficult to reconcile this number with any degree of durability and the problem is not simplified by the fact that the cell undergoes occasional division and is kept at the rather high temperature of slightly above 98 degrees Farinheit.

Schrodinger[35] attempts to account for the high degree of gene stability on the basis that such a small system by its very nature possesses only certain discrete amounts of energy--called peculiar energy levels. To change from one energy level to another envolves force. These changes, however, are not effected in a continuous transition but in terms of quantum-jumps.

Activity at any quantum level thus leaves the atoms with only a limited discrete series of relationships to choose from. The lowest level of energy relationship admits a closer formation or grouping of atomic nuclei, thus making possible the relatively stable molecule. Molecular stability (and hence gene stability) is dependent upon being able to withstand the tension of 'unlawful' outside forces and, therefore, it is basically at the mercy of

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[35] Ibid.,

temperature activity. Heat motion, that is the impinging of other atomic systems, however, is irregular and there is no precise temperature at which a quantum change may be effected. Thus the "time of expectation", as stated by Polanyi and Wigner, depends largely upon the ratio of (a) the energy necessary to effect the life, and (b) the amount of energy available (above quantum requirement). This may be expressed as

$$W : kT$$

where W equals the energy required, k the energy available and T absolute zero.[36]

The great significance for life, of course, is the fact that for a W, say thirty times kT, the time of expectation might be as short as 1/10 of a second, but as reported by Schrodinger would rise to six month when W is fifty times kt and to 30,000 years when W is sixty times kT!

The improbability of an energy amount as large as W gathering in some particular part of the system (as, for example, change due to illness or some other unusual somatic event) is enormously increased when a considerable multiple of kT is required.

The presence of a geometrically progressive margin of cellular safety lies in the statistical improbability of an energy amount as large as W gathering. Thus

$$t = r \cdot e^{W/kT}$$

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[36] M. Polanyi & E. Wigner, "Zeitschrift fur Physik", p. 439, From Schrodinger, op. cit., p. 51

where r is a certain small constant of the order of 10^{-13} or 10^{-14} seconds, representing the exponential function.[37]

A second factor of importance for organic stability is that isomeric transitions, i.e., rearrangements of intra-molecular patternings, are the only changes of significance. Transitions with no threshold interposed between the initial and the final state are without effect for when they occur they are followed quickly by a return to the initial state, thus the molecules remaining the same. The energy necessary to effect an intra-molecular change--and hence a gene mutation--is, therefore, the energy necessary to effect a quantum jump.

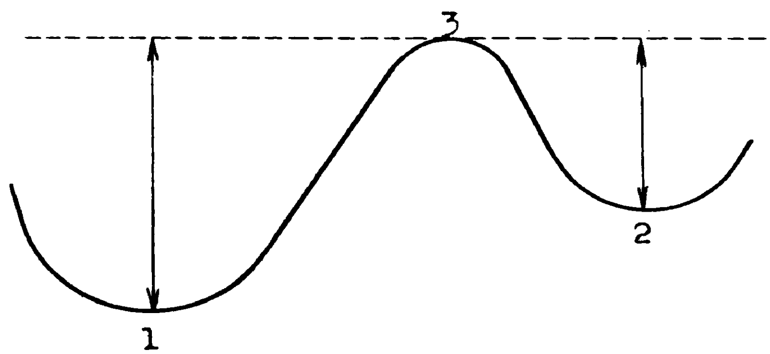

Figure 4. Energy threshold (3) between the isomeric levels (1) and (2). The arrows indicate the minimum energies required for transition. From Schrodinger

Experiments based upon the Drosophila demonstrate the stability of naturally selected genes. A charge of 0·9 electron volts corresponds at room temperature to a lifetime of only 1/10 sec.* But a quantum threshold of 1·8 electron-volts

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[37] *Ibid.*, p. 52

The electron-voltage of 1·8 is approximately the equivalence of the batteries of an ordinary pocket flash-light.

is capable of producing stability calculated at 30,000 years. The mutation rate is thus a direct function of the degree of ionization, or some very similar process. The radio-activity of the environmental surroundings--such as soil, air and cosmic radiation--indicates that natural radiation is much too weak. Moreover, any ionization (or similar process) would have to take place inside a certain volume of only about "10 atomic distances cubed" in order to produce a specific mutation--unless, of course, the gene area be subject to massive charges which, in any case, would not produce an orderly isomeric transition, but tissue lesion, i. e., molecular destruction.

Gerard comes to the same blind alley as to the causes of spontaneous mutation, but notes that when the fruit fly is bred "for some generations in a deep cave, and so partly protected from these sideral shafts (cosmic rays) the incidence of spontaneous mutations was distinctly lowered."[38]

The Structure and Chemistry of Cytoplasm. Beyond the nucleus is the cell proper, an area which if one could don 'molecular-scope' glasses would reveal a scene of tremendous activity, motion and seeming utter chaos, as molecules, ions and other bits of matter move about at high speed, in every direction, darting, colliding. Like the crowded arteries of a large city, however, there is method in seem-

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[38] R. Gerard, *op. cit.*, p. 402

--J. A. V. Butler, *op. cit.*, pp. 72-87 ing madness.

Our emerging organism is an energy capturing system and it depends upon many levels of life forms for its existence. Here in the bedlam of minute cytoplasm the complex compounds built by lower forms, by plants, microbes and the rich protein of other animals are taken in from the stream of environment through a selective wall and under the guiding actions of genes and enzymes broken down or rebuilt into economical forms of food reserves, or as integral aspects of cellular structure. In cytoplasm travels the mystery and wonder of life as a tremendous and complex unity of molecules and molecular complexes react to external forces, constantly adjusting and, in turn, reacting exogeneously as bisensimotive molecules and atoms, organic and inorganic, ceaslessly exhibit their inherent combining and repelling properties.

The story in the swirling of cytoplasm is the constant process of living matter 'fighting back' against a Second Law of Thermodynamics, of energy becoming useless and unorganized, of resisting breakdown, regression and ultimate disintegration against the larger order of random, 'unlawfull' energies of environment, against the ultimate nonquantitative nature of all actions and reactions, against the wear and tear which pulls at strong and established patterns of molecular bonds.

But our zygote is just beginning and bathed in the stream of a nutritive environment it has the upper hand, of a tremendous storage and potential of specialized asymetrical molecules, needing only their environmental cues to refurbish substrate into food (energy) which is needed to build more structure and structure enabling organism, in turn, to establish geometric control over environmental mediums and to probe new ranges.

a. <u>The Electrolytic Life of Cytoplasm</u>. By establishing itself apart and delimiting its size, the organism creates an environment which forces atoms and molecules ordinarily spread out into closer formations of polymorized molecular systems.[39]

The second great property of cytoplasm is its watery, saline medium, constituting approximately 90 per cent of the total volume.[40] Water presents many conditions which make life as we know it possible. Some of these qualities were listed by Henderson in 1913.[41] They include such aspects as the extensive distribution of materials, low compressibility, high specific heat capacity; the widest range of solvent powers, high absorption capacity and internal surface despersion of insoluble particles; a high rate of solution for CO_2, ammonia, hydrogen, nitrogen and oxygen and the endless equilibratory, respiratory exchanges with the athmosphere; of the acceleration of incomplete ionic dissociations in the

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[39] *Ibid.*, p. 75

[40] A. Carlson & V. Johnson, "The Machinery of the Body", U. of Chicago Press: 1937, p. 23

[41] L. Henderson, "The Fitness of the Environment", Macmillian, New York: 1913

greater acid and lesser basic disproportions by metallic bases and in greater base and lesser acid disproportion by non-metallic acids, always with constant products.

The tremendous significance for life in this balance may be seen in the maintainance and regulation of collidal integrity and in basic anabolic, catabolic transaction as potential and kinetic energy system emerge or are depleted in ionic dissociations into free O and H or in their recombinations.

One could go on to list many additional specialized qualities inherent in the cytoplasmic media but they embellish the same outcome: in this fluid medium (as we shall elaborate upon presently) molecules, of all sorts useful to the zygote, are sorted, broken up or combined into more useful compounds, and then utilized for certain specific life processes. Perhaps most significantly, this involves the breaking up of complex carbon systems, with concomitant releases of energy and of the resulting waste products, largely CO_2 and water being expelled back into the environment to be reprocessed by the complementary action of plants into free oxygen and carbohydrates.

Figuratively, in holding up our zygote at its unicellular state to study the cell as the basic unit of the human system, it is worth considering somewhat briefly the major structures of the cytoplasmic assembly line.

Watery cytoplasm has dissolved within it various salts--such as sodium and chlorine ions, the molecular fragments of potassium, magnesium and a little calcium--extractives, and various simpler sugars, all which move about in the more numerous water molecules.

But water also contains many substances which do not dissolve and exist in the cytoplasm (and nucleoplasm) either as rather large islands (especially the fats) sharply demarcated or in colloidal formation. The former relationship would include the glycogen granules and fat droplets, and the latter, certain lipins and proteins.

Of the major three, first the colloids. The colloids are proteins constituting the most basic of the three organic groups. In a sense they are the most important: protein is the cellular building block and is most intimately envolved in fundamental life processes. As we mentioned, the genes and enzymes are thought to be large protein molecules. The colloids are composed of the common basic elements, oxygen, hydrogen and carbon, and in addition nitrogen and occasionally small amounts of sulphur or phosphorus. Unfortunately, however, their structures, except for the simplest forms, are unknown as yet. Organic protein formulae usually are charted with an unknown (r), standing for a simple or complex group of atoms. Thus:[42]

```
    H    H    O    H    H    O    H    H    O    H    H    O
    /    /   //    /    /   //    /    /   //    /    /   //
H---N---C---C---N---C---C---N---C---C---N---C---C---O---H
        /            /             /            /
        r            r1            r2           r3
```

[42]Gerard, op. cit., p. 67

The large protein molecule is composed of a long combination of amino acids and these, in turn, of a carboxyl group (similar to the fatty acids) and an amino group (base in reaction) placed on the carbon next to it.

```
   O
  //
--C--O--H--
```

<u>Carboxyl Group</u>

```
      H
     /
-H---N-
```

<u>Amino Group</u>

The colloids thus are huge molecules and in the cytoplasm 'float' in a sea of much smaller water particles. They move swiftly about colliding and ricoheting, and exchanging electrical charges with each other and, in turn, being bombarded by myriads of tiny water particles (Brownian movement). The total effect is to cancel out movement in any direction, or towards settling out due to force of gravity.

Now, the property of the colloids to move about and interact is of vital importance in the dynamics of the cellular economy and in the maintenance of life itself. Although the large protein molecules are almost inert electrically, colloidal movement is maintained because of the tendency of simpler compounds of certain types to ionize when in the watery cytoplasmic environment. Although the protein molecules are neutral essentially, they pick up ions on their surfaces and hence become positively or negatively charged, thus reacting with avoidance to molecules of similar charge, or, with attraction for molecules of opposite charge.[43]

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[43] <u>Ibid</u>., p. 102

Since the charge on colloidal protein particles depends upon ionization which, in turn, depends upon the acidity or alkalinity of the cytoplasm, the integrity of the organismic environment is related intimately to the acid-alkaline balance. A point could be reached, for example, where the tendency for a protein to ionize as an acid is exactly balanced by its tendency to ionize as a base, and thus leaving the molecule entirely neutral. At this point molecular collision would result simply in clumping together and settling out under the force of gravity as a solid precipitate.

The second of the three organic compounds are the fats, or lipins. These compounds function less as structural constituents of the cell--although they are vital in that capacity--as they do in supplying it with bulk, representing an economical form of reserve energy storage. Ordinarily the fat molecules do not attract ions and thus tend to clump together in truly giant molecules, or molecular combinations.

The fat molecule is formed by the combination of one molecule of glycerine with three molecules of fatty acid. Often these combinations become large (due to the chain-like pattern of the fatty acid) and are easily visible in the cytoplasm as sharply demarcated globules.

The third group, the carbohydrates, are distinguished as simple, double or compound sugars--double sugars forming from a combination of simple sugars and the polysaccharides forming from complex combinations of simple sugars into single giant molecules. These large sugar molecules are economical forms of energy storage and are broken quickly into simple glucose for immediate energy utilization.

> Though their chief role seems to be that of a fuel for cells, some carbohydrates are also built into the structure of protoplasm; to a certain extent they serve as building materials as well as fuel.[44]

From these basic variations upon a common theme of O, H, C and N (with an occasional outside chord) are built molecular combinations for specialized purposes. Further, through the relations of atoms within the protein molecule can be accounted the essential variations in phylogenetic life forms. Levels of life organization, of life potential, are largely writ around how simple oxygen, hydrogen and nitrogen are formed and structured about the high-valenced carbon atom. It is largely around carbon that asymetric organic structure emerges, synthesizes, restructures through equilibration, synthesizes again--almost endlessly--to the eventual manifestations and magic of consciousness with its capacity for social and cultural adjustment.

It is, admittedly, still difficult to grasp the notion that in any complex of compounds, of any synthesis of pyramiding chemical organization, can come the artistic, or the unique human capacities of self and cultural evaluation, of self and cultural enhancement (Cantril). For comfort in the magic of this complexity, one may invent a vitalism--perhaps for practical purposes, one must. But again, the problem

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[44] Carlson & Johnson, op. cit., p. 30

or enigma remains, of elements forming new organization, not summation, not concatenation, but synthesis, and with it new and unique classes of manifestations, qualitatively different from the total of the parts.

We are at the cell and there great reflections of synthesis have not yet arisen. To be sure, we are already overwhelmed with the living chemistry of the tiny zygote, but what emerges later is of an infinitely greater level. Yet, basically--and we are asking pardon for juxtaposing two such seemingly incongruous projections--the writing of an opera, a story, of just 'lowly' thinking, in short of all the activities and trappings of consciousness essentially are physical organismic adjustive efforts--chemically and physically so, although there is little point in interpreting them there--and they are a compounding and many-timed reintegration of homeostatic, bisensimotive, equilibratory problems going on at the cellular level.

We cannot say just how much heuristic value there is in trying to tie basic processes to social science. The gap is terribly great. We cannot even account for the synthetic manifestations of two atoms of hydrogen and one of oxygen. At present for good reasons we deal with the two upon quite different levels, and, as we shall see, when we try to relate consciousness and mental organization with that of the organic, our attempts become blatantly anthropomorphic and analogous.

It needs to be restressed, however, that we are not seeking the truth. We are and can only reconstruct by analogy. And if we can parallel and make our theories consistent and pragmatically valid at enough points, to this extent we do not have the 'feel of the fur' but we do have something of great value and use and perhaps all that we can ever hope to possess. Seemingly, baring future improbable momentous discoveries, we are again riding la ronde, seeking under whatever name some elan vital; but like following the circular movements of Berg's Violin Concerto, having made an effort, we are perhaps at a more satisfying relationship with our big problem.

b. Metabolism, the Activity of Life. Returning to the concrete aspects of our zygote (which is gradually becoming impatient to proceed with destiny) one sees that what is the essence of life centers about the constant processes of energy transmission, of the amazing ability of certain molecules to capture foreign molecules or particles, rearrange these, and in the process utilize the kinetic energy released to maintain themselves and the elaborate system of specialization they have erected.

The concept of energy transmission, and even more so the concept of energy itself and of its utilization are understood only very incompletely. Basically the process of energy release takes place when food materials are broken down to pure glucose, which in turn--usually in the presence of oxygen and an enzyme(s)--is partially oxidized, while another combined molecule is reduced. For example, because of the greater attraction of the carbon molecule, electrons are pulled away (oxidation) from the outer rings of another molecular system and picked up by the carbon molecule (reduction). The net amount of energy released will be the difference between the amount that was necessary to remove the negative electrons from the oxygen molecule and the amount created by its release and transfer.[45]

This constant process of living tissue, then, is a steady movement of selected molecules and atoms through the cell--there to be ripped apart, rearranged and, with the exception of those retained for cellular bulk and structure, eliminated. Even while the cell remains seemingly quiescent the process of oxidation, with its concomitant release of energy, goes on without letup. Gerard employes the analogy of a pump running continuously to keep the bilge from rising to describe the life activity of the cell.[46]

> A feeble but steady expenditure of energy keeps the system intact, ready at any time to do something useful. . . (the cell's) semi-permeable membranes leak, they tend to depolarize and lose their charges; and such discharged cells are "sunk" if the condition lasts for any time. . . .
>
> Is it not a sign of poor craftsmanship that cells have such leaky membranes and so fragile an organization that they are perpetually disintegrating of themselves? No, this is rather the necessary price paid for flexibility and control. . . . If its membranes, for example, were rigidly and safely impermeable at rest, activity, which involves their temporary breakdown or alteration, would be difficult or impossible.[47]

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[45] Gerard, op. cit., p. 149

[46] Ibid, p. 188

[47] Ibid, p. 188

The price of adaptability of organism and of its potential capacity to modify permanently and evolve quite clearly lies in a close and extensive as possible relationship with environment and without, at the same time, losing its identity. In a seeming paradox, therefore, organism ultimately achieves a maximum of security in building not a high fence, but rather in structuring a low but flexible one. Evolution and ontogeny are patently a product of this close interaction and of organismic equilibration along a broad front. What may be seen in zygote process is a wonderfully complete environment restructuring early phylogenetic saline conditions from which primitive forms have evolved, but which in the course of evolution have been preserved within and around the cell.

In large part the new organism exists upon the stored food from the yolk of the ovum. Passing through the oviducts and into the uterus, however, proper osmotic and other mechanical conditions, as well as the existence of supportive fluid and nutritive mediae, are supplied by the mother and the new life exists as an integral part of the maternal system. As we shall emphasize later, the bonds between the two systems--if they can be distinguished as two systems--are very intimate. Again, perhaps this emerging division of organization is triggered as parents have reached an optimum, of having utilized their store of developmental potential, and then of decay, disorganization, or what Gerard terms 'mixed-upedness', slowly settling in. In any event reproduction closely follows the beginnings of decline.

Returning to our immediate problem, however, this dynamic and wonderfully coordinated interplay between organism and embryo or organism and organ, which ever it may be, may also be viewed from good vantage point at the cell wall, where materials from both organizational levels are exchanged.

c. The Cell Membrane. The outward manifestation of living processes of the zygote is a constant microscopic motion of cellular components in and out of the organism through the cell membrane. In our tiny one-celled zygote the cell membrane seems to have two functions: its single-layer molecular covering acts to preserve the cell's integrity by the exchange of vital materials and also it is the skin or hide as well.

The membrane is a mosaic of large protein molecules and clusters of only slightly smaller fat or lipoid molecules These under the influence of extra cellular ionic charges gell and assume their irregular but semi-rigid patterning. In this condition they are ready to assume specialized functions for the cell as a whole. At first glance, their appearance is hardly such as to inspire confidence. The wall is generally only one molecule in thickness and around each molecule large holes often appear. Yet this

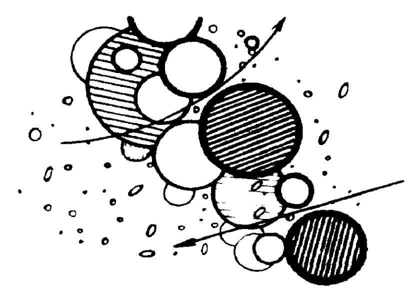

Figure 5. Cell membrane. Protein particles shaded. (From Gerard)

fragile, sievelike wall is tailor made for a special job. As we earlier noted, a thin wall provides for optimal flexibility and a maximum of exchange. During an extreme growth period, above all this is what is needed. The zygote exists in an extremely rich and nutritive environment and the objective is a membrane which will allow maximal stimulation to nuclear genes and enzymes: this means an abundance of new substrate moving and developing within the cytoplasmic medium.

The 'hide' function of the cell is hardly a significant one since the cell exists only poorly differentiated as yet within a larger medium. Further, it is in direct contact only with a very narrow range of external factors. Slight variations within the mother's blood stream may carry far-reaching implications for the almost completely dependent cell system.

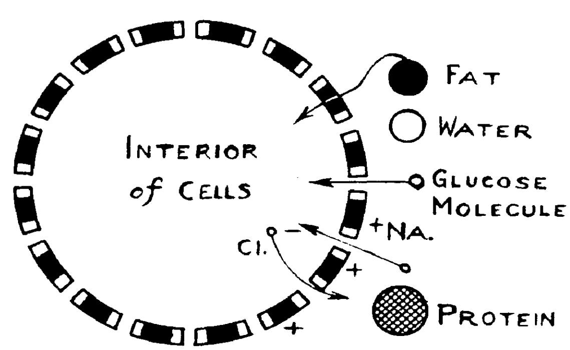

Fig. 6 Permeability of cell membranes. Molecules the size of glucose are thought to penetrate cell membranes through interstices too small to admit passage to larger water-soluble molecules, or to protein molecules. (From Carlson & Johnson)

The cellular membrane is constructed so that continuous water channels through the space between molecules permit the passage of small molecules and ions with the proper charges. Other small particles which can be dissolved in water if not too large are also able to pass: glucose, glycerine and amino acid molecules enter and those of urea leave the cell.

The movement of ions, despite their diminutive size, is controlled by the fluctuation of electrical charges which adhere to the micelles that compose the gelled mosaic. If the charge on these micelles is positive, then positive ions approaching the membrane from either side would be repelled before they got into the water channels, but negative charges could pass easily.[48] Thus in this example chloride being negatively charged could pass, while calcium and potassium being positive would be unable to approach the cell membrane. "The charge on the membrane, like that of its protein, is determined largely by the acidity or alkalinity of the surrounding solution."[49]

The membrane also functions to admit certain types of fat particles into the cell, even though they may be much too large to shoulder their way through the pores between the molecules. Those which are soluble in the membrane lipoids (white spaces in Figure 6.) can dissolve into the fatty portions of the membrane, mix with the molecules which compose the particle, and finally emerge again on the inside.

> Given, then, the proper enzymes, acting upon surrounding water and dissolved substances, there would grow about this enzyme nucleus the substances of protoplasm. There would be sugar formed, to serve for food and structure; protein would appear and give the forming cell its unique character and special composition; fats would arise, to act as a further store of food and, more important, help to isolate and protect the fragile mass from its

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[48] Ibid, p. 118

[49] Ibid, p. 119

environment, weaving about it, together with the proteins, a fragile veil, yet firm enough to repel the bombardment of vagrant molecules and resist the sway of water currents. . .[50]

And on to destiny.

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[50] *Ibid*, p. 209

CHAPTER III

THE PRENATAL PERIOD

> Yes,--the history of a man for the nine months preceeding his birth, would, probably, be far more interesting, and contain events of greater moment, than all the three-score and ten years that follow it.
>
> --Coleridge (1885)[1]

Thus far we have paid our respects to an early environment--perhaps now lost in geological time-evolution but now existing in traces within our veins--and to certain organismic dynamics which seem to pervade and underlie all levels of life. We have surveyed the cell, both as the kernel of new life (the zygote) and as the basic unit of complex form to follow. The overriding significance of this tiny organization, of the chromosomes within its nucleus, lies in its co-controlling, co-initiation of growth and structure immediately to follow.

We also briefly examined the vital function of the cell membrane, one which seems to be similar to that of the doorman of a prohibition speakeasy (the unsung hero of a past decade) for upon the judgement of guarding molecules rides the continuing integrity of the organism.

Prenatal development means a blazing recapitulation,

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[1]From L. Carmichael, "The Onset & Early Development of Behavior", Manual of Child Psychology, Ed. L. Carmichael, J. Wiley, New York: 1946, p. 43

albeit in a loose and incomplete sense, of the evolutionary trail of man, it means the laying down of adjustive structure which in only 9 months will carry life to a stage where it enters upon a scope beyond that of traditional biology; and to do all these prenatal development denotes entry upon a growth rate which, if the curve were not quickly flattened after a few months, would within a life span (given adequate energy availability) create a monster of truly astronomical proportions.

Somewhere way back--when a few elements synthesized into a new compound--and before, since we started with an unknown unit of energy, the atom, we have lost out operationally as to the 'how's' of life coming into being. Now we must sink further into unknowns and description and be content to leap from tiny island to tiny island amid very dark seas of unknowns. Practically the entire story of how organism begins to look familiar--like baby--is unknown. Why fingers five and in the proper size and relationship, why two eyes and located where they are--these at present are somewhat hopeless questions. But the tiny islands do exist and from some the sines and cosines to others have been computed, and the story-incomplete becomes fascinating, nevertheless, to reconstruct.

Prenatal developmental processes for convenience are usually divided into three rather arbitrary phases--the germinal, embryonic and the fetal. The germinal is brief and extends from conception to the establishment of pre-placental nutritional contact between the organism and the chorionic villi of the uterine wall.[2] This generally takes about two weeks. Scammon and Calkins[3] refer to this phase as the ovum stage and they emphasize the establishment of primary membrane layers and the beginnings of germinal differentiation.

The embryonic phase, which Gesell types as the pre-neural, extends from the third to about the fifth or sixth week. During this time the heart, musculature and certain other organs become differentiated and the embryo begins to take on human form.

The final stage, the longest, is the fetal and extends from the end of the embryonic to the termination of gestation at birth (approximately 280 days following conception). The phase marks the rapid, over-all growth and maturation of differentiated organs of the system. This chapter will be organized in terms of these phases and with the understanding that no sharp boundary lines really exist but that transition is gradual and continuous.

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[2] W. Feldman, "Principles of Antenatal and Post-natal Child Psychology, Pure & Applied", Longman-Green, New York: 1920, p. 61

---J. Williams, "Obstetrics", Appleton-Century, New York: 1931, p. 163

---A. Gesell, "The Ontogenesis of Infant Behavior", Manual of Child Psychology, Ed. L. Carmichael, J. Wiley, New York: 1946, p. 300

[3] R. Scammons & L. Calkins, "Growth in the Fetal Period", U. of Minn. Press: 1929, p. 1

GERMINAL PROLIFERATION: THE BEGINNINGS OF RADIAL SYMMETRY

On watching the apparent random cancerous-like proliferations of the germ, one may think there is little of significance in the periodic division of cells beyond the mysteries of mitosis. Perhaps nothing could be further from the truth. In this relatively simple series of processes, as in watching a much more simple cell system, nature will demonstrate many of her time-won adjustments to environment about her.

Perhaps of greatest significance during this earliest and shortest phase of prenatal growth is a kind of recapitulation of evolutionary processes which took originally untold ages for development. In this brief fortnight the unicellular spheroid leaps through these great time reaches to achieve a radial symmetry, a level of specialization and to lay the foundations for structural differentiation and cellular integration.

Hierarchy, indeed, seems to be the key term to what is implied in the process. It is obvious in any given system of things that more varied and adequate adjustment can be had if sub parts within the system can specialize in equilibrating to certain classes of stimuli in functions. What happens in the development of the young germ is paralleled closely in other levels of organization within institutions and other forms of societal groupings. Specialization within a system, in turn, connotes a greater tendency towards adjustive posibilities within additional ranges and further, in terms of greater levels of syntheses and possibilities for evolution.

After a brief sojourn as a single cell, the new organism, as it slowly drifts down the oviducts, proceeds to divide by common mitosis. Within several hours after fertilization organism now consists of two cells, of a right side and a left side; several hours later, after teams of genes and waves of enzymes have acted upon and modified substrate about them (probably yolk, primarily), converting it into new structure and energy, four cells become eight--a morula--and the tiny mass is now 72 hours old.[4] During the process the size of the cells decrease, indicating perhaps that the energy source is still derived from the stores built up originally in the unfertilized ovum. In appearance the mass resembles a solid but lumpy ball (from cleavage having proceeded in the three planes).

Figure 7. Early cell division (From Gerard).

This process of cleavage rapidly accelerates, not because cells division proceeds at a closer interval, but simply because division takes place at geometric rates. At approximately the fifth day following conception the germ in

[4]G. W. Corner, "Ourselves Unborn", Yale U., New Haven: 1944, p. 7

dividing further forms a hollow ball--a blastula.[5] The cell-s originally in the center of the mass push in among their relatives at the periphery and after the first few divisions all planes of cleavage are perpendicular to the surface.[6] Perhaps this is the last hour of relative toti-potence, of homogeneous cell function. The blastula is again a circular, spherical unit, with no 'front', 'side' or 'end'. Significantly, all cells now face the outer environment, that is, the fluid media of the oviduct or uterus. Each point on the surface, as with simpler organisms, is equally the business end.

Now the interplay of environment is beautifully illustrated and for our priviledge the process may be viewed in fast motion as ontogeny recapitulates phylogeny: Further division produces larger cells, indicating perhaps the organism's establishment within a nutritive environment. And now something elso alse happens: the cells in one hemisphere develop more rapidly than do those in the other, so that the 'upper' part of the ball tends to overgrow the portion below it. This is illustrated in Figure 8. The result is an actual infolding

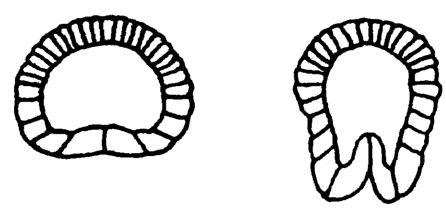

Figure 8. Beginnings of gastrula. From Gerard.

[5] Ibid, p. 8

[6] R. Gerard, "Unresting Cells", Harper, New York: 1940, p. 343

of the less active segments and this gives an inner layer of cells, which, as growth proceeds, becomes pressed close against the outer layer, so that there results again a hollow ball but with its wall composed of two cell layers instead of one, i. e., a gastrula. The new opening is the blastopore.

A somewhat contrasting conception of this ontogenetic phase exists. In contrast to Gerard, Corner visualizes a germ disc forming under the trophoblast, or ectoderm, at the point of highest gradiency. Endoderm, which is destined to form the inner lining of the alimentary tract and lungs, forms by splitting off from the germ disc, proliferating laterally, ventrally and eventually surrounging the future yolk sac (See Figure 9). The final basic layer, the mesoderm, then forms around the large, temporary yolk sac and thus the basic superstructure is completed.[7]

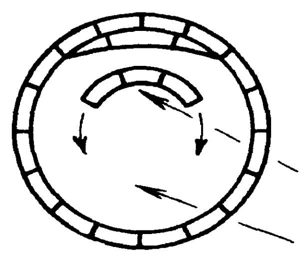

Figure 9. Blastocyst; beginning of endoderm. (From Corner)

At this point a question logically presents itself, namely, why the appearance of a metabolistic gradiency and how is its location determined--how does the new phenomena of front and rear, of radial symmetry emerge?

On the basis of research quoted by Gerard[8] it is noted that a gradiency of cell division actually occurs in lower

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[7]G. W. Corner, op. cit., pp. 6-11

[8]R. Gerard, op. cit., p. 348

animal forms (similar to human ontogenesis at the present stage), lowest at the point of contact with an environmental bed or base, and highest at the opposite end which is projected into the environmental medium. And with Child and Driesch (see page 75) hierarchy and gradiency emerge as a function of the interaction of cell position and reactive potential.

In this case external environment is the initiating force which produces a radial symmetry and further, a gradual shifting and specialization of function among the cells of the gastrula. In closest contact to the stream of nutritive supplies of the uterus, the front end divides at a greater rate, while cells further back receive less and gradually take on subsidiary and storage function. At this early stage of relative undifferentiation, however, this point of specialization must not as yet be pushed far.

Towards the end of the second week the trophoblast, or outer layer, sends out moss-like plasmodial outgrowths which burrow into the very porous and richly supplied mucous membranes of the uterus and make contact with branching chorionic villi that extend into the blood spaces formed in the outer layers of the surface. Thus the tiny organism establishes a functional connection with the mother's vascular system which supplies nutritive needs and serves to remove bodily wastes.[9]

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[9]G. W. Corner, op. cit., p. 24

This system will do until a vascular structure emerges within the embryo which will necessitate in turn a more specialized structure (placenta) to facilitate material exchange.

The Germinal Environment. The tiny organism is, for many purposes, a part of a larger system. Its existence, indeed, its very nature and form, are part of a larger on-going order. To conceive of it apart is useful and economical in some purposes, but an important consideration always remains of attempting to view organism through some focus upon this larger process. The question therefore of its nature is dependent ultimately upon the place it occupies within a larger configuration and of the bonds existing within.

Environment will be considered from three related points: (1) the relationship between the ovum and parent host; (2) the extra cellular environment; and (3) the problem of apportioning determinating responsibility of environment upon maturation.

a. The Relationship Between the Ovum and Parent Host. Emergence of a new unit of life is gradual; if one were unaware of the tremendous potential contained within the macroscopic organism, it might appear less as a true organism than as a somewhat insignificant but privileged organ of the mother's system. Separateness of life units at any stage are relative problems actually and these referring to degree of demarcation within other levels of systems.

At one level, the organism's relation to the parent is parasitic, but Gerard is certainly correct in describing the total bonds between ovum and mother as symbiotic. While the organism will exact a nutritive priority as the prenatal period develops--even to the extent of robbing the mother of certain needed minerals--her homeostasis is ingrained and positively correlated with that of the ontogeny of the embryo. Any interruption of pregnancy, therefore, even at its early phase, carries far reaching reverberations within the mother system.

The tremendously complex patternings built into genes over untold ages have elaborated and preserved an asymetric structural complex which interlocks the two systems along a continum of organization levels. For this writer, the most helpful way to relate the two, as we partially indicated earlier, is to conceive of the future fetus as actually an organ within the parent system--for many practical purposes it is--but to denote it in terms of its unfolding potential, which demarcates gradually it as relatively independent, as an emerging on-going system. It remains in succeeding pages to illustrate and spell out in some detail both of these points, of the close physio-psychological bonds between the fetus and its world--at this stage little more than the mother--and of the gradual emergence of the figure from the ground.

b. Environment. The earliest environment of almost all living matter that we know anything about was apparently some form of salt water. The embryo maturates in a similar medium and it is only in evolving into multi-cellular states that the organism escapes these confining limitations--although even at maturity the water-saline environment is maintained at the intimate cellular level.

It is difficult to explain the system's great sensitivity and complete dependence upon ionic balances except in phylogenetic terms, of life originating and evolving through the slowly changing conditions from which it could develop.[10] The presence of ancient seas cruising around present living cells is indicative of the continuity of evolution and ontogenesis and more specifically, of the fact that similar mechanisms underlie living levels, that nature finding a good thing seldom gives it up but through evolution builds upon it.

The effects of ionic balances has been discussed in an earlier section. In general it is due to a correct saline or acid-base balance that the cell is able to maintain its colloidal equilibrium and hence able to carry on its vital chemical activities.

At this earliest stage of development the ovum exhibits its greatestdegree of dependence upon the continuing stability of the extra cellular environment. Until further differentiation, for example, when the parathyroids and the adrenal cortex act to mediate between the organism and the environment by regulating the utilization of calcium and potassium

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[10] A. Carlson & V. Johnson, "The Machinery of the Body", U. of Chicago: 1937, p. 28

respectively, the embryo exhibits a minimum range of adaptivity[11] to environmental flux.

The ovum also is dependent vitally upon its environment for a constant availability of glycogen, protein, fat, water and oxygen. The right amounts of the right molecules can enter or leave the organism only within the correct mechanical field. That is, extra cellular sugar concentration, for example, must be such that osmotic action will result in a proper cellular glycogen balance. Likewise, the ability of the organism to obtain oxygen is completely dependent upon the presence of a greater concentration outside the cell in order that it may diffuse through the membrane. The reverse is also true for elimination of excessive carbon dioxide.

We are here attempting merely to define and outline the nature of emerging relationships and it remains in recounting later fetal stages to describe some of the specifics which exist. Another important aspect or level of environment which is relavent to prenatal phases is less direct and centers in the emotional-adjustive spheres within the maternal system. This means that the mother is an equilibratory system and that many of the products of her adjustive states are readily and often quickly translated into the dynamics of the tiny mass clinging to the side of the expanding uterus.

Montagu terms this bond the neurohumoral system, indicating that while maternal neurons do not synapse with the

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[11] R. W. Gerard, "The Body Functions", J. Wiley, New York: 1941, pp. 93-95

germ membrane, a strong field, nevertheless, exists.

> For example, stimuli originating in the cerebral cortex (of the mother) may set up reflexes which pass directly into the automomic nervous system (through the autonomic representation in the cerebral cortex) or are mediated through the feeling-tone center or relay station know as the hypothalamus, the great coordinating center of the autonomic nervous system situated at the base of the brain. By whatever route such reflexes travel, the autonomic nervous system acts upon the encocrine glands and these pour their secretions into the blood. In the pregnant mother such secretions are known to be capable of passing through the placenta to the fetus, with the possible exception of some of the hormones of the pituitary glands.[12]

c. The Role of Environment Upon Maturation. If organism represents ultimately a kind of environmental extension, of a pyramiding of energy organizations, then the old controversy of nature versus nurture, of inherited potentialities as against environmental influences, is hardly a correct formulation. What is debated perhaps is the extent to which more complex levels of organization (i.e., heredity) effects the formation of organism as against a combination of all other classes of organization (environment).

This issue seems to imply that having evolved to such a marked extent, life now stands in sharp contrast--with many of its evolutionary links destroyed or invisible--to that organization from which it arose. Child's early statement "The organism represents an order and unity in protoplasm which is related at every point to the external world"--is

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[12] M. F. Montagu, "Constitutional and Prenatal Factors in Infant and Child Health", Josiah Macy, Jr. Foundation, New York: 1950 (Supplement II), p. 8

certainly appropriate equally in the light of later evidence and findings, yet for practical purposes this is as a concept often difficult to operate with.[13]

For convenience, therefore, we construct two blurred interacting forces, of impressing and being impressed, of genes, on the one hand, and substrate-environment, on the other. It remains necessary to recognize that heredity is not constituted merely by genotype, but by genotype as modified by the environment in which it has developed. Thus organism inherits a genotype and a particular environment, and the former itself is certainly capable of modification by the latter. Thus from Dahlberg the idea that a gene on the verge of expressing itself may be effected by random variations in the constitution of the cell substances.[14]

In summary it is necessary to proceed from the fact that what the organism inherits is a dynamic integral of the genotype and the environment--a resultant of the dynamic interaction between the two.

This eternal interplay of forces is demonstrated dramatically in the germal and early embryonic phases in terms of subsequent implications for fetal and infantile growth. It is known that many still-births and malformed infants upon the basis of genetic investigations inherited healthy geno-

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[13] C. Child, "The Origin and Development of the Nervous System From a Physiological Viewpoint", U. of Chicago, 1921, p. 7

[14] D. Dahlberg, "Environment, Inheritance & Random Variation", Acta Genetica & Statistica Medica, I, pp. 104-114

types. These basic abnormalities represent, rather, the interactions of normal gene complements upon inferior substrate caused, in turn, by inadequate maternal nutrition, i.e., inadequate environment.[15] It's all a little like, say, giving skilled foundation masons inadequate cement and other necessary materials from which to fashion a foundation for construction to follow. The structure that follows can be only deficient and prevade and limit all subsequent development.

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[15] J. Warkany, "Etiology of Congenital Malformations", Advances in Pediatrics. (Interscience Publishers, New York: 1947), 2, 1

THE EMBRYONIC PHASE: FOUNDATION FOR HUMAN FORM

Embryonic growth is both startling and magnificant beyond any equal. The three week period is a momentous one in its ontogenetic sweep; of a brief time when a few hundred amorhous cells, bearing more similarity to primitive microbes, proliferate at a dazzling speed and are assembled by the magic of possibly plus or minus 30.000 genes[16] into a small and delicately fashioned outline of almost-human form--surely synthesis climbing near its zenith!

Cell proliferation is enormous; in three short weeks organism expands from a tiny, barely visible speck to over 4 mm. in length.[17] Cells divide and redivide. In four weeks they have captured energy, converted substrate until one million exist![18] And then--minutes later--that great achievement is but an unnoticed milestone.

But this is no mere tissue culture running wild under the stimulus of a nutritive agar and as yet unbefoulled by its own wastes. Perhaps at no other time in human ontogenesis are we permitted to witness and so vividly feel the full wonder and implications of cells unfolding, integrating amid a

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[16] R. D. Evans, "Quantitative Inferences Concerning the Genetic Effects of Radiation on Human Beings," Science, 109, (1949), 299-304

[17] L. B. Arey, "Developmental Anatomy", Saunders, Philadelphia: 1946, p. 103

[18] R. E. Scammon & L. Calkins, op. cit., p. 1

--G. W. Corner, op. cit., p. 21

seeming chaos, in a definite and perfect order and symmetry, of nature building at a terrific rate new levels of enrgy synthesis upon old, of the beginnings of an internal vascular system, for example, to replace one of simple diffusion and osmosis, and of everywhere the right kinds of cells emerging at the right places, and in the correct proportions and time.

All of this seems a little like a crew of super artisans suddenly emerging at a signal into a flurry of activity, converting stray bricks, boards and nails into a beautiful fifty-room house as if each had practiced his particular skill a hundred times over. But actually, however, even the most perfect, the most beautiful of houses does not even constitute a good analogy.

Thus in the feverish constructive activity of the embryo the stage is set to sweep organism from a collection of homogeneous cells through millions of years of time-development to the heights of physiological organization. And then, in the fetal and in the brief neonatal phases--when the achievements of the embryo have been consolidated--life will again be ready--genes and the environment poised--to make a last great dash, one made by man alone, to the towering spheres where organism thinks, reflects, creates, evaluates, enhances. As Huxley said, this, the human man, walks alone: he alone may share purposively in determining the direction of evolution and so act as "its prophet and pioneer."[19]

This is, then, the story of a protoplasm which learns to think, but it must yet be told by the beggars who have only seen the towering, glittering columns of the palace and of the wonderful happenings going on inside it walls from the haze of a tiny dust-permeated alley.

<u>The Emergence of Embryo Form</u>. Up from the germinal phase are bequeathed three rather confused and blurred layers of cells. The two inner layers are thin, often incomplete and little more than a cell in thickness, with the presence of frequent gaping spaces.[20] But in this seemingly disordered and casual arrangement of cells is the superstructure of the three basic layers of all advanced organismic forms. From the outer ectodermal layer will evolve skin, nerve structure, eyes and certain linings of organ structure; and emerging into configuration within the blurred field of the inner endodermal layer are the glandular factories for digestion, organs of respiration and the inner lining of the alimentary track; the presence of the newest, the seemingly crude third and middle layer, the mesoderm, carries the germ and embryo already beyond the most mature levels of such as the hydra, and is destined to make skeleton and vascular apparatus.[21]

The ectoderm, now covered partially by the spreading

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[19] Julian Huxley, "Knowledge, Morality, and Destiny", I II, <u>Psychiatry</u>, 14, 2, 141

[20] G. W. Corner, <u>op</u>. <u>cit</u>., p. 8

[21] A. Carlson & V. Johnson, <u>op</u>. <u>cit</u>., p. 575

amniotic sac, is the thickest--it is the hide--and presents a somewhat compact and uniform appearance. Mesoderm is thinner, perhaps two cell layers in thickness; endoderm is poorly formed and trails off unevenly around the large yolk sac. At this time (about 18 days) the little embryo measures at its widest diameter 1/16 of an inch.[22]

Almost immediately after completion of these three fundamental layers of superstructure, new relays of genes are propelled into action. Up to this point differentiation has consisted largely of intra-cellular specialization, then of the emergence of a degree of heterogeneity in three distinguishable cell layers. To be sure, tremendously complex coordinating forces--gradiencies, metabolic fields, etc.--have been at work to effect division and symmetry, but by the beginning of the third week it becomes possible to detect a new order of differentiation--that of morphological variation: of certain cells evolving into specialized structure, forming even closer bonds with each other to accomplish new tasks formally undertaken only in a more general fashion within the cell and/or by external environment.

In the emergence of organs--institutions of the body--bisensimotive molecules proudly are exhibiting their apparently limitless equilibratory skills, for by forging assemblies for specialized tasks organism becomes able to extend itself in seven league strides beyond the dependent confines

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[22]L. P. Arey, _op. cit._, p. 105

of a closely delimiting level of environment. By providing internally the necessary conditions heretofore met by environment, it reaches new planes of possible equilibration and these, in turn, paving the way for new levels of potential, interaction and longevity. We write organismic longevity, of the greater life span of man over his friend the dog, in terms of a richer, more varied adjustive potential--of more steps, developmental-wise--to be taken, of more things to be built--of more bonds to be forged with environment. And, when these have been achieved, when man, has reached his forte, he too, like his four-footed friend gives way to mixed upedness and fades away.

A Vascular System. At approximately 16 days the embryo is little more than three layers, with a precocity hardly visible (see A, Figure 10). But only 48 hours later (B, Figure 10) a slight pericardial cavity clearly is visible in the

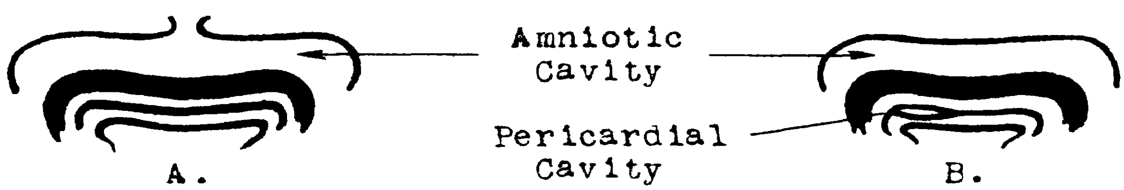

Figure 10. (A) Sagittal section of embryo (16 days) showing symmetrical development (From Corner). (B) Same section at 18 days with visible pericaridial cavity (From Gesell & Amatruda).

left mesodermal area. This tiny and insignificant appearing structure will in only days time form a heart[23] and at the same time, in an almost incomparable gesture of coordination

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[23]A. Gesell & C. S. Amatruda, "The Embryology of Behavior", Harper, New York: 1945, p. 26

and integration, tiny blood vessels gradually will differentiate within the system. Thus as size gradually renders simple direct contact by each cell with the chorionic villi of the uterus difficult--and actually impossible--a new internal transportation system gradually takes over, freeing organism of size limitations and restriction towards specialization, leaving it free to tackle other problems of engineering.

The heart first emerges as a tube within the pericardial cavity, then loops and infolds, developing into two and then four chambers. Gradually during this process the unstriated primitive muscle cells which make up the heart begin their subliminal, irregular twitching. Within only hours enough cell relays have reached a liminal point and easily discernible twitching begins.

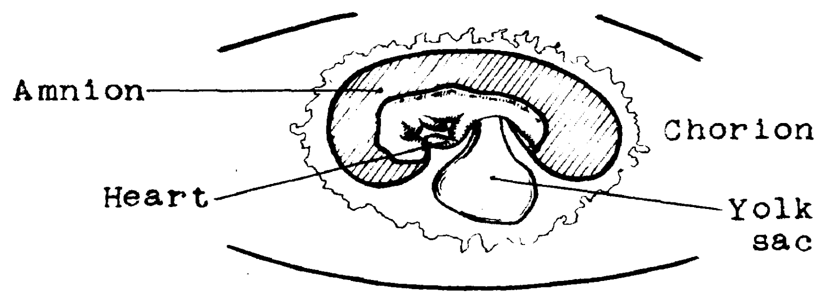

Figure 11. The embryo at four weeks. (From Corner)

> These cells in the atrium and ventricle react in unison with sufficient power to produce contractions at first sporadic, then in brief rhythm, and then in peristalsis and pulsation. Later the sinus also shows contractile activity, and takes over the pacemaking role. It sets a pace which is sustained till death.[24]

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[24] Ibid., p. 37

Almost unbelievably by the end of the third week heart has emerged, differentiated and has begun to beat. It takes the genes approximately only a week to lay down a system of blood vessels. And at the same time, in this first lunar month racing genes have differentiated two parallel tubes, these to be the forerunners of the gastro-intestinal tract and the cerebrospinal canal.[25]

Beginnings of the Nervous System. Gesell types the embryonic phase as pre-neural but it is during the third week that the beginnings of neural structure are laid down. In actual fact, of course, one can draw no line in the ontogenesis of organism as being the point of neural functioning for all levels clearly indicate 'neural' activity. Cells, collections of cells and cell assemblies are capable of transmitting electrical-molecular excitation. Of such great significance is the emergence of specialized organs and structures to accomplish afferent, efferent and coordinating tasks. True function belongs to the fetal phase, but here we may see an approximation of structure.

Heuser's 18 day old embryo contained a definite chorda canal--or primitive notochord.[26] This precursor of the spinal column (vertebral column) arises at the juncture of the ectoderm and mesoderm, axially on the dorsal side

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[25] Ibid., p. 27

[26] C. H. Heuser, "A Presomite Human Embryo With a Definite Chorda Canal", Contributions to Embryology, Carnegie Institution of Washington, No. 433, p. 262

(Figure 12). First noticeable is ectoderm thickening into a neural plate (A). Shortly after it invaginates forming a 'U', with the open side outward. The process continues until

Figure 12. Transverse view of the formation of the neural canal from a thickening of the neural plate. (Dorsal secuence adapted from Davenport)

the ectoderm completely closes over the neural tissue (D), leaving a hollow tube lined with neuroblasts, these to quickly evolve into complex and highly specialized neurons. Actually, by the end of the fifth week the spinal cord is laid down to its full extent.[27]

Organism, Coordination and Hierarchy. The development of specialized structure focuses attention once again to the vast problems centering around differentiation: what are the controls for growth and proportion, interaction, coordination and what is the nature of these governing, coordinating centers or forces? Questions such as these are at the heart of the unknowns of biology, all else seems to turn about them.

In the prenucleated organism specialization and gradiency are established instantly by the changing nature of environment--organism reacting somewhat passively. In evolutionary time many of these frequent adjustments by irritable protoplasm tend to become permanent and structuralized, genes

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[27]Gesell & Amatruda, op. cit., p. 26

acting to anticipate, so to speak, future environmental-organismic equilibratory demands.

In the dorsal view of the Heuser embryo (Figure 13) and in the sagittal section schematized by Corner (Figure 14) a gradient differentiation is visible clearly. In both development is precocious from the tail or caudal region to the head or cephalo end. Closer examination would reveal also a transverse proximo-distal gradiency, with differentiation more advanced along the axial region and less so towards outer lateral extremities.

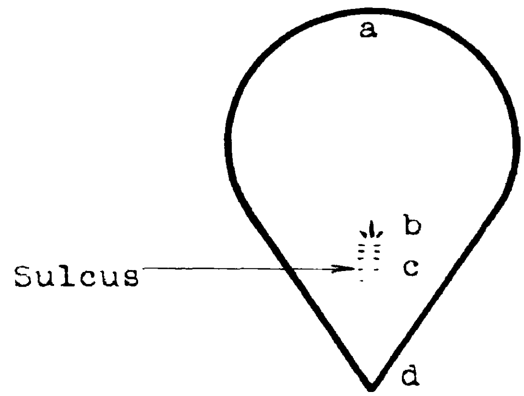

Fig. 13. Dorsal view of embryo 18 days old; .75mm x 1.53mm. Sulcus indicates chorda canal (Heuser)

All of this seems first to have been noticed by Jackson. Structures which in the scheme of things subtend function of other bodily parts--of the archaic brain functioning earlier than the cortex, the vascular system antedating that of the digestive system, etc.--logically appear first.[28] At the embryonic stage most advanced is the upper spinal area; in the Heuser embryo this corresponds to the area at b, which marks the junction of the head and body. Although the area a-b is larger, it is, like the caudal regins, b-d, largely undif-

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[28] C. M. Jackson, "Morphogenesis", From Morris' Human Anatomy (5th Ed.), Blakiston, Philadelphia: 1927, p. 275

--On the Prenatal Growth of the Human Body & the Relative Growth of the Various Organs", American J. Ana., 9, 119 ferentiated. Cortical function and cortical dominance are as yet many monthsaway. Thus it seems to be within this b area--what constitutes the mid-brain, that early regulatory process--breathing, tonus, primarily--are coordinated.

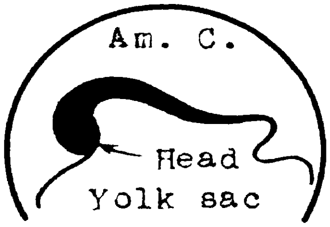

Fig. 14. Asymmetric morphology. (From Corner)

How to explain this happy cooperation? We have mentioned in some detail Child's pioneering approach. This theory of gradience first points out the agreement in space and orientation between morphological and physiological polarity. It then asserts that the significant gradient is metabolic in nature[29] and that the relative intensity of metabolism at the two end-stations on a gradient is the cause of a head and tail existing and reconstituting as they do.[30]

An egg, for example, first shows an animal-vegetal polar gradient. At gastrulation the organizing center appears within organismic differentiation itself, i.e., of specialized structure appearing to 'meet' external forces as the embryo progresses antero-posterior, dorso-ventral and medio-lateral gradients can be demonstrated, as well as gradient fields where the various organs are emerging.

Child's early work is no longer the only statement we have as to this problem of organismic functioning, yet at

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[29] C. M. Child, "Physiological Foundations of Behavior", Holt, New York: 1924, pp. 47-55

[30] L. B. Arey, <u>op</u>. <u>cit</u>., p. 167

the present time ontogenetic studies of organismic architectionics are still crude shots in the dark and represent little more than elaboration upon Child's work. In some cases, in fact, Child's more fundamental contribution--that of the organism emerging through the dynamic interaction between chromosomes and environment--has been lost sight of, with researchers scrutinizing one aspect or the other of what constitutes a unified process of dynamic interplay. We have at hand several interesting theories of organism and integration--including growths aspects--but most of these are based upon neural process; little is said of preneural growth and differentiating guides, or of the forces which order neural growth itself. That neural development is subject to similar laws as other parts of the system has been amply proven by Coghill, Gerard, Schneider, Wetzel, Hoagland and Speidel.

Without attempting to get ahead of our growing embryo, it can be noted that neural growth and the pathways it takes seem determined by sets of metabolic gradients--centers of intense electro-chemically polarized activity in the oral and caudal ends of the embryo.[31] New organs and systems are brought in by the existence of these fields and these, in turn, negate the necessities and consequences of their original forms and activities; these, however, continue in

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[31]F. Northrop & Burr, "Experimental Findings Concerning the Electrodynamic Theory of Life and an Analysis of Their Physical Meaning", Growth, I, 78-88

new forms, corresponding to various stages of development, as long as growth continues.[32]

Wetzel's statement (1937) that growth is a process in motion of work done--translatable into mass, and a portion of work done in releasing a growth kinesis, translatable into growth heat per unit mass.[33] offers a comfortable base to construct a non-operational anthropomorphic analogy. Thus something we call genes control growth; this may mean, in turn, that while certainly there is no over-all geometrical-asymmetrical patterns locked within the giant molecules of the chromosomes as such, these consistencies are by-products of a complex process; genes control growth because there are just a certain number of certain kinds present to act upon a certain available substrate. Any given gene may denote a very specific protein structured to react electrically and catalytically within the existence of only very specific, complementary environments. It is simply impelled into action--automatically--in virtue of a given open electrical field, and this, in turn, structured by the action of earlier acting genes. Ectoderm closes over the neural grove to form a closed tube 'simply' as the results of specialized relays of genes being forced into action because of actuating fields along the axial column. The tube initially emerges where it does and not somewhere else in virtue of certain

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[32]Daniel Schneider, "The Growth Concept of Nervous Integration", Introduction to a Genetic Neurology, Nervous and Mental Disease Monograph, 78, New York: 1949, p. 6

[33]N. Wetzel, "The Nature of Embryo Form", Growth, I, 51

earlier polar fields. Of course, proper fields do not always form and genes elsewhere occasionally are propelled similarly to construct the right project, but in the wrong place.

All this may seem like a very flagrant abuse of reasoning after the fact. Yet that something such as this does happen has been demonstrated repeatedly in countless experiments upon plants and animal embryos. In these, the experimental surgeon simply changes or transplants bits of tissue or even whole limbs, with the results that growth and differentiation are effected by new electro-chemical fields and with such dramatic results.

The real underlying mystery in all this business of growth control is in the formation of gene patterns, in the transmissible modifiability of protoplasm. How are these little electrical fixtures each given their particular reactive combination in the course of on-going external-internal equilibration?

Leaving this problem until we again encounter it in the fetal-neural phase, we need to note that rapid embryonic growth entails additional engineering problems: not only must a system which develops mass provide for its circulation, but it must differentiate out specialized tissue to support its very mass, and further, it needs to construct an apparatus which will carry out the physical, kinetic work necessary--in short, it must again become engineer and build skeleton and muscle.

Muscle and Cartilage. The forerunner of muscle tissue are the small, compact cell masses on each side of the axial line. Within a short period these 'bumps' evolve into muscle making tissue--myotome--and arrange in paired series along the axis. This gives the embryo the appearance of being made up of a series of rings.

Of the greatest significance during the feverish activity of the forth week is the emergence of two tiny pairs of stumps, one pair behind the gill arches and the other at the base of the tail and these, of course, to form arms and legs, respectively.[34]

By the fifth week the embryo has reached a size where it becomes necessary to provide a certain amount of structural rigidity (see Figure 15). The precursor to much of the subsequent bone formation is an extensive system of semi rigid cartilage. Cartilage arises from enlargement and differentiation of the mesenchyme cells into compact precartilage areas. It is thought that while in their compact stage the mesenchyme cells produce a protein collagen matrix[35] in the form of inter cellular deposits and that this substance works into the spaces and proceeds to harden.[36] Once formed, the cartilage

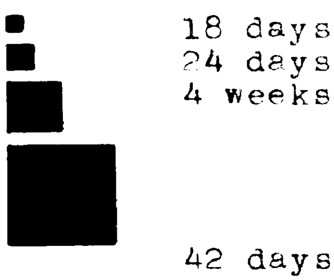

Fig. 15. Relative growth. (From Arey)

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[34]C. H. Davenport, "How We Came by Our Bodies", Holt, New York: 1936, pp. 34-35

[35]Ibid, p. 269

[36]L. B. Arey, op. cit., p. 365

cells--except for tiny capillary spaces--are isolated and imprisoned.

Embryonic Activity. The grand passion of experimental psychology seems to center around the onset of prenatal behavioral manifestations. Tomes are written on such subjects as the earliest date an embryo can be detected to react to the prick of a camel's hair, or when do the embryo's eyes function. Since this is a synthesis perhaps we ought to include a choice statement or two from such so-called psychological research.[37]

Carmichael reports that possibly the youngest human fetus to be observed to move is one reported by Yanase (1907). In a fetus 20 mm. long and of an estimated age of 6 weeks, one movement involving the right arm is rather casually noted.[38] He also reports upon an early experiment by Strassmann (1903) in which both arm and leg stubs exhibited a rhythmic movement.

Of seemingly greater importance, the earliest movement which may be observed is that of the beating heart. Gesell,[39] Schneider,[40] Parker[41] and Williams[42] have long since settled an old argument as to whether or not adult heart action is

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[37] In passing one cannot resist being reminded of Sapir's pithy statement: "Be it remarked in passing that what passes for individual psychology is little more than an ill-assorted melange of bits of psychology and of studies of highly fragmentary modes of behavior which have been artificially induced by the psychologist. This abortive discipline seems to be able to arrive at no integral conceptions of either individual or society and one can only hope that it will eventually surrender all its problems to physiology and social psychology. From "Cultural Anthropology & Psychiatry".

to be thought of as essentially determined by direct muscle or by neural stimulation. In research upon the embryonic phase it becomes very clear that preneural controls exist long before neural function. In this consideration of early muscle action it needs to be remembered, of course, that we are talking of unstriped--or, more technically, unstriated--muscle tissue. It is noticeable in embryos only 1mm. long; striped musculature generally does not appear in embryos smaller than 2.5mm. and it does not take on its definitive characteristics in fetuses less than 22 weeks old.[43]

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[38]L. Carmichael, op. cit., p. 108-109

[39]Gesell & Amatruda, op. cit., p. 28

[40]D. Schneider, op. cit., p. 6

[41]G. H. Parker, "The Elementary Nervous System", Lippencott, Philadelphia: 1919, pp. 52-54

[42]J. W. Williams, "Obstetrics", Appleton-Century, New York: 1931, p. 163

--"Williams's Obstetrics", H. J. Stander, Appleton-Century, New York: 1936, p. 127

[43]W. E. Hewer, "The Development of Muscle in the Human Fetus," J. of Anat., 62, 72-78

THE ENVIRONMENT OF THE EMBRYO

The environment of the embryo--here we can see life stretching its bands. Initially the world of new organization was in the rhythm of cilia and the peristalsis of the Fallopian tube as they carried the tiny cells into the uterus. Sources of nutrition beyond what were stored in the egg existed in bits of useful matter about the egg, amid a proper physiological solution for organism to move and capture food. In the earliest germinal phase life was at its simplest and most constricted form; in the embryo it has reached out and taken what it found plentifully about. In elaborating--extending--life also fuses with greater sources of energy; it is beginning to meet its world at many new points. There is no use in trying to figure out which side of the fence effects the other first--when the signal be green catalysts and genes go ahead and organization emerges to capture energy in greater areas--and, again, the rate becomes geometric.

Here seems to be a basis of all life sciences. In trying to decern significances along what is a continuum, we are not really interested primarily in the changes in equilibration of the tiny embryo: we want to see this interplay where our problems exist--of childhood, adulthood and of the gamete of social and cultural struggles. Equilibration however starts here and as organism builds towards term the quality--adequacy--of these interactions is momentous, but not only in terms of organic consequences to follow, but also for that of the psychological or, in a sense, super organic.

In studying the comparatively humble embryo many trends are shorn of their elaborations and made easier to see. If we look at the changes which take place--even only those in the course of a few weeks--we see that in this total equilibratory process organism tends to internalize the forces, the means and mechanisms of each new level. The trend repeats itself over and over again. Fetus, child, adult, solve their problems by incorporating aspects of environment so that the organism may be less dependent, less vulnerable, to achieve greater viability and security. A physiological solution necessary for life and initially occuring outside and around it is internalized and freeing organism to reach out to new levels.

In this process, of moving through developmental levels organism builds and elaborates upon what it has, upon its antecedent organization; new form emerges from and is functionally based upon the old; process is always transitional, gradual and along a continuum. Thus also life becomes more differentiated and structured within its sphere.

With the embryonic phase is laid the foundation for a super equilibratory structure--mind--which in its almost unlimited potentiality suddenly propelles man--frees man--from the helplessness of being apart of an evolutionary process without at the same time being able to see it and to take part in its direction . . . "all the treasure of mind and spirit buried, throughout most of the cosmos, in the darkness of mere potentiality, and awaiting life's struggle for existence to bring them into the light and reality of fruition.[44]

> Alternate light and day, and the teeming, spititual darkness;
> Unspeakable, high processions of sun and moon, and countless stars, above;
> Below, the manifold grass and waters, animals, mountains, trees;
> With inscrutable purpose--some hidden, prophetic intention;
> Now, first, it seems my thought begins to span thee.[45]

But this must only be a preview of later levels for now we are far ahead of the story.

The Second Level. Organism's second level within environment is in its firm implantation within the purous membrane of the womb. "When the ovum reaches a favorable spot in the uterus its ectodermal cells eat their way through the epithelium."[46] When this happens the exposed layer of the uterus, decidua vera, spins equally porous blood-rich capsularis around it. The trophoblast of the ovum meshes into this easy street with tiny finger-like processes calles villi and after a series of changes the maternal blood nutrients filter through.

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[44] J. Huxley, op. cit., p. 130

[45] Walt Whitman, "Passage to India", Quoted from J. Huxley, op. cit., p. 131

[46] J. DeLee, "Principles & Practice of Obstetrics", 5th Ed., Saunders, Philadelphia: 1930, p. 30

During, and for some time preceeding this process, development of embryonic membranes are also under way. Two embryonic folds are formed early and then join to make up the enclosing amniotic sac (Graf Spee[47]). The sac while enlarging becomes filled with a watery amnion with a specific gravity very nearly that of the developing embryo:[48] in a short time it envelops the organism, providing thereby a cushiony, protective bag against external shock, noise and pressure change.

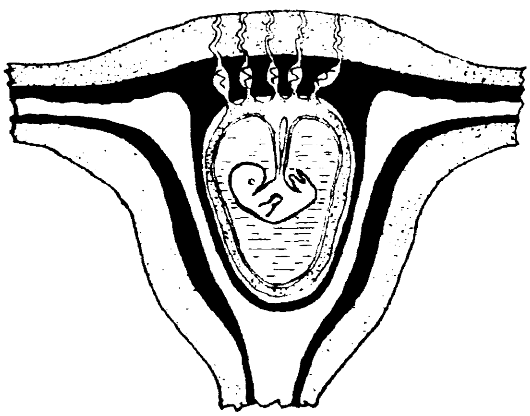

Figure 16. Embryo, membranes and uterus. (From Carmichael, 1933)

Immediately exteriorly to the watery amnion the mature chorion laeve forms from a fusion of allantois--which is an outgrowth of the developing digestive tract--and the previously formed primitive chorion.[49] The chorion continues to be attached to the embryo proper by means of the allantoic stalk (see Figure 16) which comes to conduct, as well, the two allantoic arteries and veins.

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[47]From J. DeLee, Ibid, p. 43

[48]W. Feldman, op. cit., p. 34

[49]L. Carmichael, op. cit., p. 61

--J. DeLee, op. cit., p. 45

This embryonic circulatory system mechanically is completely separated from the maternal blood system but the separation is only that of a cell wall in many places. By interchange through living membrane, therefore, oxygen and food materials pass from the maternal blood system into the independent embryonic blood system; similarly, carbon dioxide and other metabolites pass in the opposite direction into the maternal blood stream. Villi along the outer arcs of the chorion soon disappear in all higher mammal forms.[50] In time the stalk narrows down and becomes the flexible umbilical cord. In it run the same blood vessels.

This in brief is the physiclogical picture of the embryonic environment, but it hardly constitutes the extent of its immediate functional range. Besides the mechanics of the uterus and of the significance of its thick protective outer wall, is the real world of the maternal blood stream. Via this fluid media the organism is in varying degree exposed and linked to many additional planes--of the routine functioning of the mother and indirectly sharing in the effects of her social-emotional states through psychosomatic variations via the neurohumoral system. The common endocrine pool of the mother and fetus form the neurohumoral bond between them. The endocrine systems of mother and fetus complement each other. Thus in the emotional and physical condition of

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[50] N. Millard & B. King, "Human Anatomy and Physiology", Saunder, Philadelphia: 1945, p. 357

the mother gross chemical states are transmitted to the embryo.

Many hormonal molecules are so large as to be blocked by the chorionic villi (and this seems to hold later also for the placenta as well) but there is little doubt that many maternal hormones are composed of molecules of small enough size to be able to pass readily.[51]

That a close correlation exists between the embryo and the nutritional state of the mother has been proven clearly (see also pages 126-127). From the studies of Tisdall (1945) and Burke et al at Harvard (1943),[52] a close relationship is known to exist between such factors as low socio-economic status and nutrition and between nutrition and the rate of still-births, miscarriages, neonatal size and physical health (this latter expressed chiefly in the form of radio-opaque white striae which may be seen in the tarsal bones by the end of the first postnatal month.)[53] Montagu reports a study by Murphy (1947) that indicates a high frequency of malformed fetuses occur in women whose diets were deficient in calcium, phoshorus and vitamins B, C and D.[54]

Such a listing as this could easily be continued. In

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[51]W. Windle, "Physiology of the Fetus", Saunders, Philadelphia: 1940, p. 284

--L. B. Flexner, "Studies on the Permeability of Mammalian Membrane", Science, 105, 635

[52]F. Tisdall, "The Role of Nutrition in Preventive Medicine", The Milbank Memorial Fund Q., 23, 13

general, however, these studies fail to draw a line between the effects of early nutritional deprivation (ovum-embryonic) and the damage caused by deficiencies expressing themselves in later fetal stages. Also, at present we do not yet have a picture of the extent to which maternal emotional states may effect germinal or embryonic development. Of the fetal there is a relative abundance of evidence and a sampling of it will be reviewed in the next section.

--B. Burke, V. Beal, S. Kirkwood and H. Stuart, "Nutrition Studies During Pregnancy", Am. J. Obst. & Gynec., 46, 38-39

[53]L. Sontag & L. Harris, "Evidence of Disturbed Prenatal & Neonatal Growth in Bones of Infants Aged One Month", Am. J. Dis. Child, 56, 1248-1255

[54]M. Montagu, op. cit., pp. 14-15

THE FETAL PHASE: FOUNDATION FOR THE SOCIAL PLANE

Fetal development, characterized chiefly by its relatively great increase in size, and of course by the emerging quickening movements clearly felt by the mother--is the longest of the prenatal phases and one from all concerned that draws the greatest interest. That it may be more dramatic than earlier stages, there might be little doubt, but in contrast to these earlier stages it is a time largely of rapid growth along plans previously laid down: it becomes the finishing stage bridging the gap between the emergence of human structure and appearance and its readiness and maturity at term to function within a new, more extensive world. The fetal stage characteristically, then, is a period of proliferation and of preparation, of teams of genes working to meet future demands and of putting the finishing touches to all the differentiating organs making up the human system.

By the fetal stage, the study of human development must admit of several new--or at least now clearly perceptible--areas of focus. Certainly one that becomes prominent, and one needing a tremendous amount of additional research, is that of emerging individual differences. By the 3rd month this interplay of a particular complement of genes within a particular environment bears a very characteristic product and one by now so complex through these vicissitudes of interaction that organism has become unique. Each organism is the result of this dynamic process, with room for variation and leeway all along the way. But further, each organism reflects clearly, in geometric proportions through time-development, its capacities for auto- and exo-geneous adjustment and modification through layers of synthesis; organism is thus now highly differentiated within its sphere and now dramatically a force in itself.

A second focus, one we raised in the previous section, centers about the now central issue of organismic hierarchy and coordination. With the emergence of neural tissue more may be said as to how this tremendous factory moves so smoothly along. But again--and alas--such contributions are pitifully small, and they only seem to drive one back into awareness of the great need for more research and of the almost unbelievable wonder of what is involved in the life system.

Closely related to this problem--and one which could just as logically have been included in the ovum or embryonic stages--is that of organismic integration and of the way in which individuation proceeds ontogenetically. Here is an issue that has attracted so much attention from biologists and psychologists alike--of how organized behavior takes form. Two lines have been drawn clearly: one says behavior proceeds from the whole to the parts; the other sees organized behavior emerging through an interlocking from the separate movements, of parts combining to form the whole.

This problem of the whole versus the part seems to be part of the issue of what is the larger question, namely, that of the basis for organismic coordination.

From the perspective of a survey of human development it seems that research priority belongs to the larger issue and some evidence will be presented which indicates that, as in many a political or ideological conflict, the solution is neither all white or all black.

In a general outline such as this we have to give ground in attempting to account for and follow ontogenesis of each part within the system. The development of certain organs are, however, especially important: the formation of skeletal tissue, of the breathing or respiratory apparatus and particularly of neural structure will receive attention.

Many aspects of growth and the enormous proliferation which takes place during this period are of course directly measurable. The trends in infancy, of overall growth and of changing proportions, are projected from patterns during prenatal stages and the continuity between the pre- and postnatal periods may with profit be picked up in the present early levels under consideration.

Finally, with the on-going maturation and functioning of specialized equilibratory, coordinative tissue the interplay between organism and the external-internal environment becomes especially important. The new fields in fetal research are those concerned in some fashion with this interaction and such research is fast carrying attention away from an earlier conception of all infants facing life with essentially the same psycho-biological preparation and outlook. Thus in somewhat greater detail than previously we have the task ahead of presenting evidence of the effects of environment and of attempting to sketch something of its nature and inclusiveness. From this focus such problems as accounting for emerging individual differences in temperment, energy levels, of differences in resistance to disease, of differences in neuro-muscular reaction and coordination occupy a central stage, although as yet little can be said in explaining them.

Above all the fetal phase is, phylogenetically, a space of time in which organization synthesizes and races through the lower, delimiting levels of all other animal form to emerge at term with a cortical potential that admits the human to a new level, of a new sphere of equilibratory means. For the infant-human new horizons stretch without limit and the stage is set which may free the organism from preoccupation with its gene-ordained rituals of metabolism and direct chemical homeostasis; receivers and effectors begin buzzing with the impulses, the precursors, the sounds of the social and interpersonal which build into new configuration called cultural.

Organismic Structural Differentiation. Striated muscle tissue evolves from less diferentiated cells somewhat later than does unstriated heart tissue, and then proceeds to proliferate at an amazing pace. The young fetus rapidly gains bulk and much of this must be devoted to the physical task of effecting movement and serving coordinative needs. As we shall see also, much more is involved in muscle maturation: the readiness of muscle tissue, i.e., its tonus or ability to do work, is indicative of the total welfare of the system and of its equilibratory, adjustive capacity. The vigor of muscle cells is akin to the powerful torque of a motor, of its ability to send power through the system and of the latter's ability to utilize it to perform useful work.

Phylogenetically the deep axialmuscles of the trunk and of the pectoral and pelvic girdles are the first to differentiate out of the myotome muscle plates.[55] These muscles, mostly bilaterally symmetrical, organize to afford the trunk and its neck and head extensions power of movement which will be basic or preliminary to future more distal movement patterns. Thus archaic motor activity centers around the developing spinal vertebrae; early fetal movement will therefore include passive accompaniment of outer appendages which are not yet as advanced ontogeneticaly. Trunk muscles first serve to unite adjacent vertebrae, thus allowing spinal extension and flexion, and secondly to organize the trunk and provide a

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[55]Gesell & Amatruda, op. cit., p. 46

base for future appendage activity.[56]

> If we had the knowledge (and the patience), we could depict the course of development by a series of stereograms showing step by step how individual muscles and muscle bundles come into increasing functional maturity. This would be a descriptive portrayal, and yet it would serve to rationalize why, now the trunk, now rotation, assume prominence in the ever-changing behavior picture.[57]

At term muscle development (and especially muscle function) is of course still incomplete. Adequate striated muscle function will depend upon fibral maturity, but also it will be related closely to the total environment (i.e., internal also) and to the degree of the subsequent process of enervation. Mature functioning, therefore, depends upon stimulation of sufficient numbers of differentiated fibers and secondly upon the number of fibers threshold.[58]

As growth proceeds the first trend is to envolve larger and larger areas of the body. Where at first only the trunk reacts, later the head, arms and finally the legs take part in an as yet poorly coordinated response to some external or maturational pressure. By the 11th week, approximately, stimulation to the head region elicites reaction in the form not only of trunk rotation, but of semi-independent head and/or arm lateral flexion movement. Then to a next step.

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[56]C. Davenport, op. cit., p. 118

[57]Gesell & Amatruda, op. cit., p. 49

[58]A. Gesell, "The Ontogenesis of Infant Behavior" Manual of Child Psychology, Ed. L. Carmichael, J. Wiley, New York: 1946, p. 307

Out of this mass movement more specific adaptive reactive patterns emerge. Total relatively inadequate movement is replaced by more specific and appropriate responses.

As early as the 20th week, arm and head movements occur in association. When the fetus turns its head to the right, the right arm tends to abduct, the left to adduct, or draw in. This rotation and extension of the neck (what Gesell terms the tonic-neck-reflex) serves to prepare organism for future postural needs and also provides a degree of incipient readiness against postnatal gravity influences.[59]

Thus if compiled these apparently random movements of the fetus seem purposeless and passive: of responses, now to a change in pressure of the mother's uterus, to myogenic or neurogenic change, or now to a shift in metabolic focus. But behind these activities are even more complex ordering forces which as level upon level of organization are built up serves to prepare or reherse organism for readiness in a postnatal world that lacks the relatively effortless freedom of action and protection of the amniotic medium.

a. Beyond the Superstructure. By the end of 16 weeks the fetus is almost four and a half inches long. Its appearance, with fingers and toes already delicately differentiated and its nose almost completely sculptured, is somewhat like that of the underweight infant in miniature. But also is visible

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[59]Scammon & Calkins, *op. cit.*, p. 5

a startling contrast: the fetal head is relatively large, with a gradual immaturity towards the caudal; the infant's head also is large but its lower extremities do reveal a greater degree of development.

Organ development proceeds at a rapid pace after the 8th week or so. The umbilical cord is now the only communication between the fetus and placenta. With the inception of a regular heart beat embryonic circulation is replaced by fetal circulation; red blood corpuscles move through the main blood vessels and smaller arterial and venule paths differentiate out.[60] Also at about this time the intestines begin to emerge along the digestive tract.

By the 16th week eyelids have formed, although these are still fused, and external genitalia have become distinctive. It is no longer an 'it' although the waiting world must be patient for many weeks longer before the decision can be known. Internally the thymus, thyroid, tonsils, pancreas and tastebuds are assuming shape and approximation of function.[61] Already bile is secreting and blood forming in the bone marrow.

b. The Beginnings of True Skeleton. Bone formation act-

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[60] Gesell & Amatruda, op. cit., p. 61

[61] Ibid., p. 65

--L. Arey, op. cit., pp. 167-185

--For an extensive approach to developmental morphology see also Joseph DeLee, "Principles & Practice of Obstertrics", 5th Ed., Saunders, Philadelphia: 1930, op. cit., ually begins during the embryonic phase but it is after the 5th week that the process develops on a large scale. With its production two trends go on simultaneously. In the first bone simply begins to develop within tissue which has had no previous cartilaginous support. In the second it proceeds to replace the softer, phylogenetically earlier, cartilage.

In both cases skeletal bones form separately; as maturity nears the bones extend towards their functional neighbors and at the same time the structures of the joints begin to differentiate. Thus one writes the relative mechanical helplessness of the fetus or young infant not only in terms of still too few muscle and neural relays, but also in terms of an absence of maturity at the joints and of the flexibility and weakness of new bone tissue itself.

In its early manifestations migrating cells penetrate between myotomes and form ribs and around and above the axial rod to form the vertebrael column.[62] During the second month skeleton proceeds to form around earlier cartilage deposits and partially replacing them. Migrating osteoblasts, the precursor to bone cells, secret a soft preosseus tissue which becomes impregnated with lime salts almost as fast as it appears. At one or more points intramembraneous ossification begins. During the process some osteoblasts are trapped and become bone cells. Later developing points become enclosed within a periosteum, or bone covering, a fibrous membrane condensed from local mesenchyme. Some bone develops through cartilage distruction and in the cavities thus formed blood vessels find their way.[63] In long bones ossification takes place along the length (diaphysis) and also at the ends (epiphysis).

c. <u>The Breathing Mechanisms</u>. The rapid fetal growth rate continues after the 10th week but long before mid-term the organism is essentially complete. In less than five months the monocellular zygote has completed its cyclical process of basic differentiation. Growth characteristics from mid-term on are largely in terms of organ completion and integrative maturity. "Physiological as well as postural functions are in a stage of partial completion and incipient readiness."[64] At this time the fetus is a foot tall and weights approximately one pound.[65]

By as early as the 20th week the fetus is in possession of its full quota of neuroblasts and neurons, some 12,000,000,000 in number.[66] At this time the eyes may be opened, the smooth muscles of the stomach are motile, gastric and intestinal glands are capable of secretion and the liver and kidneys are in almost full function.[67]

The characteristic achievement of the period, however, is the relative maturity of the respiratory system, and this

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[62] C. Davenport, <u>op</u>. <u>cit</u>., pp. 109-112

[63] Gesell & Amatruda, <u>op</u>. <u>cit</u>., p. 72

[64] L. Arey, <u>op</u>. <u>cit</u>., p. 105

[65] Gesell & Amatruda, <u>op</u>. <u>cit</u>., p. 71

[66] <u>Ibid</u>., p. 72

despite the fact that the organism is just past mid-term. Should the fetus be born prematurely it might be capable of existing in an aerial environment for several hours before the undersized team of nerves and muscles gives out under the burden.

The lungs develop early (appearing at approximately 5 weeks) by bulging out from the food canal to form a pocket, which then proceeds to divide into two, four, and so on until some 375,000,000 tiny air sacs are formed.[68] Arteries quickly follow, undergoing division into smaller units and establishing intimate junctures with the alveoli.

Early 'breathing' movements, the so-called Ahleld signs, are in the form of spasmodic movements of the chest and have been observed as early as 16 weeks. Whether they reflect a healthy state or not is not known.

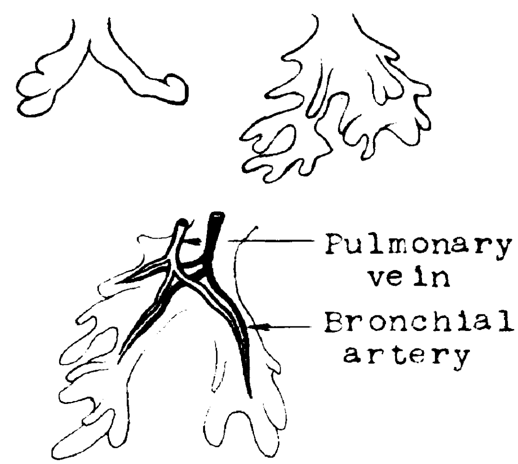

Fig. 17. Differentiation of lungs by division into smaller air sacs (Jackson)

Barcroft and Barron working with fetal sheep (1936)[69] have established a pattern of hierarchical stages, or levels, and

[67] Arey, op. cit., p. 366

[68] Davenport, op. cit., p. 86

[69] J. Barcroft & D. Barron, "The Genesis of Respiratory Movements in the Fetus of the Sheep", J. Physiol., 88, 61

each--while not replacing the preceding imposes itself in a superordinate position. Thus as larger relays of neurons come into play the artifically induced singular spasm gives way to a rhythmic pattern which, however, may revert to the earlier stages under environmental stress.

By the 45th day, stimulation of a sheep fetus evokes a comprehensive, almost total, response which includes head, trunk, limbs and chest. But as maturity proceeds a greater gap appears between mass response and breathing movement, and the latter continues after the general responses have ceased. Thus out of mass-like activity individuation emerges. Also as time passes the fetus responds progressively to less and less stimulus pressure, until by the 50th day it is extremely sensitive.

At approximately the 60th day maturation has reached a stage at which the respiratory mechansim no longer reacts to artificial stimuli at the fetal surface but only to the real thing, i.e., an increase of CO_2 in the blood acting upon the respiratory center in the medulla. Now, for example, impeding gaseous exchange through the umbilical cord causes the fetus to revert to preceding levels of organization.[70]

d. Growth Trends. It has been difficult thus far for researchers to formulate precisely a growth curve over any but a relatively short period of maturation, especially of a postnatal phase. Scammon and Calkins in their study of

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[70] *Ibid.*, p. 58

fetal growth (1929) accumulated 35,000 determinants of 71 external demensions of body features upon 400 selected fetuses.[71] Their results indicate that in prenatal life the various parts of the body follow a similar growth trend which continues until birth.

> .....that in general the linear growth of the various parts of the body is in uniform ratio during the fetal period. This seems at first glance to contradict the well-known fact that the proportions of the various regions change during this period, the lower limbs becoming relatively larger and the head relatively smaller. But the present study demonstrates clearly that those changes in proportion arise, in spite of the constant fetal growth ratios, through inequality established in the earlier embryonic period.[72]

On the basis of growth in weight of four specific body organs (the suprarenals, brain, uterus and thymus) and the general factor of over-all body growth, Jackson also has determined that prenatal growth is uniform.[73] The relative growth (percentage-wise) between parts is correlated highly and this continues until birth when the correlations change completely.

Carter and Krause (1936),[74] using the data of Bakwin and Bakwin (1934), conclude that growth patterning cannot be formulated on the basis of correlation between any two parts,

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[71] Scammon & Calkins, op. cit., p. 2

[72] Ibid., p. viii

[73] C. Jackson, "Some Aspects of Form & Growth", From "Growth" (Jaskson et al), Yale U. Press; New Haven: 1928, p. 132

[74] H. Carter & H. Krause, "The Physical Proportions of the Human Infant", Child Deve., 7, 60-68

that no single factor can account for a major part of the measured variance when widely different parts of the human body are measured and with this condition becoming more pronounced beyond the neonatal stages.

Growth measurements and their interpretation have proved elusive and much accumulated data has been found inaccurate due to crudities in anthropometric concepts, in lack of accuracy in measurement, and also to a failure to grasp the great number of factors and components involved and their specificity.

Summarizing growth under Jacksonian theory, the body does not grow as a whole and in all directions at once. Each part must be considered separately. In general, embryonic and fetal growth proceed cephalo-caudally and proximo-distally. That is, with few exceptions, head development precedes neck development, neck development precedes chest growth, chest growth precedes pelvic growth, and arm growth precedes leg growth; also upper-arm growth precedes lower-arm growth, which in turn precedes hand growth; and likewise for the lower extremities.

Differences in the rate of growth or of overall figures between the sexes is slight. In a study by Cates and Goodwin (1936)[75] the weight of the male exceeds the weight of the female by 4 per cent and that the height of the male exceeds the height of the female by 2 per cent. Thompson

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[75] H. Cates & J. Goodwin, "The Twelve-day Old Baby", *Human Biology.*, 8, 449

quotes Bakwin and Bakwin (1934)[76] that newborns from a poverty-stricken environment are smaller in all dimensions measured than newborns from a more favorable environment, but that the infants from different environments are similarly proportioned.

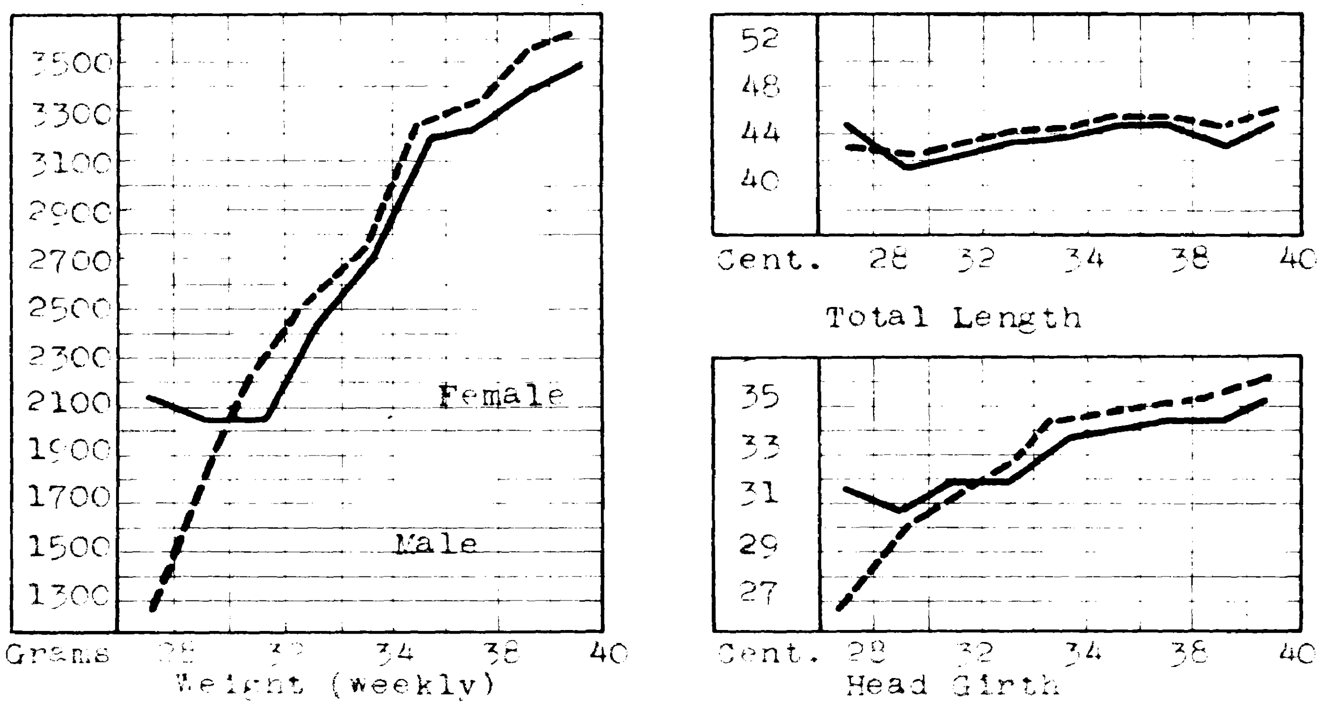

Figure 18. Size of Fetus in terms of pregnancy duration. Adapted from the figures of Kjolseth (1913)

e. <u>Behavior and the Formation of the Central Nervous System</u>. There is probably little opposition to the current view that while the nervous system emerges to a position of general coordinative dominance, it itself is preceded by some more primitive integrating, adaptive system (Child, 1924;

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[76]H. Thompson, "Physical Growth", From Manual of Child Psychology, Ed. L. Carmichael, J. Wiley, New York: 1946, p. 264

Spemann, 1927; Coghill, 1929; Carmichael, 1942; Freeman, 1948; Schneider, 1951[77]). "Indeed the embryonic nerve cell can be observed to behave as though it were in motion doing work against the resistence of a pre-existing set of integrated forces."[78]

The great problem of modern biology is that of determining the nature of the ordering forces of growth. Neural (as well as other organic) patterning, growth and maturation seem basically dependent upon some probably multiple system of gradiencies which serve to stimulate certain select areas into further elaboration and, at the same time, in harmony with changes taking place elsewhere in the system. Individuation, therefore, proceeds out of those tissues which ontogenetically may contribute directly to the formation of new organismic syntheses and resulting in more diversified and adequate levels of equilibration.

In many respects neural function emerges, like earlier

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[77] C. M. Child, "Physiological Foundations of Behavior", Holt, New York: 1924, p. 235

--H. Spemann, "Organizers in Animal Development", (Croonian Lecture), Proc. Roy. Soc. London, 102B, pp. 177-178

--L. Carmichael, op. cit., pp. 140-143

--G. E. Coghill, "Anatomy and the Problem of Behavior", U. Press, Cambridge: 1929, pp. 11-13

--G. L. Freeman, "The Energetics of Human Behavior", Cornell, Ithaca: 1948, p. 47

--D. Schneider, op. cit.,

[78] G. E. Coghill, From D. Schneider, Ibid, p. 4

forming vascular and digestive structure, concomitantly with the great increase in structural bulk. Problems of auto-exogenous sensimotivity are increased tremendously in the multiple-celled organism and still further so in differentiated, specialized systems. With growing complexity beyond a phylogenetic point, engineering principles appear to demand the existence of some sort of super coordinative system.

In this section we are interested specifically in just a part of this basic problem, the nature of the stimulating and guiding forces which effect neural development. Perhaps this process proceeds somewhat in the following fashion. As we stated earlier (see pages 74-77), genes are propelled into action by newly created complex electro-chemical fields, these being, in turn, the results of earlier syntheses of gene action. When growth proceeds, i.e., when a limb extends, a bone develops, or later when a nerve pushes into the new structure or organ, we are preceiving a similar process from a more general perspective. Thus we may exclude genes from further discussion and speak of growth hormones existing in the cones of developing organs (Gerard) and being guided by 'proper' electrical or metabolic gradiencies.

According to the theory of neurobiotaxis[79] outlying neuroblasts are attracted by the decending axial gradient manifested by differences in electrical potential between

[79] C. Kappers, "Further Contributions on Neurobiotaxis," (IX), J. of Compa. Neuro., 27, 261-298

axis and cell and are stimulated to send out fibrils into spinal processes.

Specifically, then, given a sufficient level of excitation, neuroblasts will grow toward an active axial neuron(s) if the developing cell from which the fibrils emerge and the center towards which it is projecting itself are in simultaneous, or else successive, excitation. And as fibrils establish functional contacts with the central system many neural cells drift towards the axis while extending their axons distally.

In all probability growth and direction are determined by multi-gradient systems and mechanical influences. The latter might include sterotropisms which induce the cone to cling to a surface as it moves, and hydrodynamic influences in the inter cellular fluids.[80] Northrop and Burr (1937)[81] have postulated a bioelectrical gradient based upon electrical forces or drifts in voltage which are set up or preexist in the aura of the cone, or throughout the organism.

Thus from these theories growth and arrangements of the nervous components are tropistically determined responses of the elements of the nervous system. Gerard sites experimental surgical transplantations of budding limbs which support dramatically the possibility of electro-chemical driving-

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[80]Gesell & Amatruda, op. cit., p. 42

[81]Northrop & Burr, loc. cit., pp. 78-88

controls. When a limb as yet without its own nerves is transplanted to another spot new nervous pathways nevertheless push into it, indicating the probability of some form of growth gradiency operating within the limb and exercising a controlling influence upon the young, differentiating neurons.[82]

The extension of axones into differentiating tissues has been revealed dramatically in the studies of Speidel.[83] Through use of a motion picture camera study of the thin, semi transparent tail of a live tadpole, Speidel determined that neural fibrils travel outward by amoeboid movement through expansion at the growth cone located at the forward end. The tiny axones make their way through minute cavities and past obstacles toward their objectives at relatively great speed, often covering 225 micras in five and one half hours!

In this process gradually extending dendrites establish themselves in a functional relationship with the rich vascular environment and begin gradually and by approximation to function ". . as antennae for the absorption of returning currents . . . as receiving station(s) for synaptic drive, and as controllers of potential drop. Ideal conditions are present for the nerve to function as an electo-chemical generator of a self-exciting current."[84]

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[82] R. W. Gerard, op. cit.,

[83] C. Speidel, "Adjustments of Nerve Endings", The Harvey Lectures, Series 36, pp. 126-158

[84] Robert Gesell, From Gesell & Amatruda, op. cit., p. 98

> Every neuron is thus a small chemical system whose metabolism sets up an inherent rhythmic, electrotonic current. This centrogenic current may be reinforced by reflexogenic currents which have their origin in outlying receptors and in other neurons. When the resultant current is strong enough, to rise above threshold, the neuron fires.[85]

Thus there exists at every stage of growth a thermodynamic potential kinetic equilibrium. Nerves grow not through reflexive pathways, but rather as determined by the basic state of growth itself and thus obviously they reflect faithfully somatic and environmental forces of potential and growth -kinesis which they integrate and which indeed they eventually partly displace.[86]

The earliest activity in neural development is probably in the establishment of reflex arcs to mediate archaic, fundamental life activities. In the hierarchy of maturation lamination of neuroblasts at the base of themedulla (vaso-constrictor, respiratory centers) takes precedence over more distal differentiation and maturation--of, for example, the neocortex or knee reflexive control (see Figure 17).

Coghill in his exhaustive study of the Amblystoma noted that early neural patterning consists largely in establishment of connections between newly forming sensory pathways and motor systems, that initially the anatomical relations between these systems are such that an excitation cannot

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[85]Gesell & Amatruda, op. cit., p. 99

[86]D. Schneider, op. cit., p. 5

pass from the one to the other. Thus pressure applied at the surface of a muscle causes contraction but no such action follows if, say, some appropriate stimulus is applied to the skin.

> With the ability to respond to tactile or chemical stimulation of the skin there appears a third series of cells. They bridge the gap between the sensory system of one side and the motor system of the other. . . Their bodies lie in the floor plate of the medulla oblongata and upper part of the spinal cord. . . In the non-motile stage these cells are unipolar. The one to the left into close relation with the motor tract on one side only. When they become bipolar they complete the path from the sensory field to the muscle; and this path leads to the muscles of the opposite side from the stimulus because the conductors from the sensory field pass across the motor path of the same side to establish synapses with the dendrites of the commissural cells in the floor plate. . .[87]

During the fetal phase many complex arc-like processes are completed between motor efferent neurons and sensory neurons attached to specialized organs via the 'adjustor' neurons which lie in the medulla. Maturation develops along two approaches: First, additional arcs are established caudally to the primary center in the medulla; and secondly, additional controls appear superimposed in part over those of the brain stem and located cephalad to the archaic centers. It is in the story of this latter trend, and in the extent of it, that humanness appears within the configuration animal.

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[87] G. E. Coghill (1929), loc. cit., pp. 11-13

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What are these thread-like fibres, working themselves into every nook and cranny of the system, and how do they function?

Sherrington (1922) thought of the neuron as simply a co-ordination specialist.[88] Later with others (Creed, Denny-Brown, Eccles and Liddell (1932), and also with Holt (1931))[89] he accepted the view of neural and organismic development as being mediated through differing thresholds at the synaptic junctures existing between neurons.

Hoagland (1936) and Schneider (1949), and to some extent Lashley, have built upon the early ideas of Child[90] which emhasized structure within an organismic-environmental play. Lashley[91] objected to a one and only explanation. Hoagland enlarges upon Sherrington's idea and views the particular nerve cell as charged with a definite potential or, simply, to an electrochemical tension which discharges or reflexes at a threshold critical for that cell and, in so doing, channelizes the pathways of discharge.[92] In the process a defin-

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[88] C. S. Sherrington, "Some Aspects of Animal Mechanism", _Science_, 56, p. 352-3

[89] R. Creed et al, "Reflex Activity of the Spinal Cord" Clarendon, Oxford, 1932, Quoted from L. Carmichael, _op. cit._, p. 145

--E. Holt, "Animal Drives & Learning Processes" V. 1, Holt, New York: 1931, Quoted from L. Carmichael, _Ibid._, p. 145

[90] C. M. Child, (1924) _op. cit._

[91] K. S. Lashley, "Studies of Cerebral Function in Learning." VI, Rev., 31, p. 370

ite pattern is established and capable of providing the basis for conditioned behavior.

Earlier we indicated the view that neural differentiation proceeds within the influence of previously operating ordering gradiencies. In neural maturation older gradiencies are in turn superordinated (but not superseded entirely) and an intimate synthesis is effected between levels of hierarchy.

Thus with further somatic growth (including endocrines and viscera) neurons are charged (probably through the blood stream primarily) from the soma with the raw materials for increasing the cell's complex functions of tension and relaxation: substances for myelin and glia synthesis for tissue support; metals: iron, copper and manganese for pacing oxidation; vitamins, glucose; cerebrospinal fluids for proper dielectrics.[93]

Thus equipped, the new system uses its evolutionally higher neopallic precision qualities towards the internal-external environment with the aid of the muscular system in relaxing stimulating tensions by techniques of mastery or avoidance. Towards the inner world of the viscera and blood stream, the nervous system uses the primitive brain (i.e., the brain stem) to alter temperature, pressure and heat production.

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[92] H. Hoagland, "Pacemakers of Human Brain in Normals & General Paretics", Am. J. Physiol., 116 (1936), 604-615

[93] D. Schneider, op. cit., p. 11

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Of the greatest significance in human ontogenesis, and of special importance in an outline or survey of child development, is the gradual emergence of higher levels of neural synthesis cephalad to the old, archaic centers in the hind brain (medulla). At the spasm stage in the maturation of the respiratory system (see pages 160-162) control centers lie in a thin plane at the caudal end of the medulla; later rhythmicity is located at the extreme cephalic end of the medulla; postnatal inhibition finally centers in the cerebrum.[94]

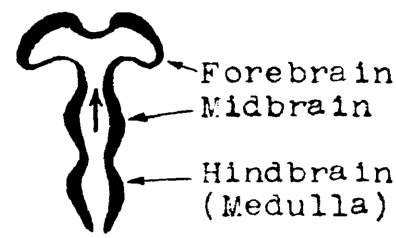

Figure 19. Cranial orientation of breathing control, from the medulla. (From Carlson and Johnson, 1942)

General cortical differentiation is indicated in the brain of the sex week old embryo;[95] at about the 7th week primary lamination begins and by the 13th week three separate layers are visible.[96] During the 13th week the fetus is capable of generalized, mass motor movement and is able (under externally induced artifical stimulation) to move its head apart from the trunk.[97]

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[94] Barcroft & Barron, op. cit., p. 60

[95] F. Tilney, "The Structure and Development of the Brain", Unpublished Lecture, New York: 1937, From M. McGraw, "Maturation of Behavior", Manual of Child Psychology, p. 356

[96] C. Davenport, op. cit., p. 119

[97] Gesell & Amatruda, op. cit., p. 64

By the 18th week the cortex has differentiated to the extent that local prespecialized areas may be mapped. Most advanced is an area of giant Betz cells (pyramidal cells) which correspond to the precentral motor area of the mature brain.[98] Significantly correlated with the emergence of lower cortical motor differentiation is a manifested higher degree of motor coordination by the fetus (which has been described as "graceful" and "delicate"). When stimulated fetuses of this age exhibit mass-like responses but are also capable of specialized adjustments of a more adaptive nature.

Tilney in his studies of the phylogenetic evolvement of the brain noted that motor behavior greatly preceded differentiation of motor cortical areas and drew a distinction between nuclear activity and cortical behavior.[99] On the structural side, nuclear regions are recognized by the way in which cells are clustered together, without much distinction in the size, shape and dendritic processes of the neurons.[100] Nuclear regions are much older phylogenetically and behavior when under control of this area exhibits a sudden turnover (labile) of impulses without much latency in the period of delivery. "Structurally, the cortex shows an orderly arrangement of cells, and cortical behavior discloses a planned element in the reaction, a latency and variety

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[98] L. Carmichael, _op. cit._, p. 113

[99] F. Tilney, _op. cit._, p. 355

[100] _Ibid_, p. 355

of responses."[101]

In general cell maturation of neurons corresponds fairly closely with myelin formation along the axon shafts,[102] and myelin appears in a proximal to distal order.[103]

> The first appearance of myelin occurs in the 4th or 5th month of fetal life and is not finished until puberty. . . From the many studies of myelinization it is clear that the myelinization of pathways in the neural system of mammals occurs in a very definite order and that the myelinization occurs in the order in which pathways have been differentiated phylogenetically.[104]

There is an inability at the present time to adequately account for the brain's rapid increase in mass.[105] A large part of its growth is explained in terms of the lamination of the six cortical layers which are completed by the fourth month.[106] Neurons of the thick mantle (central) layer also add bulk by alinging themselves perpendicularly to the surface and by greatly extending their axones and dendrites.[107]

It is believed that up until midterm migrating neurons

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[101] Ibid., p. 355

[102] C. Davenport, op. cit., p. 51

[103] C. Speidel, "Studies of Living Nerves", J. Comp. Neurol. 76, 57

[104] O. Langworthy, "Development of Behavior Patterns & Myelinization of the Nervous System in the Human Fets & Infant", Contr. Embryol., Carneigie Inst. Wash., 24, p. 18

It is to be noted that at present there is some confusion and doubt over the myelinization law and whether or not it denotes the inception of function. Tilney, Langworthy support it; Windle, Fish and O'Donnell (1934) conclude that it does not correlate with function. For a discussion of this problem see L. Carmichael (op. cit., pp. 145-146) enter the cortical area through the cavities and attach themselves to the matrix (archiortex) layer, thus also adding to bulk.[108] Langworthy also notes that myelin greatly adds to size and that its formation does not cease with the beginning of neural function, but continues to increase in thickness and to cover greater areas.[109]

At the 7th month the brain has its six layers of cortex but these cells are largely undifferentiated and nonfunctional. Cortico-spinal pathways show no trace of myelin and the behavior of the fetus is still largely in control of subcortical layers of the archaic centers, and with a type of behavior already noted. Myelinization is largely limited at this time to parts of the midbrain and cranial nerves other than the optic trunk (probably olfactory also).[110] On the behavioral level there is doubt as to the onset of fetal hearing but inception seems to precede medullation.[111]

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105 F. Tilney & L. Kubie, "Behavior in Its Relation to the Development of the Brain", Bull. Neuro. Inst., NY, I, 242

106 Ibid., p. 247

107 C. Davenport, op. cit., p. 49

108 Ibid., p. 119

109 O. Langworthy, "Medullated Tracts in the Brain Stem of a Seven-month Human Fetus", Contr. Embryol., Carneigie Inst. Wash., 21, No. 120, p. 49

110 Ibid., p. 49

111 W. Preyer, "Embryonic Motility & Sensitivity," Mono. of Soc. for Research in Child Dev., V. II, No. 6, p. 64

The myelinization of the optic nerve, however, seems to correlate closely with vision development.[112]

> At this time the pathways concerned with the fundamental activities of the fetus are myelinated. The vagus nerve is myelinated and the medulla. In the spinal chord well medullated reflex are present. A child born at the end of seven months has a good chance for survival.[113]

At nine months the thalamus is fully medullated and myelin appears in the projective pathways of the cerebral cortex. Langworthy notes that birth greatly increases the rate of its development, serving to indicate perhaps the dependence of higher brain function upon the external environment.[114] Infants born prematurely indicate a more advanced level of myelin development than those of the same age at term.[115, 116]

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With great inadecuacy we have attempted to place together some of the more significant pieces of information and insights into the development of prenatal neural structure. The picture is vastly incomplete although the use of imigination brings use close to bridging some of the gaps in these

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[112] Ibid., p. 65

[113] O. Langworthy, "Medullated Tracts in the Brain Stem of a Seven-month Human Fetus, op. cit., p. 51

[114] O. Langworthy, "Development of Behavior Patterns & Myelinization of the Nervous System in the Human Fetus & Infant", op. cit., p. 22

[115] Ibid., p. 22

[116] Ibid., p. 23

emerging patterns which lay the foundation for cerebral dominance--a phenomenon entirely unique thus far in the biological ontogenetic hierarchy.

With the fetal phase the human animal virtually is complete (physiologically, that is), with precortical neural control haltingly and unevenly established over physiological functions. Of much great significance, however, long before fetal maturity and term, the small organism is in full possession of a tremendous neural-cortical potential, of vast amounts of rapidly differentiating nerve cells maneuvering and extending their communicating processes more firmly into the kaleidoscope of motion that is life and within this context of their gradual, as yet subliminal, approximation of function.

These are thus alive cells and functioning in varying states of maturity. In a consideration of the fetal environment we shall see that they are already 'learning', already reacting to, <u>and initially acting upon</u>, their internal environment and to the forces at their elbow and of the many ever extending levels beyond. A basic thesis in this outline is Hebb's point that the psychological story of development is not, as an older psychology of simply S-R would consider it, a series of reactions (instead of actions), each of which being determined by the immediately preceding events in the sensory system. The locus of the neuron is not that of an internal isolation but in terms of its own specific structure and activity, of active and reactive capacities, of the total somatic configuration it exists within and of the communicated impulses beyond the organism. Electrophysiology of the central nervous system indicates that the cortex and neocortex are continuously active, in all parts, and afferent excitation must be superimposed on an already existent excitation.[117] But of this in the neonatal phase.

Ahead the basic problem: of the interaction between a postnatal world and the somatic system, of the quality and pattern of the new vector--of the physiology and psychology of the vast human central associational, integrative neural potential as it unfolds and progressively comes to mediate between the organic sphere and the endless levels of the physical-social world.

Theories of Organismic Functioning & Integration. As the fetus differentiates, as levels of hierarchy develop, two overall problems in turn develop: (1) What is the nature of organismic functioning and (2) what are the patterns of progressive integration?

Of the first little can be said beyond that mentioned in connection with neural maturation, gradiency and dominance. The second, seemingly a part of the first, has attracted wide attention, perhaps none to profitably so, and about it there exists a fat literature.

Unfortunately at the present time ontogenetic studies of

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[117] This area is reviewed by H. H. Jasper in "Electrical Signs of Cortical Activity" Psychol. Bull., 34, 411-481

both the architectonics of organism (especially of the central nervous system) and overt behavior are still inadequate and methodologically in a exploratory stage. After all one doesn't probe the maternal uterus with needles, camel hairs and the electrodes of an electroencephalogram machine, nor does one find fetuses available for autopsy in quantitatively significant numbers and at the desired developmental ages. Also women notoriously are uncooperative about aborting for the cause of science and nature has hidden the infant well behind her soft screen--one might say an iron curtain of her own. Further, normal fetuses in essentially normal, healthy mothers don't abort, so what is left is the patient work of such as Goldstein upon all sorts of fetal monsters, syphilitics and neural amentics.

One method of investigation, one having a large body of medical tradition behind it, is that of a biochemical approach. From this general approach such techniques as the chronaxic-metric method and the study of electrical brain wave patterning with infra human animals have gained rather wide attention. Goldstein, however, has objected to these seemingly ideal techniques. In reviewing the work of Stein and Monakow, he insists that "the electrophysical methods do not actually achieve any more than 'phenomenal analysis'".[118]

> . . . we are by no means dealing with direct manifestations of the activity of nervous substance or the course of excitation, but only

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[118] K. Goldstein, "The Organism", American, Chicago 1939, p. 126

> with expressions of the nervous system or of the organism under specific conditions, namely under the definite demands as are exerted by stimulation through the electric current.[119]

Goldstein, therefore, would insist that such methods deal not with a physical and chemical searching of life processes, but only with the physics and chemistry applied to living objects.

A second approach to an understanding of function is by arm chair hypothesizing, of the necessary attempt to go beyond objective evidence. In this category would be in varying degrees of theory the syntheses of such as Paul Weiss, Sherrington, Child, Burr and Hovland, Sinnott, Scammon and Calins and Goldstein, among others.

Weiss has attempted to explain total behavioral organization in terms of a gradiency tuning between parts of the central nervous system and peripheral effectors. As a result of this tuning it is assumed each specific wave of excitation brings only specific muscle groups into action.[120] He does not clarify his ideas as to whether or not there are preexisting and/or subordinate concurrent gradiencies beyond the neural.

C. S. Sherrington's work is based upon attempting to explain function in terms of an effect series from the outer world. One starts with a simple reflex and sees organiza-

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[119]Ibid., p. 124

[120]P. Weiss, "Principles of Development", Holt, New York: 1931

tion emerge through the sum total of reflexes; each reflex being coordetermined by the other. The activity of the organism is guaranteed through the synergy of the reflexes which are kept active through the total stimulation of the environment.[121]

Child's theory of organization based upon metabolic gradiencies has been discussed (see page 139). Somewhat related to this appraoch is the idea of organization of the biodynamic system in terms of a complex electrodynamic field which is in part determined by its atomic physicochemical components and which in part determines the behavior and orientation of those components.[122]

Sinnott has observed that the ratio between width and length remains constant in prenatal growth[123] despite the great variety of forms which organisms may finally take. This proportional unfolding is controlled by gene action:

> What is inherited, and therefore what genes control, seem to be these constant growth relationships. As growth proceeds, the proportions of parts change, complexity increases, and the familiar developmental story unfolds. Running through all this complexity, however, is a basic constancy, the inherited growth relationship, established from the beginning. It should be possible to determine for any organic pattern a series of constants of this sort. If genes control relationships between rates of growth in various dimensions, they may perhaps control

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[121] C. S. Sherrington, "The Integrative Action of the Nervous System," Yale U. Press; New Haven: 1911

[122] F. Northrop & H. Burr, op. cit., pp. 78-81

[123] See also Scammon and Calkins, "Growth in the Fetal Period", U. of Minn. Press: 1929, p. viii, op. cit.

> relationships between rates of other developmental processes which are not spatially arranged, notably the complex series of chemical changes concerned in the development of many traits. This is opposed to the view that genes initiate only the first step in such a series, the later ones bearing no resemblance to the original genic impetus.[124]

In Goldstein's mind the organism functions essentially under the control of a ganglion nerve network, with unevenly interspersed specialized organ receptors. This system is, of course, constantly tonic, never at rest, and at all times receiving stimuli in the form of electrochemical impulses from exteroceptors, interoceptors, proprioceptors and nociceptors (pain sense) for which the organism via its ganglia system must adjust.[125]

The ganglia serve first to localize stimuli (local near effect) at which point stimulation and reaction are greatest. As a stimulus traverses other systems its effect decreases. The decrement effect, the "near effect", is, however, not only determined by the proximity of a part of the nervous system to the point of contact but also in the more or less greater appropriateness of the stimulus for the various parts of the nervous system. This latter point, however, brings up the developmental question of achieving appropriateness, for which Goldstein is silent. Ignoring this,

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[124] E. W. Sinnott, "The Genetic Control of Developmental Relationships," Amer. Nat., 71, 113-119, From M. McGraw, "Maturation of Behavior", Manual of Child Psychology, op. cit., p. 352

[125] K. Goldstein, op. cit., p. 104

however, the eye thus reacts more to a visual stimulus which tends otherwise to remain subliminal at some other part of the system.

The approaches of synthetic formulation tend to favor holistic and dynamic explanations of organismic function, certainly a step in the right direction, but they also highlight, sadly, the paucity of factual data of the right kind from which to project functional constructs (functional) in a sense only, of course). At present integrative efforts need range far beyond such data and again sadly this must happen too early in any attempt at holistic formulation.

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The second question of prenatal growth is that of the way behavior comes into being. Here the concern is not how the fetus is organized and of how it functions as a unit, but of how it is integrated and ontogenetically individuates.

In theory we might assume that organized behavior takes form through the knitting together of separate movements and bits of behavior through a process of combing parts into larger wholes. As against this we might assume that the course is precisely the opposite: that activities involving the entire organism come first and that it is only in the further course of development that behavior limited to any segment or separate group of muscles appears. In this assumption development proceeds from the whole to the part, rather than from the part to the whole.[126]

Of the case for differentiation within the whole.

Coghill (1929) determined the status of the nervous system of the salamander at the onset of neurogenic behavior and then followed it through all the progressive stages to adulthood. Specifically, he was successful in correlating manifestations of sequence activity with progressive changes in the nervous system. Coghill concluded, in part, that structural maturation of separate organs precedes their initial functional developmental.[127]

On the basis of these longevity studies Coghill took issue with the notion that behavior represents a knitting together of many independent movements. Rather, he argued, reactions of the total organsim precede separate movements of the parts of the body. The basic state seems to be one of integration, and sub-patterns subsequently develop within the whole.

A student of Coghill's, Angulo y Gonzalez, applied essentially the same experimental proceedure to rats.[128] It was noticed that the first movement consisted of slight lateral bending of the head and secondly of an extension caudially to include a true trunk flexion. As additional muscle fibers were enervated, the embryo reacted to stimulation by including in its movement the forelimbs and later the hindlimbs.

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[126] A. Jersild, "Child Psychology", Prentice: 1947, p. 8

[127] G. Coghill, "Anatomy & the Problem of Behavior", op. cit., p. 36

[128] Angulo y Gonzalez, "The Prenatal Development of Behavior in the Rat", J. Comp. Neurology, 55, 395-442

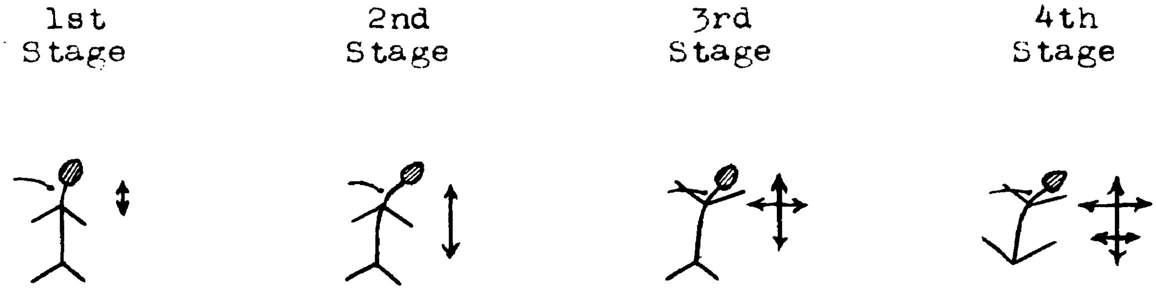

Figure 20. Integration of behavior. Neuro-muscular development in a cephalo-caudal, proximo-distal patterning.

In 1933 Coghill summed up his position by defining first total action and then going on to trace organismic integration and its patternings:

> An action is regarded as total when it involves all the muscles of a functional system that are capable of responding at the time... Action appears first in the anterior part of the axial musculature, and spreads thence tailward through the axial system, and then into the appendicular system, so that before an appendage can act on its own it acts only as an integral part of a whole, which is axial and appendicular.[129]

Reviewing this problem in 1944, Hooker similarly states that morphological development paves the way for functional manifestations and forms its necessary substrate. As the morphological substratum of the behavior is integrated from the beginning so also is the activity by the fetus manifested as an integrated whole from the start.[130]

Opposed in varying degrees to Coghill are those who assert that local reflexes may be primary, or at least that

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[129] G. Coghill, "The Neuro-Embryologic Study of Behavior", Science., 78, 132

[130] D. Hooker, "The Origins of Overt Behavior", U. of Michigan Press, 1944: No. I, 3

local reflexes occur as early as the total body responses. Windle and Griffin while working with fetal cats (1931) noted that the "reflex movements seem to make their appearance (in some cases) with little or no relation to the primitive behavioral background."[131]

Later Windle completely disagreed with Coghill and held to the view that the basic elements in the genesis of mammalian behavior are relatively simple reflex responses and that the more complex reactions of older fetuses are formed by progressive neural integration of the less complicated activities of the embryo.[132] With Orr (1934) he discovered that the first responses to stimulus by the chick embryo were in the nature of local reflexes which merge only in time into the total patterns.[133]

Carmichael on the basis of his work with guinea pigs (1934) also sees behavior develop specifically for each area, rather than by a process of partial patterns appearing within a total process.[134] He points out that it is difficult to make interspecies comparisons concerning the "zero of behavior" without scientific error; and the fact that in Coghill's

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[131] W. Windle & A. Griffin, "Observations on Embryonic & Fetal Movements of the Cat", J. Comp. Neurol., 59, 149

[132] W. Windle, "The Neurofibrillar Structure of the Spinal Cord of Cat Embryos", J. Comp. Neurol., 59, 487-505

[133] W. Windle & D. Orr, "The Development of Behavior in Chick Embryos", J. Comp. Neurol., 60, 287- 308

[134] L. Carmichael, "An Experimental Study in the Prenatal Guinea Pig", Genetic Psychol. Mono., 16, pp. 337-489

salamanders the first total movement appeared before the limb buds had developed provides a condition fundamentally at variance with that of the human and mammalian fetus.

For Freeman there is some structural differentiation of parts before any stimulus-aroused behavior occurs and behavior has the characteristics of a local reflex response.

> It suggests that while there are probably certain general physiochemical states that preserve the vegetative totality, the organic energy system had to achieve wholeness in its self-preservative reactions to an ever-expanding field of disruptive change, and that it does this by integrating and reintegrating the part-systems that individuate from a more fluid state. Very early embryologically, the organic energy system is a group of developing parts whose unity is preserved by interchanges within their common fluid matrix.[135]

Coronios (1933), Barcroft and Barron (1936), Jersild (1947) and Gesell (1945) are members of a third group which takes a double position. Coronios in his work with fetal cats, for example, notes both a whole-to-a-part pattern of integration and a concurrent knitting together:

> The development of behavior progresses from a diffuse, massive, variable, relatively unorganized state to a condition where many reactions are more regular in their appearance, less variable, better organized and relatively individualized. (But also, p. 336) ...An almost imperceptible retraction of the fore legs was possibly observed. This was elicited only when the head, the shoulders or the paw was stimulated.[136]

Barcroft and Barron note that respiratory movements "are

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[135] G. Freeman, "The Energetics of Human Behavior", Cornell, New York: 1948, pp. 47-48

[136] J. Coronis, "Development of Behavior in the Fetal Cat", Genetic Psychol. Mon., 14, 377

derived from a general mass movement of an extensor type by the dropping out of the movements of the head and limbs."[137]

> It has been assumed that the two conceptions set forth are alternatives: our work in the large and slow growing embryo of the sheep indicates an element of unreality in this controversy, for the two views appear both to be potentially true.[138]

Jersild[139] and Gesell are also essentially in the same position: "...the organization of behavior expresses itself in both integration and individuation. The two processes are reciprocal. Each implies the other."[140]

Shortly before his death Coghill (1940) made a critical examination of the entire literature.

> From this consideration of the literature on fetal behavior one is justified in concluding that there are no primary reflexes that come into more general comprehensive patternings, but that reflexes within a total behavior pattern of primary integration.[141]

This long-enduring controversy demands that we take a far-sighted as well as near-sighted look at development and the argument obviously is important because it reflects upon the larger question of the nature of organismic unity, of what holism really connotes, if anything, beyond its convenient, comforting and catchall qualities.

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[137] Barcroft & Barron, op. cit., p. 61

[138] Ibid., p. 62

[139] A. Jersild, op. cit., p. 8

[140] Gesell & Amatruda, op. cit., p. 37

---See also D. Hooker, op. cit., p. 16

Carmichael says that we cannot go back to the "zero of behavior", yet with this position he ignores a necessary aspect of the problem, that of evolution. Both he and Freeman say that from animal to animal the situation may change, thus dis-allowing comparison. And for both organismic totality, wholeness, is writ in the nature of a confederation: "...the organic energy system had to achieve wholeness in its self-preservative reactions to an ever-expanding field of disruptive change."

If we admit the lessons of evolution to the argument this last statement seems patently incorrect. At the beginning--the zero of behavior--one starts with a completely synthesized, dynamic unity. The atom, and then the molecule, are composed of parts--true--but both are absolute units, nevertheless. Secondly, through organismic elaboration organism becomes more complex, not through mere integration, but through an all-pervading synthesis, emerging again, therefore, as a unity and not in terms of a partial reintegration.

If our earlier thesis, based closely upon the thinking of Child, Kempf, and secondarily of Schneider, is valid, ontogenesis of parts can never emerge and maturate somewhat disjointedly, and then reach a closer coordination within the whole. With Barcroft and Barron, there seems to be some-

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[141] G. Coghill, "Early Embryonic Somatic Movements in Birds, and in Mammals Other Than in Man", Monograph of the Society for Research in Child Development, Vol. 5, No. 2 (Series No. 25), 1940, p.46

thing unreal about the entire argument. Also confusing is Carmichael's position that from one kind of animal to the other there exists no basis for comparison. One might as well, if he is to be consistent to this position, give up all comparative research--and Carmichael his own preoccupation with animal psychology.

To carry this point further, given a level of development--this denoting a total synthesis of an electro-chemical-molecular, macro-chemical structural organization--because of its particular electrochemical configuration, new gene waves are drawn into activity. Those at the big toe react to it and, in turn, through their action immediately change the rest of the total balance, and so on with other parts. The genes of any part react not only to the effects of their immediate substrates and environments, but equally all these elements react to a total molecular, organismic reality. Thus a change at any point, like a bucket of water dropped into the ocean, quickly changes (resynthesizes) the system.

Despite external manifestations organism differentiates horizontally, so to speak, hierarchy notwithstanding. If we view reaction as mass-like, it merely denotes total relative maturity (immaturity), princiapally of the neuro-muscular system. If we view one limb seemingly reacting separately it also is a reflection of a given synthetic level and denotes an equal immaturity of internuncio and coordinative structure, or a difference accountable by gradiency. At birth one may notice the apparent disconnectiveness, say, of the sensory organs within the central associational area. These elements, however, do not exist separately and then integrate. Equally with internuncial tissue, they exist within a blurred, early synthesis and through maturity within an organic-environmental interaction and becoming clarified within a Gestaltism.

Apart from an evolutionary prospective this kind of argument is difficult to see. If with Child, we look to the environment (total, i.e., internal-external) and especially to its consistency, we see organismic structuralizing reactions, and these in time made permanent, and then transmissible in the face of reproduction. In reproduction genes again reconstruct, flying through an evolutionary trail (and it is through this path, not merely ontogenetically, that Child's and Sullivan's concepts that organism is related at all points to reality become true) in which genes reconstruct chemical synthesis.

After all, the organism is a large chemical system--true more than a glorified compound--but one, nevertheless, in which equilibrium must be maintained at all levels. Molecular behavior within the semi-closed, fluid system denotes constant internal, external adjustment and equilibration and can admit of no less.

Some Concluding Molar Aspects of Fetal Physiology.

a. Viability, Adaptivity and Physiological Maturation. Adaptivity is distilled out of the unity of total process, of the differentiation and maturity of organ systems, and is correlated closely to growth of the nervous system, central and autonomic. Function and adaptivity are the products of the degree of organization--of the increasing ability of organism to subordinate, specialize and differentiate its metabolic and related activities. This viability, vitality and increasing functioning range is in large measure indicated by muscle tonus.[142]

Tonus reflects a state of total activity, its level of functioning, and of a dynamic tension, readiness or mobility of the growing energy-capturing system to reach with greater depth into the energy sources around it. Basically this is established and regulated by the digestive-circulatory system--a conditioner of total behavior[143]--and mediated and directed through the somatic and autonomic nervous systems. A set of basic tissues that require certain constancies of temperature, nutriment, etc., for their continued functional existence are so structured as to set up internal excitation upon reaching states of excess or deficiency.

> This excitation has disruptive effects upon the parts of the superposed neuromuscular system, which, being displaced, initiates overt behavior calculated to produce alleviations of the basic tissue disturbance.[144]

Tonus emerges gradually as the fetus develops through the heightening interplay between genes and expanding levels

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[142]Gesell & Amatruda, op. cit., pp. 85-92

[143]G. Freeman, op. cit., p. 49

[144]Ibid., p. 50

total environment. As the maturating nervous system lays down additional functioning fibrils ever greater numbers of

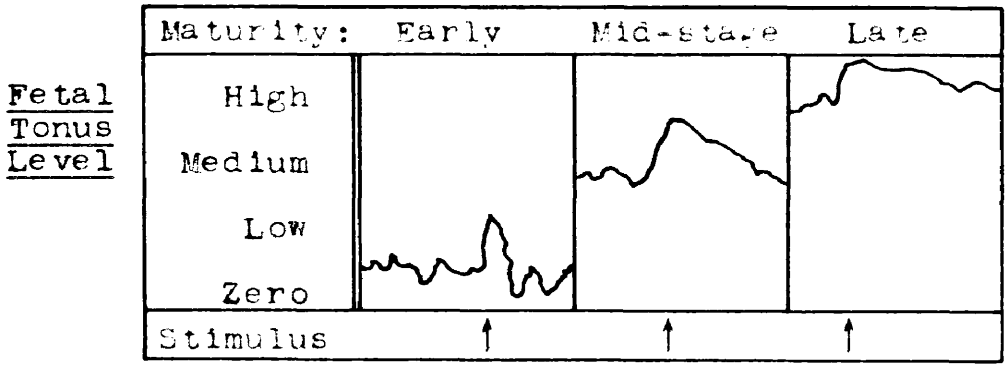

Figure 21. A diagrammatic representation of the characteristics of muscle tonus at three stages of fetal maturity. (Arrows indicate stimulus by tactile contact.) Early Stage: Tonus is fluctuant, patchy and at low level. Response to stimulus is weak and temporary, with rapid exhaustion and slow recovery. Mid-stage: Tonus is variable, but better sustained and at a higher level. Response to stimulus is prompt and moderately prolonged. Late stage: Tonus is more firmly organized at a yet higher level, with ampler reserve for emergency. Response is relatively vigorus and steady. (From Gesell & Amatruda)

muscle cells become stimulated by this growing network of diverse and system-wide afferent neurons--proprioceptive, interoceptive and exteroceptive. Signals begin pouring into muscle fibers: externally aroused excitations disturb the muscular system which reacts properly and, in turn, draws upon energies of the basic circulatory-digestive system. Thus a process of mutual interaction of the two-part system is established and can go on quite circularly throughout life.

> In these self-regulating and self-perpetuating reaction dynamics, we see that food energies are changed by the digestive system into a concentrated type of fuel. This fuel, together with oxygen for burning it, is easily made available by the circulatory system to tissue of the neuromuscular system; disrupting external stimuli

> <u>touch off these energies</u> (catabolism), and response is made; this requires that new energies (anabolism) be built up through withdrawals from the stores of the digestive-circulatory system; as anabolism equals catabolism, a kind of 'basel' equilibrium is again established.[145]

b. <u>Modification in Fetal Physiology</u>. In contrast to the physiology of the zygote, where organism existed completely dependent upon environment for second to second molecular needs, and for maintenance of a complex physical and physiological stability, the fetal organization has evolved large, closely coordinated clusters of cells to take over many of these specialized, regulatory and digestive functions. This means it has become less dependent upon the continued existence of a narrow physical medium, having internalized many of these necessary conditions in the course of development. As tonus increases so does, for example, the young organism's ability to regulate its own temperature and blood pressure.

Secondly, with certain cells combining to perform certain specialized tasks, the organism gradually develops the potential to tap and then utilize greater variations of basic energy sources. Long before term, as we have seen, it is able to obtain oxygen from the atmosphere and circulate it within its own system if prematurily expelled from the uterus. Gradually towards term it is able to extract basic molecular needs from less directly derived substances also. No longer will the maternal blood stream and the placenta, with their

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[145] <u>Ibid</u>., p. 50

quick forms of energy, need to carry out this process. For the mature fetus, therefore, the time is ripe when it may escape the confines of a saline environment and move out into the great sphere of the atmospheric world. And not too far beyond this great jump is a further extension, that of an ability to capture and utilize energy from solid foods.

But for the time being, until birth, the fetus takes its needs pretty much the easy way by remaining passively tuned in at the maternal placenta. While lungs and the general digestive tract are almost completely mature they remain functionless.

Digestion obviously is unnecessary as food is circulated in a form which may directly be utilized by the cells, or stored for future use. About the only noticeable digestive activity is the results of an occasional gulp of amniotic fluid by a wayward fetus.

The heart is active and busily establishing circulatory pressure. Because lungs hardly can function, certain typically prenatal circulatory patterns exist. Very little unaerated CO_2-laden and oxygen poor blood returning to the right heart is pumped to the nonfunctional lungs. Blood which <u>is</u> channeled into the pulmonary artery (see Figure 20) is shunted quickly into the aorta through an embryonic vessel (which becomes nonfunctional following cutting of the umbilical cord after birth), the ductus arteriousus, connecting pulmonary artery and aorta. Much of the blood entering the right auricle passes immediately into the left auricle through a special fetal-existing hole in the wall between the two auricles (the foramen ovale, or oval opening). Thus the 'impure' blood returned to the right auricle is pumped on unchanged into the systemic circulation, only later to find its way into the placental vessels, where aeration occurs.[146]

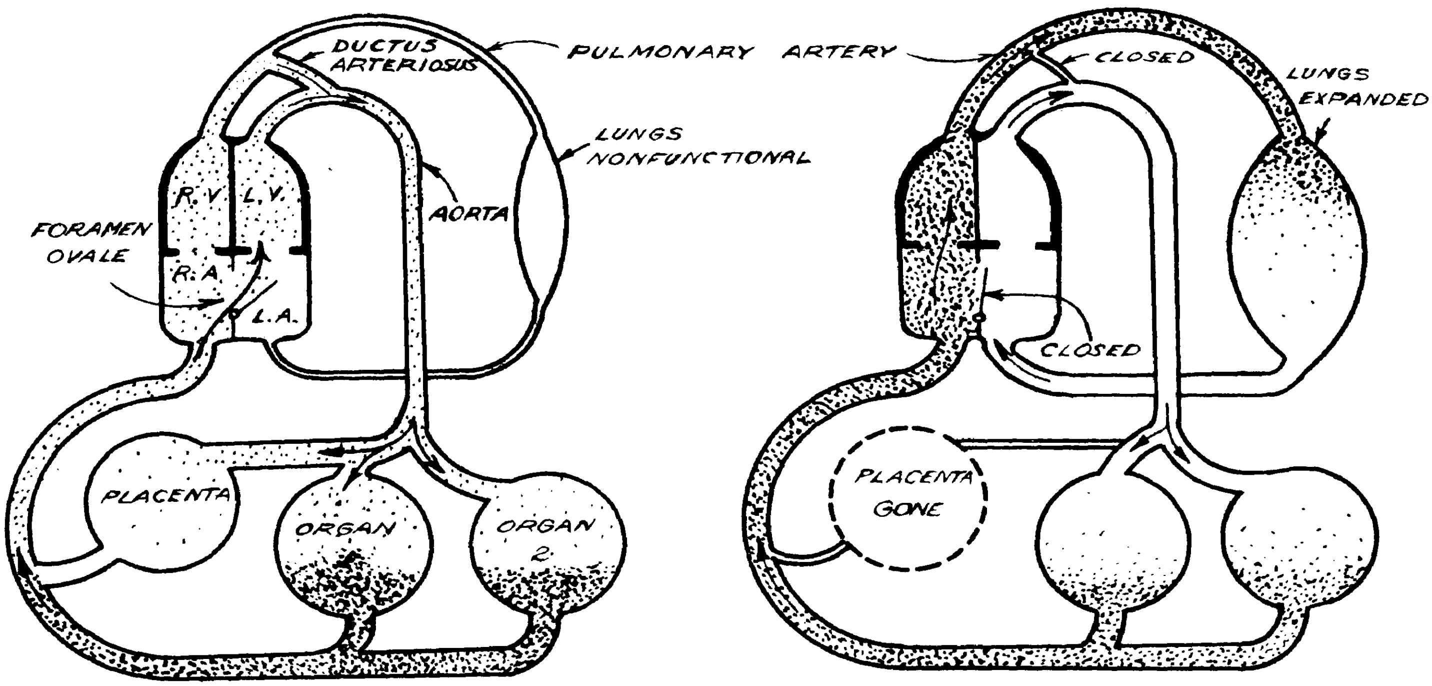

Figure 22. Circulatory changes at birth. Aerated blood is shown in white; unaerated blood, black (heavy dots); a mixture of aerated and unaerated blood, dotted. (From Carlson)

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Being largely preoccupied with the developmental mechanics of the physiology of prenatal ontogenesis, we have neglected to present a systematic outline of multicellular and differentiated-organ fetal physiology. As to the former its mechanics are similar to those of simple animal forms, and seem beyond the interest and scope of an outline such as this.

As to the latter, understanding possibly can be better served, and with an attending economy, if the physiology of the largely 'potential' organism is delayed until potential becomes function. The neonatal phase is largely and hardly more than an allotment of time in which organism achieves a radical change in organic economy. This transition is dramatic and it is logical to sketch briefly some of the relevant physiological aspects at this point.

To those who feel that the outline thus far has leaned too heavily upon physiological organismic dynamics, to a delay in reaching the more familiar neonatal and postnatal social stages, we argue again that the intolerable gap in our knowledge of human development is between a touchable chemical-physical soma and its projected psycho-social, but ever so evasive, evanescent and vaporous mental characteristics. Much of the floundering in psycho-social research is accountable in just this failure to attempt to understand man (as far as is thus possible) through the particular somatic thing that he is. This is not to say for a moment that until the transition between the physiological energy system and its higher (psychological) projection is effected we must stay at the level of neurons and muscle spindles. We argue simply that research in these terms is vital and that social science constantly must ground itself, measure itself, so-to-speak, in reference to what clues we already have of

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[146] Carlson & Johnson, _op_. _cit_., p. 584

the physical base. From this view we must also proceed from a long, searching look at the somatic system and its transitional pyramiding to the adjustive foundations upon which personality (self) evolves. There is no argument here with such as Dr. Earl Johnson and the sociological point ot view that man takes his humanness and almost all the meaning we can wrap around him through his interpersonal, social and cultural context. We are saying only that we must know the complex of basic strivings and need projection sources, the well-springs, from which the life game is patterned.

THE FETAL WORLD

It is appropriate to touch upon the important problems of individual differences--differences in reaction patterns, energy levels, physical build, and so on--during the last intrauterine phase. These differences exist of course at all levels of life, from the instant of conception on, but they begin to assume graphic proportions in fetal behavior.

Contrary to much older thought it is no exaggeration to say that by the termination of gestation the fetus faces its world with definite individual bodily structure and adequacy of function, and this to the extent that it already bears unique fundamental personality characteristics--of an easily discernible system of individualized adjustive approaches.

This also connotes that personality patterns are built up by the interaction of excitation aroused in the organism with its specific biological structuring of meeting varying degrees of thwart or frustration imposed upon its overt expression by environmental circumstances. It is saying that the kind of intrauterine world the fetus has existed in for nine months, and modified in turn, is fundamental and carries implications for basic ordering of self development.

We noted earlier that the embryo rapidly establishes effective contact with a second level of environment: it taps in on many of the homeostatic, equilibratory effects of the maternal system. During its nine month residence within this intimate relation, and as it gradually differentiates itself apart, it shares and dynamically reacts, is modified, and build upon reoccuring maternal adjustive patterns. How organism meets and reconciles these now internalized forces (i.e., now internal since they act primarily through the infant's circulatory system) is a resultant between imposed forces, limitations, etc., and the initial quality and nature of its inherited genetic components. This resultant product--that is, the self and its personalistic reflections at any given moment--is, therefore, evidence of a quality of interaction between the earlier interaction of genes and environment (resulting in synthesis) with a new environment. In short, genes and environment continuously synthesize, both modifying each other, and the result--organism--then meets environment anew.

While this may seem confusing and unnecessarily complex, it is hardly a correct formulation of the case to say that organism (self) emerges simply through interaction between constitution, so-called, and environment. Environment is not marked apart but extends right up to and effects genes themselves. With continual synthesis (development) organism fuses with new and imperceptible expanding levels. As if this were not complex enough, one might add that environment is also modified by the fetus (in extreme cases to the mother's biological impairment) and this change is in turn fed back upon the fetus. The world is indeed as Thomas Wolfe characterized it--a web.

Thus in a crude sense a kind of sub-human personality (personality in the sense of total organismic projections) meets the world from a nine months sojourn in its maternal boarding house (European plan). Some of the conversations between landlady and fetus--the effects of her food and room --have been mentioned in the last section. These need to be elaborated upon for they provide a few more of the pieces in the important but essentially unknown picture of mother-child dynamics and of how the one contributes to the other.

The sharpest contrast between the two prenatal periods lies in the greater neuromuscular viability of the more mature fetus. Long before term it moves, blinks its eyes, swallows, closes and opens its fists--even sucks its thumb--and may thrash about its cell. If conditions aren't too good, it its oxygen level drops a bit or if toxics are allowed to accumulate, if myogenetic changes are giving it 'growing pains', it dosen't hesitate to let the world know about it and proceeds to bang lustily against the walls of its private, fluid-filled chamber. What specifically are some of these fetal conversations about?

The transmission of fatigue seems to be one of the simpler factors. Harris and Harris (1946) observed that fatigue in the pregnant mother may produce hyperactivity in the fetus.[147] Infants of mothers who were emotionally disturbed during pregnancy frequently exhibit evidence of an irritable and hyperactive autonomic nervous system. Many young babies

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[147] D. E. Harris & E. S. Harris, "A Study of Fetal Movements in Relation to Mother's Activity", Human Biol., 18, (1946), 221-237

indicate more than their share of regurgitation, dyspepsia and diarrhea. Such infants squirm and cry excessively for their milk every two or three hours, instead of sleeping through the four-hour interval between feedings.[148] Those early feeding difficulties based on motor and sensory abnormalities of the gastrointestinal system are in many instances of autonomic origin.

> The presence of feeding difficulties of a motor or secretory nature from birth must presume their etiology and basic disturbances during intrauterine life. In prenatal development of such a condition, prolonged nervous and emotional disturbances of the mother during the later months of pregnancy seem to be important.[149]

The possibility exists that the autonomic system of the fetus becomes sensitized through the hyperactivity of the maternal neurohumoral system. This relationship is now also being explored clinically. Preliminary findings tend to indicate that patients who develop recurring depressive states in adult life frequently provide a history showing that the mother was grievously disturbed emotionally during the intrauterine phase of the patient. Similar findings seem to also occur with duodenal ulcer.[150]

> The indications are that some postnatal disturbances of the alimentary tract may be primarily owing to a particular series of intrauterine experiences. The striped-muscle responses which are observed in the fetuses of emotionally dis-

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[148] M. Montagu, op. cit., p. 11

[149] L. W. Sontag, "War and the Fetal Maternal Relationship", Marriage and Family Living, 6, (1944) 1-5

[150] J. Halliday, "Psychosocial Medicine", Norton, New York: 1948, pp. 91-92

> turbed mothers may constitute but a faint replica of the smooth-muscle changes which are being induced through the autonomic nervous system in such fetuses, and of the changes induced in the whole alimentary tract through the cholinergic activities of the autonomic components of the vagus nerve (the nerve which supplies the organs of the chest and some of the abdominal organs, chiefly the stomach). These latter activities may account for the increase in the heart rate and thus may possibly be related to later heat conditions and possibly high blood pressure.[151]

Greenacre suggests that the eivdence may add up to a possible existence of preanxiety reactions in fetal life without, necessarily, any psychic content. Factors such as sudden sound, vibrations, umbilical-cord entanglements, and like, may produce traumatic effects which develop into lasting anxiety reaction patterns. And Sontag concludes:

> He (such an infant) is to all intents and purposes a neurotic infant when he is born--the result of an unsatisfactory fetal environment. In this instance he has not had to wait until childhood for a bad home situation or other cause to make him neurotic. It has been done for him before he has ever seen the light of day.[152]

As if to nail this possibility down, Spelt (1948) has proven that the fetus is capable of being conditioned, that is, capable of making through training the same or modified responses to substitute stimuli, stimuli which take the place of some original stimulus while still in the womb.[153]

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[151] M. Montagu, op. cit., p. 10

[152] L. W. Sontag, "The Significance of Fetal Environmental Differences", Am. J. & Gynec., 42 (1941), 1001

[153] D. Spelt, "The Conditioning of the Human Fetus in Utero", J. Exper. Psychol., 38 (1948) 338-346

The literature is growing rapidly in this important area of fetal-maternal relations and interactions. The reader possibly has noticed, however, that what insight we have is very fragmented and deals with largely pathological dynamics. Our insight of normal growth and of process along a broad, related front (of the biochemical actions involved in normal nutrition at various stages, for example) is largely absent.

Earlier we noted the methodological difficulties involved. Even so there is more that can be accomplished in this direction. A comparative approach to class and cultural patterns towards pregnancy would be helpful. Longitudinal studies involving many careful psycho-biological measurements, and especially emphasizing careful measurement of relative changes within known total conditons, rather than of absolute static measurements, may offer rich rewards.

In the meantime, however, we can hardly afford the attitudes frequently taken by researchers in human development that the abnormal is beyond the range of scope and proper interest, and that one should therefore focus only upon the 'normal' (what ever that may be or mean). Whether this view refers to psycho- or bio-pathological levels is beside the point. What is important is that we realize that to a large extent abnormality refers to degree, a quantitative measure, rather than to differences in kind. By making use of this approach one is able to detect factors ordinarily too well integrated within a system; by this approach one may be in a position often to preceive attributes and their dynamic effects exaggerated into clearer view in terms of their function within context.

Origins of Individual Differences. Individual fetal patterns of reaction denote the resultant of interplay between a given synthesis and all levels of forces working around organism. How a fetus will act or react is dependent upon the degree of coordination and quality of function he may bring to bear and in general adjustive (self, personalistic) patterns reflect relative strengths and adequacies of part systems which are most pertinent to the nature of the stimulus or changes.

We can lay down much of the probable theory behind emerging individual differences and we are also able to speculate as to probable over-all physical aspects which form the basis for later personalistic elaborations. One can say something towards explaining such factors as body build, energy levels, resistence to disease, etc., as long as one isn't forced to document closely or detail the nature of the processes involved.

We seem to be on sound ground in establishing as the basis of all adjustive patterns (hence of the total of self projections) the underlying, continuing efforts of the organism to maintain a dynamic equilibrium. Logically--and perhaps one day practicably so--it should then be possible to measure men in terms of physcial modes of meeting frustration, of the bodily maneuvers, defenses and of their effeciency in bringing organsim to a new level of energy availability and levels of equilibration (Freeman).

Each fetus obviously faces an entirely unique constellation of genetic and environmental forces to adjust from and with. And the 'he' represents the mode of solution. We are still at a very theoretical, and also very general, state of knowledge but some of the overall solutions may be conceptualized. Thus the fetus is exposed to stress situations (in which no habit is available for removing the condition responsible for maintained tensional state).[154] In such a case one would expect a spread of this excitation, perhaps producing some form of prepsychic all-pervading or free anxiety.[155] Logically also, one will then expect organism to mobilize towards ridding itself of tension. The mode of this solution would turn characteristically about the relative weakness of part systems and the nature and degree of the stimulus. Diffuse excitation may find a partial discharge outlet at some weakened point, i.e., tension focalizing in a particular organ, with a mechanism of fixation being established.

This partial inability to overcome frustration (either biological or psychological) becomes a part of the organism's characteristic, patterned modes of adjustment and equilibration, i.e., the self system. Continuing with our

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[154] A. Luria, "Nature of Human Conflict", Liveright, New York: 1932, p. 211

[155] H. Harrington, "A Biological Approach to the Problem of Abnormal Behavior", Science Press, New York: 1938, From G. Freeman, <u>op. cit.</u>, p. 292

example, organism may indicate no relative weakness to the stimulus, in which case the extra tensional load is discharged, without manifesting any persistent, residual symptoms. In most cases, however, frustration will call upon some degree of added effort (by definition) and this characteristically will be resolved in certain ways. Thus with use of refined instruments one might discover frustration to be met by primarily visceral constrictions, as against skeletal reactions, say, and this ultimately decided by (1) the nature of the frustrations as they bear upon the fetus, and (2) of fetal self development at the time.

> Important in the development of anxiety potentials in any human is the degree of tension existent, dependent on the sensory-motor balance, that is, on the ratio between the sensory stimulation and the capacity (development and opportunity) to effect some sort of motor discharge. Where there has been considerable disproportion between an increased sensory stimulation and a limited motor discharge over a period of time, such tension may conceivably be incorporated into the working balance of the individual and become temporarily or permanently a characteristic of his makeup.[156]

Newberry (1938) showed that, given a degree of frustration within tolerance limits, the fetus will also reflect in some somatic way its successful adaptation to it. Thus fetuses active during later pregnancy (for what ever reason) are more advanced in motor development (as indicated by the

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[156] Phyllis Greenacre, "The Biological Economy of Birth", The Psychoanalytic Study of the Child, Ed. Otto Fenichel et al, International U. Press, New York, I, (1945), p. 55

degree of myelinization) during the first postnatal year than infants who were comparatively inactive as fetuses.[157]

Organism (or some aspect of its part system) may fail in some degree to run off all of its tension (disequilibration). Aroused excitation, denied specifically adaptive discharge, must then recruit reinforcement (autonomic generally, since this network is primarily concerned with meeting internal-external disequilibruim through its control of available energy distribution and transformation (see pages 194-195)) and thus depending upon the length and degree of tension, this becomes a self-maintaining 'emotional' (i.e., reenforcive) tension system.[158]

Each fetus, therefore, ends its intrauterine existence with certain dispositions, predispositions and equilibratory tendencies, these based upon the way it has handled its problems in utero. Thus one infant may react in some degree (along a continuum) towards frustration by motor automatisms and skeletal action because he has the high energy level which will support such metabolically costly discharge, while a less robust infant may 'select' one of the psychasthenic-like debilities. An infant with a congenitally weak heart may find his redirected tensions (i.e., residual tensions) attempting to discharge themselves through this

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[157] T. Richards & H. Newberry, "Can Performance on Test Items at Six Months Postnatally Be Predicted on the Basis of Fetal Activity?", Child. Dev., 9, 79-86

[158] A. Maslow & B. Mittelman, "Principals of Abnormal Psychology", Harper, New York: 1945, pp. 63-66

organ, thereby producing a relative cardiac weakness.[159]

Emerging upon reoccuring general somatic equilibratory effects, therefore, would be the basic indices of self characteristics and their personalistic reflections (projections). One building stone from which further differentiation may emerge (and to interact within a total action) may be the typical effort which can be requisitioned and brought to bear.

A second element may be the peculiar way this is channelized. And a third factor logically follows (this depending upon the first two): a total executive or preceptive quality, inherent in the system and specifically in the integration and quality of functioning of the associative nerve centers, of neuromuscular connections, and the ability to use the produces of metabolism to advantage.

> The uniqueness of the individual personality pattern is conceived, then, to depend upon the interaction of quantitative gradations in such factors as discriminative capacity, drive arousal and discharge control. A visualization of such patterns should somehow relate these major axes of differentiation with each other and make it possible to show each individual's position with reference thereto.[160]

Through the dynamic interactions between developed energy capacities, of the ability to mobilize these sources, of the neuromuscular utilization and control over them and

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[159] P. Schilder, "The Somatic Basis of the Neuroses", *J. Nerv. & Ment. Dis.*, 70, (1928) pp. 502-504

[160] F. Freeman, *op. cit.*, p. 266

finally in the nature of environment, emerges an over-all pattern of organismic economy and the basis from which adaptive patterns become structured.

In the precortical level we can see the gradual superimposition of a neural dominance of external equilibration over phylogenetically earlier preneural (muscular) and largely internal homeostatic gradiencies. During the late fetal and early neonatal periods one sees the continuity between bio and psyche graphically demonstrated; the activities of the fetus or infant suggest almost simultaneously neural and more primitive vegetative-muscular responses.

Through this interaction there emerges within a still diffuse, undifferentiated and largely mass-like reactions certain behavioral patternings in which somatic economics are early translatable into psychological characteristics. These reoccuring equilibratory adjustments form the biological bases for personality: through consistencies of genes and uteral environment certain isolatable qualities gradually differentiate within the blurry behavioral configuration.

Freeman's two concepts of discharge control and arousal seem admirably suitable as a base from which to postulate precortical personality profiles. Thus in Figure 23 point A represents the position of a seemingly calm individual of medial arousal whose higher nervous centers naturally or by training exercise a high degree of inhibitory control over skeletal responses. This configuration may antedate possibly later adaptive patterns in which the infant's solution is to block socially unappropriate or untimely overt discharge. Aroused energy may in these cases be directed towards the smooth muscles and often towards other tissues which are not under such a degree of inhibitory control as are striped muscles.[161]

Heightened activity in smooth muscle tissue may help relieve the system of some of the unexpressed excitment. As we shall note later, inner control over many impulses is almost the pass card to membership in the middle class and that of the small upper upper socio-economic ranks.

B is overtly figetity, with control of skeletal discharge basically weak. Unresolved energy seems likely to drain in this jittery skeletal movement while smooth muscles remain quiet. Digestive patterns will probably also be calm. In summary control is poor but energy mobilization is average.

C illustrates a personality constellation in which autonomic mechansims of arousal are basically weak. In this state the infant fails to mobilize enough energy to carry out appropriate reactions. It will have average directive control but low drive arousal.[162]

D is a high energy system and with average discharge control. In contrast to C, D gets too mad in an emergency, being somewhat overwhelmed with his own power in the process.

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[161] Ibid., p. 270

[162] Ibid., p. 271

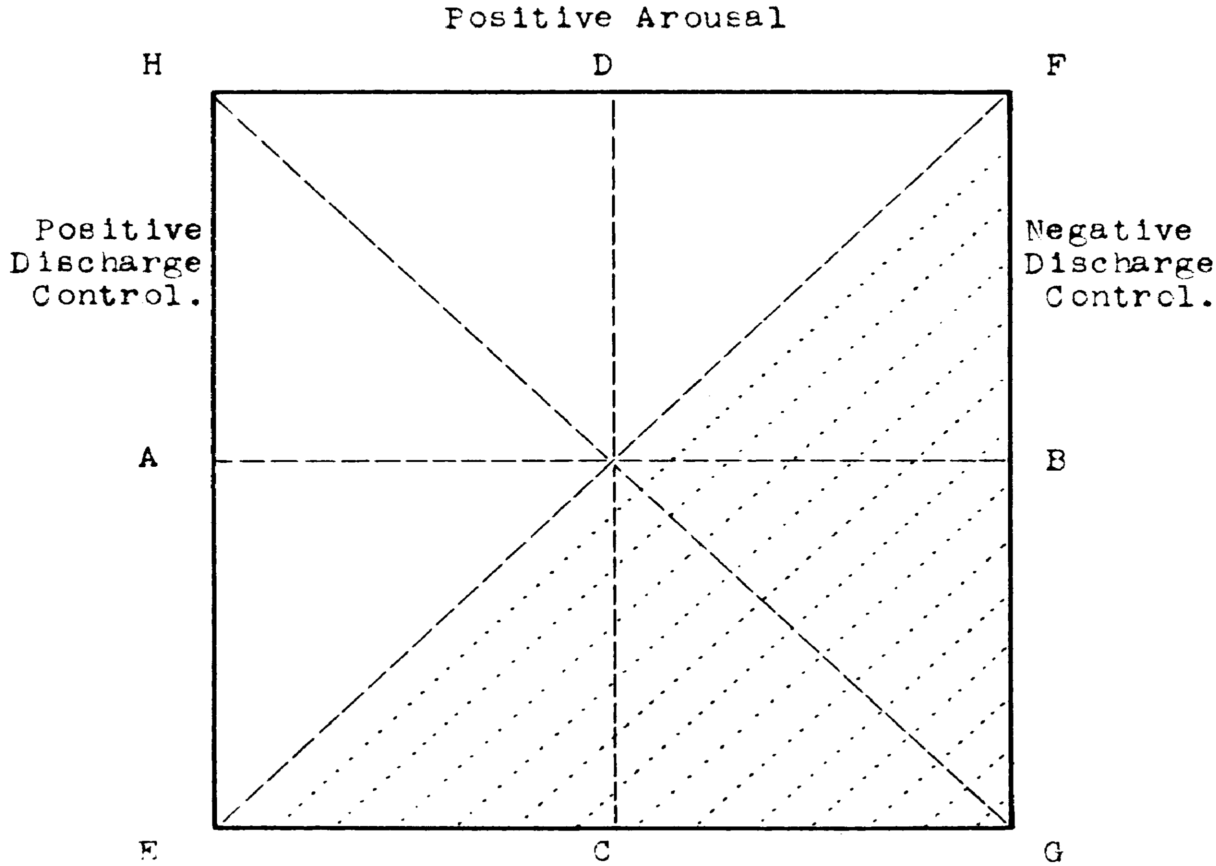

Figure 23. Dynamic interrelation of two axes of personality differentiation. (From Freeman)

E is an extreme A and his future personality will suffer from a lack of drive. If he is intelligent anxiety in some degree might be his lot. If lacking in intelligence E may be phlegmatic, a vegetative and unproductive infant.

F meets a postnatal world with high arousal and low control. Such a constellation may form the basis of a manic type of personality (Mania psychopathology, of course, represents an extreme along a continuum, and in this case may be 'normal' bounds. Environment would seem to be the future deviding element.).

G (continuing this speculation in regard to pathology) would be a candidate, it seems, for the weakness of the neuroasthenic. He exhibits both low energy mobilization and low directive control. Again, whether the fetus goes on to establish the base for a later pathology would seem to depend upon the extent of personality frustration. From these speculations one can also see with great force that a given environmental frustration pattern will mean quite different things to individual fetuses who bring to it quite dissimilar organization and adjustive-tolerance capacities.

H, the final extreme constellation, is an infant with high neural control and high arousal. Given a future adequate capacity (education) he presents the basic elements for coordinative, creative expression.

Freeman notes that individuals in the HEF area (high arousal, high control) will be met in the general American cultural pattern with greater acceptance as contrasted to the GEF (low arousal, low control) orientation. The former tends to correspond to the energetic, extroversive go-getter, while the latter may be generalized as a sluggish individual who withdraws. But of this later.

In summary, the late fetal period indicates the gradual formation of neural dominance over bodily economics, especially as these relate to integration of environment forces. In a crude sense the fetus (and young infant) seem at a transitional state--one beyond preneural dominance but preceding future true cortical elaboration. Fetal behavior reflects a simple theme mainly under hypothalamic coordination, with the human variations to develop later under the stimulating effects of a complex postnatal environment.

In the absence of the interpersonal and of other additional levels of postnatal stimuli, the hypothalamus seems to function by reenforcing and coordinating the sympathetic, hormonal and motor mechanisms in the expression of gross, undifferentiated emotions.[163] In thalamic expression, however, certain predispositions exist (a step removed from direct manifestation of bodily dynamics) in a series of blurred collective tones and affective states from which to form the basis for cortical structuring.

Cortical patterning, therefore, quite clearly will reflect an integration and finally synthesis of arrows of forces arising internally and of those from without which will modify the former, lend substance to them, but, in turn, will be read by organism in terms of preexisting tone states.

The Reciprocal Interplay in Organismic-Environmental Dynamics.

We frequently have made the statement that as organism matures so does, in a sense, environment. Strictly speaking one cannot change without effecting the other. What this can mean in the ontogenesis of organism has been illustrated beautifully in the various experiments designed to upset this interplay between organic unfolding and a stimulating-accomodating environment.

Ideally structure and function meet environment more or less optimally; more or less because there generally exists

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[163] Jules Masserman, "Principles of Dynamic Psychiatry", Saunders, Philadelphia: 1946, p. 17

room for leeway. The emergence of a supporting environment, however, rapidly becomes crucial in any delayed behavioral manifestation beyond a period of time. Carmichael (1926, 1927) restricted the onset of swimming movements in salamanders by placing them in chloretone prior to the expected maturity of swimming mechanisms. After a control group displayed swimming movements, the experimental lot was placed in tap water and immediately upon recovery from the effects of the drug they exhibited swimming behavior almost at par with the controls.[164]

These findings emphasize a certain leeway; the crucial importance of a proper environment to initiate behavior may be demonstrated by extending the improper environment beyond a critical point. Matthews and Detwiler prolonged the treatment with chloretone on amblystoma (salamander) embryos beyond apparent limits with the results that behavior failed later to appear.[165]

Although it may be a little early to emphasize the point, it needs to be noted also that as the fetus and infant graduate through their developmental levels the environment they encounter may change not only in terms of an elaborating, ex-

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[164]L. Carmichael, "The Development of Behavior in Vertebrates Experimentally Removed From the Influence of External Stimulation", Psychol. Rev., 33, 51-58

---"A Further Study of the Development of Behavior in Vertebrates," Psychol. Rev., 34, 34-37

[165]S. Matthews & S. Detwiler, "The Reactions of Amblystoma Embryos Following Prolonged Treatment with Chloretone", J. Exp. Zool., 45, 292

panding organism, but also in the qualitative sense that at a new stage both infant and, say, mother may create a new for-better-or-for-worse relationship. The physical condition of the mother may improve, for example, from embryonic demands to fetal. Likewise birth may institute significant changes in that a new set of maternal attitudes (via the mother's personality makeup and/or cultural training) become relavent. Louis Barclay Murphy beautifully illustrates the point that maternal and paternal attitudes may undergo marked change in, for example, the babies transitition from the crawling stage to walking. If a crawling pattern of locomotion fits in with a mother's unconscious needs towards over-protection, the walking stage may threaten this relationship in that the infant now possesses the capacities for escape.[166]

* * * *

With termination of gestation an entirely new ontogenetic era opens up. Untried organismic mechanisms stand ready; with the abrupt cutting of a slim cord a tiny unity is propelled into a new and strenuous series of adjustive tasks.

He feels encompassing pressure. Suddenly there is something called 'brightness', vibration--harsh and unfamiliar; 'sound', a crazy blurring of darkness and light; movement.

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[166] Louis Barclay Murphy, "Childhood Experiences in Relation to Personality Development", From Personality & the Behavior Disorders, Ed. J. McV. Hunt, Ronald, New York: 1944, Vol. II, p. 658

Now he gasps and 'inhales' under a newly experienced tension. He feels strange tactile sensations, all blurred with sound and light--where does one end and the other begin? Motion, kinesthesia, total sensation moving passed in a bewildering kaleidoscope. . . and then nothing. Fragments of stimuli, these without meaning and in an atmosphere of unreality; only pain and absence of tension--unconsciousness.

Time, distance, the sound of automobile horns from the street far below in the late homeward rush, of rain against the delivery room window, of the monotone voice from the intercom outside in the corridor--these press against receptors in a meaningless jumble, blurr, fade out; of taboos, loneliness, satisfaction, reflection, traffic laws, of the obvious projections of a tired nurse--these enter, too, but are coded and slip by.

His throat vibrates, muscles contract, but he is born and there is no return.

CHAPTER IV

THE BASES FOR BEHAVIOR

> It would be clearly unreasonable to expect either the normal or abnormal behavior of human beings that issues from the complex interrelations of these three factors to be wholly explicable in terms of only one member. Just as there is never a single and simple cause of normal behavior so there is never a single and simple cause of mental ill-health. Any etiological diagnosis of this kind must always remain an over-simplification. . . The necessity for a multiple approach to these problems under the above headings of ego, somatic and environmental can sometimes be seen in an almost diagrammatic way.[1]

The constant interplay between fetus and environment produces a very characteristic and utterly unique synthesis. The prenatal infant integrates, endlessly reintegrates, and in this process emerges as a more viable, adaptive organism. The great and long-range significance of birth is to tap a vast new equilibratory potential and one which portrays strikingly the combining, the synthesizing, of the bio(still with the physical) now with the vast reaches of the social.

The remainder of our story, in effect, is in this structuring, in the linking up, of associational patterns of the bio-social and of their emergence at the pyramidal apex of equilibratory resources represented in the human cortex.

In the evolutionary interplay, in this synthesis and

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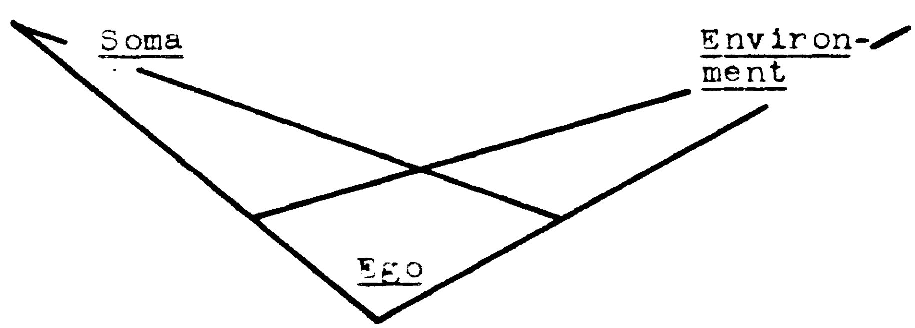
[1]D. Curran & E. Guttmann, "Psychological Medicine", Williams & Wilkins, Baltimore: 1949

continuing resynthesis of countless processes and varied-angle movements, man has emerged from the reflectionless dictates of his vegetative and chromosomal constrictors to a level beyond, one allowing him to survey his own processes, to reflect and then to enhance. Likewise in rapid motion does the infant traverse much the same road. In this process of growth it is not enough, however, that he complete his biological sequiturs; man must also integrate within himself a vast accumulation of cultural constructions which with his somatic wellsprings his world and himself are assigned meaning.

In these achievements we are focusing upon the wonder and magnificence of the 'living' and interpersonal activities of vast collections and combinations of non-living atoms and molecules, of ultra-microscopic bits of matter-energy to endlessly exogeneously, autogeneously equilibrate towards something as fantastically remote as the social , the cultural and the capacities for transmission.

Man's tremendous cortical capacity and potentially (its limits yet undetermined) demonstrates, perhaps as nothing else can, the qualitative magic inherent in biological synthesis for through it man may gradually--perhaps endlessly--evolve the raw capacities, the elements of sensation--of touch, of taste auditory reception, sight, of smell--these driven and colored by cycles of needs and energy rhythms, into softness, sweetness, of mood, of the endless weavings of tonal qualities, color and depth. These intermediate combinations of elementary communications and expression are projected and fed back upon all-pervading, underlying tones of the somatic system and culminating in an aura of evaluative, enhancing qualities and capacities: to the experiencing of beauty--art, literature, music, of love--and of the abilities to assign meaning to the everlasting, endlessly adaptive activities of an energy-capturing system fighting to maintain homeostatic balance.

The abilities of the human infant to achieve these levels of adaptive organization, more directly of his susceptibility to vast new levels of environment, of the interpersonal, of his powers of communication and of the cultural, tax any organizational framework and cry out that we can no longer treat with the soma on the one hand and the environment on the other, with barriers of traditional isolation between. We are dealing, again, with a unity and now a new task emerges with birth: increasingly we become forced to attempt to perceive much of this synthetical activity through its reflections--the mind-- and remembering, however, that mind is also increasingly an energizing force, itself a nexus and increasingly an innovator, of the dynamisms moving within synthesis.



The task ahead for a science of human development is suggested in the presence of faulty division of effort--indeed often of the presence of divisions at all--in our traditional fictions where mind is apt to be mind, culture out by itself and guts just guts--and never (well, almost never) the twain doth meet. Our task in this paper is to help suggest, to open up for exploration, possible heuristic directions for elaboration. In this sense we are concerned above all with ontogenetic and horizontal levels of organizing dynamics. There is the need to search the storehouses of knowledge for certain insights, and for balance and economy we must be prepared to reject others. Specifically, our task seems one of sketching a bridge between the physiology of the soma to the psychology of the ego.

Many of the problems we face in a modern age, the understandings needed, no longer permit bland formularizing, structuring and applying atop a foundation of unknowns. We cannot hope to prescribe for man's problems without some functional understanding of the processes from whence these energies spring. In the term human development is connoted recognition of this attempt to spin a web between physiology, social psychology and culture. The answers seemingly can only be found within syntheses of combinations such as these.

<u>A Plan for Attack</u>. To birth and for a short time beyond we are presented with a largely precerebral infant--really, from our position, a poorly integrated and essentially subhuman animal. From a mass of data that is available we need

to sift through for those contributions and conceptions which will be of use towards visualizing and reconstructing, in a sense, the emergence of supra-equilibratory levels-- of consciousness and the social--from the basic activities of the differentiating somatic system, arising and unfolding along a continuum through homeostatic efforts of organism to external impingings and to inner maturational promptings.

Thus through the multiple equations of soma and environment flowing within each other there emerges a tangible change in both and forged a new surpa-equilibratory structure, the cortex, proud examplar of this synthesis and increasingly captain at the helm. In maturation (of differentiation and reentegration of process through time) we accordingly must recognize energy sources--at this point of the neuromuscular maneuvers of an energy capturing system within a neonatal environment. This indicates, first, that we need to examine briefly the new post-fetal physiological economy and attempt further to visualize its patterns as determined in part by the relavent new external forces.

Here we have a base for total behavioral projections, specifically the ground structure (of the basement we have already elaborated) from which further potential is readied or impelled through the inpacts of maturity and widening circles of environmental forces beyond. How may we build a bridge from the activities of a largely vegetative energy system to a next level of integration?: that of elaboration within the neuro-muscular complex and basically of development within the central nervous system. This second task, easy to state, is a formidable one for psychology. It involves providing a working understanding of the mechanisms and dynamics of sensory reception and organization, and the resulting impressions synthesized with basic homeostatic, interlocking part-reactions of the organismic energy system. In short, how are post-natal adjustments effected by the impress of the infant's world and, in turn, by what basis are impressions traced to their motivating sources in the physiological processes?

From coordination and synthesis of somatic activities with the organization of perception, we may further move into the psychological organization of self. Thus from the feeling tones of a somatic system, and from its increasingly acute organization of the stimuli around it, how and why does the infant form his earliest interpersonal linkages? Finally, how do these associations become a permanent force in his hitherto selfless, autistic world?

The obverse of this vastly complicated and long trail of dynamics, but one which can no longer be dealt with separately, is growth through the extending levels of an external world, of socialization and the cultural influences. This also a tremendous task and one which at present we can only very imperfectly approximate.

Subtending these processes, what seem to be the lasting effects upon self; for a phase what is its epilogue?

NEONATAL EQUILIBRATION: ELEMENTS OF EGO STRUCTURE

In all living activity there is rhythm. In young bodies it beats with vigor and rapid tempo; in the old it is less certain, feeble. At all evolutionary levels of life, at all stages of growth, these cycles tell of the activity of living matter to capture energy from the surroundings, to break it down, utilize it, and then to rid the system of metabolic wastes. In these activities there is a race against what Gerard called 'mixupedness', a race to capture more energy than is expended. In the young, teeming genes are ready for action--for realization--and providing a draft for combustion that proves irresistible. The story of child development is in this process of the structure erected and of the forces within and without which guide its lines.

We sever the umbilical cord and the neonate is cast into a new sphere.

The literature on this neonate is large. Much of it deals with surface phenomena, but describing directly or indirectly the exploratory, often floundering, equilibratory maneuvers of an organism suddenly exposed to a new range of stimuli: shaping-forces of light, sound, tactile sensations, a new atmosphere, internal maturational promptings, cycles of awareness and fatigue, taste, smell. Behavior, however, funnels towards a most basic new task: of organism being forced to now seek actively those sources and aids whereby needs are satisfied so as to maintain a new economy, and then, very quickly, restructure towards meeting ever additional external-internal maturational promptings and developmental tasks.

In the most basic sense we plan here to look for future maturation and growth in terms of elaboration upon the quality of this flow and utilization of energy through the system. Thus we accept the task of tracing the formation of self (of its reflection personality) as stemming from a focus around the nursing relationship--but keeping in mind that by birth the points of interaction between infant and its environment are far from simple. Nourishment and nursing, as we could begin to see even in the prenatal stages, becomes, therefore, more complex than in the mere receiving of sufficient food supplies.

Centering about the digestive system, and being especially concentrated at the oral end, are complex systems of receptors and prehensors. Through birth these are propelled into activity by a veritable flood of stimuli. They function at first with complete lack of coordination (i.e., from the adult perspective) and are only poorly differentiated within a field. Perception appears summative, rather than synthetical. The Gestalt is there to be sure and yet its boundaries are fliud and blurred. Ego, denoting a separateness and subjective awareness, is hardly present. Absent is almost any conception of field and ground and purposive action and adaptation are almost absent.

> The ego becomes differentiated under the influence of the external world. Correspondingly, it can be said that the newborn infant

> has no ego. . . Innumerable stimuli pour out upon him which he cannot master. He is not able to differentiate the encroaching stimuli. He knows no object world and has no ability yet to 'bind' tension. One can guess that he has no clear consciousness but has at most an undifferentiated sensitivity to pain and pleasure, to increase and decrease of tension.[2]

With birth, receptor and prehensor serve to span the new gaps between infant and mother, to again restore a disturbed unity. But it is in this active effort to reduce tension, in this effort to return to egoless sleep, that paradoxically enough, the neonate and young infant develop consciousness, ever greater ego identity, and hence in the process, differentiation and increasing relative independence.

In a real fashion, then, and mixing phylogenetic and ontogenetic growth in our consideration, it would seem that the emergence of consciousness and of the interpersonal-social stems about man's vast heritage of preceptive-prehensile potentials, these to be synthesized beyond count to satisfy basic tensions of organism arising directly from metabolic-nutritive and allied physical demands. In one sense the cultural is directly a variation and elaboration of adjustive maneuvers from a basic theme; in another, one can almost see in this growth of purposive, executive function a level of synthesis which because of the great distance of this biological-cultural evolution becomes almost an end to itself,

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[2]Otto Fenichel, "The Psychoanalytic Theory of Neurosis", W. Norton, New York: 1945, p. 34

being measured too easily (too often) in terms of its own form and ends. In its best sense it brings man to a point where he may with design and reflection alter and plan actively towards enhancing man through evolutionary process itself; he has achieved a height whereby he may filter and control evolution through his laboratory.[3]

Of the elements to be compounded then: through the quantitative-qualitative dimensions of the extroceptors, the environmental realities of sight, sound, smell, taste and touch; from the introceptors and proprioceptors, a multitude of sensations flooding from inner impingings within homeostatic dynamics; through a vast central cortical associational area a power, a potential to synthesize elements into ever wider levels and dimensions of unity and configuration.

From such a conceptual scheme there thus is set the task of attempting, endlessly by ever closer approximation through analogy, to analyze (a) the nature of the energy process, and (b) the qualitative contributions of maturating receptors and effectors functioning within fields of forces toward (c) synthesis within a biological system.

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[3]Julian Huxley, Knowledge, Morality, and Destiny: I, II, <u>Psychiatry</u>, 14, 2, pp. 127-152

THE ENERGY SYSTEM OF THE NEONATE

Crisis of Birth. Birth, beyond a descriptive understanding of it and further of its significances, remains largely a mystery in terms of the mechanisms of coordination controlling it. Carlson and Johnson can still ask, with little fear of being answered,--

> What adjusts the onset of uterine contractions to the state of development of the fetus? What stimulates the uterus to undergo these rhythmic contractions? What factors other than the mechanical ones ... are responsible for circulatory changes at birth? What causes the placenta to separate from the uterine wall? What prevents excessive uterine bleeding when this occurs?
>
> And why do the rhythmic uterine contractions cease soon after the fetus and placenta are expelled? Why are the uterine contractions painful?

If we do not understand the mechanics of these processes, we do understand their significance. In approximately nine months time the organism has parlayed organization from a single, barely macroscopic cell into a vastly complex and highly adaptive system, one ready for a greater degree of independence and forces. Too often, perhaps, do we permit ourselves the distortion of seeing only the relative immaturity of the young neonate against our own developmental levels, rather than in terms of the enormous distances he has covered in a mere nine months, of the great skills he stands ready to demonstrate at birth.

Birth, following normal conditions of gestation, denotes then a level of organization beyond that required in utero; it denotes through its phylogenetic history an ontogenesis or developmental readiness to adapt in a postnatal world in which organism must literally capture its own oxygen and food supplies and expell its own metabolic wastes. These are obvious statements yet they have seldom been recognised as a central organizing focus from which personality and interpersonal processes emerge.

Birth, therefore, is a disruptor, forcing latent mechanisms into operation as nourishment and elimination cease even before the cutting of the cord by the physician. The actual process of birth has received considerable attention in the literature in terms of its possible impact upon subsequent personality formation. Unfortunately, the implications of this environmental cataclysm can be little more than speculated upon except in some cases of pronounced obstetric pathology.

Perhaps through the physical pressure exerted upon the parturient, especially upon the skull and thorax, the system is stimulated profoundly vaso muscularly, with subsequent effect upon tonus. Also, during birth the fetus remains without external sources of oxygen, or of means to expell CO_2.

Ribble in 1943 advanced the argument that because the oxygen level in fetal blood is low, this anoximia makes the birth process dangerous.[5] She quotes Shock in this matter

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[4]Carlson and Johnson, "The Machinery of the Body", U. of Chicago: 1941, p. 585

[5]Margaret Ribble, "Infantile Experience In Relation to Personality Development", From Personality and the Behavior Disorders, Ed. J. McV Hunt, Vol. II, Ronald, New York: 1944 p. 636

and further speculates that "in all probability this deepening of the oxygen privation provides the stimulus for the extensor reaction which starts birth and assists the delivery."[6] In particular, Ribble is concerned with prolonged deliveries and their possible effect upon the brain.

Ignoring for the present the rest of her psychology, later evidence has tended to minimize many of Ribble's fears and in this matter to render her assumptions incorrect. Perlstein, among others, for example, has expressed a view based upon more recent research that oxidation does not yet procede to its logical chemical state.

> The infant brain, fortunately, is able to withstand anoxia for much longer periods than the adult brain. This may be due in part to the fact that in the newborn oxidation of carbohydrates may be carried only to the lactic acid stage instead of the terminal stage of carbon dioxide and water. Such deviations from the normal adult type of metabolism may be responsible for decreased oxygen need of newborn brain tissue.[7]

Similar research being conducted, in part, through the Children's Bureau has strongly supported this latter position.[8]

This is not to deny the ultimate fate of protracted delivery, however. Thurstone and Jenkins (1936)[9] and Wile and Davis (1949)[10] have reported statistically significant results indicating that fetuses delivered instrumentally

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[6]Ibid, p. 636

[7]M. Perlstein, "Medical Aspects of Cerebral Palsy", Nervous Child, Vol. 8, 132

[8]A statement by Dr. Bain, Director for Research, Children's Bureau.

more often exhibit a serious general hyperactivity which manifests itself in endless restlessness, irritability and distractibility, as against infants delivered by spontaneous birth. Thus:

> This leads us to believe: (1) that the hyperactivity and restlessness are probably related to the greater pressure involved in protracted and especially instrumental delivery; (2) that there are changes due to asphyxia, since the brunt of cerebral disturbance arises on the basis of a compression from above with the maximum pressure falling upon the basal ganglia; (3) that residual elements of varying degree cause inadequate coordination, expressed as restlessness, and lowered inhibition for muscular activity.[11]

One can also obtain from a sampling of the literature hints as to the possible effects upon the infant of assorted environmental variations such as statistically higher incidences of cerebral palsy, spinal palsy and neural palsy in first born children.[12] Likewise the incidence for certain birth-connected pathologies increase as the mother's age deviates above or below a general mode.

The immediate biological significance of the ordinal

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[9] L. Thurstone & R. Jenkins, "Order of Birth, Parentage, & Intelligence", U. of Chicago: 1936, pp. 31-56

[10] I. Wile & R. Davis, "The Relations of Birth to Behavior", From Personality in Nature, Society and Culture, Ed. Kluckhohn & Murray, Knoph, New York: 1949, p. 308

[11] _Ibid_, p. 308

[12] H. Cates & J. Goodwin, "The Twelve Day Old Baby", _Hum. Biology_, 1936, 8, 435

[13] B. Malzberg, "Is Birth Order Related to the Incidence of Mental Disease?", American J. Physical Anthropology, Vol. 24, 102

position is not clear. Malzberg,[13] Willis[14] and Goodenough and Leahy[15] report somewhat conflicting and generally indecisive findings. Perhaps one can not go further than Kluckhohn and Murray:

> All men are born, but they are born in different ways. At the moment preceding the beginning of birth process, each fetus has its own constitutional predispositions dependent upon genetic structure and the particular intrauterine environment in which it has developed.
> . . .if the birth process in general cannot be considered of such crucial importance for personality formation, there are some indications that the mode of birth--whether speedy or slow, spontaneous or by instruments--may be related to such personality characteristics as hyperactivity and aggressiveness. It is obvious that 'accidents' in delivery that result in actual malfunctions are momentous for personality.[16]

With this statement we thus have shifted from immediate effects to the implications of birth upon subsequent patterns of maturation. Unfortunately at this point we are almost helpless to spell out cause and effect. We have all experienced birth, but we remain helpless to recall any memory traces of our experience. This inability to recall and a relative absence of significant studies has left only an alternative of rather free speculation.

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[14] A. Willis, A study quoted by Hurlock, "Child Development", 1942, p. 73

[15] Goodenough & Leahy, "The Effects of Certain Family Relationships Upon the Development of Personality", J. Genetic Psy., 34, 91-104

[16] C. Kluckhohn & H. Murray, "Personality, in Nature, Society, & Culture", Knopf, New York: 1949, p. 297

Speculation on the implications of birth upon personality range from the cautious position of Murray and Kluckhohn, already quoted, to the pseudo-scientific guess of Dianetics founder L. Ron Hubbard. These speculations, some little more than flights into fancy, need not be considered in any great detail. Thus Hubbard speaks of a "basic-basic engram" which is recorded by the fertilized ovum. Anything said within the 'hearing' of the engramatic zygote is recorded and becomes the beginning of a long chain of engrams which may be incurred both pre- and post-natally. They remain dorment until "keyed-in"--this apparently meaning until some event in the individual's life coincides in content or conotation with the engram.

As one might guess, reaction to this thesis (claimed as proven by the author) from psychologists is somewhat violent.[17]

One might say moving towards the 'right' is the curious picture of birth given given by Alfred Adler. Adler broke with Freud over the issue of the nature and origin of anxiety. For Adler birth, disease and the developmental tasks have the effect of imposing a strain--a threat--in which the infant 'because of his feelings of organic inferiority' reacts with anxiety. It is only within the womb largely that man is initially free from all tensions and strivings.

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[17]Review by editors of Psychiatric Q., 24, 831-834

--Editorial Notes (Mabel B. Cohen): "The Phenomenon of Dianetics", Psychiatry, 13, 381-382

Anxiety thus represents the effort of the organism to compensate for this proposed organic inadequacy.[18]

This theory of the meaning of birth has never succeeded in influencing the main stream of psychological thought; rather, perhaps, it has come to reflect the general outcome of many of Adler's tenets in the often bitter chronicles of analytic (Adlerian) and psychoanalytic (Freudian) history.

Rank, of course, has attracted a great deal of attention. In 1923 he published his theory of the "Trauma of Birth", birth being the first danger situation and economic upheavel, and constituting in effect the prototype of the anxiety reaction.[19] A position similar to Adler's and soon challanged.

The model for most of the forthcoming objections to Rank 's theory was formulated by his co-worker Freud. Rank postulated that those persons become neurotic who on account of the severity of the birth trauma have never succeeded in abreacting it completely. For Freud the logical outcome of the theory was to render it unworkable. He writes:

> It is not entriely clear what is meant by the abreating of the trauma. If it is taken literally, one arrives at the quite untenable conclusion that the neurotic approaches more and more closely to a state of health the more frequently and the more intensively he reproduces the effect of anxiety.[20]

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[18] P. Bottome, "Alfred Adler", Putnam, N. Y: 1939, p. 148

[19] O. Rank, "Trauma of Birth", Harcourt-Brace, N.Y: 1929

[20] Sigmund Freud, "The Problem of Anxiety", Trans. Alden Bunker, from Hemming, Sympton und Angst, Norton & Psychoanalytic Q. Press, New York: 1936, p. 95

Freud felt also that the theory left little room for the legitimate etiological claims of constitutional factors. For him the fact that the human shares the birth process with other mammals, whereas a particular disposition to neurosis is the special priviledge which man alone possesses, did not speak very strongly in Rank's favor.

One is reminded at this point of J. Le R Conel's observation that from an organic basis it would seem that the nervous system of the infant at birth is hardly mature enough to record or be impressed by little more than varying states of visceral, thermal and chemical disruptions.[21] Freud adds a parting shot to Rank's theory:

> The principal objection to be raised against it, however, remains the fact that it hangs in mid-air, instead of being based upon verified observation....as long as such a check has never actually been undertaken, it is impossible to estimate its real value.[22]

Freud's own position at first glance is curiously similar to Rank's, but there is a basic difference in degree of emphasis. Thus birth initiates anxiety but anxiety is conceived, except in large amounts, as a normal formative component in personality organization.[23]

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[21] J. Le R. Conel, "The Postnatal Development of the Human Cerebral Cortex, Vol. II, "Cortex of the One-month Infant," Harvard Press, Cambridge: 1941, pp. 36-37

[22] S. Freud, op. cit., p. 96

[23] Ibid., Chapter 3, "The Ego"

Kanner,[24] English and Pearson,[25] Allport[26] Masserman[27] and a large group of more conservative workers stress not the act of birth itself (except insofar as it may be pathological) but, with Jersild, for example, the broader implications which derive from a vastly extended environment.[28]

If we consider the gross immaturity of the neonate's neuromuscular receptor-associative system, and if we can get by the dramatic change birth entails, i.e., of an obvious physical separation from the mother's body, the fundamental significance of the act centers in the immediate and radical alteration from a fetal physiological economy to the stumbling trial and approximative adjustments of the organsim towards a postnatal level of functioning. In this basic change of immediate significance to the organism there is, as Jersild suggested, the implications of new rings of environment soon to act upon organism, to be acted upon, in turn, by the infant, and with new levels of integration and bio-social syntheses resulting.

Thus, in effect, birth presents the tiny neonate with a

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[24] L. Kanner, "Child Psychiatry", Thomas, Springfield: 1948, p. 202

[25] O. English & G. Pearson, "Emotional Problems of Living", Norton, New York: 1945, p. 21

[26] G. Allport, "Personality", Holt, New York: 1938, p. 208

[27] J. Masserman, "Principles of Dynamic Psychiatry", Saunders, Philadelphia: 1946, p. 21

[28] A. Jersild, "Child Psychology", Hall, New York: 1947, 2

vast new collection of building blocks, levels of energy to tap (not summatively but, again, synthetically) and synthesis carrying organism through elaborations upon somatic, vegetative equilibrations to new heights in the social, interpersonal realm.

One can at this postnatal stage lose all awareness of the unity of the infant with his new world. And perhaps it may seem that a strained quality creeps in if we continue to stress this point. We argue, however, that by doing otherwise we are, in Von Bergmann's words, "Always in danger of seeing 'reciprocal action', where we should see 'biologic complex-situation.'"[29]

With our present limited evidence from which to give this conception of systems within systems some substance, we need remain excessively vague; to give up such an approach however is to surrender any hope of attempting to explain either phylogenetic or ontogenetic change. Consider, in passing, the meaningless of infant without its maternal counterpart (and this, too, in subcultural animal forms!); or, from a positive sense, how do we explain symbiosis? What meaning or sense is there in a single individual apart from others--or apart from lower living and non-living forms of organization?

> It is the outer world. . . which causes the emergence of instinct. It is much more like-

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[29] Gustav von Bergmann, From "Problem of Integration and Differentiation Psyche-Soma", in H. Flanders Dunbar's "Emotions & Bodily Changes", Columbia, N.Y: 1938, p. 48

> ly that environment somehow impinges upon the . . .organism and makes itself known as environment than that the. . .organism knows only subject and sensation. It is the environment which contains the real sources of satisfaction.[30]

One does not need to ask at birth, despite graphic indications contrariwise, at what point oxygen becomes of the organism.

> In living organism is only, as it were, a place where certain forces have been nucleated and where they have developed in a peculiar way *but not in a way out of relation to the forces that surround them* (Italics mine).[31]

The future psyche of the infant, the primary concern of this outline, is therefore, a bit of introjected environment, this in somewhat the same sense that blood is an elaborated, developed and evolved bit of seawater inclusion. Our next concern then is in the nature of this postnatal energy system, of its changes and of these as the bases of projection into the conscious, interpersonal realm.

The Dynamics of a Two-Part Energy System. In the concept of organism, of organism at any level, and so too in the young, poorly differentiated neonate, living is never merely a special series of processes of various organs, but a series

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[30] Paul Schilder, "An Introduction to a Psychoanalytic Psychiatry", *Nerv. & Mental Disorders Monograph, No. 53*, 1931, 13

[31] William Alanson White, "Medical Psychology, The Mental Factor in Disease", *Nerv. & Mental Disorders Monograph, No. 52*, 1931, 47

of interactions between the infant organism and environment, in which environment supplies the energy, the infant the means for capturing it, transforming it and reducing it. This transposition and reestablishment of balance occurs at several levels, and what the organism gets out of it is discharge, fullfillment--a self realization.

At the neural-vegetative level this connotes restoration in homeostasis between the sympathetic and parasympathetic systems. At the hormonal or glandular level this may be translated into new equilibrations of adrenalin and its opposite acetylcholin. Perhaps at the cellular-electrolytic level it connotes most grossly a regulation and modification of extremes in Ca and K excess. Future research may throw light eventually on homeostasis as ultimately a range in the quantitative movement of electrons such that there is neither an absence of resistence nor too great a potential for discharge.

Thus in life activity, and acutely so in the rapidly growing infant, there is but an appropriation and redistribution of energy constantly streaming in from the external world which may be utilized for the needs of the organism. One facet of this outline is to portray the increasing role of the nervous system as its transmitter and transmuter.

The energy plant of the neonate is basically a long tube, closed except at the ends, and pocketed with numerous short _cul du sacs_, glandular openings which pour various special acting enzymes into the channel to reduce milk into its simpler elements so as to permit absorption into the blood stream and destined ultimately for rapid energy utilization within the cell.

Superimposed in a sense upon the vascular-digestive system is a neuromuscular network. Energy needs become determined by constitutional and environmental demands and are mediated by the neuromuscular system and translated into appropriate activity in the gastrointestinal tract. Thus interaction between these two systems denotes a dynamic circular process of the organism (see Figure 25) and the essence of all life activity, which only death disrupts.

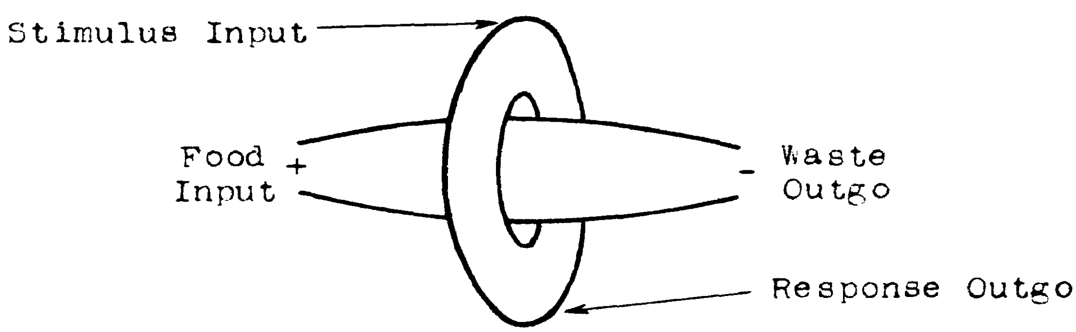

Figure 24. Interlocking part-reactions of the organismic energy system. (Freeman)

> This process of mutual interaction goes on quite circularly throughout life. In these self-regulating and self-perpetuating reaction dynamics, we see that food energies are changed by the digestive system into a concentrated type of fuel. This fuel, together with oxygen for burning it, is easily made available by the circulatory system to tissue of the neuromuscular system; disrupting external stimuli touch off these energies (catabolism), and response is made; this requires that new energies (anabolism) be built up through withdrawals from the stores of the digestive-circulatory system; as anabolism equals catabolism, a kind of 'basel' equilibrium is again established. But before stores become

> seriously depleted there is sufficient disruption of the steady nutritive states to produce internal effects which excite the neuromuscular system to general spontaneous activity; among the potential reactions of this system are those leading to attainment of external stimulus energies (food, etc.) which will return the basic tissue conditions to their normal constant states. These essential maintenance operations are carried on by the interacting part-systems throughout life.[32]

In actuality there is no separation between neuromuscular tissue and the digestive tract, for food is not only captured and brought into the oral cavity by neuro- and largely striated-muscular action, but too, it is mechanically carried along the tube by virtue of the delicate coordination between relays of autonomically controlled smooth muscle. In part, one might note, it is in the establishing and coordinating of this fantastically complex peristaltic process that distinguishes the new-born as a neonate. When the organism has secured itself within its new world, when it has obtained a rhythm and degree of flexibility in taking gases into its lungs and food and waste molecules through the digestive track, then it is by definition no longer a neonate but now an infant. From passive equilibration through the placenta to active integration at the postnatal level takes the youngster a mere matter of a few weeks.[33]

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[32] G. Freeman, "The Energetics of Human Behavior", Cornell, Ithaca: 1948, pp. 50-51

[33] K. Pratt, "The Neonate", From "Manual of Child Psychology," Ed. L. Carmichael, Wiley, New York: 1946, pp. 191-92

At this point we are confronted with a basic biological problem of hunger, for we are attempting to mold, in larger part, future neuro elaborations around the energy needs of the system. Hunger, unfortunately from present knowledge, no longer lends itself to any simple, unitary mechanism. Eating is not dependent necessarily on the occurance of stomach contractions, since the surgical removal or denervation of the stomach does little to prevent or decrease it. Further it does not depend necessarily on blood-sugar, since hunger is reported when the blood-sugar level has not changed.[34] While both factors are related they are not so in a simple way.

Secondly, as Hebb points out, the termination of eating likewise has no simple control.

> The animal that has been starved eats more than one that is well fed, but the termination of eating comes before the food can have much effect on bodily tissues. A thirsty animal will drink approximately the amount of his water deficit, and stops drinking before the water has been absorbed.[35]

Bellows illustrated this point in great clarity by cutting a fistula into a dog's throat so that little if any of the water was absorbed, yet 'satiation' occured.[36]

There strongly seems, therefore, to be an element of learning involved. Clifford Morgan calls the precondition

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[34] D. O. Hebb, "Organization of Behavior", Wiley, New York, 1949: p. 190

[35] Ibid., p. 190

[36] From Hebb, op. cit., 190

a central motive state.[37] We have not yet reached consideration of cortical activity, but it is enough perhaps to conceptualize this state of equilibration as being (1) essentially independent of input from a specific extro- or introceptor, representing thus a kind of subcortical synthetical function of perhaps several sensory-transmitted states (thus blood-sugar level, stomach contractions, perhaps lip and cheek mucus irritation, and so on); (2) as its second facet it would function as a central priming action that reinforces some adaptive modes and not others (this being determined by developmental level--thus in the neonate of only mass reactions, i.e., random, unpurposeful movement of arms and legs and perhaps crying).

Presumably for the fetus there has been no real felt needs, i.e., no gaps between felt need and satiation. Thus we may expect that confronted with hunger, this central motive state can provide the neonate with no purposive neuromuscular adaptive action. Until learning has occured, the lack of milk is apt to be disruptive of behavior. With more experience, i.e., in the accidental discovery that something (leading to sucking) brings relief, behavior is not psychologically purposeful. We would modify Morgan's position only slightly by again noting the highly adaptive function of the lips and cheek mucus membrane which by their

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[37] C. Morgan, "Physiological Psychology", McGraw-Hill, New York: 1943, pp. 460-465

postion at the oral end of the gastrointestinal system tend to focus or funnel tension towards objects. Gerard notes that neural activity at the oral end of the tract is under central cortical control and that further along the digestive process falls under autonomic-glandular coordination.

What we are seeing in the confused, patternless self-demand eating schedules of the neonate, then, is learning, and this at two levels: first, a learning that sucking on something relieves hunger tension; second, of regulating the amount he needs, for as we said satiation and cessation occur (when no external event has interrupted the activity) before the physiological needs of the infant have been met.[38]

Thus far we have sketched something of this important aspect of neural control over the digestive system. Perhaps then we are to the point of attempting to see guiding somatic dynamics as a source of control over the nervous system.

Scott, Scott and Luckhardt (1938) reveal that there is no correlation between blood-sugar level and stomach contractions with states of hunger, although there is too much overall evidence to deny some basic relationship.[39] Again, learning,

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[38]D. O. Hebb, op. cit., pp. 192-193

[39]W. Scott, C. Scott and A. Luckhardt, "Observations on the Blood Sugar Level Before, During & After Hunger Periods in Humans," Amer. J. Physiol. 123, 243-247

--See also Morgan, op. cit., p. 488

perhaps fatigue, and later culture become important factors. The blood-sugar level, however, would reflect an aspect of the basic nutritive state of organism but this cannot be set in a one-to-one relation with felt hunger.

One can, therefore, propose a process of cortical structuring (see Hebb, pp. 189-194) bridging a time gap between felt hunger states at the tissue level, arbitrary cessation of eating through, say, fatigue, and later of closer correlation between tissue needs and the quantity of food eaten. Morgan concluded his argument by asking is there a single tissue substance which sets off neural function:

> Even though experimental alternation of blood-sugar level are correlated with the drive for food, the fact that one cannot satisfactorily demonstrate spontaneous changes in blood-sugar level in relation to food demand leads to skepticism of a hypothesis that blood-sugar changes are the primary chemical changes involved in food demand. We may have to look elsewhere for the common factor in hunger. There are, in fact, several lines of evidence that point to the presence of some specific hormone as the agent which sets in play the various behavioral activities associated with hunger.[40]

What is important for our argument here is that via what ever routes and means, the need for food affects the central nervous system directly. Further, we know that lack of food tends to disrupt behavior (in the absence of earlier learning or in extreme deprivation, producing restlessness, discomfort, and in extreme degree emotional apathy. (We intend to note at a later point that hunger itself is not simply a

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[40] C. Morgan, _op_. _cit_., p. 449

matter of molecular needs and that from this view apathy may be translated into Holt's term 'marasmus'.[41]

Secondly, a learning process seems to be involved in transforming this primitive disturbance into hunger as we know it, and that the drives from this neuro-somatic need-synthesis project the selfless, autistic infant outward--towards a world of objects--via the erogeneity of the oral end of the digestive tract i.e., of the lips and mouth. Most fundamentally, then, hunger, as we shall see, is the great first lever the world has over the archaic ego towards compelling it into a bio-social sphere.

The conditions necessary for learning are provided in this sequence of events. As it is repeated the activity of other sensory organs firing concurrently become linked by their contributions being associated and finally synthesized at the cortical level around basic central motive states. Thus visual, olfactory, gustatory and kinesthetic impressions are recruited and pyramided into new levels of consciousness --this with its vast attending meanings and implications.

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The process of respiration forms a second part of the energy-capturing process. The task of respiration intimately coordinates with the ability to utilize molecules avail-

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[41] L. E. Holt, "The Diseases of Infancy & Childhood", Appleton-Century, New York: 1918

able. The digestive system captures and arranges molecules for energy release; the respiratory system provides oxygen by which to carry this process out. Both are concerned with the removal of metabolic wastes.

The taking in of oxygen and the giving off of CO_2 may be regarded as one of the most deep-lying and fundamental of vital functions. It persists in the most highly differentiated cells. The cell may have to give up other simple functions which are taken over by other parts of the total organism but each cell must breathe. Breathing and combustion are synonymous with life.

We are interested in respiration only indirectly, primarily as it closely reflects the quality of the infant organism's first contacts with a new world, and as there forms a basis for future elaboration. The weaving links between respiration and energy process and the psyche are more indirect perhaps than between the gastrointestinal tract and the psyche. Breathing, like the flow of adrenalin, is a draft upon combustion, indicating the expenditure of energy by the organism to maintain itself. In the 'tight new motor' of the neonate this draft moves at something like 43 respirational cycles per minute![42] and the rate alters markedly from one situation to another.[43] In ten years it will be

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[42]D. Murphy & E. Thorpe, "Breathing Measurements on Normal Newborn Infants", J. Clin. Invest., 10, 549

--See also Gerard, "The Body Functions", Wiley, p. 163

regulated to meet total needs at less than 20 cycles per minute.

The medulla is the primary center of control. Here there are two centers, one for inspiration and another for expiration. Above the medulla, the pons function to further regulate periodicity. In the cortex, finally, is vested the integration of respiration with 'higher' psychological process. The medulla reacts to CO_2 largely; the cerebral cortex reacts to a total welter of sensory-associative stimuli.[44] The relation, then, between the psyche and the organic system proper is reversible. Thus one can see that affect causes changes in the respiratory curve, of the depth of breathing and of its frequency. Probably pain or psychic excitement (which the neonate cannot yet 'bind'--see page) lowers the CO_2 tension in the blood and thus acting upon the medulla to increase ventilation. Contrariwise, in being fed and in slipping back into sleep (relative absence of stimuli), CO_2 tension decreases the sensitivity of the respiratory center, hence producing a slowing of respiration.[45]

Extreme psychic stimuli (of a strongly ungenial internal

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[43]H. Halverson, "Variations in Pulse and Respiration During Different Phases of Infant Behavior", J. Genet. Psychol., 59, (1941), 259-330

[44]C. Morgan, op. cit., p. 438

[45]H. Flanders Dunbar, "Emotions and Bodily Changes", op. cit., (and Laudenheimer) p. 255

--See also Gerard, op. cit., pp. 163-166 and/or external environment) may, via vasovegetative centers, lead to most serious spastic-exudative symptoms and to typical infantile asthma.[46]

Many psychologists and physiologists (Wundt, among others) have noted the reversal of this process. Thus we know that voluntary acceleration of respiratory rhythm causes affect. One can easily imagine, therefore, something of the effects upon cortical organization of long-term infantile organic dysfunctions. Perhaps too, as Laudenheimer suggests, various allergic stimuli may, over reverse pathways (body fluids, colloidal disequilibrium, hormonal influences, etc.) lead to shock, bronchospasmus, asthma and anxiety.[47]

Thus, again, via what ever routes, at what ever levels, there is no separation between the mind and body, no separateness between the effects of the environment and the soma. The lungs (as related within a soma) along with the infant's world are interacting facets towards cortical synthesis.

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[46] H. Flanders Dunbar, op. cit., p. 255

[47] R. Laudenheimer, "Hypnotishhe Uebungstherapie des Bronchialasthma", Therap. D. Gegenw. 67, 1926, 339-344, From H. Flanders Dunbar, Ibid, p. 255

NEW GESTALTS

Infant Orality.

> The newborn member of society must receive enough positive indulgence form the human environment to enable him to be indulgent towards himself and others. Such a basic character formation operates selectively as an enduring predisposition in subsequent life situations. It makes it possible for the person to supply himself with indulgence in circumstances in which a favorable ratio of indulgence is not accorded to a prodemocratic conduct by environment.[48]

From this point in our outline we are attempting to relate a physically maturing organism with the elements which meet it from the postnatal world. We are thus concerned with energy needs orientating the neonate towards supplying sources and then of the qualitative nature of this synthesis and its implications for future development. To Freud goes everlasting credit for first perceiving the dynamic relationship between the drives of biological life, higher psychic activity, and something of the external cultural contributions.[49]

We have noted that the oral end of the gastrointestinal tract is heavily equipped with sensitive, specialized receptors. Phylogenetically, perhaps, these evolved as mere guides

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[48]Harold Lasswell, "Power and Personality", Norton, New York: 1948, pp. 162-163

[49]See Sigmund Freud, "Instincts and Their Vicissitudes", In Collected Papers, Vol. IV, Hogarth, London: 1925

--"On the Transformation of Instincts with Special Reference to Anal Erotism", Vol. II, Collected Papers; Hogarth, London: 1924 towards sources of nourishment, that with only a vegetative potential, sense organs fullfilled their only functions--unless also to satisfy sexual-reproductive needs.

In the ontogenesis of the human infant, however, we are beginning to more fully appreciate the fact that while these functions certainly remain as basic, evolution has given many of these receptors such tremendous associative potential that they now emerge, in effect, as vast elaborations upon simple metabolic demands. Thus with the evolutionary development of man's enormous neural associative and coordinative capacity have been added dimensions in perception and neural synthesis which interweave and spin a vast web around primitive organic activity.

Developmentally, the first organ to bridge the separation caused through birth is the sucking apparatus. For Freud it became clear that in the sensitive mucosa lining of the lips and mouth, the infant possessed a receptor with greater implication than as being merely the upper end of the digestive tract. From Ribble:

> The baby is not only filling his stomach; he is getting his first taste of the outside world and the first grasp or hold of which he is capable. His initial sense of security, of pleasure satisfaction and success, is closely linked with his mouth activity.[50]

It is extremely difficult with adult after-sight to empathically grasp what actually is involved in such statements

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[50] Margaret Ribble, "The Rights of Infants", Columbia, New York: 1943, pp. 22-23

as 'first contact' and early learning. In our story of growth we are looking at what is actually only a blurred element within configuration--of a 'soulless' organ removed from organism--slowly, ever so slowly, and almost imperceptibly, coming into focus, and with organic elaboration also subjective awareness, identity and the emergence of self. Perhaps this is all summarized in the quantitative-qualitative growth of consciousness.

Of affect--now there are only vague, largely vegetative and metabolic feeling tones. Eyes operate--blurred and poorly, but they function; likewise for auditory reception.[51] But these neural impulses run off into vast, as yet unstructured areas of cortical cells. Crude but strong signals pour into the brain and up into its higher centers but there are no antecedent associational channels to give them meaning.[52] At the oral phase the only mature contact and awareness of a semiconscious, selfless and autistic infant is through changes in physiological-psychological feeling tones along the walls of the lips, mouth and in the lining of the stomach and intestines.[53]

Poetically put, this is the beginning--of a tenuous, weaving bridge stretching out into a blurred, vague unknown: irritation, hunger pangs, mass-like physical restlessness;

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[51]Karl Pratt, op. cit., pp. 203-210

[52]F. Tilney and L. Kubie, "Behavior in its Relation to Development of the Brain", Bull. Neurol. Inst., New York, I, p. 230

blind collision--this meaning at first only reduction of mucosa irritation, warmth and pleasure through the digestive tract; again a loss of all awareness and contact and a return to unconsciousness and vegetative functioning.

Successful orality makes two great contributions to the groundwork from which ego is synthesized. Through it objects are first discovered, and secondly, in the nature of this pleasant contact with them, affect tones are generated both towards the world and as a basis for the infant to accept and value his own feelings and being. Thus impulses born of physiologic needs may be projected, with reasonable expectancy of acceptance in their reception and subsequently integrated harmoniously within the knitting self.

a. The Discovery of Objects. The earliest period of infancy is characterized by a relative absence of ego and self boundaries. At first there are only cyclical phases of sleep and stimulation (there being no real distinction at this point between internal and external), the latter being often overwhelming in its degree of tension. Perhaps as Freud suggested, this flooding of excitation without adequate defense apparatus is the model for all later anxiety.[54]

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[53]Ribble reports Brock ("Child Biology", Springer) describing structures showing erectile capacity. These are the longitudinal swellings on the inside of the infant's lips and the so-called magotot membrane along the lateral margin of the gums. She says: "I have been able to see these structures immediately after breast feeding in infants studied, but in bottle-feeding they were rarely seen. These structures tend to disappear after the second or third month of extrauterine life. From "Infantile Experiences", op. cit., p. 637

But anxiety denotes anticipation and for the present this capacity is only slightly developed.

Thus from bodily dynamics, and specifically from the newly and imperfectly functioning digestive and respiratory systems, the life of the neonate alternates between states of hunger, cold, thirst and perhaps vague neurogenetic and myogenetic maturational pressures and loss of what poorly defined consciousness he possesses. True monophasic, cortically controlled sleep is yet to evolve through cyclical rhythmic control of energy flow and somatic coordination.[55] We partially define consciousness as an adjustive mobilization and its first traces would not differentiate between ego and non-ego, but rather between greater and lesser tension. As Fenichel states it; ". ... at this time relaxation is concomitant with loss of consciousness."[56]

We need to see also at this earliest stage the tremendous implications of these time gaps between felt need and satiation (i.e., from tension to a return to the unconscious). In the fetal phase, presumably, these gaps hardly exist. For the neonate, however, despite even the most sol-

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[54]Sigmund Freud, "The Problem of Anxiety", op. cit., p. 71

[55]N. Kleitman, "Sleep & Wakefulness, as Alternating Phases in the Cycle of Existence", U. of Chicago: 1939

[56]Otto Fenichel, op. cit., p. 35

--S. Ferenczi, "The Problem of the Acceptance of Unpleasant Ideas", Inter. Psycho-Analytical, No. 11, p. 366

icitous parental-cultural care and provision, they become more pronounced. In moderate amounts they bring signals of tension and discomfort, but they also force upon the autistic infant the task of dealing with them, and hence of forging a conception of reality. If every need was met immediately there would be no need of consciousness and hence there also would be no ego.

When the infant is fed (or when other needs are met) a relative freedom from stimuli sets in. The first signs of object representation, therefore, gradually emerge during states of hunger.[57] Imperceptibly the idea may emerge during these states of hunger or tension that in the presence of this vague 'something' tension eases. Object thus becomes equated with tension and, through experience, a longing for that something already familiar that previously gratified needs, but that is not present at the moment.[58]

It is perhaps a commentary on both the distance the infant has to travel, and his slight regard for parent figures that these first acceptances of reality are really only intermediary steps towards getting rid of them.[59]

> . . .This is the point at which a contradiction of basic importance in human life arises, the contradiction between longing for complete relaxation and longing for objects (stimulus hunger). The striving for discharge and relaxa-

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[57]S. Ferenczi, op. cit., p. 369

[58]Ibid, pp. 365-370

[59]Otto Fenichel, op. cit., p. 35

> tion, The direct expression of the constancy principle, is necessarily the older mechanism. The fact that external objects brought about the desired state of relaxation introduced the complication that objects became longed for; in the beginning, it is true, they were sought only as instruments which made themselves disappear again. The longing for objects thus began as a detour on the way to the goal of being rid of objects (of stimuli). This is probably meant when it is sometimes stated that hate is older than love. The truth is, however, that the first object relations are neither hate nor love, but the still undifferentiated forerunner of both.[60]

In these initial steps towards recognition of the world, and in the infant's emerging sense of reality, we are seeing by definition the birth of ego. In Glover's terms we are individuals inasmuch as we feel ourselves separate and distinct from others.[61] Further, from this point the neonate is only a short step from a next very fundamental discovery--that in the realization that tension is 'inside' and the awareness that an object exists to quiet this tension--thus of a 'something outside.'[62]

Thus the feeling tones arising largely through the gastrointestinal tract help initiate a dichotomy from whence through elaboration the 'I', 'me' and 'you' will spring.

b. Basic Trust.[63] Stockard,[64] in his "The Physical

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[60] Ibid., p. 35

[61] James Glover, "The Conception of the Ego", Inter. J. Psychoanalysis, VII, (1936), 4

[62] Sigmund Freud, "The Ego and the Id", Hogarth, London: 1927, Chapters 2, 5 and 9

[63] Erik Erikson, "The Childhood and Society", Norton, New York: 1950, pp. 67-72

[64] C. Stockard, "The Physical Basis of Personality", Norton, New York: 1931

Basis of Personality", emphasized the epigenetic principle that growth has a ground plan and that additional differentiation only emerges directly from that which preceeded it. Each part seems to have a time of special ascendancy and is dependent upon the total, functioning whole. If environment or ontogenetic conditions are unfavorable at the time for expected supremacy of a part, that part and subsequently the total organism are modified. It was Freud who first translated organismic development into its component psychological phases. Further, he noted that the mouth was of far greater importance than as merely the oral end of the digestive tract. The mouth was first the focal point of communication and around which other sensory and prehensor organs were stimulated and became organized. The lips and lining of the mouth thus became the first erogenous zones into which bodily needs are funneled and translated into rather painful feelings of itching or sensitivieness (thus affect), which only the outer stimuli remove.[65]

From this, what is taken-in (incorporated) the body, the infant also takes in many of the feelings of the objects doing the giving.[66] We are hardly refering to cortical activity in any usual sense, but of physiological feeling states

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[65]Sigmund Freud, "Three Contributions to the Theory of Sex", From: "The Basic Writings of Sigmund Freud", Modern Library, New York: 1938, p. 588

[66]O. English & G. Pearson, "Emotional Problems of Living", Norton, New York: 1945, p. 23

that emerge in how the infant is handled and stimulated mechanically, of how satisfactory the physical aspects of nursing are, of the way he is bathed, and of the host of other activities that center around nursing. These, too, are basic building blocks for cortical-synthesis towards the developing self.

In reoccuring patterns of energy flow, of adjustment and adaptation to environmental trends, Freud hypothesized the growth of an oral personality constellation which seems to establish permanently the cuality of the organism's object relation.

> . . .personality, therefore, can be said to grow according to step predetermined in the human organism's readiness to be aware of, and to interact with, a widening social radius, beginning with the dim image of a mother and ending with mankind, or at any rate that segment of mankind which counts in the particular individual's life.[67]

Thus although the 'end' personality is not simply a function of physically mature organism, the laws of physical development become highly important when we speak of the growth of personality, because such growth follows the successive levels of the organism's readiness to interact with the opportunities offered in its world.

For Erikson this first social modality is expressed admirably in the basic English 'to get', to receive what is given, and in the process to coordinate bodily needs to post-

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[67]Erik Erikson, "Growth and Crises of the 'Healthy Personality'", From Problems of Infancy and Childhood, Milton Senn Ed., Supplement II, Fourth Conf., Josiah Macy Jr. Foundation, New York: 1950, p. 10

natal, parental-cultural forces. For Freud, failure to come to terms with inner feeling and demands, i.e., in the failure of the infant's early environment, is the basis for a failure to mature and/or the groundwork for future personality, and indeed, psycho-somatic collapse (this often occuring during a period of stress, thus the rapid regression in dementia praecox at puberty).

Beginning with the work in the psychopathologies of Freud, Meyer,[68] Fenichel,[69] Jelliffe,[70] of Sullivan's pioneering work in shcizophrenic wards, of Fromm-Reichmann,[71] the equation between oral needs and care and future permanent personality constellations has been forged. In the oral phase the infant first (and quite literally) tastes his new world. If he likes it, i.e., if it brings comfort and a feeling of well-being, he encorporates it--introjects it--into himself. If, on the other hand, it is bitter, he spits it out; if he is required to pay too big a price for it--suffers too much pain before receiving it--he approaches his world with ambivalence and in all cases, to the extent he has suffered, learns to

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[68]Adolph Meyer, "The Dynamic Interpretation of Dementia Praecox", Amer. J. of Psychology, 21, 385-403

[69]Otto Fenichel, "Outline of Clinical Psychoanalysis", Norton, New York: 1934

[70]S. Jelliffe, "A Summary of the Origins, Transformations & Present-day Trends of the Paranoia Concept", Med. Rec., 83, 599-605

[71]Frieda Fromm-Reichmann, "Principles of Intensive Psychotherapy", U. of Chicago: 1951

reject it as being too dangerous. In being forced to reject it, however, he must turn his back, so to speak, and he can only feed upon himself.

We may see clearly in schizophrenia not only the contributions orality makes towards basic personality, but also towards its necessary precondition, i.e., of the discovery, orientation and acceptance of one's own body and its needs. True schizophrenics, along with their often pronounced behavior symptoms, under close examination also reveal a gross immaturity in the integration and understanding of their own bodies; to some extent they remain strangers to it, indifferent or confused towards its feelings. This disarticulation is not merely a superficial manifestation and one sees evidence of an overall dulling or depression of physiological functioning. Of the unity of the psyche with the soma in this connection, N. C. Lewis writes:

> To me the chemical reactions of the integrated tissues, the mechanics of the several physical tissue systems, and the psychological behavior of the individual in his relations to society are merely different aspects of the same thing. . .and in disorders of the personality, whether such disorders are expressed mainly at the chemical, physical or psychological levels, a corresponding deviation must be present in the other aspects.[72]

H. Flanders Dunbar translates this at the level of resistence to bodily infections:

> The statistics show that tuberculosis is three times greater in the schizoid group of patients as

[72] Nolan Lewis, "A Discussion of the Relationship of the Chemical, Physical and Psychological Aspects of the Personality", Psychoanalytic Review, II, (1924), pp. 404-405

> in all the other three groups put together; now the schizoid is psychi cally noncompensatory, he succumbs to his stresses and deteriorates. At the somatic level he shows the same reaction to tuberculosis, being easily infected and easily dying. Second, the schizoid has no protective ability either mentally or physically: he forms no delusional compensations, and when tuberculous he forms no fibrosis to make the infection slower and chronic. (Italics mine) Third, he is regressive: psychically he proceeds towards simple mechanisms, and tuberculosis is a disease in which the parenchymatous tissue is replaced by much sinpler interstitial types.[73]

Ribble has used Holt's term 'marasmus', denoting general disorganization of organic functions and a deterioration of primary body reflexes and tonus (and thus a kind of primary schizophrenia), to describe a condition often seen in young infants--especially those in institutional settings. She concludes that it is due not to some biological defect in circulation but in large measure to lack of "mothering" or extra molecular needs.[74] In the case of the infant there is as yet little psychic structure laid down and lose of faith in the world at this stage can only mean primary physiologic regression towards death. The task of orality, and from environment in the form of mothering, is in reestablishing a unity violently disrupted by birth.

For real purposes, in this initial focus upon energy transmission and translation, the infant is taking in two forms of

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[73] H. Flanders Dunbar, op. cit., p. 41

[74] Margaret Ribble, "The Rights of Infants", op. cit., p. 4

--See also: K. Young, "Personality and Problems of Adjustment", Crofts, New York: 1946, pp. 164-167 energy. In the chemically determined eroticism in the lip and cheek pouches, and in the muscular sucking of fluids he brings in needed molecules from the outside. But sucking action is not determined simply by molecular needs alone. The fetus may suck before birth--even during birth itself--and the neonate may suck following a full meal.[75] Perhaps largely through the work of Ribble, Holt and Aldrich,[76] we come head on with this second need, not molecular directly but tactile and mechanical, of what is included under the term mothering outside of direct nursing.

The apparent needs to be gently fondled, rocked, held to another body, softly talked to, and so on, seem to reflect the need for regulatory aid from external sources, aid to help regulate temperature, tonus, the development of breathing and digestive-circulatory rhythms. The need indicates desirability to provide transition between the close support received in the uterus to the postnatal world, the latter with its greater demands upon organic-regulatory processes.

Perhaps this second general need is different but it can hardly be separated from the need for food. Erikson recognizes this close relationship. He writes:

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[75] Margaret Ribble, "The Rights of Infants", op. cit., p. 26

[76] C. Anderson Aldrich and Mary M. Aldrich, "Babies are Human Beings", Macmillan, New York: 1938

> In the first oral stage, the first incorporative mode dominates the oral zone. However, we prefer to call this stage the <u>oral-respiratory-sensory</u> stage because the first incorporative mode at the time dominates the behavior of all these zones, including the whole skin surface, which is to be understood as a sense organ; the sense organ and the skin too are receptive and increasingly hungry for proper stimulation.[77]

This early relationship of leisurely taking-in by the infant, and on the mother's part of giving willingly (this for the mother a need in its own right), constitutes ideally the dominant pattern of the early months. The infant largely through his mouth incorporates needed objects. These, whether they be food supplies or tactile-visual impressions and stimulations, help restore equilbrium and are intimately woven into elaborating structure.

In this process continuing day after day through the weeks and into the months, organism is drawn into new spheres and its developing feelings towards these, its degrees of integration within them, become correlated with the quality of the relationship and the extent to which the object-environment can meet evolving basic needs.

Erikson makes this relationship graphic by use of a series of circles (see Figure 26), each circle denoting a component element within a total approach. These testify to the potential range and complexity of the infant-maternal relationship, to the extent of the gaps between felt needs and

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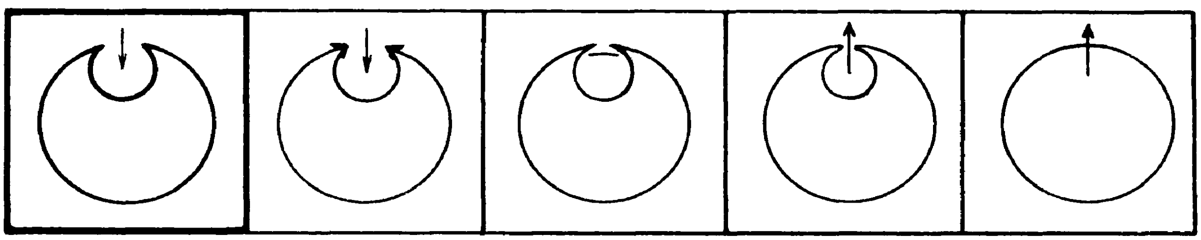
[77]Erik Erikson, "Childhood and Society", <u>op</u>. <u>cit</u>., p. 68

satiation and further, to the quality and variation of giving by the infant's world. Circle 'a' represents the (ideally) dominant modality of the early oral phase. All modalities in this figure represent, again, an interpersonal relationship in which both baby and mother (and others) are involved dynamically, where the arrows of affect and effect go in both directions and where modification is total and a continuing process.



a b c d e

Figure 25. Patterns of modality at the passive oral phase (Erikson): (a) incorporation, (b) very active incorporation, (c) retentiveness, (d) eliminative, and (e) intrusive.

Circles a,b,c,d,e represent auxiliary modes, variations in which the infant instead of indulging in relaxed sucking, because of a hostile environment is forced to aggressively seize or bite(b), to retain in fear of letting go (c), of forcing out or expelling that which is too dangerous (d), or of pushing into that which seems so elusive (e).

To the extent these approaches need to be adapted in preference to the ideal oral modality (again, although all will exist with some prominence within configuration) indicates a lose of mutual regulation between infant and mother. Neuroticisms may evolve from a maturational failure to suck or from any number of other physiological-organic imperfections carried down from fetal stages. They may stem primarily from a failure of the mother to uphold her own role--of a failure to derive deep pleasure in giving and this born of her own immaturity or present conflict. One consequence may be an early overdevelopment of the retentive role, of an oral closing up (c), which becomes a generalized mistrust of whatever comes in because it is apt not to stay.[78]

A loss of mutual regulation may force the infant to hang on literally--to exert too much effort to get needed supplies. This may lead to excessive biting (b) and, in turn, causing the mother to withdraw her nipple in pain and anger.

These modes, however, are necessary bricks for ego growth; they have their role and at one developmental period or another may have normally a dominant role. In early orality all infants no matter how carefully they are nursed and cared for must at times and to some degree fall back upon mechanisms of withdrawal or of aggression (later fantasy). Random activity will at times replace central sucking when the latter fails temporarily; then, for the moment, up comes the thumb and the world is damned.

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[78]*Ibid.*, p. 70

Earlier we noted however that these frustrations born of time gaps and needs imperfectly met are inevitable and organism is durable enough to begin to take small doses in stride, that in fact the gaps function as activating agents motivating the tiny infant to learn, to deal with tensions, maturation, the world, and in the process to evolve a unique synthesis of adjustive modes, i.e., self and personality.

These early discomforts are along with introjections from shifting foci and expanding modalities in the sense organs the stuff from which an utterly unique ego is hammered. The random movements of the infant in rage are psychologically almost functionless because the infant is almost without ego. The ego forms through the patterns of interplay (on-going as long as life exists) between demands of soma as against demands of the supplying source, environment.

The establishement of a basic trust during the nursing-oral stage is certainly seldom an either-or proposition, but one reflecting a many-faceted interpersonal, dynamic relationship which developes level by level its own unique patterns. . .a reciprocal and complementary process and rather more like the variations along a key surface within the tumblers of a lock. Thus in Erikson's schema of five variations we have a means by which to trace a symbiotic relationship at five points, where each facet has a theoretical range from 0--100, and where the total is greater than the sum of the parts.

Each infant therefore meets his first year with a long biological history behind him and indeed a crude outline of personality structure. Not only has the foundation been laid through the vicissitudes of constant interaction and synthesis, but also something of the future towering architectonics. Already we term him a quiet baby or an active baby, a crying baby or a happy baby, a nervous baby or a relaxed baby. As of the synthesis so he feels. The catatonia of self is still grossly amorphous and fluid, and projections are unconscious.[79] There is no differentiation between ego and id because there is no differentiation between subject and object, or between self and enviornment. But towards the end of the first year this state of adualism, as Piaget terms it[80]--this lack of dualism between perceiver and that which is perceived--begins to chip away and earlier we saw something of the dynamics envolved. All factors balanced out, and granted a healthy degree of solution to tasks stemming about the first contact, the infant stands ready to be propelled by inner neuromuscular maturational promptings into a new, wider range of bio-social reality.

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[79]Susan Deri, "Introduction to the Szondi Test", Grune and Stratton, New York: 1949, p. 210

[80]Jean Piaget, "The Child's Conception of the World", Harecourt, Brace, New York: 1929

WIDENING CIRCLES: ENVIRONMENT AND CORTICAL SYNTHESIS

> There was a child went forth every day,
> And the first object he looked up and
> received with wonder, pity love, or dread,
> that object he became.
> And that object became part of him for the
> day, or a certain part of the day, or for
> many years, or stretching cycles of years.[81]

> The month old baby is no longer a mere neophyte in the elementary art of living. He breathes with regularity, his heart has steadied its pace, his body temperature has ceased to be erratic. His muscle tone is less fluctuant than it was in the days of long ago when he was only a newborn. He taps the reserves and responds with motor tightening when you pick him up. This makes him feel less molluscous and more compact. By virtue of his heightened muscle tonus he is already more competent to meet the buffetings of fate. His reactions since birth have become more configured. He sleeps more definitely, wakes more decisively. He opens his eyes widely and does not lapse so much into shallow, ambiguous drowsing. . .
>
> In a few more weeks the baby will begin to look in the direction of the extended arm and catch sight of his hand. Even now he will see and briefly follow a moving object dangled near his eyes. . .[82]

Implicit in the music of Whitman's <u>Leaves of Grass</u> and behind the colorful description durnished by Gesell, lies a veritable physio-psychological no-man's-land. Outside of little more than sectional neural micro-stains and vague learning theories, the organization of behavior has, until

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[81] Walt Whitman, "There Was a Child Went Forth", Leaves of Grass, From J. Plant, "Personality & the Cultural Patterns", Commonwealth, New York: 1937, p. 11

[82] A. Gesell, "The Child from Five to Ten, Harper, New York: 1946, pp. 45-46

recently, remained almost totally an area of unknowns. We may describe with precision surface behavior and its evolution, and we may through analogy describe the dynamics of personality, but we have remained until recently largely helpless to relate even vaguely the events in neural organization itself, of the gap between the stimulus and the response. Of the first, behavioral level, we have alluded frequently. The literature here is rich and fairly complete. The second level, from the skin inward, we term a level of personality organization. This we have attempted to deal with in detailed outline fashion (See Figure 1).

Subtending behavioral and dynamic psycholgy is an area one might term dynamic physiological-psychological. This clumsy term denotes the bodily changes in the synthesis of the bio and the social; what happens to cortex when self develops?

Environment, Perception, Needs and Synthesis. Psychology has long operated, openly or otherwise, upon the idea that behavior is a series of reactions instead of actions, and that each reaction is determined by the immediately preceding events in the sensory system. This idea of complete sensory control of behavior is hardly the property of any particular school or theory. It was implicit in E. L. Thorndike's principle of frequency to explain learning.[83] And James used both concepts

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[83]E. L. Thorndike, "The Fundamentals of Learning", Columbia U. Press, New York: 1932, pp. 497-525

before Thorndike. In the S-R psychology of J. B. Watson it took its most explicit form. For Watson maturation meant little more than a growth of direct connections between a particular sensory perception and a particular muscular sense-organ. Learning was explained in all cases as due to either frequency (James, Thorndike), recency (Watson, Guthrie), or to effect (Mowrer)[84] and arguments over the relative merits as to one or the other, or a combination of these factors has waxed long and heavy up to the present time.[85]

More importantly, all implied a direct relation between stimulus on the infant and response, the former always explaining the latter. Regardless of theory subscribed to, the central nervous system was conceived in principle as a collection of routes, some longer, some shorter, leading without reversal from receptors to effectors--a mass of conductors that lie inactive until a sense organ is excited and which then conducts the excitation promptly to some muscle or gland. For Watson this had the effect of giving us complete control over the infant. Proper training (conditioning) could make anything of a basically sound infant. All could be Babe

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[84] E. R. Guthrie, "Association & the Law of Effect", Psychological Review, 47, (1940) 127-148

--C. Mowrer & H. Jones, "Extinction & Behavior Variability as Functions of Effortlessness of Task", J. Experimental Psy. 33 (1943), 369- 386

[85] See V. O'Conner, "Recency or Effect--A Critical Analysis of Guthrie's Theory of Learning", Harvard Ed. Review, 16, No. 3, 1946, 194-206

Ruths or Kit Carsons.

Of course embarrassment has crept in. We have long had such acceptable terms in the psychological vocabulary as 'attention' and 'attitude', and psychologists have had to notice grudgingly that even in the most carefully controlled experiment man or animal is responding continuously to some events in the environment and not to others that could be responded to (or noticed) just as well. Thus a more recent adaptation, one such as Hilgard and Marquis' autonomous central process[86] or what Gibson refers to as simply set.[87] Hall calls the same thing a stimulus trace, i.e., a lasting cerebral state set up by a specific stimulus but not transmitted and dissipated at once.[88] Morgan, again, terms it a central motive state and Kleitman refers to it as simply interest.[89] All these terms imply much the same property of an activity with a selective effect on behavior without being part of the present afferent excitation.

The rational basis for the central process between stimu-

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[86]E. Hilgard & D. Marquis, "Conditioning & Learning", Appleton-Century, New York: 1940

[87]J. Gibson, "A Critical Review of the Concept of Set in Contemporary Experimental Psychology", <u>Psychol. Bull.</u>, 38, 781-817

[88]C. L. Hull, "Principles of Behavior: An Introduction to Behavior Theory", Appleton-Century, New York: 1943

[89]N. Kleitman, <u>op</u>. <u>cit</u>., pp. 111-123

--F. A. Beach "The Neural Basis of Innate Behavior: I. The Effects of Cortical Lesions Upon the Maternal Behavior Pattern in the Rat", <u>J. Comp. Psychol.</u>, 24, 393-439 lus and response has come from electrophysiology. We know from the readings on the electroencephalogram that the central nervous system is active continuously in all parts, whether exposed to afferent stimulation or not. Jasper reviewed work with the EEG up to 1937, with all findings indicating that EEG patterns must be at least a summation of action potentials, an index of cellular firing.[90] Thus even before birth neural tissue is persistently active, under no stimulation except that from the nutrient fluids bathing it.[91]

More accurately, perhaps, one may argue from the opposite side by saying that it is completely meaningless to talk of a total absence of stimulus for of course every neural cell exists within an environmental setting and presumably even the relatively unstructured cells of the young neocortex are acting and reacting to vague patterns stemming from the adjustive dynamics of the soma.

If the neurons of the infant are firing continuously the feeling states reflecting equilibration will be determined by the rate and coordination of firing. Since a cell cannot exist out of synthesis, the role of environment (whether internal or external) functions to control it. Instead of the

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[90]H. Jasper, "Electroencephalography", In W. Penfield & T. Erikson's "Epilepsy & Cerebral Localization", Thomas, Springfield; 1941, pp. 380-454

--See also N. L. Kleitman, op. cit., pp. 38-51

[91]B. Liber & R. W. Gerard, "Control of the Potential Rhythm of the Isolated Frog Brain", J. Neurophysiol.,2, 153-169

sensory, for example, supporting the synchronous rhythmic firing and large potentials as seen in the EEG of a sleeping infant, it has the opposite effect--of introducing irregularity and flattening in the graph.

In this discussion thus far we have collected data to indicate (a) that the cortex of the infant is active, that there is a functioning central process, a highly important middle function between stimulus and response, and (b) that the sensory, now highly active since birth, has a necessary function for adaptive behavior in organizing this vast sea of rhythmically firing neurons. Ahead are the problems of spelling out the details of perception, of their organization and eventual synthesis within soma, and of the nature and emergence of a central motive state.

Kohler (1929) and Lashly) 1930 led the fight against the theory of neural connections as a basis for learning.[92] Until Lorenta de No (1939) and Hebb (1949), however, this has applied only to older theories of linear, sensori-motor connections, in which a single cell was supposed to be always capable of exciting a second cell with which it synapsed. de No argues that connections are necessary but may not be decisive in themselves; in a complex system especially time

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[92] W. Kohler, "Gestalt Psychology", Liveright, New York: 1929, pp. 103-147

--K. Lashley, "Basic Neural Mechanisms in Behavior", Psychol. Review, 37, 1-24 factors must always influence the direction of conduction.[93] Lashley and Kohler argued for a pattern of excitation whose locus is unimportant. Hebb holds to a middle position similar to that of L. de No, a particular perception by the infant depends on the excitation of particular cells at <u>some</u> point in the central nervous system.[94]

All of this may seem excessively vague or off the point but the issue is a basic one in attempting to recapitulate cortical learning. If, for example, one agrees with Lashley and Kohler and the Gestalt principle that perception of say a square by the infant is as simple and immediate as it seems to us as adults, i.e., if it suddenly leaps into configuration, then, as Hebb points out, Gestalt argument is unanswerable.[95] If with de No, Hebb and implicit with Riesen,[96] perception by the infant is additive, a serial reconstruction, there is no need to accept field theory and with it a blind alley towards describing behavioral organization.

As with the affects of the birth process, we cannot subjectively or objectively recall or reconstruct how we initially organized the elements of our environment. But unlike

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[93]Lorente de No, "Transmission of Impulses Through Cranial Motor Nuclei", <u>J. Neurophysiol</u>., 2, 402-464

[94]D. O. Hebb, <u>op</u>. <u>cit</u>., p. 17

[95]<u>Ibid</u>., p. 18

[96]A. Riesen, "The Development of Visual Perception in Man & Chimpanzee", <u>Science</u>, 106, 107-108, Quoted by Hebb

the limitations of birth, we can escape an impasse by examining how a congenitally blind person might learn after an operation restoring his sight. This is what Riesen and Senden did.[97]

In these experiments it was noted that at first the newly seeing person could not tell the difference between simple forms, say a circle and a square (to say nothing of distinguishing one face from another). These findings correlate closely with the behavior of the neonate. The visiual world of the young infant is hardly more than a blurr, of darkness next to light and amorphous shapes.[98] There are of course important differences. At the neonatal stage organism is still not differentiated enough and the infant has at first little motor control over his eyes. Ocular patterns prove to be correlated closely with total action-system[99]

97Hebb, op. cit., pp. 18, 38, 21
We realize that sight is only one facet of perception feeding cortical organization but we assume that, independent of quality, vision is organized similarly to the other senses.

98William Stern, "Psychology of Early Childhood", Holt, New York: 1930, p. 46 (English ed.)

99Arnold Gesell, Ilg & Bullis, "Vision Its Development in Infant and Child", Hoeber, New York: 1950, p. 82

--Heinz Werner, "Comparative Psychology of Mental Development", Follett, Chicago: 1948, pp. 59-103

--Karl Pratt, op. cit., pp. 203-206

responses. But his eyes function, neurons fire, and they have, as we indicated, a coordinating effect upon cortical firing.

> When the neonate fixates an object of interest, his activities tend to subside; he stops freting; he assumes a postural set. He may open his mouth and tense his lips. There are changes in rate and depth of respiration. . .they also assume a directive role in determining body and limb attitude.[100]

Following successful surgery patients, instead of seeing the Gestalt of a square or circle, see at first only a corner or line within the total field. 'Circle' becomes something without a corner. 'Corner', and perhaps other simple form qualities, constitute apparently a primitive unity, i.e., where previous learning is unnecessary. The most intelligent and best motivated patient has to seek corners painstakingly, even to distinguish a triangle from a circle, and this being accomplished by counting the corners. Werner notes that early vision in infancy simultaneously is unified and amorphous. One does not perceive readily elements within the whole but only the field.[101] Interestingly enough, however, neither Rieson, Hebb or Werner report these patients indicating any difficulty in learning the colors. Whether this is the case with infants is not known for certain. Apparently color is another primary quality that develops early in the

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[100]A. Gesell et al, "Vision", op. cit., p. 82

[101]H. Werner, op. cit., pp. 104-142
This interesting aspect of cortical development will be developed further in a later section. For the present we are focusing at a neurological level.

ontogenesis of vision and cortical organization.

Accordingly for such patients and we assume likewise for the infant, there is a long additive process in which vague unities become structured. These reports also indicate consistently that the perceived whole of first vision is simultaneously unified and fluid, or as Werner would term it, syncretic, i.e., things do not stand out apart, discrete and fixed in meaning with respect to the cognitive subject.[102]

Thus we have followed Lorente de No, Hebb, and Werner in their attempt to prove that perception is not a unitary process in all its aspects; that in contrast to Lashly and Kohler, learning is not a sudden process but a slow, additive one, where organization reaches a point where Gestalts form within a total and until then unstructured field. Actually, of course, Gestalts exist at any level but they are almost formless at first and seemingly nonfunctional.

To a next point. Lashley and Kohler argue that there is a high degree of sensory equipotentiality in the cortex, i.e., that locus or specific cells are unimportant. They speak in terms of electrical fields and (Lashley) of irradiating waves of excitation and interference patterns. For Lashley all cells necessarily acquire the same function when excited in a given pattern, so that separate learning processes are not necessary.

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[102] loc. cit., pp. 104-142

Thus a retina stimulated by the form of a circle, say, transmits this pattern whole to the central nervous system. These two theories are at extreme poles from the old S-R connectionist theories. Under each extreme it is difficult to account, however, for attention and attitude, and further we can note that these theories cannot account for slow early learning and the rapid progress of later years.

Configuration theory, therefore, leaves little room for the factor of experience and it makes it difficult to see how learning can occur or how autonomous central processes can exist and influence behavior.[103]

In attempting to describe early learning we have to reapproach the total problem to account for (a) initial relatively slow concept formation, and (b) of how basic neural organization takes place; finally we need also (c) to correlate this second factor with learning at the behavioral level.

a. The Neocortex at Birth. From the studies of Langworthy (1930, 1933)[104] it has been determined that those aspects of the total brain which are necessary for basic function at any given developmental level will be well medulated. Thus from his studies it seems evident clearly that infracortical

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[103] D. O. Hebb, op. cit., p. 58

[104] O. Langworthy, "Development of Behavior Patterns and Myelinization of the Nervous System in the Human Fetus and Infant", Contr. Embryol., Carnegie Inst., Washington, 24, p. 18. (See also Langworthy (1930, 1933) Contr. Embryol., 25, pp. 176-178)

centers which are necessary to neuromuscular activities of the newborn infant are mature.

de Crinis (1932) realizing that postnatal maturation of the brain cannot be attributed to multiplication or subdivision of cells, stained them to determine their dendritic maturity. In the 5-day old infant's brain the motor region hardly revealed dendritic processes, but in preparations from the brain of a 10-week old infant such processes were discernible clearly.[105]

Flechsig, using somewhat similar methods has achieved the same findings essentially. In other words the development of the brain areas is paralleled by the total ontogenetic level of man.[106] From the findings of both researchers the earliest areas to mature are those zones mediating motor and tactile, visual and auditory qualities. And these findings correlate with behavioral evidence and with the cortical theory of Hebb (to be presented). Further they suggest the qualitative nature of early learning, and something of the infant's relevant environment, factors which agree also with Hebb's approach but not with that of Lashley, or Kohler. Thus, one sees in infant behavior a high correlation between mass-like behavior of the neonate--his poorly developed

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[105]"Maturation of Behavior", M. McGraw, Manual of Child Psychology, Wiley, New York: 1946, p. 354

[106]From Heintz Werner, op. cit., p. 49

sensory areas, and the almost complete absence of associational (internuncial) neurons.

The behavior of the young infant is transitory and labile; total behavior is under the second by second control of the sensory and introceptive system; there is as yet little central process. For the time being at least S-R psychology is almost adequate. When hungry the infant cries almost immediately; when his eyes catch something in the surroundings he can--perhaps is impelled--to fixate upon it, and then only briefly. In Werner's terms his behavior is extremely diffuse, concrete and syncretic. At first his world is not distinguishable apart from himself, but is meaningful only as a thing-of-action.[107] Thus if psychophysical motor behavior is deliberately constrained, learning becomes almost impossible. Coordination of physical movement and sensory impression for example is basic for primary form perception.[108]

Returning to the findings of Flechsig and de Crinis, we may see a second internuncial zone becoming active during the second month. As its name implies, it denotes the beginning of a greater degree of cortical coordination. Thus at from 4-16 weeks the infant can now not only fixate visually upon a simple object within his field but he can coordinate <u>eye and</u>

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[107] <u>Ibid</u>., p. 59

[108] <u>Ibid</u>., p. 60

---See also Gesell, <u>op</u>. <u>cit</u>., p. 84

<u>motor control to follow its movement</u>, say through an arc of 90 degrees.[109] Likewise mental activity denotes the gradual emergence of the ability to be directed towards an object by auditory stimulation. Thus the second general phase denotes along with increasing sensory skill the beginnings of sensory-motor coordination. Raw and crude impressions from environment are slowly being parlayed towards new levels as each sensory and motor area reenforces and contributes its qualitative impressions towards the total.

A third stage consisting primarily of the frontal, prefrontal and temporal areas is the last to medulate, and these are the centers for highest correlation as reflected in abstract, conceptual thought modes. These centers are not fully mature until the fifth year--an insight pregnant with educational implications.

In this trend away from sensory-bound 'concrete' thinking, we need to note that we are not seeing discontinuity between lower and higher functions, of a self-subsistent status in each. It is characteristic of higher mental organization that there should be an interrelationship of function and a subordination of the lower to the higher. Thus what our infant is so busily, so hungerly, taking in a meaningless blurr and jumble are the bricks for later conceptual synthesis.[110] Note we say synthesis, for the Gestaltists are

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[109] A. Gesell, <u>op</u>. <u>cit</u>., p. 84

[110] William Stern, <u>op</u>. <u>cit</u>., p. 46

certainly correct in making a distinction between perception a,b,c and their synthesis. Thus abc is no longer the mere sum of a,b,c but t, something different than the sum of additive qualities.[111]

Under our present heading we still have to account for the seemingly slow pace of early infantile learning, this against the speed of the adult or lower phylogenetic form. We noted the intrinsic organization of cortical activity at birth by the large, slow waves of the EEG, patterns similar to deep sleep or coma in older subjects. This is in line with the findings of Weiss (1941)[112] that unstimulated neural cells eventually must fire spontaneously until knitted together under constant bombardment via the total receptor system. As long as the receptor surfaces are being stimulated (neonatal environment), therefore, the sensory projection areas of the cortex must remain completely and constantly under environmental control.

Also under control are the fibers that lead from the sensory areas into the association areas. This control is extended only gradually. Considering the association areas as made up of a population of transmission units, two factors must affect the length of time needed to bring all these units under control. One is the number of controlling fibers lead-

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[111]D. O. Hebb, op. cit., p. 97

[112]P. Weiss, "Autonomous versus Reflexogenous Activity of the Central Nervous System", Proc. Amer. Phil. Soc., 84, 53-64

ing from the sensory areas into association areas. The second is the number of transmission units in the association areas themselves.[113]

> With cortex of a given size, these two factors may be considered to be roughly proportional to the size of the total sensory cortex, and the total association cortex. It follows that the length of the primary learning period will be roughly proportional to the ratio
>
> $$\frac{\text{total association cortex}}{\text{total sensory cortex}}$$ [114]

Thus as in say the case of a dog, where sensory areas are relatively large with respect to associational areas, sensory control over associational areas would be established quickly. If, on the other hand, as in the example of the human infant, sensory projection is small and association cortex very large, the control period takes longer, i.e., the period of 'primary' learning will be long.

We are considering mental development primarily in sensory terms. This we are obliged to do because such relatively simple development is about all that can be handled within our present level of theoretical insight. Yet we are probably within our rights to relate what is happening at the stage of primary learning to earlier considerations concerned with the concurrent problem of the development of a basic trust towards one's world. At any level of this early phase of ontogenesis

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[113] D. O. Hebb, _op. cit._, p. 124

[114] _Ibid._, p. 124

what is happening is essentially an introjection of objects through the sensory and GI tract. These incorporations are necessary to meet introceptive-proprioceptive alternations arising within somatic needs and becoming manifest in the cortex. Therefore, whether these 'bricks' be sensory impressions of color, taste, affect, or what not, they are coupled and eventually synthesized with upward-surging somatic needs and experienced through cortical and blood-nutritive patterns. They are the suppliers for somatic hungers and in the quality of cortical synthesis, i.e., in the way they meet bodily needs, they are invested with appropriate feeling tones, and so the world and self become interpreted.

b. Primary Neural Organization. The following hypothesis is based primarily upon the thinking of Hebb and Lorente de No and attempts to show that a repeated stimulation of specific receptors will lead slowly to the formation of an 'assembly' of association-area cells which can act briefly as a closed system after stimulation has ceased.[115] This approach is somewhere between the extreme connectionist theory of such as Watson and the field theory of a Kohler or a Lashley.

de No postulates that when an axon of cell A is near enough to excite a cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells such that A's efficiency, as

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[115] Lorente de No, "Synaptic Stimulation of Motoneurons as a Local Process", J. Neurophysiol., I, pp. 197-198

one of the cells firing B, is increased. This is not the same as Kapper's theory (see page 168-169). Unlike the proposition of neurobiotaxis, this idea does not require action at any great distance. Thus there might be facilatating growth (synaptic knobs) from a fibre passing another cell by repeated simultaneous excitation in the two.[116] Following Hebb, let us try to apply this idea to visual perception with the assumption that having explained organization here it can be generalized to all other modes of learning at this primary level.

Figure 27 represents the visual cortex of area 17 and we are concerned as to how a retenal impression might be organized in terms of the total function (here denoted by Brodmann's area--18 and beyond. The problem is extremely complex. We know that perception of simple objects is unified and determinate, a well organized process. What basis, therefore, can be found for an integration of action, in cells that are anotomically so disorganized?

For one thing, there is convergence as well as spread of excitation. Cells lying in the same part of 17 may conduct to different points in 18, and likewise of 18 into 19, and beyond. Conversly, cells lying in different parts of 17 or 18 may have connections with the same points in 18 or beyond.[117]

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[116] <u>Ibid</u>., <u>op</u>. <u>cit</u>., pp. 198-199

[117] D. O. Hebb, <u>op</u>. <u>cit</u>., p. 67

Secondly, perceptual integration develops through structural change (synaptic knobs perhaps, de No) at the synapse, these lower synaptic resistences perhaps developing on the basis of the old proposition that two cells or systems of cells that are repeatedly active at the same time will tend to become associated, so that activity in one facilitates activity in the other.[118] This may be illustrated by cells A,B,C in Figure 27 a.

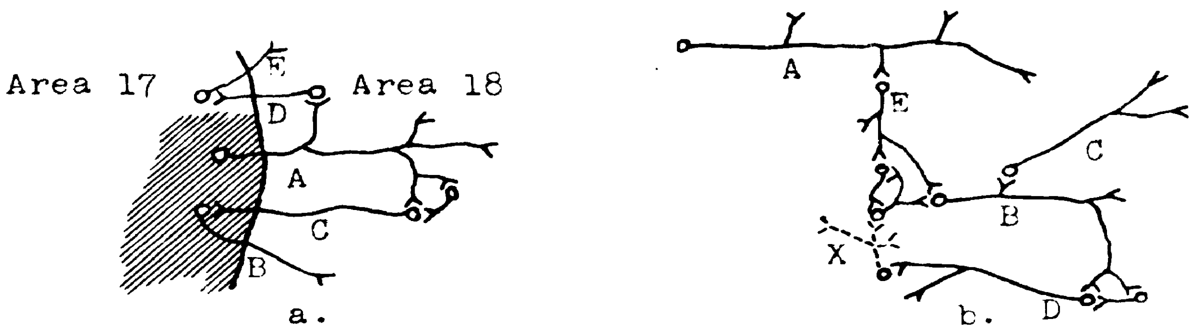

Figure 26: a. Cells A and B lie in a region of area 17 (shown by hatching) which is massively exicited by an afferent stimulation. C is a cell in area18 which leads back into 17. E is in area 17 but lies outside the region of acitivity.

Figure 26: b. A,B, and C are cells in area 18 which are excited by converging fibers (not shown) leading from a specific pattern of activity in area 17. D,E and X are, among the many cells with which A,B and C have connection, ones which would contributes to an integration of their activity (From Hebb).

Thus A and B are visual cells simultaneously active. A synapses with cells beyond including C, but C leads back into 17 and B, the same area that is firing A (some massive sensory excitation denoted by the shaded area). Thus with repetition of the excitation in 17 it is conceivable that growth changes

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[118] *Ibid.*, p. 72

would take place at synapses AC and CB. This means that A and B, both afferent neurons of the same order, would no longer act independently of each other.

In the diagram we note also, however, that A synapses D and through D to E. E is not in an excited area of 17, however, and the synapse DE would be unlikely to be traversed since it is not, like CB, exposed to concentrated afferent bombardment.

This consideration can be extended also beyond area 18. Figure 27 b diagrams three cells, A,B,C that are effectively fired in 18 by a certain visual stimulation, frequently repeated (by fixation, for example, on some point in a distant environment). D,E, and X are possible connections which might be found between such cells. Following Hebb, supposing that time relations in the firing of these cells make it possible, activity in A would contribute to the firing of F, and that in B to firing C and D. Growth changes at the synapses AE, BC, BD would be a beginning of integration and would increase the possibility of coordinated activity in each pair of neurons. Under these conditions of increasing control through proximity and timing a <u>closed cycle BDXB is set up</u>. That is, A acquires increasing control of E, and E, with each repetition of the visual stimulus, would fire more consistently at the same time that B is firing (B, again, is directly controlled by area 17 action). Synaptic changes EB would therefore result. Similarly B acquires an increasing control of D; and whenever a cell such as D happens to be one that connect again with B, through X, a closed cycle is established.

Finally we face the problem of needed time and reverberation by which to experience the sensation, for ordinarily this sequence would be run off in less than a hundredth of a second.[119] Our example is actually misleading for instead of a one dimensional loop or ring, the best analogy is a three dimensional lattice, with no regular structure and with connections possible from any one intersection to any other. The whole thing depends upon convergences and timing. Thus whenever two cells fire upon a third (as E and X converge on B in Figure 27 b) the synapse is made. Figure 28 attempts to diagram this more clearly.

This then is the cell assembly as Hebb has constructed it. It would correspond to a particular basic or primary aspect of perception, thus the corner of a cube. During the early months of life it would exist relatively unrelated to the untold numbers of other cell assemblies (i.e., in terms of synthesis to a conceptual degree). Again, this would not be denoting a part to the whole scheme of development, but rather to a basic syncretism

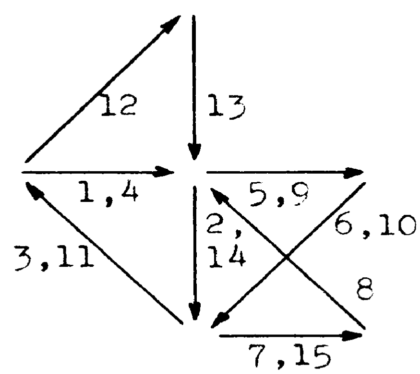

Fig. 27. Arrows represent a simple assembly of neural pathways firing according to the numbers on each. (From Hebb)

[119] *Ibid.*, p. 73

at all levels of synthesis, for while one perceives more and more detail it is movement from field into ground, i.e., increasingly it is becoming discrete from a previous syncretic contex.

We have dealt very abstractly by necessity with aspects of primitive neural organization and thus far we have mentioned only briefly and indirectly what the infant's world might be like, that is, of what is perceived and relevant and what is not, given a certain level of cortical organization. If the ideas of Lorente de No and D. Hebb are sound, we have the basis for correlation of growth at substantially three levels (these to be dealt with on this basis in the next chapter): of the neural, of the formation of self, and of the behavioral.

c. Early Stages of Preception; An Infant's World. The scope and extent of the infant's world is immediately and with completeness bound to and held by the impourings and degree of maturity of his sensory-neural organization. Conation and set are expressed in the almost second by second dictates of now this and now that sensory or introceptoral flow of impulses. Also at this earliest phase of postnatal development organism reacts in overt, mass-like behavior to press. At first there is no back-log of experiences to guide action, no extensive syntheses of neural assemblies to effect subordination, integration, and with these the ability to abstract common qualities and to formulate psychologically purposive action. Early learning, therefore, is tied almost completely to things of action.[120] Undifferentiated modes of behavior are common particularly in the neonatal period. Quoting Stern again, "All that we are fully justified in assuming for the mentality of the newborn child is a blurred state of consciousness in which sensorial and emotional phenomena are inseparably fused".[121] This state of consciousness may be described as a mere state of feeling, a total sensation, in which object and subject are merged.

Many of the young child's activities can be understood only through the assumption that the motor-emotional and sensory factors are blended into one another. Shinn, for example, speaks of her nephew, an infant of six months, who was given a round rattle instead of the customary square-edged one. The child tried in vain to find and bite the 'corner' of the round rattle.[122] This seems to demonstrate that the infant's conception of the rattle was not determined by its qualities of angularity or roundness, that it was not an optically and tactually known form per se, but that it was rather a thing-of-action, understood in so far as it was a signal for a specific motor-effective reaction. The rattle for the infant is not a thing standing out there in contrasting relation as a subject, a thing of distinct,

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[120] Heintz Werner, op. cit., p. 59

[121] William Stern, op. cit., p. 46

[122] M. W. Shinn, "Notes on the Development of a Child", U. of Calif. Public. 1893/99.,I, p. 87

fixed significance. The thing is there as 'something to be bitten' and is accordingly determined by its motor-affective meaning.[123]

> The awareness of objects during early childhood depends essentially on the extent to which these objects can be responded to in motor-affective behavior. The investigations of Iwai and Volkelt dealing with the response of the child nine to twelve months old to diversely shaped objects show that those objects most easily gripped with the hands occasion a distinct preference. They appeal to the child's need to function as K. Buhler expresses it (Italics mine). Martha Muchow has also demonstrated that even for the younger child the objects of the adult world exist mainly in so far as they exhibit a form which facilitates their use as instruments in motor activity.[124]

The high degree of unity between subject and object mediated by motor-affective reactivity of the organizm results, therefore, in a dynamic, rather than static, apprehension of things.

Through these early weeks cell assemblies probably form at a tremendous rate but these are poorly articulated. Basic trust is facilitated through continuity, through reenforcing developing cortical structuring and secondly in reenforcing particularly those patterns of cell assemblies which dissipate tensions constantly building up within the system. Faith in a world achieved largely through an environment which seldom over stimulates, seldom over taxes, the ability of organism to organize and hence master. Again,

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[123]Heintz Werner, op. cit., pp. 65-66

[124]Ibid., p. 66

there would seem to be optimal ranges of needed stimuli, these determined individually for each child; disharmonies and imbalances would emerge through qualitative-quantitative stimuli and discontinuities moving above and/or below this range.

Despite seeming isolation of perceptual introjections--of what is seen, as against what is tasted, for example--organism (via cortex) is a unified process, remains a unified process but which through developmental time endlessly differentiates out hierarchies and value systems of form within larger systems of form. Thus continuity via gentle handling facilitates, feeds back and promotes, construction into other cortical areas. Stability engendered in this area supports developing vision, for example, especially if the two are active at the same time. Disruption likewise spreads by association, feeding into other systems and by feed back into subsequent process. Thus fear (disequilibration) born of harsh handling may, through linkage, also come to denote danger in what is visually taken-in subsequent sensory sets.

In the next chapter we attempt to follow organization towards a conceptual level. In large part concept formation emerges out of figures clearly perceived within ground and these acting as the basic bricks from which common or intrinsic elements and properties are abstracted. From nipple and internal warmth--of breast, smell of mother, long hair, dress, sound of voice, comes the discrete, stable and very concentrated concept summed up in the term 'mother'.

It is obvious that early learning involves not only avoiding over stimulation or cortical flooding, but of continuity within the infant's world. The additive elements rapidly adding or feeding towards the early concept of mother need to be counted on if the infant is to have them to build with. This also means seeing mother's face again and again within a stable, total setting. Thus the frequent occurence of the infant not recognizing his mother in a coat, or with a hat on. It also means that growth of organization is to a high degree dependent upon stability of setting, thus mother within nursery and nursery being somewhat the same day after day. We also know, for example, that children frequently lose ground in being moved to another room or a new house, without proper warning by parents. And in surrendering to the unknowns of darkness and sleep, carrying a familiar and usually cuddly toy is often a source of strength in meeting the tests imposed by transition. Transition there must be but an infant will be a great conservative if its rate is acceding his ability to organize and master it.[125]

These illustrations serve to stress what was said earlier: that the infant's primitive experience field is global, diffuse and syncretic. The cube, as cube, is a concept and does not stand out yet as figure, as itself, within ground

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[125]Bettelheim connotes to much the same difficulty in his excellent discussion of 'the in-between time' of emotionally disturbed children. See B. Bettelheim, "Love is Not Enough", Free Press, Glencoe; 1950, pp. 115-132

but is recognized only as part of an indivisible total or through action. To move furniture, say a mirror in the nursery, is to shatter temporarily a slowly wrought unity and children often protest against changes which to adults seem inconsequential.

Underlying all learning, then, there exists a strong physiological compulsion--drive--to organize stimuli pouring upon receptors. From one angle, growth denotes successful reduction of tension to pleasurable limits. Sensory and internal receptive flooding will denote an intensity beyond any given level of existing cortical structuring by which to cope with it, and boredom may refer ultimately to a relative absence of stimulation by which to meet and offer resistence to energy flow.

One can see, therefore, that cortical activity is anything but the passive process it is sometimes thought to be. In mental growth the brain is thus exercising itself (realizing itself) in basically the same way as do maturing muscle systems which cause the infant to lift his head over and over again and later to crawl. These are developmental tasks coming from an intrinsic nature of biological process--one being stimulated, structured and modified from without and propelling organism into synthesis. Patterns of energy flow --these inherent through the phylogenetic structure of the system--surge into perceptoral and prehensoral organs and subsequent modification, of a greater dynamic facilitation between a closed system within its environment, is marked and carried lastingly in the mysterious activities of spidery neural cells.

> Man is a microcosm, or a little world, because he is an extract from all the stars and planets of the whole firmament, from the earth and the elements; and so he is their quintessence.
>
> Paracelsus

CHAPTER V

GROWTH PYRAMIDING INTO A SOCIAL SPHERE

> The first incident I remember is that I was starting to walk by myself without anybody having taught me. I arrived in the living room where my mother had a party. All were amazed I connect with this incident the attitude, La voila, here I am, and a strong drive for independence and originality to do things by myself which nobody taught me.[1]

Chapter IV attempted in one way and another to deal with first contacts of organism to an almost totally new environment and with the untold numbers of building blocks fashioned through bio-environmental synthesis. We attempted to look at what is actually a unitary process by seeing something of its complex operation at different levels. Thus basic trust emerges at a dynamic psychological level, and with it a feeling of security, that one's needs will be met. And this, in turn, was examined in terms of environmental implications and of underlying neuro-cortical organization.

Also in the last chapter we saw the beginnings of a bio-social synthesis--just a beginning, however--but felt the potential wonder and power of the infant's biceps--of his huge associational cortex slowly being galvanized into fighting trim. But we left off with the infant still engaged in a kind of primary learning in which the raw 'data' of percep-

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[1] Werner Wolff, "The Personality of the Preschool Child", Grune & Stratton, New York: 1946, p. 14

tion was being collected and the large electrical potentials being whipped into control. Metaphorically, oxygen and hydrogen were still separate or additive elements and water was not yet. To build or synthesize one needs something to work with.

In this elemental phase it was comparatively easy, and heuristic, to attempt to correlate closely activities of the soma with projections and external demands. We may still do this but we must realize that concepts attempting to explain behavior on a basis of biological needs increasingly becomes more remote. Ultimately there is limited value in attempting to trace the motives of a Albert Schwitzer or Stalin, to provide a glaring contrast in motive, to underlying needs and patterns of energy flow. This is not an appeal or regression to magic. It is that with later infancy a central motive state rapidly comes into its own. It means that S-R is no longer adequate, and that set and attitude slide imperceptibly into will and conation at levels hopelessly beyond elaboration upon basic drives.

Why? Again, because uniquely with the human animal there exists the ability to abstract endlessly and conceptualize upon basic perceptual elements, and then to feed these back into action. Through childhood into maturity is a growth phase where man escapes the second by second dictates of receptoral press and, indeed, where he acquires the power to modify, select and sublimate among his own biological drives.

In his book Evolution and Ethics, Huxley points out that "biological or organic evolution has at its upper end been merged into and largely succeeded by conscious or social evolution."[2] He even states that "there are grounds for suspecting that biological evolution has come to an end, so far as any sort of major advance is concerned."[3] Psychologists like Cantril, however, have seized upon a statement such as this to rid themselves of what they see as a dilemma by cutting the transition between the bio and the social. Admittedly it becomes difficult, and in fact ridiculous, to cope with a Stalin in purely biological terms; biology there still is but it is not quite useful to think of what is connoted in Uncle Joe in terms of K excess, or in some X glucose complex. It is simply that in working with a particular problem or level we cast about for appropriate scales and approximate systems of analogy.

Thus Cantril needlessly confuses in any attempt to deal with human ontogenesis in as unified and continuous a fashion as is possible when he makes a statement such as the following:

> Current attempts to account for man's motivation solely in terms of the 'reduction of tension' seem to me completely inadequate if we are going to 'explain' the many situations in which men's satisfactions and happiness are actually related to an increase, not a decrease, in the state of 'tension' such as exists,

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[2]J. Huxley & T. Huxley, "Evolution & Ethics", Pilot Press, London: 1947, p. 122 (3) Ibid., p. 123

> for example, when one undertakes a new task, strives to meet new levels of aspiration. No matter how much such theories are strained and enlarged they somehow fail to bring in the pull of expectancies as well as the push of the existing 'tensions'. The only way out, I think, is to jump to a different, a higher, order of accounting which must include man's desire to develop and his capacity to experience value-quality. Once this is done, 'tension' can be understood, the 'now' in which the organism finds itself can be seen as indissolubly related to the past and the future and clarification of the reasons for action which seem to increase, rather than decrease, 'tension' become possible.[4]

Cantril can only be lauded in his attempt to widen the base of psychology to account for the 'human' in man, but to do so he needlessly burdens the unifying task ahead. There is no mystery, granted memory and a conception of 'future', in a man deliberately increasing tension. If he does so, if he undertakes a new task, is not this behavior itself an attempt to reduce tension ultimately. Man, we have to remember is saddled with a huge cortex. It is an essential characteristic of all life that energy and structure have to be put to work. The brain cannot remain idle in comfort anymore than can, say, a leg; potential has to be realized and this in itself is a drive to reduce tension, whether it be in learning to talk or walk, or struggling for a Master's degree.

In other words, while we can hardly explain the magic and beauty of human behavior biologically, no matter how complex it becomes it is still subject to biologic law and we can see

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[4]Hadley Cantril, "Towards a Scientific Morality", J. Psy., 27 (1949), pp. 364-365

no reason why a concept of tension as a source of motivation is still not adequate.

New levels of aspiration are not difficult (through analogy) to account for. Through the unknown quirks of evolution man 'simply' has emerged, unique to himself, as an animal with a preposterously huge associational cortex relative to his sensory cortex, and the former carrying him far beyond the necessary margins of needed safety for biological survival. He has, in effect, a surplus and is now in the strange position of having to invent needs, to redefine security, to keep his oversized brain busy. And thus culture and its continuity and accretions. But we need note that in any final judgement of what is good or bad in what man builds, and if we seek morality on causal grounds, we come again to biologic standards. We need to remember, in Cantril's own words no less, "that because of the reciprocal influence of the purposes of one individual or group on the purposes of another individual or group, actions will prove effective in the long run only when the purposes common to individuals or individuals as members of groups are included. . ."[5]

And thus, we feel, we are back to the criterion of organic equilibration, and all the cries of the pragmatists and absolutists notwithstanding.

This chapter is concerned with the beginnings of true

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[5]*Ibid.*, p. 371

ego. We are attempting to trace its formation into pyramiding conceptual, synthetical activity arising from the multitudes of sources--at first isolated, seemingly--within the vast cortical medium.

> It is, of course, also a heterogenous process, since ego-forming encounters with reality and with one's own body occur in connection with manifold needs. The subsequent ego, therefore, has manifold 'nuclei'. A final ego is formed by a synthetic integration of these nuclei, and in certain states of ego regression a split of the ego into its original nuclei becomes observable.[6]

In the ontogenesis of all that we sum up conveniently in the concept of ego may be seen, therefore, the literally endless combinations of conceptual construction through which somatic energy sources may be routed and channeled. Healthy ego denotes just this ability to guide this flow of energy into outlets affording optimal resistence (work) patterns acceptable to both the soma and the external reality.

From first a consideration of what little is known of concept formation at the cortical level, we then need to attempt to correlate further this development with change at the perceptual level, of how one organizes his unique world of stimuli, and finally, of how this process feeds into an organizational level of personality dynamics. Thus from a state of basic trust, through perceptual organization, to a second stage (and again borrowing Erikson's terminology) of 'autonomy', as versus a failure denoted by shame and doubt

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[6]Otto Fenichel, "The Psychoanalytic Theory of Neurosis", Norton, New York: 1945, p. 39

in the faith in one's own ability to control and manage his biologic functions and impulses.[7] Thus we conclude this outline at the threshold of development where the child is ready to ask himself "what kind of a person would I like to be?" This question can be posed only after the child has organized his basic needs within the context of the interpersonal-social. At such a point he will be only two or two and a half years old, but what a long way he has come!

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[7]Erik H. Erikson, "Growth and Crises of the 'Healthy Personality', From Problems of Infancy & Childhood, Ed. M.J. Senn, Josiah Macy Jr. Foundation, New York: 1950, p. 21

CONCEPTUALIZATION AT THE NEUROCORTICAL LEVEL

> After small amounts of learning early in the life of the individual, every instance of learning is a function of the already learned organization of the subject; that is, all learning is influenced by transfer. . .
> The learning of complex, abstract, meaningful materials and the solution of problems by means of ideas (reasoning) are to a great extent functions of transfer. Where the subject 'sees into' the fundamental relations of a problem or has insight, transfer seems to be a major contributing condition. It is, likewise, a basic factor in originality, the original and creative person having, among other things, unusual sensitivity to the applicability of the already known to new problem situations. Perceiving, at whatever level, is probably never free of its influence; and there is no complex psychological event which is not a function of it.[8]

These are strong words. The task at this point is to attempt to provide some neurological bases for them if they are to be taken seriously at all. That they cannot be overlooked is evident from the findings through many new avenues of research. If the old S-R was ever true it is so in the earliest phase of infancy when, presumably, the vast associational cortex was relatively unstructured and we say the infant lacks a will of his own.

Earlier, through the studies of Lorente de No, Kohler, Lashley and Hebb, we attempted to sketch something of primary learning, i.e., of recognition of the simplest elements scattered about in <u>bas relief</u> within the blurr and syncretism

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[8] J. A. McGeoch, "The Psychology of Human Learning", Longmans, Green; New York: 1942, pp. 445-446

of the neonatal world. Even for the young child, however, the object of a chair is not only a much more complex organization of stimuli than the single elemental perception but increasingly too it is associated and fed back to layers of seemingly unrelated affect as it comes to occupy an integral part of the personalistic make-up. The chair and other stimuli are the introjections of objects which hope and give meaning to our lives. They and the affect woven within them are the stuff we synthesize with the upsurgings from the id, or as Mead would term it, the 'I'.[9] We are, thus, what we are as the outcome of vectors between a unique somatic structure and an equally summation of objects introjected.

In Chapter IV we followed modern theories which attempted to show that (a) there is a long period of integration of the individual perception, apart from associating the perception with anything else; (b) that cell assemblies form in part through individual cells being active simultaneously and repeatedly; (c) that through association organic modifications of some sort take place, lowering synaptic resistence; and (d) that thus in time are formed well structured circuits making possible recognition of simple basic environmental perceptions.

This degree of insight may be adequate to understand basic learning but we are then confronted with three new problems if we are not to have to seek recourse in some kind of

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[9]George Herbert Mead, "Mind, Self & Society", U. of Chicago: 1934, p. 143

animism. First we have to explain or account for perceptual generalization; secondly we need to account for the stability of memory, and thirdly of the instabilities of attention, of a central motive state.

If an angle represents a primary element--a cell assembly--and a triangle an integration--or phase sequence, as Hebb terms it--can we explain how angles add and then synthesize to a new concept?

From the work of Walker and Weaver (1940) it has been shown that when one looks at one angle of a triangle (call it angle A) two things are happening concurrently. First there is a central fixation upon the angle, this constituting the macular or central field and being for the moment under central cortical dominance. Angles B and C lie outside the area of central vision. But secondly there is a motor field, that visible area lying outside the central focus of the macular field where acuity is less intense (thus much as one seeing something out of the corner of his eye). Thus there is central vision and peripheral vision simultaneously. Focus upon A, therefore, likewise stimulates ocular motor tension to move towards B or C.[10]

In its simplest sense, A stimulates 'a', a cell assembly beyond area 17. But likewise does B and C, seen peripherally, stimulate areas beyond: 'b' and 'c'. Given then a degree of localization in cortical structuring, a,b, and c lie in somewhat the same cortical areas and are firing simultaneously. Seemingly therefore these three cell assemblies in virtue of their position and concurrent firing gradually acquire an interfacilitation in which A (a) stimulates B (b) and b stimulates 'a' again or 'c'. This process through continuity and time adds up faster and faster. Thus:

a-b-c-b-a-c-a-b-c . . . . .

In this secuence there is a rapid exchange between the central and motor states. In time, moreover, it becomes more than a rapid interfacilitation of cell assemblies a,b,c but slips in and out of a new order--the phase secuence or conceptual order of t. Thus:

a-b-t-a-c-t-a-b-a . . . . .[11]

In this schema the activity so aroused must be transient; perception of the whole as such is momentary, and alternates with perception of the various parts. Certainly similar phase sequences are forming also and instead of an indifinitely prolonged reverberation, interrupted only by some event outside the system, excitation in one of the assemblies is an unstable ecuilibrium which moves readily into another phase.

Efficient learning will mean that instead of having to see A, B and C, to achieve T, in time only A or B or C will suffice to run the sequence off. Perhaps all this recognition takes or lasts approximately a second.

The different properties of a single sensory event may have separate central effects. This can be conceived as

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[10]Quoted from D. Hebb, op. cit., p. 88

[11]Ibid., p. 99

follows: The infant's hand making contact with two or three objects in succession may receive from them stimulation which differs except in one respect, such as the degree of pressure on the skin as the hand closes. In the schematizing there was only one stimulating object in the environment; in the environment of an actual infant stimulation involves a number of objects and a cumulative effect of stimulation would be established most promptly by the property that several of these objects have in common. Such a consideration actually makes abstraction fundamental in the first learning; thus in the context of one group of stimulating objects, a metal bar on the crib might contribute only to the development of the perception of hardness; but, while contact is being made intermittently with another set of objects, the same bar might contribute to the perception of (tactual) roundness.[12]

At this point the infant's repertoire consists of being able to perceive many complex objects, thus toys, furniture and aspects of more complex unities such as mother and nursery. Further, perception and motor action are hardly separate, as indeed, neither is affect. Thus motor changes may be elicited (1) directly by stimulation of the peripheral retina; (2) less directly through an assembly action; or (3) even more indirectly through a large phase sequence or seccession of assembly actions.

Certain phase sequences will exist from birth or become

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[12] Ibid., p. 105

quickly elaborated. Thus there must be a great amount of facilitation for example in the act of sucking in the complex nursing context. This would first of all involve innumerable basic cell assemblies just to delineate aspects of the nipple--line, angle, tactile qualities--organized and facilitated into other larger sequences involving metabolic hunger patterns, patterns of breast, maternal odor, and so on.

From this schema we need to see also how the infant comes to escape gradually from the tyranny of his immediate environment. Figure 29 attempts to indicate the possibility that

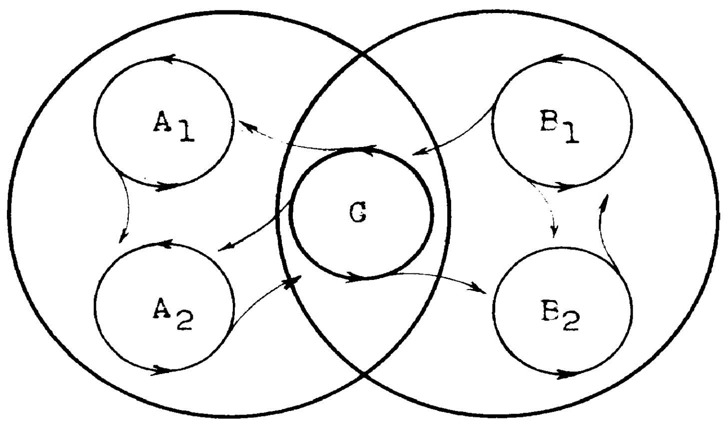

Figure 28. A basis for association (From Hebb).

a subsystem C may act as a link between two systems (conceptual complexes). One concept is represented by A_1,A_2 and C; the second by B_1,B_2 and C. But the two systems have a subsystem C, some quality or complex in common, to provide a basis of prompt association.

Thus the perception of an actual object (that can be seen from more than one aspect--touched, heard, smelled, tasted) involves more than one phase cycle. It must be a hierarchy:

of phases, phase cycles, and series of cycles. Therefore any given environmental press tunes into vast assemblies, these taking merely a second to run off or going on for many seconds. Perception thus acts to initiate through common qualities great organized systems capable of running off on their own, running into new cycles, or turning outward as a feed back or assumptive set towards new stimuli. Thus too, what one sees is based upon the repertoire one brings to it.

The prompt learning of maturity is not an establishing of new connections but a selective reinforcement of connections already capable of functioning. Thus unlike traditional associational theory, two concepts may acquire a latent association without ever having occurred together in the subject's past experience.[13]

> The implication . . . is that a concept is not unitary. Its content may vary from one time to another, except for a central core whose activity may dominate in arousing the system as a whole.[14]

'Emotion' in this approach has no specific meaning. Certainly this approach is against the concept still current that emotion is an awareness, a distinctive conscious process that is quite separate from intellectual process. From Hebb's view emotion may denote, rather, a disruption of cortical organization which could occur because of incompatible phase sequences, an absence of a sensory facilitation that has always contributed or fed into the phase sequence, or in pain, of

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[13] Ibid., p. 132

[14] Ibid., p. 133

massive hypersynchrony being fed into the cortex and caused by tissue lesion--this, again, of disruption of signals constantly feeding into the brain.

Fear may denote too great a gap or lack of correspondence between expectancy and perception; up to a point, however, it would be pleasure. Thus the central facilitation from one phase on the next is usually not specific, since sensory events occur in a variable order, and because of this the facilitation from one phase or conceptual activity is not completely specific, but tends to arouse one of a number of subsequent activities. The flexibility of the phase sequence permits a considerable variation of the sequence without a disturbing effect.[15]

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> The fact is that, descriptively and mechanically, there is no stability in behavior, and habits do not exist. There is stability in respect to goals or results, but none in respect to movement.[16]

We feel that Hebb (& de No) have met this statment of Lecky's head on at the neurological--to boths advantage. That Hebb, in particular, has gone far beyond the confines of empirical, objective evidence there is no denying. Probably this theory has met--in Leckyian terms--the test of consistency and further that it agrees with a wide body of objective and carefully gathered data.

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[15] Ibid., p. 236

[16] Prescott Lecky, "Self-Consistency A Theory of Personality", Island Press, New York: 1945, p. 7

Because of length, we have had to leave many additional aspects of cortical theory out of this outline. One additional aspect however is central to our purpose--that of the neurological nature of consciousness.

In all probability that which we call consciousness arises gradually, imperceptibly along a continuum from cortical function. It is at any level of consideration a superequilibratory, adjustive phenomenon, and neurologically it denotes probably a certain degree of complexity of structuring (phase sequences) in which both central and sensory facilitations merge the central acting to reinforce now one class of sensory stimulation, now another. From another approach it would denote activity of complex cycles and series of cycles with the added provision that current organization may be changed or disrupted by an unusual sensory event. The lumen for the unusual, that is, remains low.

Ahead is the task of correlating neurological organization with its psychological and personalistic aspects, and thence of the world meaningful to that level of organization.

THE WORLD INTO THE CHILD

Cerebral activity comes to overlay gradually control of many organismic adaptive functions but it supersedes a unique and defined basic modality of organization. Thus while impulses ranging upward through the central and autonomic nervous system now frequently pass through the archaic centers and the thalamus, to be dealt with in the gyri of the cortex, they nonetheless are uniquely formulated on the bases of earlier ontogenetic patterns and by the quality of earlier solutions.[17]

Each infant, therefore, meets his social world with his own range of adjustive abilities and established reactive modes. The hyper this and hypo that will command a unique synthesis of any developmental task and each child will read the signs somewhat differently. These basic predispositions are the stuff with which the infant meets head-on the equally set regulations, patterns and provisions of unique families within unique cultures.

We attempted earlier to indicate that thalamic behavior is largely autistic and for the human a largely inadequate level from which to face interpersonal-cultural demands. Unlike many lower animal forms, the young human does not meet his world with built-in biologic predispositions to act purposively given certain environmental clues. The instincts of humans have, through geologic time, surrendered impercep-

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[17] J. Nielson & G. Thompson, "The Engrammes of Psychiatry" Thomas, Springfield: 1947, p. 14

tibly to a huge cortex and accretions of culture. Each infant in effect learns, is taught, his operational instincts and these become a part of his life-long organismic equilibratory system. In effect then man's inborn instincts are drive fragments to be assembled, given meaning, and organized during prolonged childhood by methods of child training and the many facets and levels of education. Need demands (conation), these meet culture in the cortex; in this lies man's hope as an organism, as a member of a society, as an individual. But as Erikson notes, in this process also lies man's limitation. Education inherits a tremendously important task.

> For while the animal survives where his segment of nature remains predictable enough to fit his inborn patterns of instinctive responses or where these responses contain the elements for necessary mutation, man survives only where traditional child training provides him with a conscience which guides him without crushing him and which is firm and flexible enough to fit the vicissitudes of his historical era. To accomplish this, child training utilizes the vague instinctual (sexual and aggressive) forces which energize instinctive patterns and which in man, just because of minimal instinctive equipment, are highly mobile and extraordinarily plastic.[18]

Whether we term energy sources sexual, libidinal, or what not, it matters little. What seem important is that these adaptive, work-capable energies flow outward, modified and filtered firstly by a systematic ontogenetic modality and secondly by an outer world, the latter itself to be internal-

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[18] Erik Erikson, op. cit., pp. 90-91

ized and modified, and in turn, modifying organism through synthesis. The story of child development is writ around objects internalized, of recipes forged and of their consistency and digestibility in terms of organism and in terms of organism within culture.

Active Orality: Exploration of One's World. We noted earlier an initial passive oral phase in which the organism must coordinate and adjust itself to a new economy. With further maturation of the sensory, of the prehensors and of the cortex, the infant is projected into new levels of relatedness. Rapidly he comes into contact--becomes receptive--to new ranges of interpersonal and social affect and rapidly also he introjects and builds upon the objects about him.

a. Organization and Mental Development. Sensory maturation (although it cannot be separated from neuromuscular growth) brings with it a new modality, of an active process of incorporation.

> The eyes, first part of a passive system of accepting impressions as they come along, have now learned to focus, to isolate, to 'grasp' objects from the vaguer background, and to follow them. The organs of hearing have similarly learned to discern significant sounds, to localize them, and to guide an appropriate change in position (lifting and turning the upper body).[19]

In looking upon concurrent cortical development, we can see that the infant is impelled literally into organizing

[19] *Ibid.*, p. 72

this new world, and as the clincher in determining whether it is good or bad, he attempts to reach for it and taste it in his mouth. Mouth, therefore, is still the modal sensory center.

This world of the infant is a vastly different one than that of the older child or adult and we might add an almost inaccessible one to reconstruct. The evidence of it is slim and its very paucity poses a problem in itself.

> For never yet hath any man rowed past
> This isle in his black ship, till he
> hath heard the honeyed music of our lips,
> and goes his way delighted and a wiser man.
> For see, we know the whole tale of the travail
> That Greeks and Trojans suffered in wide Troyland
> By Heaven's behest; yea, and all things we know
> That come to pass upon the fruitful earth.
>
> Odyssey of Ulysses

This song evokes the past, but it is too dangerous to look back and Ulysses had to have himself chained to the mast so that he might have his cake and eat it too. The ambivalent attitude we hold towards distant memories appears to reflect infantile recollections of happiness and pleasure but also a threat to the kind of activity, planning and purposeful thought and behavior encouraged by modern Western civilization.

Freud's well known explanation of infantile amnesia is that the forgetting of childhood experiences is due to progressive repression of infantile sexuality.[20] In his brillant

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[20] S. Freud, "Three Contributions to the Theory of Sex", Basic Writings of ---, Random House, New York: 1938, p. 581

exposition on early thought Schachtel argues that the archaic imagery and sensory synthesis of the infant is also unfit for those types of experiences which the adult consciously makes and is capable of making.

> . . .The biologically, culturally, and socially influenced process of memory organization results in the formation of catagories (schemata) of memory which are not suitable vehicles to receive and reproduce experiences of the qualities and intensities typical of early childhood. The world of modern Western civilization has no use for these types of experiences. In fact, it cannot permit itself to have any use for them; it cannot permit the memory of them because such memory, if universal, would explode the restrictive social order of civilization.[21]

In Werner's terms, the young child's world is not only widely syncretic in the sense in which we discussed, but too it is physiogomically perceived, understood--dynamized--through motor, affective, sensory and introceptive reception. Things perceived in this way may thus appear animate and even though actually lifeless seem to express some form of life.[22]

These early feeling forms of perception are built largely around significant objects in the young child's life. One finds his security closely bound to the minute to minute moods of mother, and her face thereafter is subject to

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[21] Ernest Schachtel, "On Memory & Childhood Amnesia", Psychiatry, 8, 298

[22] H. Werner, "Comparative Psychology of Mental Development", Follett, Chicago: 1948, p. 69

intensive scrutiny and analysis.

These basic feeling states emerge early, before there is much of a polarity between subject and object--and thus of a high degree of fusion between self and mother. This very primitive perception probably subtends typical anthropomorphism. Basically it is more general than the latter and more deeply rooted. Anthropomorphism is itself a definite interpretation of the world, with exceptence of a polarity. Thus Werner quotes Scupin's account of his two year old: "Upon seeing a cup lying on its side, he said: 'Poor, tired cup!'" This comment refers not to an anthropomorphism, i.e., of being tired because like sleeping humans it was on its side, but rather to a deeper intro- and propreio-ceptive feeling state of position and fatigue.

Seemingly we are denoting experiences of early childhood which have escaped as yet the Procrustean bed of culturally conditioned schemata which allows for certain kinds or levels of experiences, forbids others, and omits a great many for which the culture has either no frame of reference or only an unsuitable one. This is a prelogical phase, so to speak, in which perception is tied closely to basic, diffuse biologic sensation. Because this is an extensive subject our outline needs to be somewhat incomplete. Other aspects of primitive sensation need to be noted however.

Schachtel notes that phylogenetically as well as ontogenetically the distance senses, sight and hearing, attain their full development later than the proximity senses--smell, taste and touch. Sight and hearing, he argues, are more highly differentiated and more closely linked up with the human mind than smell, taste or touch.[23] The latter senses, especially smell and taste, are neglected and to a considerable extent even tabooed by Western civilization. "They are the animalistic senses *par excellence*."

Apparently man in his fight for mastery of nature outside and inside himself does not wish to be reminded "that he is not only man but also nature, also animal." Now both pleasure and disgust are more intimately linked with proximity senses than with the distance senses.

> The infant is not disgusted by his feces; he quite likes their smell...The infant, long before he knows and remembers how his mother looks, knows how she smells and tastes. Very likely, angry or frightened mother tastes and smells rather different from good or comfortable mother to the infant, just as she will look very different to him as he grows older.[24]

Under a double pressure of maturation and social taboos very gradually and slowly this emphasis shifts from the proximity to the distance senses. Strong pressure is put upon the baby not to put things in his mouth and cleanliness education is pushed strongly often after the first year. The proximity senses then give way as culture tends to isolate people, to put distance between them and to prevent spontaneous relationships and natural animal-like expressions of such relations.

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[23]Ernest Schachtel, *op. cit.*, p. 23

[24]*Ibid.*, pp. 24-25

This pattern of distance and repression is noticeably stronger in the middle class than in the laboring classes of Western European societies. As Freud noted, disgust arises where the repression has not succeeded completely and a powerful deterrent is needed in order to bolster it.[25]

In growing into childhood the tiny infant, degree by degree, learns to see his world about him not directly as he once did, but by the experience schemata furnished by the culture. And those kinds of experiences not provided for in a culture are repressed, disassociated and remain in the unconscious, lost, to be drawn upon not at all or only for fleeting second in the twilight between sleep and wakefulness, or perhaps during deep fatigue, when higher centers are apt to give way.

We have not dealt yet with this repressive phase of development and see it here only at the perceptive level. In the concluding pages of this outline we will refer to it again in terms of a phase's implications upon the future adult development of the child.

* * * * *

Our toddler by now has a limited repertoire of basic perceptions from which to organize and even begin to abstract upon. Slowly increasing in importance in this tempting new world with its endless beckoning vistas, is a need to organize it. This need is born not only in the rapid maturation

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[25] S. Freud, <u>op</u>. <u>cit</u>., p. 567

of the sensory, prehensors and cortex, but in the gradual pressure put upon the infant as he solves oral tasks and enters a phase of active mastery of many of his own processes.

At this stage society places important restrictions upon the patterns of gratification. Where once these tensions were resolved in the most direct way possible, now satiation must be resolved increasingly by outwardly imposed channels which involve less direct satisfaction, greater delay and hence problems of managing tensions.

Looking, exploring, smelling, etc., are <u>active</u> attempts of a budding ego to organize its world and reduce confusion and are structured around it. Involved in this emerging attempt towards mastery is the need to control objects, to manipulate them, and to project outward that which seems dangerous or is unacceptable within a fusing ego. What is dangerous and what is friendly is dependent to some degree upon what impressions the child derives from his parents and of his own readiness to handle such objects through projection, repression, introjection or personification.

Of the latter, physiognomic perception facilitates personification, so-called, but probably it is not identical with it. Personification seems to appear when the child's need to handle objects in his everyday life as if they were persons comes into being. If he wants something from the immediate object, it inevitably comes to personal life. In coping with parentally induced tensions the child can become angry with it, or sympathetic with it, or punish it.

Personification is ingendered principally by a specific attitude which the child must adopt in dealing with objects of his world in a 'social' fashion.

As noted earlier, the older infant sees objects in his world frequently as some quality-of-the-whole. Thus, as Werner states, small children may recognize a certain animal in a picture book without being able to point out the animal's separate characteristics;[26] and Dix speaks of his two-month old son who stopped crying instantly for his food as soon as the bib to which he was accoustomed was fastened about his neck. Earlier we noted also the conservatism the infant exhibits in his attempt to organize (reduce tension) his world. Early childhood also is a phase of development where the child when left to his own devises handles materials very loosely.

This lability is certainly due in part to the child's ability to shape things much more according to his own shifting needs than can an adult. Werner points out that it can be partially attributed also to a primitive manner of grasping material in terms of 'non-articulated, global qualities,' whereby otherwise important details are quite neglected.[27]

> Especially in the constructive activity of play, e.g., in drawing or in building with blocks, it is often found that the younger child is continuously changing the meaning of the objects as the

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[26] H. Werner, *op. cit.*, p. 112

[27] *Ibid.*, p. 130

> work goes on. The changing lines and contours suggest a changing content to his mentality.[28]

We noted that the senses of taste and smell seem more primitive and more directly representative of the biologic in the infant. Probably early visual experiences are also intimately bound up with equilibratory states, and felt kinesthetically. Thus primitive perception is precisely characterized by its closeness to motor-affective reaction. One perceives by first changing one's body through the influence of the perceived object--and then taking cognizance of this bodily change (an aspect of feed back). For some time, therefore, many perceptions usually considered optic are really kinesthetic.[29]

Likewise, eidetic research has shown that primitive optic perceptions are bound up with motor reactions ready for discharge.[30] Such imagery is not a mere sensory phenomenon, i. e., a positive after-image occasioned by the object; in part it can be influenced by the will and undergo in the process a radical inner change. Eidetic imagery therefore seems to denote an intermediate stage between the perception of a thing and a creative synthesis of an inner and outer world.[31]

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[28] Ibid., p. 130

[29] E. Erikson, "Configuration in Play", Psychoana. Q., 6,

[30] Otto Fenichel, op. cit., p. 36

--Otto Isakower, "A Contribution to the Pathopsychology of Phenomena Associated with Falling Asleep," International J. Psychoana., 19, 234

[31] G. Allport, "Eidetic Imagery", Br. J. Psychol., 15, 239

This tour of the young child's world has been, we realize, very incomplete and perhaps also poorly organized. In general early perception seems to be the mechanical bridge between activity at the neurocortical level and on-going (simultaneous) psychic organization. As to the latter we have anticipated a bit the activity beginning with weaning and including that phase of ego formation psychoanalytics refer to as the anal stage--in Erikson's terms, the eliminative organ and musculature phase.

b. The Early Impact of Culture: Of Meaning and a Setting to Growth.

> Let us take an infant from a luxurious New York apartment and place him on the back of a toiling Western Indian mother and he will become through time as the children and then as the adults of that tribe. His complexion will be lighter and his features different but he will worship Zuni gods and he will see his world through Zuni eyes; the stone and steel monument of his infancy, of street cars and bright lights, will be strange and almost incomprehensible.
>
> If by magic we could tamper with time and snatch an infant from a neolithic mother and place him in a modern home, he will grow up to eat ice cream and cheer at foot ball games. On his way back he will drive his father's car as a matter of course. One day he may visit a museum which has the axe head of his real father. He might laugh, nudge his partner and wonder what his chances are of getting into flying school.

One can say with Linton that "culture must be considered the dominant factor in establishing the basic personality types for various societies and also in establishing the series of status personalities which are characteristic for each society."[32]

> The process of personality formation seems to be primarily one of integrating the individual's

> experiences with his constitutional qualities to form a mutually adjusted, functional whole.[33]

This statement is in close agreement with that of Cantril. Fromm states the case from a cultural perspective primarily:

> In order that any society may function well, its members must acquire the kind of character which makes them <u>want</u> to act in the way they <u>have</u> to act as members of the society or of a special class within it. They have to <u>desire</u> what objectively is <u>necessary</u> for them to do. <u>Outer forces</u> are replaced by inner compulsion, and by the particular kind of human energy which is channeled into character traits.[34]

In moving into a stage of active orality and towards a later phase of early childhood, we focus upon a broader area of human symbioses, an area infinitely complex because of man's ability to construct and continuously elaborate upon patterns of behavior which can be handed on and which in their encompassing scope hold almost complete power over the very meaning of life itself. As stated earlier, social learning is a process of internalizing one's complement of working 'instincts' and one may internalize the highest in beauty the world holds or an insanity from the gates of hell itself.[35]

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[32] R. Linton, "The Cultural Background of Personality", Appleton-Century, New York: 1936, p. 151

[33] ---"The Study of Man", Appleton-Century, New York: p. 466

[34] Erich Fromm, "Individual & Social Origins of Neurosis", <u>Am. Soc. Rev.</u>, IV (1944), 380

[35] Harry Stack Sullivan, "Conceptions of Modern Psychiatry", <u>The First William Alanson White Memorial Lectures</u>, Washington: 1947

In Sullivan's terms, the foci of this process centers within the interpersonal relations of human beings. It is a story of communication between dependent individuals bringing their bio-social needs to others for satisfaction and relief. Society and culture become traditionalized or conventionalized modes of meeting man's collective, interdependent needs. These needs are bio-social because, as the terms implies, they derive in part from organismic wants and in part from socially created wants, which have usually been internalized and accepted by the individual.

Communication links person to person and every person to the group. As such it is the basis and matrix for shared understanding without which social confusion or mental disease results.

> When persons convene, things happen. People have their feelings and thoughts, and both while they are together and afterwards, they act and react to one another. They themselves perceive their own actions, and other people who are present can likewise observe what takes place. Sensory impressions received and actions undertaken are registered; they leave some traces within the organism, and as a result of such experiences people's view of themselves and of each other may be confirmed, altered, or radically modified. The sum total of such traces, accumulated through the years by thousands of experiences, forms a person's character and determines in part the manner in which future event will be managed.[36]

We note again, however, that though culture (family) works de novo upon each infant, it meets certain very well

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[36] Jurgen Ruesch & Gregory Bateson, "Communication, The Social Matrix of Psychiatry", Norton, New York: 1951, p. 6

established predispositions from which to work upon and further, the range of personality constellations formed, despite tremendous variations from culture to culture, remain much the same.[37]

There is, therefore, in the nature of social behavior a moral imparative. The infant organism is born into a particular family whose members behave in ways similar to, but not identical with, the ways of other members of the total society. These parents not only have the power of life and death over this helpless extrauterine protoplasm, but they have the power of determining what kind of life it shall have.

Thus the infant learns to behave in certain ways within his family group by interacting with his parents. As the infant grows older he learns to distinguish 'good' behavior from 'bad' behavior, 'right' behavior from 'wrong'. Certain kinds of behavior are rewarded by many tokens of his parents' love--smiles, caresses, praise, material rewards--and to be loved is the infant's greatest desire. Ferenczi somewhere remarked that babies who aren't loved don't live. On the other hand, other kinds of behavior evoke punishment--scowls, frowns, blame, perhaps whippings--symbols of the withdrawal of parental love.

Now 'good' behavior is behavior which gains for the infant the love of his parents, and 'bad' behavior is behavior

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[37]Ralph Linton, "The Cultural Background of Personality", _op_. _cit_., p. 148

that results in loss of love. In time behavior X becomes right because one's parents approve of it; and wrong because they disapprove of it. Thus the sense of <u>ought</u> is built up in the child's mind, by making the ways of his parents his ways; by incorporating their ways into himself, as part of his very being. With them as his ideal norms he proceeds to evaluate his own behavior, as well as that of others. In short he has begun to develop a surperego, a symbolic representation, within himself, of that interactional pattern between himself and his parents which is known as identification.[38]

> Now what does all this mean for one's understanding of culture? Cultural behavior is learned behavior, and it is learned initially in the family. The infant learns to behave in order to satisfy his needs and desires; but he learns to satisfy them in the manner that his parents prescribe, because by so doing he not only satisfies his needs and many of his desires, but he also gains the love of his parents, which is one of his greatest desires. In later years this same infant, now grown up, continues to behave as his parents had wanted him to, because the ways they had taught him have become part of himself.[39]

> . . .it is the families way, its patterns and rhythms, the spirit and mood of its living. This is the basis for the. . .process of ethnocentrism which among all people define the obvious 'rightness' of the familiar ways. . .(thus these ways) become not simply habitual, but the standard for individual living.[40]

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[38]M. Spiro, "Culture & Personality", <u>Psychiatry</u>, 14, 1, 34

[39]<u>Ibid</u>., 35, 35

[40]G. Murphy, "Personality", Harper, New York: 1947, p. 846

The quality of this integration within the biological organism is reflected in the synthetical self and its nature reflected out in the form of personality. In Hallowell's terms, man's emotional nature becomes structuralized in such a way that anxiety, guilt and depression become indices to the integrative level reached by the personal adjustments of the individual in relation to the symbolically expressed and and mediated norms of his society.[41] To the final anal phase we have to assign the individual's typical mode of managing his various hominid impulses which his culture will not entertain. Parents require certain kinds of behavior which does not satisfy an experienced need. To secure love, the child must learn to inhibit aggressive impulses. Some kind of adjustment must be made to these otherwise unbearable situations and the adjustments that are made are often of a symbolic-displacive nature, involving usually unconscious mechanisms of repression, rationalization, projection, sublimation, and so on. These impulses, thus, are cleared from the deck and ego is kept on a fighting, adjustive keel.[42]

Although cultural influences upon even the very young are important, they cannot be evaluated with any degree of surety. We know also of course that while cultures may differ strik-

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[41] A. Hallowell, "Personality Structure & the Evolution of Man", Amer. Anthropologist, 52 (1950), 169

[42] *Ibid.*, p. 171

ingly, they are definitely limited as to any range of variation of treatment towards young infants because of the physiological realities and exigencies of that period. Significantly different patterns of child care become visible towards the end of the first year. In a complex such as the Western world there is apt to be encountered a range of child care patterns as wide as between differing cultures themselves.

We argued earlier that what the infant carries from his early orality is a deep somatic trust. We noted that through the oral phase comes an acceptance of one's body and world.

While we cannot construct equations between cause and effect, i.e., while we cannot describe early communication and interpersonal modifications in terms of specific one to one relationships, certain environmental constellations produce rather typical personality configurations.[43]

Further, much of this interaction still centers around the maternal relationship. Apparently tremendous meaning is condensed into the way the child is handled, nursed, etc. D. Burlingham reports that infants are able to pick up the conscious and unconscious emotional reactions of their mothers. She attributes this phenomenon to an extremely well developed ability to perceive or pickup empathic signals on the part of children.[44]

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[43]See Jacob Kasanin et al, "The Parent-Child Relationships in Schizophrenia," J. Neural. & Men. Diseases, 79, 249

[44]D. Burlingham, "Infantile Empathy Towards the Mother", Imago, 21, 429-432

Helene Deutsch makes similar observations on the mothers being receiving stations of their infants' affective impulses. She expresses the opinion that the mother and child gradually develop each a gift for observation that is based upon a deep community between them.[45] Significantly it is this communication (empathy) which breaks down completely in schizophrenic children, or is subject to pronounced parataxic distortion in neurotic children.

Thus through say finger pressure, handling, etc., many levels of environmental effect and affect are conveyed to the child. First, of culture, at its direct or manifest level.

Normative influences, in the form of affectivity as shown by mother to child, are plentiful. In infant care there is generally an abundance of emotional and affectional demonstrations in the form of physically handling the child, of stroking, petting, mimicry, singing, kissing, and the like. This would be in marked contrast to say child care in the Alorese culture where, after the second week, the infant is subjected to sporadic and inconsistent care and attention.[46] It remains to a later point to trace respective effects.

Kardiner sees in the Western patterns pressing invitations

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[45] H. Deutsch, "The Psychology of Women", Vol. II, Grune & Stratton, New York: 1945

[46] Cora Du Bois, "The People of Alor", U. of Minn: Minneapolis: 1941

to the child to imitate and to become accustomed to receiving and giving a large variety of affective responses.[47] Especially from Western middle and upper class groups, there is also close attention to the comforts of the infant--feeding, cleaning and care of his body temperature. Rest and sleep are also carefully guarded and wetness is not permitted to become a source of tension.[48]

At present there is a strong movement to again encourage breast feeding among mothers and also towards self-demand feeding schedules. Here and there a pediatrician still holds out, but in general, Watson's doctrines are dead.

In the lower socio-economic groups especially, weaning is apt to be late and a gradual process.[49] Perhaps also among this rocking will be more important; cleanliness would be less important and with it less handling and inadvertently induced eroticism. Generally among all class groups of the Western cultures the infant will receive nursing care almost solely by his mother--this in contrast to, say, a Hopi.

On the face of these normative surface patterns what may we conclude towards psychic synthesis at this level?

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[47] Abram Kardiner, "The Psychological Frontiers of Society", Columbia, New York: 1945, p. 346

[48] Ibid., p. 346

[49] See C. S. Johnson, "Growing Up in the Balck Belt", ACE, Washington: 1941

In the first place, such attention decreases the amount of tension the infant must cope with. Seemingly also it serves to build up in the infant a powerful constellation of the larger, resourceful and powerful parent who is always capable of relieving any tension in the event of need.[50] Thirdly, as a result, the child's acquaintance with his environment is facilitated, the traumatic influences of that environment diminished, and a foundation is laid for the development or stimulation of curiosity, investigative manipulation of objects in the outer world and some confidence in handling them.[51]

For Kardiner and Erikson, at this point there is also a foundation laid for the idealization of the parent, especially for the mother and the functions associated with her.

In contrast, for the child of Alor neglect, being shifted from one mother surrogate to another, means that during the helpless period the maternal care fails and failure in this instance can, in Kardiner's words, only "be interpreted to mean that ego resources are not aided, but the effects of continuously unsatisfied tensions are permitted to take their toll in defensive inhibitions and confusions. The parental image as a reliever of tensions from hunger or other sources

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[50]Abram Kardiner, op. cit., p. 346

[51]Erik Erikson, "Childhood & Society", Norton, New York: 1950, pp. 267-283

--Abram Kardiner, op. cit., p. 346-348

does not have a chance to form."[52]

In the Western cultural complex we have seen that the concept mother looms as a large one. Love of mother, however, as Kardiner,[53] Erikson,[54] and Lundberg and Farnham[55] have shown has become in Wiley's term 'momism', indicating some form of overcompensation and thereby hangs a tale that all is not well. Of this later.

Close and careful handling such as has been outlined is also a basis for idealization of the super-natural and the foundation for strong superego formation.[56] It appears also that good oral care is associated with passivity and introversion. If one does not have to struggle to provide needed supplies, one need not make the effort.

In the culture of the Yurok's, a western American Indian tribe organized around the salmon economy, the child is forced very early and propelled with great energy into the anal phase. Here, apparently, we have an oppose trend and the

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[52] Ibid., p. 147

[53] Ibid., p. 347

[54] E. Erikson, op. cit., p. 247

[55] F. Lundberg & M. Farnham, "Modern Woman, The Lost Sex" Harper, New York: 1947

[56] A. Kardiner, op. cit., p. 347

--See also Robert Odenwold, "The Spiritual Developmental of the Child, With Emphasis on Problems of Madadjustment in Children and the Emotion of Fear", J. Child Psychiatry, 2, 2 161-167 culture is in part built around avoiding the snares of the "dangerous, scheming women". Having suffered oral privation Yuroks for the rest of their lives divert tremendous amounts of energy towards obtaining disguised forms of oral gratification.[57]

For the Soiux child,[58] and Comanche,[59] the oral phase is similar to that of the infant in the Western culture. Even more so than in American patterns--and certainly unlike the Yuroks--infants are given freely of the breast and oral gratifications are satisfied. While we make a case for passivity in the Western cultures, certainly the Comanche or Sioux as they formerly lived were anything but passive. This notable difference in later character is accounted for seemingly by differences in infant nursery patterns. These differences are evolved in later phases and will turn about the continuities and discontinuities in cultural patterns. This point will be developed in the next section.

In this discussion of the importance of cultural patterns during orality, we are assuming that orality is the foundation for the emergence of ego patterns and that these early

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[57] Erik Erikson, op. cit., p. 155

[58] Ibid, P. 154

[59] E. A. Hoebel & R. Linton, "The Comanche", The Psychological Frontiers of Society, Columbia, N. Y: 1945, p. 71

--For a variation on a similar theme see L. Thompson & A Joseph, "The Hopi Way", U. Chicago: 1947, pp. 50-54 patterns permeate future structure. The clinician can usually spot almost with ease what he terms an oral character. Further, clinical exploration usually confirms some form of fixation or regression to this early mode of adjustment based upon some early deprivation. The entire psychoanalytic concept of orality has been explored statistically by Eisler. She concludes that "these results confirm the psycho-analytic theory of oral character types in most of its essential aspects."[60]

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In attempting to survey the pressures and moulding influences of culture about the infant we can focus largely upon the mother. Although we cannot evaluate a vast panorama of influences as they are funneled through the mother, we can assume that much of the pressures around and within the family do become condensed and filtered into the infant directly and very indirectly in the form of vague feeling tones. We can assume, again, that affect is transmitted without doubt through the ways an infant is handled, how he is picked up, talked to, nursed, etc. and all these independent of any overt cultural form.

Thus this section is concerned with attempting to determine the nature of this well developed empathic communication --something of the messages conveyed--by a summary of the

[60]Frieda Eisler, "The Problem of 'Orality'"& of its Origin in Early Childhood", J. Men. Sc., XCVII, No. 409, p. 769

forces at work upon the mother regardless of how she formally brings up her child. The following account is a distortion in part in that it highlights many elements in the maternal backgraound which work at odds with the mother's need to nurse and raise a child. These are the broadest of generalizations and thus while many of these constellations will be at work, they may be so weak so as to exert an influence so slight as to be unimportant.

In what Riesman has termed 'tradition-direction'--a type of cultural order existing only at present in backward, feudalistic areas, or in primitive cultures, so called--a whole way of life, an outlook on chance, on children, on the place of women, on sexuality, on the very meaning of existence operated and woman's role from birth to death was clearly outlined and given meaning.[61] Moreover, the pace of change was slow and childhood, motherhood, the economic role of women, etc., provided continuity, a stability which generation through generation could rely upon. No matter how humble one might have been, no matter how demeaning the career of house-wife might have been, one belonged, one had a place that was defined and one had a role to follow.

Americans and other Western groups have hardly had even a second hand acquaintance with the traditional-directed society. The American's world is one hastly constructed from a

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[61]David Reisman, "The Lonely Crowd", Yale, New Haven: 1950, p. 11

wilderness by an 'inner-directed' man, a man spun from the complexity and change of "increased personal mobility, by a rapid accumulation of capital (teamed with devastating technological shifts), and by an almost constant expansion."[62]

> . . .the source of direction for the individual is 'inner in the sense that it is implanted early in life by the leders and directed towards generalized but nonetheless inescapably destined goals.[63]

In contrast to the tradition-directed society where attention is focused on securing <u>external behavioral</u> conformity, an inner direction is beamed towards situations involving complexity and change which a code cannot encompass in advance. A dilemma is solved by channeling choice through a rigid, highly individualized character.

For the future inner-directed mother, a strong super ego is developed--a psychological gyroscope[64]--by her parents that is set spinning and internalized into the young ego structure. For the inner man, controls, ambitions, moralities, are gradually <u>internalized</u> and carried into maturity.[65]

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[62]*Ibid*., p. 15

[63]*Ibid*., p. 15

[64]*Ibid*., p. 16

[65]Hsu contrasts this beautifully in his comparison between the Chinese-Japanese and German and American patterns of socialization. Common to the former are patterns of external controls rather than internal, super ego dictates. Germany and the U. S. are selected as examples in which repression as a mechanism has greater weight than suppression. Francis Hsu, "Suppression Versus Repression", *Psychiatry*, 12, 3, 223-242

With a strong internal voice, American women, daughters of immigrants, frantically tried to emulate standards of conduct which they had not learned as small children, i.e., standards newly forged in political revolution and in virgin soil. And with the old, then, was mixed a new. Old Anglo-Saxon patterns of puritanism and frontier patterns fused into new patterns of child training beamed towards avoiding any weakening of potential frontiersman by any protective maternalism.[66]

Erikson argues that there was a need in our history to send young men, strong and self relient, out early.

> (The) much-maligned puritanism, we should remember, was once a system of values designed to check men and women of eruptive vitality, of strong appetites, as well as strong individuality.[67]

With stratification, an ending frontier and flow of immigrants, industrialization and female emancipation, this balance has been upset. Puritanism (et al), its need gone, became defensive, and as Erikson pointed out, when a system becomes defensive or functionless it becomes rigid and tends to be an end in itself.

Max Otto in his little volume Science and the Moral Life describes what is always the fundamental issue:

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[66] Erik Erikson, *op. cit.*, p. 253

[67] *Ibid.*, p. 253

--See also Ashley Montagu, "On Being Human", and, H. Cantril, "Towards a Scientific Morality"

> Morality is a means for the satisfaction of human wants. In other words, morality must justify itself at the bar of life, not life at the bar of morality.[68]

Puritanism, then, a need in a frontier world, gradually extended itself into the total sphere of bodily living and into the total mode of interpersonal contacts, compromising as Erikson says all sensuality--including marital relationships--and spreading its frigidity over the task of pregnancy, childbirth, nursing... To a large extent many of our grandparents were born and raised but fail to learn the goodness of sensuality before they learned to hate its sinful uses. "Instead of hating sin, they learned to mistrust life. Many became puritans without faith or jest."[69]

With a frontier gone, with industrialization, shorter hours, of the host of modern conditions summed up under an age of technology--leisure, material abundance--this inner-driven personality, too, was out of tempo. In the pursuit of adjustment to and mastery over the machine, American mothers (especially of the middle class) found themselves standardizing and overadjusting children who later were expected to personify that very virile individuality which in the past had been one of the outstanding characteristics of the American. The resulting danger was that of creating,

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[68]This is essentially also the view of James and later Pragmatists such as Dewey.

[69]Erik Erikson, op. cit., p. 252

instead of individualism, a mass-produced mask of individuality, a shell wearing a great big smile.

The puritan, the inner-directed pile driven, the psychological gyroscope, was too crude and clumsy in a new society with standing room only. In a shrunken and highly interdependent society, agitated by greater contact, increasingly _other people_ became the problem, not the material environment. To keep up with the Joneses what is needed is not a gyroscope, but as Wittfogel suggests, a radar.

> What is common to all other-directeds is that their contemporaries are the source of direction for the individual--either those known to him or those with whom he is indirectly acquainted, through friends and through the mass media. This source is of course 'internalized' in the sense that dependence on it for guidance in life is implanted early.[70]

Thus, both figuratively and loosely speaking, from an inner-directed Tolstoy to a modern group process expert. In summary:

> In her original attributes, then, the American woman was a fitting and heroic companion to the post-revolutionary man, who was possessed with the idea of freedom from any man's autocracy and haunted by the fear that the nostalgia for some homeland and the surrender to some king could ever make him give in to political slavery. Mother became 'Mom' only when Father became 'Pop' under the impact of the identical historical discontinuities. For, if you come down to it, Momism is only misplaced paternalism.[71]

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[70]David Reisman, _op. cit._, p. 22

[71]Erik Erikson, _op. cit._, p. 254

If American men and women have been subjected to formative forces such as these nevertheless each has reacted differently and uniquely for each individual has brought to a constellation of forces his own adjustive potential. Mom is only a generalization. And thus for many women, to all women to some degree of variation, the host of forces at work for or against a satisfying maternal relationship are to some extent modified into central focus or blurred out into isolation or nothingness.

From an historical survey what is the American mother like to day as she communicates and interacts with her baby? If we cannot put our finger on what she is saying, i.e., if we still cannot trace it, can we at least infer something of it from the psychologic states she seems to be in?

From Erikson,[72] from Kardiner,[73] from Lundberg and Farnham,[74] from the writings of such as Clara Thompson[75] and Talcot Parsons[76]--from the historian[77]--comes a summary of mother's present state that seems to carry (again to varying de-

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[72] Ibid., p. 249

[73] A. Kardiner, op. cit., p. 404

[74] F. Lundberg & M. Farnham, op. cit.,

[75] Clara Thompson, "Cultural Pressures in the Psychology of Women", From A Study of Interpersonal Relations, Ed. P. Mullahy, Hermitage, New York: 1948

[76] Talcott Parsons, "Certain Primary Sources & Patterns of Aggression in the Social Structure of the Western World", Ibid.

[77] Morison & Commager, "Growth of the American Republic", II, Oxford, New York: 1942, pp. 375-379

grees along some continuum, and remembering that therefore at one end of the line these constellations will be so weak as not to constitute a problem, to say nothing of being manifest) complex and confused state of ambivalence, of mistrust in her own feelings as a woman and mother--that her 'overconcern' (in part the 'good' care mentioned by Kardiner) does not provide trust, but lasting mistrust.

> But let it be said that this 'Mom' is not happy; she does not like herself; she is ridden by the anxiety that her life is a waste. She knows that her children do not love her, despite Mother's Day and all. 'Mom' is a victim, not a victor.[78]

How does the role of the little girl, of the young women, of marriage build to the role of the new mother? From a complex of historical vectors what attributes, feelings, inevitable ambivalences, joys, does she bring to the muscles in her fingers, to the glands of her breasts and to the chords of her throat?

As a girl she does not have to make a shift from an initial feminine identification to that of the father, as does the boy. With girls the situation is different but not intrinsically or necessarily more favorable. In childhood a girl has the opportunity to mature primarily through identification with the mother and hence introjection of the mother's role patterns. If her indentification towards her mother is strong, she stands the risk of discovering that many

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[78] Erik Erikson, <u>op. cit.</u>, p. 250

of the qualities and ideals which were the focus of her childhood identification and personality development are not the primary assets in solving her fundamental problems and to a degree are even a positive handicap. In her adolescence she must compete for the personal favor of a young man who, in the nature of the influences to which he has been exposed, tends to be deeply ambivalent about the primary role of his future wife and hence severly handicapped in making rational decisions on such matters.[79] This reference to male sexual ambivalence will be discussed in the next developmental stage at which time the Western cultures impose a sharp discontinuity upon infantile pleasures.

The severity and relative abruptness in such a close constellation cannot but, in a large proportion of cases, be a source of much insecurity and aggression against women for being led to believe a certain path was the way to security; against men because it is they who seem to have forced upon women this intolerable fate of having to be two or more incompatible things.

> This undoubtedly underlies the widespread ambivalence among women toward the role of motherhood, which is a primary factor in the declining birth rate, as well as towards sexual relations and the role of being a woman in any other fundamental respect.[80]

Approaching the modern other-directed mother from an

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[79]Talcott Parson, _op_. _cit_., p. 279

[80]_Ibid_., pp. 280-281

economic angle, anthropology is rich in examples of the deeply functional role the woman and child play in many primitive or largely rural societies. Further in the setting and building of this nation the woman had, as we indicated, a tremendous role in furnishing continuity and meaning to what men accomplished. Fromm[81] and Lundberg and Farnham[82] have developed a thesis that, in part, women have lost much of their functional contact with man. From his partner in a common struggle to make a life, she has become steadily an ornament. Industry has been taken out of the home and with it the husband. Further, modern technology, as has been pointed out so often, has so simplified the woman's domestic tasks that she is left with an emptiness which is further aggravated in that her domestic creativity is often less appreciated and even degraded by the culture.

If one adds to this the picture, already mentioned, that the sexual life often is still dominated by puritanical ideas, the position of the present-day wife who tries to live in the traditional manner cannot but be one with a constant narrowing of interests and possibilities for development.

Increasingly, the woman finds herself without an occupation (for motherhood, too, to some extent is demeaned and

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[81]Erich Fromm, "Escape From Freedom", Rinehardt, New York: 1941

[82]Lundberg & Farnham, op. cit.,

shot with cultural ambivalence) and with an unsatisfactory emotional life.[83] Probably one must attach, as part of modern woman's ambivalence, the fact that culture is beginning to offer her something positive in an opportunity to join in a life outside the home where she may compete with other women, and even with men in business. But as in any transition, there are still rough steps to be taken and too often this all looms like the bright lights to the country girl, while pregnancy foredooms one to the dullness of the traditional role.[84]

Further, in moving into the world, the woman must learn to adjust to men and other women as women (and not through masculine protest), which means she must compete while excepting her own feminine sexuality and its peculiar needs.

To an extent, then, the average woman is not a conspicuously maternal type, in spite of the fact that she shows great interest in child-welfare, studies child psychology and regards motherhood as a profession which demands lengthy preparation.

> On the contrary, perhaps, the belief held by our generation that it is necessary to teach women how to be mothers may itself be evaluated as a symptom. The intense conscious interest taken in child psychology, upbringing and motherhood is largely an

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[83]Clara Thompson, "The Role of Women in Culture", A Study of Interpersonal Relations, op. cit., p. 149

[84]Karl Mannheim, "Diagnosis of Our Time", Oxford, London: 1944, p. 38

overcompensation for a want of natural maternal instincts.[85]

Probably our grandmothers worried less. Their children had difficulties, but they took comfort in the thought that they would surely outgrow them in time. Altogether, they took things more lightly, and made less demands either on themselves or on their offsprings. The modern mother has no such refuge. It has been impressed on her so much that the smallest thing she does to the child may be of momentous importance for later life, that education must start with the earliest years, that any childish difficulty of habit may form the basis for later maladjustment or neurosis. Is it little wonder if she feels crushed by a load of responsibility and worry in the face of all the dangers she imagines to be looming ahead? Solemn warnings not to trust to one's own spontaneous reactions and instincts are only too likely to give color to the neurotic individual's doubts in himself; and the indefinite and contradictory nature of so many recommendations is enough to make even a normal woman feel worried and confused.

On the basis of a quantitative study of 78 preschool children suffering from various forms of infantile anxiety fear, and considering both prenatal (and natal) and neonatal factors, Despert concludes that early anxiety (apathy,

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[85]Melitta Schmideberg, "Environmental Therapy Based on Psychoanalysis", J. Child Psychiatry, I, 3, 344

excitement, sleeplessness, refusal to eat, neuro-vegetative disturbances, etc.) in infants may be referable to maternal disturbances of an emotional nature following birth.[86] The work of Fries on unselected newborns brings supporting evidence of the importance of maternal attitudes in the breast-feeding situation.[87]

In conclusion one must also expect that many women will bear children, not through accident, but to prove their own femininity, doubted and so culturally unsupported.[88] Basic rejection of children is often, in such cases, covered with over-protection, of making a cult of child care and with it of resulting over-manipulation and family tension. One unhappy mother brought her equally unhappy daughter to the author for psychotherapy. Her first question revealed so clearly a rather typical and pathetic parataxic circle. She was concerned not about her daughter's anxiety and fear, but whether her I.Q. was high enough!

These brief observations perhaps are some of the facets in our culture which may be relavent at the oral stage. To the extent that they are significant tensions, they may work towards contributing an initial picture of the world as a

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[86] J. Despert, "Anxiety, Phobias, and Fears in Young Children With Special Reference to Prenatal, Natal, and Neonatal Factors", Nervous Child, 5, 1, 8-24

[87] M. Fries & B. Lewi, "Interrelated Factors in Development: A Study of Pregnancy, Labor, Delivery, Lying-in period & Childhood", Am. J. Orthopsychiatry, 8, 726-752

[88] C. Thompson, "The Role of Women in Culture", op. cit., 154

place short of supplies, a place where one must learn, too early, to grub and dig, where one cannot let go and with a feeling that one's needs are important to others and will be met, where one cannot let go to restructure psychically, in order to keep up with organic maturation which propells organism into larger worlds demanding stronger ego.

Conversely, to the extent that a woman may approach her infant child with feelings that her life in the eyes of herself and her husband, her peers, is rich in purpose and meaning, to the extent that she may focus upon a tiny infant and be biologically satisfied, to that extent she constitutes a giving environment, communicating to it by a multitude of empathic routes security, purpose and pleasure born of somatic equilibration.

Most basically, she is able to receive and accept an infant's projected needs and through giving, satisfy her own in the process. There is no parataxic nonsense in this equation. Nor do we need to appeal to extra bio-social standards. A healthy bio-social, symbiotic relationship is one motivated by intelligent self interest on the part of all involved.[89] Thus there is no need to put mother on a pedestal, for she approaches her role as mother with needs as real as those of her baby.

c. Changing Object Relations: Active Orality. The very

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[89] Daniel Prescott, "Emotion and the Educative Process", ACE: 1938, pp. 60-61

young baby incorporated only to forget, to have ego slip back into id; the older infant incorporates to fend off pain and anxiety and acts to conceptualize and retain towards meeting and anticipating. In this movement from a period of almost effortless satisfaction to a sense of reality and active manipulation is the story of early development and which centers around shifting modalities of object relation.

Ferenczi[90] and Burrow[91] supposed that the newborn infant experiences a sense of omnipotence, having everything he wants and with nothing further to wish for. More likely, however, no necessity for power or effort enters these earliest relationships and the infant merely gradually slips into situations where he feels tensions and where he concurrently devises ways for coping with them.

Further patterns of solution will correspond (result from) the total of his psycho-biological maturity. Thus, as we shall see, cortical conceptualization, motor maturation and memory are ever more adequate tools by which to cope with more complex environmental fields and individual needs.

Ego has, then, two tasks: not only has it a defensive role of warding off attacks from environment, but also of making what use it can of the opportunities offered by the

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[90] Sandor Ferenczi, "Stages in the Development of the Sense of Reality", From his book Sex in Psychoanalysis, Brunner, New York: 1950, pp. 219-220

[91] Trigant Burrow, Cited in J. MacCurdy's "Problems in Dynamic Psychology", Cambridge, London: 1923, p. 188

environment for the fullfillment of its needs and wishes.[92] One can also characterize these changes occuring through maturation as a focus from initial autoerotism (i.e., a primary narcissistic state without objects) towards an interpersonal and object sphere.[93]

Silverberg proposes an initial szhizoid modality as the first maneuver. Here the attempt is made to remedy utter helplessness by abandoning the effort to manipulate external reality and by manipulating in its stead one's own psyche, wherein one is all-powerful.[94] If this concept is seen as existing as perhaps a dominant mode along with others, it may have some use. Thus existing along side it, and gradually coming to fore, would be a kind of transference maneuver which does not deny reality so completely.

> It seeks rather to discover in external reality or to recreate there the same situation which has previously found one utterly helpless, with the purpose <u>now</u> to find or to learn how to find in oneself the resources previously absent or, if present, unutilized--resource which will ensure mastery over the previously baffling situation.[96]

This mode probably coincides with the infant's relative

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[92] W. Silverberg, "On the Origin of Neurosis", <u>Psychiatry</u>, 7, 111-120

[93] O. Fenichel, <u>op</u>. <u>cit</u>., p. 83

[94] W. Silverberg, "The Schizoid Maneuver", <u>Psychiatry</u>, 10, 383-393

[95] W. Silverberg, "The Factor of Omnipotence in Neurosis", <u>Psychiatry</u>, 12, 12

neuromuscular inability in the later oral stages. He must rely upon such a maneuver to the extent that his ego is unable to handle by direct manipulation of reality his total needs. Active orality, i.e., of actively incorporating or taking in, in turn, coincides with the ability to make a more active approach by using emerging teeth and superior motor-sensory coordination in biting into or bitting pieces off things.[96]

> The eyes, first part of a passive system of accepting impressions as they come along, have learned to focus, to isolate, to 'grasp' objects from the vaguer background, and to follow them. The organs of hearing have, similarly, learned to discern significant sounds, to localize them and to guide an appropriate change in position. (This would correspond to Erikson's second stage. See Figure 26).[97]

Abraham denoted this active wilding of one's musculature as an ambivalent phase which appears after the eruption of teeth,[98] and as Erikson sees it as the point where 'good' and 'evil' enter the baby's world.[99] Both see a dilemma here because erupting teeth, they feel, create a need to bite in order to reduce tension and gnawing irritation at the gums.

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[96] Erik Erikson, op. cit., p. 22

[97] ---, "Growth & Crises of the Healthy Personality", op. cit., p. 16

[98] Karl Abraham, "A Short Study of the Development of the Libido", Selected Papers, Hogarth, London: 1927, p. 231

[99] E. Erikson, Growth & Crises, op. cit., p. 17

For these two writers this adds a social dilemma to a physical one. At this stage the mouth is still the pleasure seat and if breast feeding lasts into the biting stage it is now necessary to learn how to continue sucking without biting so that the mother will not withdraw the nipple in pain or anger. One is forced to question the seriousness of this dynamic in terms of its formative effects especially in view of the fact that many infants are not breast fed. We have not been able to demonstrate as yet any clear cut differences in personality between breast fed children and those fed by bottle.

Teething and the potential danger it affords towards a state of basic trust is, however, the overture to weaning, itself a carrier of greater ego formative implications. In these developmental transitions there is the greatest need to protect, as Erikson aptly terms it, "a mutual regulation", established during the passive oral phase. The phrase seems apt because it recognizes properly a fact that in many of the tensions which develop in this and later periods, there is, in Western cultures, to some degree a lose of mutuality, of faith by parents and culture and effecting, in turn, the infant in his own ego formative struggles.

Parents and culture must meet these stages by seeing to it that as little as possible of the original reciprocity is lost in the process of moving from phase to phase. Weaning therefore should not mean sudden loss of the breast and loss of the mother's reassuring presence. A drastic loss of accustomed mother love without proper substitution at this time can lead to acute infantile depression or to a mild but chronic state of mourning which may give a depressive undertone to the whole remainder of life. But even under the most favorable circumstances, this stage leaves a residue of a primary sense of evil and of a universal nostalgia for a lost paradise. Again, in nature there is seldom sudden great change but transition and evolvement.[100]

From the perspective of an ontogenetic summary, orality, then, is that momentous transitional phase linking an organ within organism to organism within a vast bio-social sphere. It is a phase in which culture, rather than instinct, builds towards greater differentiation, a mode of conduct (adjustment), self-discovery and self-realization --and self-acceptance. Through it an immature system is encouraged into its own, of overcoming an almost total passivity and into action. It is a phase in which the adventures of the sensory arouse a feeling of familiarity, coinciding with a feeling of inner goodness. "Forms of comfort, and people associated with them, become familiar as the gnawing discomfort of the bowels." There is a faith that mother can disappear because she will come back. There is a foundation for ego of an internalized goodness and security of objects around one--of an inner

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[100]Erik Erikson, "Childhood & Society, op. cit., p. 75

population of familiar and predictable things and people, and smiling crowns this development.[101]

> In childhood, of course, fear and anxiety are so close to one another that they are indistinguishalbe, and this for the reason that the child, because of his immature equipment, has no way of differentiating between inner and outer, real and imagined, dangers; he has yet to learn this, and while he learns, he needs the adult's reassuring instruction.[102]

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[101]Erik Erikson,"Childhood & Society", _op. cit._, p. 75

[102]_Ibid._, p. 364

HERE I AM! NOW THIS IS MY WORLD TOO!
CONTROL & COMMUNICATION

> (Everything which) directly concerns human nature, everything that can be known of the human mind and body, physiology, medicine, anthropology and psychology, is pertinent to moral inquiry. Human nature exists and operates in an environment. And it is not 'in' that environment as a coin is in a box, but as a plant is in the sunlight and soil. It is of them, continuous with their energies, dependent upon their support, capable of increase only as it utilizes them, and as it gradually rebuilds from their crude indifference an environment genially civilized.
>
> ---John Dewey[103]

If there be any universal laws true to all life, they must have as their heart the tendency of life organization to reach out everlastingly: horizontally into new reaches of space[104] and vertically into new ranges of complexity and majesty.

> Because of the restlessness of the mind of man, change has been the most characteristic feature of human life--at least during the historic period. Civilizations have not often stayed static. They rise and decay, and only continue so long as they can achieve a reasonable balance between stagnation and change, between Yen and Yang, the static and dynamic principles of life.[105]

Life fulfiling itself is majestic; it is power, power of basic cells weaving and endlessly synthesizing energy and organization to levels, in their baffling complexity, we can only reconstruct in terms of philosophical analogy.

Mind imposes a tremendous strain upon the reconstructive

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[103] John Dewey, "Human Nature & Conduct", Modern Library, New York: 1930, pp. 295-296

[104] L. Eisley, "The Great Deeps", Harper's, 12-'51, 75

abilities of the scientist. Yet we cannot agree with some mechanistic or materialistic outlooks that mind is as a mere shadow of material forces. This seems to be Woodworth's position.[106] Nor can we however agree with such a philosopher as Santayana, who states that:--

> . . .it (mind) can obviously give no aid or direction to the unknown mechanical process that produced it and that must realize its own prophecy, if prophecy is to be realized at all.[107]

In Mullahy's terms, there is no special mystery about about man or about mind, "but man and mind are harder to understand and harder to explain."[108] Psychological phenomena are neither spiritual substance nor ghost-like excrescences of matter. They are activities or functions of the organism dwelling in communal existence with its environment. So-called physical and mental functions are phases of a single life-process. Hence neither the 'material' nor the 'mental' or 'spiritual' take primacy. They are conjunctive phases of life experience and behavior.

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With weaning, with a gradual imposition of culture into the areas of bodily control, the task of mind (ego) becomes

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[105] J. A. V. Butler, "Man is a Microcosm", op. cit., p. 158

[106] R. Woodworth, "Contemporary Schools of Psychology", Ronald, New York: 1948

[107] George Santayana, "The Life of Reason: Reason in Common Sense", Scribners, New York: 1922, p. 215

[108] P. Mullahy, "Will, Choice & Ends", Psychiatry, 12, 4, 382

one of attempting to synthesize these external demands with instinctual pressures and maturational processes. The anal phase (or stage of muscular control) is the second major hurdle, so to speak, new life faces. His first problem, caused by his being born, involved first contacts and the developing of a life mode within a new sphere. The second hurdle is a social one: it sets the stage for <u>how</u> the infant will relate to his fellow man, of whom he is dependent upon for his needs being met. In the vector of this early synthesis is forged a concept of self and something of a young life's future social role. It is very likely (although further research is needed) that the so-called patterns of orality and anality and of their solution modes, these, early in life forge and lock the basic structure of the self, and that what follows is probably a fugue with variations upon a basic theme. And obviously--to follow a bit further with this metaphor--the better the original theme, the richer are the variations which can be built upon it.

As we will attempt to outline in this section, the critical equation in this beginning of the social animal is in the conditions under which human energies become elaborated, in the conditions under which the infant is required to give up gradually immediate and direct satisfaction and expression of somatic or instinctual gratifications.

The degree or success of this bio-social synthesis is dependent in large part upon the role of love, for it is love which enables the young child to give up lesser gratification for the greater attraction of belonging, being appreciated, being valued and integrated within systems of larger organization which give life the only meaning it can possibly have.

Love, or affection, is not something mystical or 'romantic', although perhaps these latter qualities are derived from it and are elaborations upon it. Affection denotes acceptance on the part of one's environment that one's needs are good, have a place and are expected. A child defines himself as he projects his needs against the gamut of introjections--glances, tones of voice, etc.--of significant others. The mother who indicates disgust for her little child's 'accident' indicates one thing; a mother who communicates disgust for the child himself (and it cannot be long hidden) because of it is quite another. The one reflects primarily the voice of culture; the other is rejection.

Love serves, then, as a kind of catalizer. It is the agent which brings together harmoniously in man's big brain the vague instincts and energy patterns from the somatic neural centers and the accretions of his cultural acheivements. It is connotive of man's deep, all-abiding unity with certain others, and of his utter meaninglessness apart. Affection reflects binding and relatedness within wholisms. The state of mature loving attends equally to the needs, self-interests of all direct and indirect participants. It is suitable substance from which stable and rich societies derive from and depend upon.

Parenthetically, love serves to reflect what must be a dominant communicative and interpersonal modality in culture and in our own culture. It is time that this deeply cooperative aspect be emphasized as against the competitive, survival of the fittest philosophy.

> Widely dispersed knowledge concerning the important role of basic cooperative processes among living beings may lead to the acceptance of cooperation as a guiding principle both in social theory and as a bases for human behavior. Such a development when it occurs will alter the course of human history.[109]

And Montague's thesis, too, is a view that cooperation, not competition and conflict, is the law of life.[110] As with Sullivan, and in the later position of Horney,[111] neurosis now becomes a disturbance in one's relations, of self, to others.

A second cultural misconception follows the first and is especially relavent to this second ontogenetic phase. In a culture which shows pronounced inability to pattern satisfactorily man's functional relations with others (as seemingly we do) it must follow that there will be great confusion and ambivalance around man's modes of communication.

One major example: In Western culture, perhaps nothing is so misunderstood and manhandled as man's sexual needs and drives. Sexual yearnings reflect a biologic need to relate to others, and ultimately the need to perpetuate the species. But, sexuality may be conceived as in the first sense, as the broad, all-embracing need to communicate at its many levels. And from this conception it is, of course, absurd to visualize the infant or young child as sexless, for of course they are not. What attracts and horrifies parents and teachers as sexual precocity or abnormal behavior is to be, in effect, a partial disruption of interpersonal relations and denoting specifically a heightened striving towards reequilibration.

Probably sexual expression stems and elaborates out from the infant's most fundamental relations with its mother. Originally he was a part of her, and this initial unity is evolved only gradually-taking its form of expression from a maturating neuromuscular system and cultural demands. Great swellings of pleasure (internal balance) are associated with nursing and being held and these perhaps serve as the nexus for later modes of communication.

In this concluding section we are concerned with this second modality of relatedness and communication. In how the infant is taught to regard his own processes and needs so he relates to others, and so the stage is set for his life pattern as a social being.

<u>Out of the Interpersonal Nexus Autonomy</u>.[112] If Freud first discovered the correlation between the anal phase of growth and personality, it is probably Erikson largely who applied

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[110] Ashley Montagu, "On Being Human", Schuman, New York: 1950

[111] K. Horney, "Neurosis & Human Growth--The Struggle Towards Self Realization", Norton, New York: 1950

[112] E. Erikson, "Growth & Crisis of the "Healthy Personality", <u>op</u>. <u>cit</u>., p. 11

it so effectively to the ontogenetic scale. Orality seems to correspond to basic trust, or mistrust. Anality corresponds with autonomy, or to its failure as shame or doubt.[113] Benjamin Spock in his little handbook gives us many clues as to the activities of the one and two year olds. These are infants confident in their new world and now eager to explore it with their brand new neuromuscular equipment. They are feeling their oats; experiencing a "passion to explore; becoming more dependent and more independent at the same time; dropping and throwing things; biting humans; learning to control their own aggressive feelings", and so on.[114]

These are toddlers born into a world which has met their physiological need projections. These are infants now projected by neuromuscular maturation into a new cortical-cultural sphere where once again a new level of self is pyramided a-top one older, less complex. Here, perhaps above all other ontogenetic stages, is personality forged in the muscular projections of the infant against the constellation of unique cultural and family provisions for these individual equilibratory maneuvers: of how one learns to control his bodily processes; then of how one learns to regard them; of how one learns to control his drives to move, to explore, to build; them how one learns to regard these and incorporate this acquired, introjected feeling into one's self. Here is

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[113] Ibid., p. 21

[114] Benjamin Spock, "The Common Sense Book of Baby & Child Care", Duell, Sloan & Pearce, New York: 1945

the beginnings of human equilibratory effort, of abstract, complex associational cortical synthesis hammered, guided, given meaning, in large measure, by the human man's accretional constructions through time; here, largely, a child is clothed in his suit of conscience, of shame, of creativity, of his sense of relatedness to others--of his humanness.

Thus with new powers come concomitant culturally imposed needs to control, of retention and elimenation,[115] of something of values, of being forced to deal with shame, and of synthesizing these into a newly forged 'I'. In Erikson's terms, from a sense of self-control without loss of self-esteem comes a lasting sense of autonomy and pride; from a sense of muscular and anal impotence, of loss of self control, and of parental over-control, comes a sense of doubt and shame.

Each culture handles this second phase differently. Further, within cultures sufficiently heterogeneous there are apt to be wide class variations, themselves as significant for personality formation as broader cultural differences. This phase of self formation, therefore, is quite meaningless apart from a consideration of active socio-cultural forces.

Muscular maturation sets the stage for experimentation with two simultaneous sets of social modalities--holding on and letting go (Erikson). What kinds of affects these

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[115] E. Erikson, "Growth & Crisis", op. cit., p. 23

modalities become linked with, depends upon the concepts of self fed into the child by significant envirnomental objects. "To hold can become a distructive and cruel retaining or restraining, and it can become a pattern of care; to have and to hold."[116] Likewise, to let go, too, can be either a letting loose of hostile and destructive forces, or it can become a relaxed "to let pass" and "to let be."

Cultural pressure and the awareness of it on the part of the young child implies control. Depending upon the affectional climate, the young ego has the power to adjust along something of the following directions:

a. Changes in the perception of the outward impulse

b. Alteration of the executive functions related to the impulse

c. Alteration of the feelings to those who impose the discipline

d. Changes in the relations to the activity and to the objects who stimulate it

e. The rise of new conscious attitudes about it and new behavior from the resultant constellations[117]

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Since culture so largely defines, sets limits and qualities, to the interpersonal nexus and its self resultant, it again becomes necessary to look at the significant others, the infant's parents (for now father too becomes directly,

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[116] *Ibid.*, p. 25

[117] A. Kardiner, *op. cit.*, p. 353

rather than indirectly, important).

We noted earlier Kardiner's argument that good maternal care creates the possibility of introversion as a mode of adaptation. The Alorese indicate that introversion is difficult with a long series of traumatic experiences--of neglect, and the like--and that only pleasurable experiences can be used for that purpose.

Hence if maternal care is good and the attachment to the mother is a binding one, pleasure zones and activities are likely to focus on her. She becomes, as Parsons points out, a very important person.

> In the first place, the affective orientation of the child is concentrated on a very small number of persons, particularly since the family size is likely to be small. Of adult objects, particularly in the early years, the mother overwhelmingly predominates, because the care of household and children traditionaly falls to her, and because the father is normally away from the household at work most of the child's waking hours. This creates a very high degree of sensitivity to the emotional attitudes of the mother and vulnerability to anything disturbing about them.[118]

At the hypothetical point where neuromuscular growth begins to propel the infant in the control-exploratory-anal phase, it becomes exposed to a sharp cross-wind of discontinuity in cultural conditioning. Till now the infant's affectional-erotic projections have found their target in the maternal person. But in the Western patterns free access to mother is gradually and often suddenly denied. The obstacles in the forms of taboos against the continuence of

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[118] Talcott Parsons, op. cit., pp. 275-276

many such projections renders these impulses incapable of direct satisfaction.

> The role of fantasy in adaptation begins here. The mother may be retained as the object of these impulses, and the father and other siblings who become (co) claimants for her attention may be correspondingly hated.[119]

If, however, the young child's relationship with the mother has been strong, and if the family is emotionally capable of preserving a gradualness to what is after all a transitional process, then even a cultural discontinuity imposed upon maturational modes of affectional-communicative relations can be made without lasting damage to future mature adult functioning.

In this process sexual behavior remains where it belongs, a part of a large affectional need pattern, and not functionally disassociated as a process in itself. But in our culture, we need to note, this is a difficult transition to make and we see that even in the normal course of events children seem to go through a kind of latency phase--a period characterized by a frantic flight towards reality--where sexual-affectional feelings are strongly repressed.

> Continuity in sex expression means. . . that the child is taught nothing it must unlearn later. If the cultural emphasis is upon sexual pleasure the child who is continuously conditioned will be encouraged to experiment freely and pleasurably, as among the Marquesans; if emphases is upon reproduction, as among the Zuni of New Mexico, childish sex proclivities will not be exploited, for the only important use sex is thought to serve in his culture is not yet possible to him.

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[119] A. Kardiner, op. cit., p. 353

> The important contrast with our child training is that although a Zuni child is impressed with the wickedness of premature sex experimentation he does not run the risk as in our culture of associating this wickedness with sex itself rather than with sex at his age. The adult in our culture has often failed to unlearn the wickedness or the dangerousness of sex, a lesson which was impressed upon him strongly in his more formative years.[120]

Of the father.

Earlier we connoted to a certain ambivalence on the part of the adult male towards women, and following from that, towards marriage and towards children. For Erikson 'momism' is paternalism misplaced. If mom faced her role to varying degrees ambivalent towards her own maternal side, towards her own sexuality, father too in our culture is subject to cultural inconsistencies for he more than his wife, perhaps, faces the larger socio-economic order and with more directness and less intervening filters.

For our culture the male is caste early into a prepared role that presents tremendous strain in the face of sharp discontinuities. In the oral phase he may remain, as with the infant girl, passive and essentially bisexual. But with the attainment of a modicum of muscular motility he is, as was the future Comanche warrior, propelled ready or not into the role of the aggressive executive. Unlike his early Comanche partner, however, he does not enjoy a continuity of cultural support towards that role. In the Comanche scheme

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[120] Ruth Benedict, "Continuities and Discontinuities in Cultural Conditioning", From A Study of Interpersonal Relations, op. cit., p. 305

village life is geared towards producing a warrior and mother, father and neighbors understood--supported--the aggressive sexual and exploitive behavior necessary towards that end.

For the Western man, emerging sexual-muscular-executive function is given both encouragment (look what that boy can do!) and discouragement (nice boys don't do that). Often father, to varying degrees, must approach his son not too secure in his own masculine role. He is ambivalent towards himself and towards women and authority. Sudden total weaning from the mother figure often destroys an interpersonal adjustment before the young child can reorganize his needs around more symbolic projections.

For the boy there is, then, during the anal phase the often sudden demand to give up close contact with mother, the demand to begin to adjust to stern sexual-affectional taboos, and, in this state, to adjust to a new disciplinary system invested chiefly in a new father figure.

Anal training introduces new value systems, and tension-relieving patterns arise which have a unique configuration and are adventageous to the evacuating function. They become in Western man important psychosomatic channels of expression. Most decisive in this connection are the painful factors introduced in connection with sexual disciplines. The ego receives its definite imprint from the manner in which these psychosexual constellations are formed, involving (a) psychosomatic patterns (terminating in various types of impotence), (b) the lowering of self-esteem,

(c) divided feelings toward partental figures, which terminate the conflict-situation by pathological forms of self-reliance[121] or passivity.[122]

To the extent that these forces are valid, young children emerge into new levels which expose them to new tensions. The infant preoccupied primarily with his mother is fed the happiness, security and tension and anxiety which is funneled through her by the husband and wider world. Increasingly however the infant discovers its father and thereby comes more directly into contact with family and cultural forces. Thus many factors such as shorter working hours, ever more crowded living conditions, traffic, job securities and insecurities (pension rights, union support, better working conditions; impersonalness and growing anonymity), the growing anomie of community and complexity and remoteness of government control, these and many other factors for better and/or worse are brought gradually to the young child, in more direct exposures.

It is worth mentioning the obvious, that if the infant can meet growing social disorganization (if that be the case) or whatever other conflict situation--war, for example --with inner confidence and security derived from the early family situation and not weakened through developmental levels, then they can take a tremendous amount of confusion from

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[121]F. Redl & D. Wineman, "Children Who Hate", Free Press, Glencoe: 1951

[122]A. Kardiner, op. cit., p. 361

socio-economic-political sources.[123]

The effects of sexuality, of its vigor or impairment, are deeply pervasive and funnel into broader ego-interpersonal activity. Restrictions, once imposed, radiate through the personality and act as a synthesizing force and/or place curbs of various degrees of severity upon other impulses and integrative activities--and if severe enough, until the entire structure is permeated by conflict.[124]

If the growth of the self is stunted because of anxieties and fears that stem from feelings of insecurity with which the infant cannot cope, his emotional development becomes fixes at a premature point in the maturation of personality.

> . . .in such circumstances, the child feels driven to seek pseudo-safety in continued identification with, and unremitting emotional dependence upon, parents or their surrogates. In effect this leads to a frustrating state of submission to parental authority, while the coincident loss of freedom and heightened feelings of emotional insecurity and fear engender hostility and rebelliousness. The latter are especially frightening to the child, since they are directed against the very persons on whom he has become irrevocably dependent emotionally, and to whom he must look helplessly for favor.[125]

And what of this final phase of an outline of early

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[123]Bruno Bettelheim, "Mental Health & Current Mores", Am. J. Orthopsy., 22, 1, 76-88

[124]Harold Lasswell, "Power & Personality", Norton, New York: 1948, pp. 165-168

[125]Harry Friedgood, "On the Psychological Aspects of Authoritarian & Democratic Political Systems", Am. Scientist, 39, 3, pp. 435-436

developmental processes? The anal phase opens up a vast new growth era. It does not end in early childhood but, as with all stages, blends into, synthesizes with, and contributes towards new modalities which build towards adult psycho-social patterns. If we may be permitted to draw a concluding line to this second stage, it is at the point where the young child is being propelled by inner maturational promptings into a new social world, a world of language and culture, and hence a world to some extent of Procrustean design. It is the initial phase where the young child is attempting to organize what will be life-long interpersonal-somatic modalities and geared towards this goal by all the synthetical devices of a tremendous associational brain. It is the initial phase subjected to cultural influences and one where organism begins to transcend the limited symbiotic-vegetative scheme of all other life forms for the equilibratory maneuvers of the conscious and reflective, and we hope, of the creative realms. Of its more immediate objectives, perhaps Erikson best sums them up.

> What enduring qualities are rooted in this muscular and anal stage? From the sense of inner-goodness emanates autonomy and pride; from the sense of badness, doubt and shame. . . (At this time) the infant must come to feel that his basic faith in himself and in the world (which is the lasting treasure saved from the conflicts of the oral stage) will not be jeopardized by his sudden violent wish to have a choice, to appropriate demandingly and to eliminate stubbornly. Firmness must protect him against the potential anarchy of his as yet untrained judgment, his inability to hold on and to let go with discrimination. His environment must back him up in his wish to 'stand on his own feet' lest he be overcome by that sense of having exposed himself prematurely and foolish-

> ly which we call shame, or that secondary mistrust, that looking back which we call doubt.[126]

Really, the question which has been resolved by the end of the 4th or 5th year is one centering around the disposition of man's creative potentials and ability to synthesize his own needs within a world he cannot escape, cannot do without. It is a question of how much freedom he can bring to childhood and beyond, of what extent a culture will serve as building blocks or prison bars.

PROLOGUE TO A STUDY OF HUMAN PROCESSES

> Today man on the whole stands in fear of his unconscious mind. But this will not always be so. Man will yet conquer his own unconscious mind as he will society, and when that day comes all art will be different.
>
> James T. Farrell[1]

In the mutation, or by what ever means nature produced man's unique capacities, she handed him a tremendous new sword. Of course today we are still cutting our fingers along its double edges. And the cultural beds we have made all have in common the presence of unpleasant lumps and corners; further they share in a hodge-podge of unplanned design and accident. Perhaps too early man became his own prisoner, of what as a child he took in. The abortive attempts of most early community planners, and of some not so early,[2] were so because they ran aground, ignored, the emotional, subconscious organizational patterns that bind the facets of self.

In the planning in some dictatorships, even these vague strivings are tapped and the little child is caught early. But even the all-knowing dictator ignores a most fundamental insight at the same time as he attempts to rob man of what is his most basic right and elemental potential: his right for self-realization--for freedom, for dignity and growth.

Parenthetically, democracy depends less upon any intellec-

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[1]James T. Farrell, "A Portrait of the Artist as a Young Man", From Farrell's book: "The League of Frightened Philistines, Vanguard, New York: 1945, p. 58

[2]Of such as Lewis Mumford, for example

tual ideology than it does upon producing emotionally mature individuals to keep it on course. The ideology of a free society need not be strained by any abstract dialectic (with its unknown or poorly understood motives), but emerges naturally from the well-springs of maturely functioning human beings. This is not to say that given mature individuals ipso facto a society is blessed by a democratic way of life. It is only that the former is the necessary precursor of the latter. In Lasswell's terms, "It is not too far fetched to say that everyone is born a politician, and that most of us out grow it."[3] For its society, a child brings what earlier it received. In a word, men are seldom born slaves but have slavery thrust upon them through interference with healthy affectional development. For those who have been allowed to develop happily and fully there is little need to deny others.

In the matrix of this problem we seem to have convincing proof of the unity of man with his environment, and of the futility of attempting to understand and guide ourselves by focus upon only one or another avenue alone. Surprisingly enough, however, a science of human development is having a hard time selling itself. Those who tend to it must still wage an uphill fight, for the insight derived from it still

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[3]H. Lasswell, "Power & Personality", Norton, New York: 1948, p. 160

cannot be translated easily into precise intellectual or mechanical prescriptions. Today it is only--sadly enough--a delicate and vaguely defined baby, and those who believe in interdisciplinary effort do so largely in empathic faith in the power that some day may belong to it. It is not like the science of engineering, but so what of that! For all the worship of the practical, the 'engineer' has fallen flat on his face as a naive dilettante against the vast maze and bewildering motion of something he only felt but did not yet see.

Probably human development is not yet even a science. And so what of that? It is a preliminary regrouping of scientific means towards a problem so vast as to yet be only dimly perceived. This is where we are today. And the architects of human development must yet be essentially artists, those voyageurs into the frontiers of the unconscious, of larger process, from which we will depend to tell us where to place our calipers and what to measure and compare with our statistical tools. The present need, one which this outline attempted to explore, is for a framework, a framework broad enough and in sufficient detail from which to project programs and guides at the disciplinary and applicatory levels.

This attempt at an outline has been, as it were, only an early vision, one vision, of what might be required towards the levels of understanding needed. Certainly it is not a prototype. Its values seems to derive from a rapid juxtoposition of hitherto idiographic elements and as a basis for future more adequate arrangements of new elements towards holistic configuration.

Certainly such an attempt is not yet synthesis, but perhaps a realization of some of the problems and obstacles towards it. Having swam about, so to speak, there is experienced an occasional glimpse--of more adequate analogies --of larger fragments of process. Like the infant learning to see, one gets the thrill of perceiving, if only for split seconds, new visions of what man may really be.[4] We would say an experiences deeply satisfying in itself.

> . . . there on the shore
> Of the wide world I stood alone and think
> Till love and fame to nothingness do sink.

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[4] DeWitt Parker, "Wish Fulfilment, Intuition in Art", A Modern Book of Esthetics, Ed. Rader, Holt, New York: 1933, pp. 73-79

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VITA

William Jennings Rowe

Jackson Street
Marshallton, Delaware

Degree to be conferred: Doctor of Education; June 7, 1952

Date of birth: August 25, 1922

Place of birth: Oak Park, Illinois

Secondary Education: Charles P. Steinmetz H. S.
Chicago, Illinois

Collegiate Institutions attended	Degree
U. of Chicago, 1941-45	Ph.B., June, 1945
U. of Chicago, 1945-48	A.M., March, 1948
U. of Maryland, 1948-52	

Publications: Report: Midcentury White House Conference on Children & Youth, Ed. Helen Witmer (Final Chapter): 1952

Positions held

Instructor, Jr. high school, Baltimore County, 1948-49
Fellow, School of Education, U. of Maryland, 1949-50
Consultant, Children's Bureau, Federal Security Agency, For Midcentury Conf. on Children & Youth, 1950
Instructor, School of Education & Child Psychologist, Psychological Services Center, U. of Delaware, 1951-52