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The Design Methods Group

The Design Methods Group is a tax-exempt, non profit association existing for the purposes of communication and education in the areas of design methodology and the application of systematic procedures to designing, especially, but not exclusively, in the environmental planning and design professions. The Design Methods Group is an international organisation counting members in 34 countries. Address correspondence to:

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DESIGN RESEARCH SOCIETY

The Design Research Society exists to establish and promote contact and communication between people involved in research into the process, products or effects of design. Examples of such research include design methods, computer-aided design, user requirements, design participation, design case-studies, design education, technological change and innovation. The Society's interests encompass all design disciplines. Address correspondence to:

The Design Research Society
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With the publication of this issue we mark the completion of our twelfth year of publication. This issue is going to the printer on schedule, bringing to an end a period of difficulty in meeting our schedules due to a variety of reasons. This is something of an omnibus issue, collecting a varied fare of entries. In the body of abstracts from the Turkish conference one can see an interesting microcosmic view of the topics that have appeared in our pages during the first twelve years. dpg

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THE DESIGN METHODS GROUP

The Design Methods Group, founded in 1966, exists for purposes of communication and education in the subject areas of theories and methods of design.

The topics included in the DMG's interest areas are:

Design Methodology, or the study of methods of designing

Design Methods, or the development and application of step-by-step procedures to aid the designer in the process of designing.

Theories of Design and Planning

The membership and publications of the DMG center primarily in the environmental design and planning professions, but this is not an exclusive focus, and engineering, industrial and information system design are represented among the membership and among recent articles published in the journal.

The DESIGN METHODS GROUP is a non-profit organization with tax exempt status in the U.S.A. through the Internal Revenue Service and in California through the Franchise Tax Board.

The DESIGN METHODS GROUP has members in 38 countries and in most states of the United States. The journal, *DESIGN METHODS AND THEORIES*, goes out to a majority of the environmental design schools and libraries in the world.

The primary activities of the DESIGN METHODS GROUP are the publication of the journal *DESIGN METHODS AND THEORIES*, the holding of international conferences on design methods and theories, and the conducting of competitions on various subjects of interest in the fields of design methodology, design methods, and theories of design and planning.

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PUBLICATIONS

The DMG began a sequence of publications in late 1966 that has continued through the present, with several title changes. The title changes are a little bit confusing, we confess, but have moved in the direction of the permanent title now used, DESIGN METHODS AND THEORIES, as being descriptive of the subject matter of the journal rather than of the identity of the publishing organization.

The publications of the DMG have been:

THE DMG NEWSLETTER Vol. 1 (1966-67) - Vol. 5 (1971)

THE DMG-DRS JOURNAL:
DESIGN THEORIES AND
METHODS Vol. 6 (1972) - Vol. 9 (1975)

DESIGN METHODS AND
THEORIES Vol. 10 (1976) - present

In addition to the above regular publications, there have been two irregular publications at various times during the past twelve years. These were the DMG OCCASIONAL PAPERS Numbers One and Two and the DMG BULLETIN, published irregularly from 1972 through 1975. These publications have been discontinued under the pressure of budgetary limitations in an inflationary period.

CONFERENCES

The DMG has sponsored three conferences on design methods and theories.

The first conference was held in Cambridge, Massachusetts, in 1968. Proceedings of this conference were published by M.I.T. Press under the title EMERGING MEHODS OF ENVIRONMENTAL DESIGN AND PLANNING, edited by Gary Moore.

The second conference was held in London, England, in 1973. Proceedings of this conference were published by the University of Strathclyde, Glasgow, Scotland, and are unfortunately now out of print.

The third conference of the DMG was held in Berkeley, California, in 1975. Proceedings of this conference were published partly in the journal during that year and partly as separate publications which are now out of print.

The next conference of the DMG has not yet been planned, and is an open topic.

COMPETITIONS

The DMG has sponsored two competitions, each with a prize of $1,000 for the most outstanding paper submitted on a specified topic.

The first competition, conducted during 1972-1973, was on the topic, "The application of systematic methods to designing." The winner of this competition was Professor Hanno Weber of Washington University, St. Louis, Missouri. This competition was supported by a grant from the Graham Foundation for Advanced Study in the Fine Arts.

The second competition, conducted in 1974-1975, was on the topic, "Design Methods for Energy Conservation in Buildings." The winner of this competition was Professor B. Paul Wisnicki of the University of British Columbia. This competition was sponsored by the National Bureau of Standards.

PARADIGMS

A SUBSECTION OF THIS ISSUE OF THE JOURNAL IS DEVOTED TO THE TOPIC OF 'PARADIGMS' AS SEEN BY AUTHORS REPRESENTING SEVERAL POINTS OF VIEW.

PAPERS IN THIS ISSUE ON THE TOPIC OF PARADIGMS INCLUDE:

PREFACE

The literature of paradigms is an expansive muddle. Since the publication of Thomas Kuhn's The Structure of Scientific Revolutions in 1962, paradigms have been claimed for most disciplines and professions, as if having a pradigm is what distinguishes respectable intellectual enterprises from upstart and disorganized fields. Even specialisms, such as environmental psychology, have been discovered to be paradigmatic. And in planning, several authors have already published papers or have manuscripts in preparation.

Despite this great conceptual bustle, there is no consensus whatever about what a paradigm is. What one writer calls a "paradigm," another dismisses as merely a "theory" -- or a "method," or a "model," or a "set of axioms," or a "weltanschauung." The source of much of the trouble is Kuhn himself. On the one hand, Structure was a brilliant revisionist view of modern scientific history. On the other hand, its analytic method was flawed by imprecision and outright contradiction; by Masterman's count, there are twenty-one distinguishable meanings of the word "paradigm" to be found in the 1962 edition of Structure.

Kuhn was not the first author to discuss scientific paradigms (Merton may have been), nor did he develop all of the ideas which constitute his conception of what one is (he is in Polanyi's debt to some extent). Still, and despite the confusions to which his book gave rise, Kuhn was the first philosopher of science to fashion a powerful analytic scheme from the paradigm idea and then to apply it in detail. And the consequences of looking at modern science in terms of paradigm formation, competition, shift, and decay were genuinely revolutionary. Masterman's claims are valid, that Kuhn's paradigm is "a fundamental idea and a new one in the philosophy of science" and that "it is scientifically urgent as well as philosophically important, to try to find out what a Kuhnian paradigm is."

In the pepers that follow, the paradigm idea and its relevance to planning are discussed from various perspectives. The question, whether a paradigm presently governs the practice of environmental planning, is addressed in the first paper by Mr. Wormhoudt. In the paper by Ms. Kreimer and Messers. Polydorides and Wormhoudt a case is made for a non- or even antiparadigmatic approach to planning, an approach that emphasizes critical awareness of the structure of planning models rather than the invention of new and "better" ones. Professor Churchman's essay discusses the issues that seem to make a systematic practice of planning compelling as an idea, but both in fact and in principle impossible. Lastly, in his review of A Pattern Language, Prof. Protzen questions the validity of Christopher Alexander's advocacy of a way of designing so fundamentally new that it might properly be called, in Kuhn's phrase, a case of "paradigm shift" were it to succeed.

Daniel T. Wormhoudt

PARADIGMS AND THE PRACTICE OF ENVIRONMENTAL PLANNING

Daniel T. Wormhoudt

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The Paradigm Concept:

The framework within which the "paradigm question" is addressed is borrowed from Thomas Kuhn, or more exactly, it is adapted from the definition of a paradigm which has evolved in the long course of controversy between Kuhn and his critics. Kuhn's book, The Structure of Scientific Revolutions, claims a wide readership among scientists, historians, philosophers, and planners. Yet, it is surprising how little understood the notion of a paradigm is. It has become, in the absence of careful reading, a buzz word, an automatic conceptual sanction: thoughts which a speaker or writer can trace to a "paradigm," or which are themselves "paradigmatic," are considered exceptionally powerful and plausible. Margaret Masterman observes that:

> ...actual scientists are now increasingly reading Kuhn instead of Popper: to such an extent, indeed, that, in new scientific fields particularly, 'paradigm' ... is now the 'O.K. word.' It is thus scientifically urgent as well as philosophically important, to try to find out what a Kuhnian paradigm is.[1]

The confusion surrounding Kuhn's work is especially unfortunate because the notion of paradigm to which Kuhn finally came is an original and useful analytic device, and because the controversy which compelled Kuhn to reformulate his original views and increase their precision is itself germane to the issue which I am to discuss. When The Structure of Scientific Revolutions was first published in 1962 it provoked an immediate and violent reaction from a number of widely respected philosophers of science, Popper, Watkins, Lakatos, Feyerabend, and Toulmin among them. It first appeared that the essential issue was Kuhn's general account of the progress of science. It seemed to many that Kuhn had, as Popper charged, exposed the philosophy of science to "relativism" and that he had advanced the nearly heretical view that science is not a continuously heroic and orderly activity. Kuhn, Popper contended with some bitterness, had adopted the Myth of the Framework, "the central bulwark of irrationalism," and he had failed to understand that "the method of science is, normally, that of bold conjectures and criticism."[2] The attacks on Kuhn's book came to a focus in a conference held in London in 1965. John Watkins read the introductory paper and contrasted Kuhn's "view of the scientific community as an essentially closed society, intermittently shaken by collective nervous breakdown followed by restored mental unison" with Popper's well established position that "the scientific community ought to be, and to a considerable degree actually is, an open society in which no theory, however dominant and successful, no 'paradigm' to use Kuhn's form, is ever sacred."[3] Most of the subsequent speakers were also in Popper's camp, and like Watkins, found Kuhn's views objectionable and even dangerous. And even now the debate is far from over.[4]

The validity of Kuhn's general theory is not at issue in this discussion. In fact, to give Kuhn's name to the constellation of ideas advanced in The Structure of Scientific Revolutions may be a mistake, since many of those ideas had been advanced by Polanyi fifteen years earlier.[5] What is of interest here is Kuhn's development of the concept of the paradigm. The first thing to be said about it is that Kuhn appears to have invented it and the second is that is has been, until recently, a very obscure idea.

As to the first point, Masterman has argued that "Kuhn's paradigm" is "a fundamental idea and a new one in the philosophy of

science."[6] So far as I can tell, the claim that the idea originated with Kuhn is true. I have not been able to find the term or the idea in use--except in its technical grammatical sense--before the publication of Structure. It does not appear, for example, in any of the translated writings of Heisenberg or Einstein and a friend who knows the scientific literature of this century far better than I, has not been able to find it elsewhere. According to Meier, the term was in use among scientists exploring applications of general systems theory in the late 1950s, and Robert Merton developed a conception of paradigms within the context of the social sciences in the 1960s. Still, Kuhn's formulation of the idea appears to be the first and most elaborate.

As to the second point, Kuhn's idea has certainly been found ambiguous. For example, in the passage of his address to the 1965 London conference quoted above, Watkins equates a paradigm with a theory. The scientific community is an "open society in which no theory, however dominant and successful, no 'paradigm,' to use Kuhn's form, is ever sacred." Watkins is unquestionably wrong--a paradigm is not a theory--but his misunderstanding may be only partly deliberate because the 1962 edition of Structure has, by Masterman's count, twenty-one distinguishable meanings of the word "paradigm." Still, theory is explicitly not among them. In Kuhn's own words, a paradigm is logically and temporally "prior to the various concepts, laws, theories, and points of view that may be abstracted from it" (emphasis added).[8] Nor is a paradigm a formula, a constitution, a contract, a law or a state of consciousness, to name a few of the interpretations which have been put upon the idea.[9] But then, as with many abstractions, it is easier to say what a pradigm is not than to give an adequate account of what it is.

The issue has been clarified considerably by Masterman and by Kuhn himself in the postscript appended to the 1970 edition of Structure. After considering the various criticisms brought against his theory since its first publication, Kuhn took the position that a paradigm might be best understood as an exemplar. This meaning is the one "paradigm" has always had in grammar--an illustration, such as a table, of the inflexion forms of a particular declension of nouns or conjugation of verbs. For example, the table:

Porter

je porte	nous portons
tu portes	vous portez
il (elle) porte	ils (elles) portent

is the paradigm for conjugating the present tense of the majority of French regular verbs. A person who has the paradigm in front of him or who has memorized it will also be able to conjugate the large number of verbs belonging to the same class, though he will not know what to do with "savoir" and similar infinitives. He requires another paradigm in order to conjugate them. The significant aspect of the grammatical paradigm is that it is neither a theory of accidence (the permissible forms words may take) nor even a set of rules, though a set of rules can certainly be propounded to explicate the paradigm, e.g., "The verb ending for the third person plural, present tense, is '-ent'." The grammatical paradigm is, therefore, logically and, as it turns out, historically prior to theory and rules.[10] Further, the person who has acquired the paradigm will be able to conjugate a great many French words without knowing either a theory or a set of rules. If he is presented with the word "donner" and told that it is a verb, he will be able to work out the six appropriate permutations.

The grammatical usage provides a clear example of what Kuhn had in mind when he introduced the idea of a "paradigm." A paradigm is above all an exemplar, an artificat or a specific behavior, which implicitly establishes an original way of understanding and doing something. As Kuhn finally got around to putting it in 1970, the essence of a paradigm is that it permits one "to group objects and situations into similarity sets which are primitive in the sense that the grouping is done without an answer to the question, 'Similar with respect to what?'"[11] A paradigm is not a weltanschauung, though it presupposes one; it is not a theory, though it almost always provides the materials from which theories will be developed; it is not a set of rules, though it entails the elaboration of rules. The body of theory and methodology which is "discovered" in the paradigm and which is formulated in order to make its application explicit and systematic is what Kuhn, in his 1970 postscript, calls the "disciplinary matrix."[12]

A further example may be useful--the Freudian paradigm. The Freudian paradigm was constructed between 1895 and 1899 and it precedes all Freudian theory, e.g., the theory of infantile sexuality, the general theory of the unconscious, the theory of transference. These theories were literally unthinkable until something had been established which they might validate and explain. That is, they were unthinkable until Freud, discomfitted by the anomalies Breuer's approach left unresolved, devised a new therapeutic behavior, a new way of looking at and treating neurosis. The paradigm was

constructed not only in Freud's ordinary clinical practice but also in the process of self-analysis. Ernest Jones' description of this period in Freud's life may be somewhat inflated in tone, but his claim for the originality of Freud's accomplishment is justified:

> In the summer of 1897...Freud undertook his most heroic feat--a psychoanalysis of his own unconscious. It is hard for us nowadays to imagine how momentous this achievement was, that difficulty being the fate of most pioneering exploits (or, in Kuhn's terms, most paradigm formation). Yet, the uniqueness of the feat remains. Once done it is done forever. For no one again can be the first to explore those depths.[13]

The content of the Freudian paradigm followed from the intuition that the accidental, apparently random and meaningless thoughts which sometimes came to his patients' mind and his own were in fact extremely important in determining the etiology of neuroses. These strange, disconnected ideas had been observed by other psychologists, particularly those such as Breuer who had experimented with hypnosis. But they had never been accounted for. On the contrary, they were dismissed as insignificant byproducts of hysteria in all pre-Freudian psychology. These thoughts, therefore, were exactly the anomaly, in Kuhn's sense, which necessitated the Freudian paradigm.

Freud's intuition provoked both an observation and an inference, the observation being that the anomalous meandering thoughts occurred only when the conscious mind was relaxed, e.g., in dreams, during hypnosis, or when free association could be induced, and that they almost invariably involved the recall of some event or events experienced in childhood. The inference was that there must be "some definite agency ...guiding and determining" these peculiar thoughts and that that agency could not be part of the conscious mind since it was only in states of cognitive inactivity that the thoughts were articulated. It had to be the case that there was something more to the mind than conscious behavior reveals and that, whatever the exact nature of this something more, it was in conflict with the conscious mind. It must contain memories and thoughts which, at least in the case of neurosis, were extraordinarily painful and frightening.

The paradigm which was formed by these considerations evolved slowly and haltingly. Freud had recognized by 1895 that in order to get at the psychic "materials" which were essential to the therapeutic processes he had to bypass or suspend the operations of the conscious mind, but he was not sure how best to accomplish this end. At first, he simply urged his patients to report their fantasies and dreams, or he resorted to hypnosis. But these techniques proved ineffective and by 1896 he had begun to experiment in earnest with the method of free association, requiring his patients to rest on a couch and letting them, with only an occasional question, wander from one apparently isolated and trivial thought to another. Similarly, it was only gradually and hesitantly that Freud came to the conclusion that the method he had adopted evoked thoughts which, however aimless and unconnected they might seem at first, were prompted by specific childhood experiences and that these experiences were sexual in character. Freud resisted this conclusion for some time, perhaps because it was initially suggested by the memories uncovered in the process of his own self-analysis:

> ...in my case at least there was no preconceived opinion which led me to single out the sexual factor in the aetiology of hysteria. The two investigators as whose pupil I began to work on the subject, Charcot and Breuer, emphatically had no such presupposition; in fact, they had a personal disinclination to it which I originally shared.[14]

By 1899, however, Freud felt himself forced to accept the prominence of infantile sexuality in the development of neurosis.

It is important to emphasize the interconnectivity of the method--free association and dream recall--and the analytic structure--the commitment to the idea of an unconscious region of the mind in which are stored the sexually related traumas of childhood. As they were developed, simultaneously, Freud became convinced that one necessarily entailed the other: only a subtly managed course of free association would reveal the contents of the unconscious, and the discovery of the contents of the unconscious was the only possible outcome of a thorough and "genuine" course of free association. The method and the analytic structure are inseparable parts of the paradigm. And it is also important to repeat that it was not until Freud had invented the paradigm (1900, the year The Interpretation of Dreams was first published, is as plausible a date as any) that he, and gradually others, began to devise theories to sanction and explain that paradigm.

The choice of the Freudian paradigm as

an illustration of Kuhn's concept was made because it reveals two aspects of that concept which, at least originally, Kuhn himself did not grasp.

1. The first is that a paradigm is generally a great deal more than an exemplar. In addition to its function as an exemplar, a paradigm usually has what Masterman has rather loosely called a "metaphysical" component, and also a sociological component.[15] The paradigm which emerges in the aftermath of a conceptual revolution of any magnitude has had to compete with a number of alternatives and its particular vitality is due in part to the fact that it imposes a radically new way of seeing things, including phenomena which the paradigm was not explicitly formulated to address. This is true whether one thinks of Copernicus or Darwin, Einstein or Malthus, Newton or Freud. The paradigms with which these people's names have become associated all provoked fundamental conceptual rearrangements, not only within the disciplines they were intended to advance, but also within the general culture. The substitution of the heliocentric for the anthropocentric model of the universe, for example, had obvious effects on religion and philosophy as well as on astronomy. Kuhn observes that the way astronomers and even laymen looked at the universe after Copernicus suggests that they now "lived in a different world."[16] Because new paradigms direct attention to aspects of the phenomenal universe which have previously been ignored or considered trivial it often seems that the nature of the phenomenal universe itself has changed. And while this cannot really be the case, the illusion indicates how profound the "shift of vision" induced by paradigms typically is and warrants the claim that Kuhnian paradigms indeed bear a metaphysical (or M) component. In the case of the Freudian paradigm, the presence of an M component is also clear. Except for a few poets like Blake, before Freud no one working within the Western tradition had formulated a view of the unconscious, let alone a conception of what was in it. In that sense, the unconscious was discovered by Freud, and the discovery had immense repercussions. Psychologists after Freud have disagreed about what the unconscious actually contains or even contended that, because it is difficult or impossible to investigate systematically, it is of little value in attempting to explain and treat personality disorders. But nonetheless, Freud's discovery has changed the way Western man looks at himself. Someone --I have forgotten who--declared that Freud destroyed what little innocence modern man had left, and while this remark may be somewhat unfair, it indicates the magnitude of Freud's achievement.

In addition to an M component paradigms have a sociological function. This function is stipulated in the two fundamental properties which Kuhn originally attributed to a paradigm. A paradigm is a concrete scientific achievement which is (1) "sufficiently unprecedented to attract an enduring group of adherents away from competing modes of scientific activity" and (2) "sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve." A paradigm thus becomes the locus of a shared group commitment and it is the shared belief in the paradigm that "accounts for the relative fullness of (the group's) professional communication and the relative unanimity of (its) professional judgments."[17]

In the case of the Freudian paradigm, the group formed so quickly that by 1910 Freud was nostalgically recalling the years of "splendid isolation."[18] In 1902, Freud, along with four colleagues, founded what became known as the Vienna Psycho-Analytical Society and by 1906 the Society included a number of people who later made substantial contributions to psychology, if not to psychoanalysis: Adler, Brill, Eitingon, Jung, Binswanger, and Abraham. What held this disparate collection of people together even for a while, was not Freud himself but the paradigm he had constructed. For Freud seems from the beginning to have taken a dim view of the capacities of most of his followers and they, in turn, found him autocratic and resistant to new ideas. And, to make matters worse, the Swiss and Viennese members of the Society detested each other. What kept the Society together was the allegiance of its members to the paradigm and their determination to explicate and apply it, to engage in "normal science" or puzzle-solving in the wholly new intellectual territories the paradigm had opened up. There were defections--Adler in 1911, Jung in 1914--but the amount of work performed in the Society's early years is vast. In 1905, Freud alone published four major papers and two books, one of which, Three Essays on the Theory of Sexuality, is regarded as next only to The Interpretation of Dreams in importance. The other members were nearly as prolific, at least in terms of technical papers (dealing with such topics as the sexual etiology of dementia praecox), and the society held a constant series of informal meetings, seminars, and finally, congresses in which even the finest points were argued with scholastic vigor.

2. The second significant property of the paradigm concept which Kuhn himself does not appear to have understood--perhaps he did not wish to--is that it is an extremely useful analytic construct for investigating the development not only of the natural sciences but the social

sciences, and at least in some cases, philosophy and the arts as well. Physics is not the same as psychology, and neither is the same as the law or Impressionist painting: the relationship is not identity. But there are, in the view I have adapted from Kuhn and his critics, structural similarities among most, if not all, systematic modes of human thought. As Diana Crane puts it:

> It is not being argued, of course, that the visual arts, literature, religion, and science are identical phenomena. Obviously there are differences in the nature of these activities, the ways in which materials are treated and analyzed, and in the nature of the conclusions that emerge. The important factor is that science shares with other types of idea systems a similar mode of cumulative development, marked by periodic discontinuities that are sometimes similar to revolutions.

And these idea systems are alike in that they are paradigm determined. They

> are guided by conceptions that are often difficult to define but well understood by those using them. A paradigm indicates what problems need to be solved, what methods should be used to obtain solutions, and what types of phenomena are to be observed.[19]

The paradigm construct belongs to the sociology of knowledge as a whole. And this fact, I think, explains more than any other the opposition of Popper and most orthodox philosophers of science to Kuhn's point of view; for that point of view entails, and consequently has prompted, doubts about the intellectual primacy and sanctity of the natural sciences. This is so for two reasons. (A) The first is that the analytic apparatus Kuhn established, though he himself uses it only to explain the development of the natural sciences, can be applied to the development of the social sciences and even the professions. The core constructs of the apparatus --the concepts of the anomaly, of normal science, and most fundamental of all, of the paradigm and paradigm formation, decay and shift--can as readily and properly be applied to the development of psychology as to the development of physics. That is the principal reason I chose the example of Freud's discoveries to discuss the nature of the paradigm construct. If it is the case that a set of constructs, and the predicates which derive from those constructs, will fit two objects equally well, then it follows that those objects must be in some way alike. And if, as is here the case, those constructs and predicates are not trivial, then neither is the similarity relation of the objects to which they apply. But for most philosophers of science and for most physicists, the idea physics is in some logically fundamental respect like psychology is, or has been until very recently, appalling. (B) The second reason for the orthodoxy's resistance to Kuhn's position is that if, as Kuhn argues, the natural sciences are continuously subject to largely unforseeable but periodic revolutions, or paradigms shifts, then the knowledge they incorporate cannot be considered, at any given point in time, absolute and final. Even the notion of steady progress in the development of the natural sciences may be open to doubt.

These two difficulties, A and B, go a long way toward explaining the outrage expressed by Popper, Watkins, et al. If it were not for the implicit attack on the uniqueness of the natural sciences as an intellectual enterprise, Structure might hardly have been noticed. Thus Watkins indignantly quotes the economist Rose Dugdale, "Kuhn has cast serious doubts upon this paragon of the virtues of objectivity--the natural sciences. After all, it is not clear that science advances as Popper would have us believe."[20] (Even the establishment of the Nobel Prize for "economic science" (1969) has apparently not given economists sufficient respectability to challenge the received views.) The truth is that Popper is right, at least when he charges Kuhn with "relativism." The question is really whether relativism is the evil Popper thinks it. It is this point that many, if not most scientists and philosophers of science have begun to doubt.[21]

DEFINITIONS:

In light of the previous discussion, the following definitions are offered:

Paradigm: I shall recapitulate the major points, paraphrasing Kuhn:

1. A paradigm is a concrete intellectual achievement which is sufficiently unprecedented to attract an enduring group of adherents away from competing modes of intellectual activity but which is also sufficiently open-ended to leave all sorts of problems for the redefined group of practitioners to resolve.

2. All paradigms operate as exemplars and most, if not all, carry a metaphysical and a sociological component. But the metaphysical and sociological influences of the paradigm are functions of its power as an exemplar, that is to say, of the degree to which it permits its inventor(s) and its adherents to group objects and situations into (new) similarity sets which are primitive in the

sense that the grouping is done without an answer to the question, "Similar with respect to what?"

3. The formation of a paradigm is ordinarily followed by the establishment of a disciplinary matrix. The disciplinary matrix is the body of explicit theory and rules which specifies the phenomenal field within which the paradigm obtains; which explains how the paradigm works and why it is superior to other paradigms; and which codifies the methods that are proper and efficient in applying the paradigm. Disciplinary matrices are paradigm-specific, whereas "idea systems," to use Crane's phrase, are not. If a paradigm is discredited, then as it decays its disciplinary matrix will be dismantled (though elements of the old matrix may be incorporated in its successor). But the idea system as a whole--e.g., religion, or religious thought--will accommodate numbers of paradigms and their associated disciplinary matrices. In fact, as Crane argues, the history of an idea system may be read as a sequence of paradigm shifts.[22]

Profession: A profession, in my view, is a collective human behavior for which adherence to a particular paradigm (or set of paradigms) and the purposes elaborated in its disciplinary matrix provides the principle of commonality. This definition carries at least the following implications:

1. Because it is a behavior, a profession cannot exist without professionals. A profession is not an idea, it is an activity in which people are engaged.

2. A profession does not come into being until a first paradigm has been discovered and a first disciplinary matrix, at least in rudimentary form, has been constructed; or, in the case of long established professions, until the most recent episode of paradigm shift has ended, and a new paradigm and disciplinary matrix have emerged.

3. Though the members of a profession share a common paradigm and disciplinary matrix (which some members may be occupied in refining), the main business of the profession is "normal thought," or solving the particular set of puzzles which the paradigm has uncovered. This paradigm-specific puzzle solving is the collective behavior of the profession.

This definition of the term "profession" is not at variance with the findings of sociologists who have investigated its meaning, but it is at once more abstract and more restrictive. For example, in a recent attempt to construct and validate a professionalism scale, five "theoretical dimensions" of professionalism were posited: use of the professional organization as a major referent, belief in public service, belief in self regulation, a sense of calling to the field, and a belief in the need for group autonomy.[23] The significance of these dimensions of professionalism has been empirically confirmed for physicists, chemists, doctors, lawyers, nurses, and several other groups. Though they do not employ the language of the definition of a profession given here, they are consistent with it since they indicate the value to professionals of a sense of shared behavior and a desire to conduct that behavior according to criteria which are internal, in the sense that they are derived from a common core of understanding and belief, and not imposed by outsiders.

A Second study, however, may be more directly supportive of the definition which I have proposed. In order to determine major concerns in architectural education, Derman constructed a questionnaire and administered it to a random sample of 100 members of the Association of Collegiate Schools of Architecture (ACSA). Among the tasks required of the respondents was a listing of "concepts considered essential for architects to know." The responses were scored, using a rank ordering procedure, and the results were startling. The most frequently mentioned "concepts" were "Louis Kahn," "Organic Architecture (Sullivan, Wright)," and "Bauhaus (Gropius)." The fourth most frequently mentioned "concept" was "Mies van der Rohe" and the fifth "Venturi."

> ...a breakdown in meaning seems to appear when concepts must be described by the respondents. This problem is illustrated by the use of names in the place of concepts: e.g., 'Kahn,' 'Venturi,' etc. Whether this problem is the result of poor language use in the questionnaire, or representative of over-internalized concept-images on the part of respondents, is difficult to say.[24]

Derman's explanation of the data may have overlooked an intriguing third possibility, unless the phrase "over-internalized concept-images" means more than I understand. One of the most frequently mentioned names--"Bauhaus (Gropius)"--belongs to a man and a school which recast the architectural paradigm to meet the needs of a technological society. The other names belong to figures who have either been instrumental in shaping the disciplinary matrix or using the paradigm in their practice, or who may be on the way to creating a major revision in the existing disciplinary

matrix (Venturi). It is not at all surprising that architects should give the names most closely associated with the paradigm of architecture and its modern disciplinary matrix when asked to list the profession's essential concepts, rather than enumerate sets of ideas. The exemplar components of the paradigms are extremely difficult to specify, for they have become for most practitioners nearly absolute presuppositions, a way of seeing, and acting, which is assumed and rarely questioned or thought about at all; and the elements of the disciplinary matrix, the hypotheses, the axioms, the dicta are too numerous and too complex to refer to briefly. The explanation for Derman's results may simply be that it is the most expedient way of pointing out the profession's fundamental concerns to name the people who have elaborated them or who, in their practice, have best demonstrated them. It would be interesting to repeat Derman's study, using another profession. My guess, returning to the example in Section 1, is that in response to the question given the architects, clinical psychologists would be more likely to respond "Freud (the Vienna Circle)" than "the theory of infantile trauma" or "the method of free association."

Specialism: A specialism may be understood as a professional subgroup process. It has, I think, the following characteristics:

1. At least initially, the specialism's work is normal thought or the solving of some particular set of puzzles to which the professional paradigm and disciplinary matrix accord special significance.

2. The special significance of these puzzles is ordinarily due to the fact that they are generated by physical phenomena or speculations which, to the profession as a whole, appear to be anomalous. That is, the puzzles resist solution in the terms of the existing professional paradigm and disciplinary matrix. The phenomena (or speculations) cannot be made to "fit."

3. As the members of the specialism labor over the puzzle, the influence of the paradigm and the disciplinary matrix begins to weaken. The specialists become more concerned with what they think the porperties and behavior of the troublesome phenomena (or speculations) actually are than with what the paradigm and the disciplinary matrix say they "must" be. A new professional dialect and new methods of observation and analysis may develop in order to permit the specialists to focus their inquiry more precisely and to facilitate communication about it, at least among themselves.

4. At this point one of two things will happen. (A) One or more of the specialists will discover that some previously overlooked element of the profession's paradigm and disciplinary matrix will in fact account for the difficulty; or that the difficulty never really existed, that it was only apparent and can be explained as the result of errors in observation or measurement or problem--formulation. In this event, the integrity of the existing paradigm and disciplinary matrix will be preserved or even confirmed and the specialism may be re-absorbed by the profession. (B) No matter how energetically they try, the specialists cannot solve the puzzle in the terms specified by the profession's paradigm and disciplinary matrix. Normal thought is inadequate. At this juncture, the specialists will have to either simply abandon the puzzle or adopt a radical solution strategy. That strategy consists of admitting that the puzzle is not in fact a puzzle but a full-fledged anomaly. It cannot be solved within the existing framework of professional knowledge and a new paradigm and disciplinary matrix will have to be devised. In some cases, the new paradigm will be beyond the capacity of the specialism which discovered the anomaly and will have to come from somewhere else, perhaps at a much later date. In others, the specialism will have advanced sufficiently in the development of new analytic behaviors for some, or one, of its members to invent the new paradigm. The final outcome will be either the establishment of a new profession or a fundamental reconstruction of the old one.

An example of this idea of specialism is available in Humphreys' account of Leverrier's discoveries.[25] According to Humphreys, by the early nineteenth century a specialism concerned with planetary motion had developed within celestial mechanics, largely in response to the puzzle of Uranus' peculiar orbital behavior. By 1840, Uranus' observed positions were daily becoming more distant from the positions the planet should have occupied according to calculations based on Laplace's equations. The puzzle was a "celestial scandal" and one so serious that some specialists had begun to speculate that Newton's law of gravitation does not hold over great distances. Other specialists had hypothesized the existence of a Uranian satellite with remarkable and irregular gravitational properties, though no such satellite had been observed. Leverrier found the first explanation a serious threat to scientific knowledge and the second improbable, and so he devised a third hypothesis, that there existed an as yet unobserved planet beyond Uranus which perturbed Uranus' motion. He then calculated the probable orbit and size of the "new

planet," and communicated his hypothesis to a number of observatories with the request that a search for the planet be undertaken. The planet (Neptune) was found within a matter of weeks.

With the discovery of Neptune the bothersome puzzle of irregular planetary motion was judged to be solved and the validity of classical mechanics confirmed. For nothing in Leverrier's solution required a revision of Newton's Laws, or Laplace's extension of those laws, and Leverrier had used them with complete assurance to achieve his answer. Actually, however, the puzzle had not been solved. Uranus was not the only planet whose orbital motion exhibited irregularities. Mercury has what is called an advanced perihelion. That is, Mercury's point of closest approach to the sun shifts 42 seconds of arc per century in the direction the planet moves along its orbital path. The shift had been observed even before Leverrier and, once the Uranus puzzle had been dispensed with, Leverrier and the other specialists in planetary motion immediately turned to Mercury. They assumed that the second puzzle was the same sort as the first and that, therefore, it would yield to the same kind of analysis which had explained Uranus' perturbations. There must be a planet--Leverrier called it Vulcan--somewhere between Mercury and the sun whose gravitational influence would explain Mercury's advanced perihelion. The planet had to exist because nothing else could be inferred from Newtonian mechanics that would solve the Mercury puzzle, except perhaps the presence of "diffused attracting matter" around the sun. But though neither Vulcan nor the attracting matter could be found--they do not, of course, exist--Leverrier and his fellow specialists continued to look for them. There is no evidence that any of the nineteenth century specialists in planetary motion ever seriously posed the possibility that there was a fundamental deficiency in the Newtonian system and that the Mercury puzzle could not be solved without a radically different paradigm of mechanics, one finally supplied by Einstein. They seem instead to have persisted in the idea that Vulcan had not been found because of observational or computational errors. The Newtonian paradigm was too powerful for one anomaly, even a major one, to overthrow it.

ENVIRONMENTAL PLANNING:

In the remainder of this paper two arguments will be made. (1) There does not yet exist a paradigm of environmental planning and the field is therefore not a profession. Rather, it is an activity practiced by specialists from various established professions. In consequence, the activity is governed by a number of distinct paradigms which, as the specialists extend them to environmental problems, may lose their power to determine the intellectual behavior of the specialists and to keep the specialists within their various professional folds (cf. "specialism" (4) above). For many environmental problems are not puzzles but anomalies and they are not susceptible to normal thought. (2) It appears possible that a paradigm of environmental planning will be achieved. If so, the paradigm will have to address at least the three issues which will be discussed below. But it is also possible that a paradigm of environmental planning will not be found. Environmental planning may remain the province of specialisms. This outcome is not necessarily undesirable because:
(A) An occupation need not be a profession in order to be socially useful or even essential--politics, for example. It must be remembered that, while a paradigm confers intellectual focus and powers of analysis upon its adherents, it also restricts the domain of inquiry and the permissible modes of seeing and thinking about things. Paradigms are also blinders. For example, the problem of Mercury's advanced perihelion could not be solved by anyone working under the warrant of the Newtonian paradigm of mechanics. In the terms of that paradigm, the Mercury puzzle had to be the same as the Uranus puzzle and it had to yield to the same solution. The persistence of the puzzle, it was believed, must be due to observational or measurement error and the fact that no one was able to find Vulcan could not mean that it did not exist. The problem had to be with the calculations specifying Vulcan's probable size and orbit, or in the limitations of contemporary optical technology. As the Mercury example demonstrates, the value of paradigms is to some degree equivocal. Paradigms are immensely useful but they also confine the vision of their adherents.
(B) If environmental planning remains the occupation of specialists from a variety of professions, radically different points of view will be brought to bear on the matters with which the occupation is concerned. There is an advantage and a liability in this prospect. Both the advantage and the liability follow from the fact that there will be very few facts and a great deal of argument. For example, a forest may be seen by the designer as a recreational opportunity, by the psychologist as an "environmental display," by the economist as millions of board feet of lumber, by the wildlife biologist as a set of habitats, and so on. To the extent that this is true, problem formation as well as solution will normally have to be the subject of negotiation. (And in consequence, the economist

will have it mostly his way with one forest, the designer with another.) In most cases, perhaps, the whole process of environmental problem solving will be undogmatic and self-critical (the advantage) but in some it may break down altogether (the liability).

To suggest that the multi-specialism arrangement is in many respects an acceptable state of affairs in environmental planning --and, for that matter, in planning generally--may seem mistaken to the majority of planners and planning theoreticians. Altshuler, for example, cites a survey of the AIP membership which revealed 87 distinct occupational background categories for the 1,415 members who responded. He laments the intellectual heterogeneity which, as the study indicates, prevails among the occupation's practitioners and explains it by asserting that planners have no unifying "normative theory." Lacking a normative theory planning cannot be considered a profession. Planners "can hardly judge themselves except by their ability to present material in handsome format, their knowledge of planning fashions, and their immediate political success."[26] What Altshuler means by "normative theory" is, I think, close to the notion of paradigm developed here and the argument that an occupation which is not governed by a normative theory (or paradigm) cannot be a profession is consistent with the conclusions reached in Section 2 of this paper. But whether a nonparadigmatic occupation is necessarily the inept and dubious enterprise Altshuler makes planning out to be is another matter.

Still, it is a legitimate question to ask: is it indisputably the case that no paradigm of environmental planning has yet been invented? There appear to be several plausible candidates, among them "ecological design" (McHarg), Steinitz' work in the Boston metropolitan region, Doxiadis' development of ekistics, or perhaps most likely, the 1972 Club of Rome Report. None of these modes of problem solving seems to meet all of the requirements of a paradigm posited in Section 2. For example, it is not possible to point unequivocally to any plan conceived by McHarg and characterize it as a concrete intellectual achievement which was sufficiently unprecedented to attract an enduring group of adherents away from competing modes of environmental planning. The claim for the Club of Rome Report, however, seems more difficult to deny and it is explicit. According to the MIT team members, the world model they adapted from Forrester

> ...is the most useful model now available for dealing with problems far out on the space-time graph. To our knowledge it is the only formal model in existence that is truly global in scope, that has a time horizon longer than thirty years, and that includes important variables such as population, food production, and pollution, not as independent entities, but as dynamically interacting elements, as they are in the real world.

The MIT model, its creators assert, is "unique among all mathematical and mental world models available to us today."[27] It is certainly true that when it was first issued, the Report (The Limits to Growth) had an overwhelming impact, not only upon planners and scientists but upon laypeople as well. Assuming the continuance of various current growth trends, the Report gave the human race no more than another hundred years before the onset of a Malthusian doom. The only alternative to disaster would require curbing the exponential growth of population, industrialization, pollution, resource depletion and other variables, and establishing a state of global ecological and economic equilibrium.

Upon reflection, however, even the Report's friends have found much in it to question. Technical criticisms of the model and the data it employed have been made by a number of people, including Gunnar Myrdal.[28] At a recent meeting in Philadelphia, even members of the Club of Rome performed what the New York Times regarded as a "turn-about." Aurelio Peccei, the Club's founder, insisted that it was "not a rich man's club, satisfied to let the poor of the world be stifled, or forced into aggression, by the shutting off of growth." Irvin Laszlo announced that, despite the 1972 Report, "the real issue is not whether to grow or not to grow. Rather it is how to grow: with which technologies and in what sectors of the economy." Herman Kahn cheerfully predicted that the world's population will have stabilized at 15 billion by the year 2176 and that, by that date, a global per capita income of $20,000 will have been achieved. According to Kahn, man will then turn his energies to the creation of "such societies everywhere in the solar system and perhaps to the stars as well."[29]

It is true that in the years since the Report was published evidence has accumulated which casts doubts on some of the Report's major premises--evidence which the Report's authors cannot be blamed for failing to consider because (1) it was not available in 1972 and (2) some of it at least may reflect the impact of the Report. For example, while the growth trend in global population is now unclear, the curb is probably not exponential. The birth rate in the U.S. has decreased significantly since the end

of the last decade, and in countries like India, where the birth rate has continued to increase, policy makers have begun to take steps which would have seemed inconceivably drastic five years ago. Several of India's twenty-two states are reported to have legislation "at various stages of consideration" requiring compulsory sterilization of people who already have two or three children. Furthermore, the federal government has recently sanctioned the enactment of sterilization laws at the state level. Dr. Daran Singh, the Minister for Health and Family Planning, has stated that "it is clear that public opinion is now ready to accept much more stringent measures for family planning than before."[30] If Dr. Singh is correct, it is difficult to avoid the speculation that The Limits to Growth and the controversy its publication generated may have had something to do with the shift in public opinion.

Nonetheless, I do not believe that the Club of Rome Report constitutes a paradigmatic achievement. Its specific conclusions are too often debatable. By most accounts, including that of the authors themselves, the dynamic systems model which the Report utilized was not as sophisticated as dynamic systems theory promises it can be and the data were of extremely uneven quality.[31] Even now, it is difficult to obtain reliable estimates of population and economic growth rates and resource depletion rates for many of the underdeveloped areas of the world. But I do not mean to belittle the significance of The Limits to Growth. It is as close as we have come to a paradigm of environmental planning and it may be the forerunner of whatever achievement, if any, is finally accepted as the paradigm. Moreover, The Limits to Growth successfully identifies what I take to be the central anomaly with which environmental planning must be concerned --finitude.

The concluding portions of this paper will be briefly addressed to the three problems which any paradigm of environmental planning must establish a broadly accepted way of treating, and to a final speculation. (It would require separate papers, each longer than this one, to discuss these problems and even the speculation adequately. What is attempted here is explicitly a set of notes.) The three problems are finitude, prediction, and what may be called the cultural fallacy.

Finitude: The terrestrial environment is finite, whether one considers its spatial and temporal properties or its capacity to absorb radical systematic change. That is, the earth has specifiable physical dimensions and, therefore, boundaries; it has a history which will someday come to an end; and the organic systems of which it is constituted are not infinitely elastic. Some components of the earth's systems are nonrenewable while those that are renewable are vulnerable to irremedial damage. There are limits--in every sense of the word--to growth.

It may seem that all this is obvious, and moreover, that since the problems of scarcity have been the business of economists since Malthus, economics must have an answer to the dilemma of finitude. But in fact this does not appear to be the case. Most contemporary economists accept some version of growth theory, usually the Harrod (or Harrod-Domar) model, in which economic growth is considered a necessary and temporally open-ended process. Those economists who do not agree that growth can continue indefinitely tend to a hard realism: as one of them has put it, "we must not doubt that man's nature being what it is, the destiny of the human species is to choose a truly great but brief, not a long and dull, career."[32] Both growth economists and their critics concur in denying the plausibility of a stationary economic state, such as that envisaged in The Limits to Growth.

> The stationary state in economic theory was not supposed to describe any actual society. It was an analytical device intended to throw light upon relationships in the changing world in which the economists (e.g., Walras, Pigou) were living.[23]

The basis of modern growth theory is given in the three equations which specify Harrod's model.[34] But underlying and justifying Harrod's system of equations is the proposition that in modern societies the rate of technological progress is at least sufficient to offset the diminishing returns from both nonrenewable (e.g., mineral) and renewable (e.g., agricultural) resources. In Harrod's words:

> Technological advance impinges directly on farming processes--it has done so most notably in recent years --and on extractive processes. With progress, the area of these diminishing returns sectors tends to decline. ...technological progress has had a positive value in most parts of the world for a considerable period.[35]

In other words, so long as technology improves, it will be possible to produce more and more steel from a ton of iron ore and more and more corn per acre of arable land. The increasing scarcity of iron ore and of arable land will be

counterbalanced by advances in technology which permit increasingly efficient use of natural resources. "We want," again in Harrod's words, "people to produce as many goods and services as the most up-to-date technology enables them to do."[36] If societies comply with Harrod's wish, it is argued, it will be possible to achieve and maintain the equilibrium rate of growth, or that rate of growth in GNP which permits an economy to reach, indefinitely, successive states of market equilibrium.

It is important to recognize that Harrod's model is very widely accepted and that its central assumptions about the efficacy of technology are shared even by economists, like Kaldor, who have revised or refined the original model. Thus Kaldor repeats the proposition that "in terms of our model, the growth of the capitalist sector in the economy involved a dramatic rise in the technical progress function, and hence in the equilibrium rate of growth of productivity."[37] The question is: is the growth economists' faith in the power of technology to offset diminishing returns from scarce factors of production warranted? A simple arithmetic example may be helpful. Suppose that at some point in time, t_o, the total world reserve of iron ore is ten tons and that, at t_o, the extraction and refining technology permits the production of one ton of steel from four tons of iron ore. Let us further suppose that (1) the consumption of steel remains constant at one ton and (2) that the rate of technological advance is such that the efficiency of the production process increases by a factor of two over every subsequent interval of time. Thus at t_1, the world reserve of iron ore will have increased to six tons but it will require only two tons of iron ore to produce one ton of steel. At t_2, the iron ore reserve will have dropped to four tons but it now requires only one ton of iron ore to produce one ton of steel. And so on. It appears that something like Zeno's paradox has been achieved and that the production of steel can continue indefinitely. Technological progress will permit us to squeeze the dwindling supply of iron ore ever harder and we will never completely run out. (For example, at t_5 we will still have 2.5 tons of iron ore left and at t_{10}, 2.024625 tons.)

Unfortunately, however, the example presents a logical absurdity as early as t_3. At that point, according to the computations, we will be producing one ton of steel from .5 tons of iron ore, and at t_6 one ton of steel from .125 tons of iron ore. But no conceivable technology will permit such a result, it is plainly an impossibility. And it is precisely this sort of contradiction between what technology appears to make possible and what common sense as well as scientific knowledge stipulate as the actuality that has led economists like Georgescu-Roegen and Mishan to attack contemporary growth theory.[38] The fact of the matter is that at some point the human species is going to run out of iron ore and every other nonrenewable resource. It makes no difference whether the rate of consumption of these resources increases, stabilizes, or even decreases. At whatever rate we use them, we will use them up, and they cannot be replaced: "even with a constant population and a constant flow per capita of mined resources, mankind's dowry will ultimately be exhausted if the career of the human species is not brought to an end earlier by other factors."[39]

But, it will be asked, what about renewable resources, what about food? Even if the mineral portion of man's "dowry" is exhausted, surely it will be possible to maintain the species with the product of an agricultural economy. Georgescu-Roegen's response to even this bare hope is pessimistic. (1) In the first place, he argues, primitive agriculture cannot yield a sufficient product to feed the world's present population, let alone the likely population in the year 2000. Moreover, even the practices of primitive agriculture entail a slow but certain "entropic degradation of the soil through continuous cultivation."[40] Manuring and other techniques will retard the process of soil degradation but it cannot be stopped, so long as cultivation continues. (2) It is possible, Georgescu-Roegen thinks, to mechanize agriculture on a scale sufficient to support a global population of more than seven billion people by the year 2000. But the problem here is obvious. If draft animals are replaced by tractors and manure by chemical fertilizers, we will simply have to use up our limited mineral resources ever more quickly, we will have to exhaust them sooner. Georgescu-Roegen concludes:

> Confronted, in the distant future, with the impending exhaustion of mineral resources...mankind--one might try to reassure us--will retrace its steps. The thought ignores that, evolution being irrevocable, steps cannot be retraced in history.[41]

Whether this view of the human future is true cannot, I think, be finally determined. But it is a much more plausible conception than Harrod's and Kaldor's, and it raises to its proper prominence the dilemma of finitude. It is about this dilemma, or anomaly, that the paradigm of environmental planning must form, if it is to form at all. And even if a paradigm is not found, dealing with finitude is the necessary enterprise of the specialists who, in that even, will continue

to practice environmental planning.

Prediction: The problem of prediction is not of the same order as the problem of finitude, but it must be mentioned. All planning, including environmental planning, involves intervening in the future in order to achieve some outcome which is deemed desirable or necessary. But intervention is not possible without some understanding of what the future is like, and, because the future does not yet exist, that understanding can never be better than approximate. The future must be construed from what is known about the past and the present but there is no guarantee that only those kinds of events which have occurred in the past will occur in the future. Novelty is an omnipresent possibility.

The first aspect of the prediction problem is methodological: What is the most reliable way of "knowing" the future, given its inherent ambiguity and, also, the pervasive constraints of the limited time and resources available in a parpituclar problem situation? Prophecy (revealed knowledge), forecasting (a probabilistic statement), prediction (a non-probabilistic which presupposes an absolute confidence level) or a "guess"? There is no easy or brief answer to these questions but any paradigm of environmental planning will have to take them into account. The viability of the profession will depend in large measure on the extent to which its clients are willing to believe what the planners have said will happen. Environmental planners, therefore, will have to decide what kind of future event can be predicted, what kind must be forecast, and which situations, because the risks are high and time is likely to be short, require a guess. It may be recalled that the Club of Rome Report began to founder, in the public mind, when its statements about the future (the projection of exponential rates of growth and depletion) were attacked by trend analysts in economics and demography. As a city planner once remarked to me, "If you're going to tell people the End is coming at noon tomorrow, you'd damn well better be right. Or have a fast car."

Earthquake prediction is a case in point. It is clearly in the public interest to be able to foretell the occurrence of earthquakes and to take whatever steps are appropriate to minimize loss of life and property. But the reliability of the availble predictive techniques has not yet been adequately established. A clear conflict has arisen for earth scientists, who are torn between their deeply-rooted professional attachment to statistical rigor and their growing sense of social responsibility. What is the scientist to do? If he acts precipitously, he may do great harm. Not long ago in Hawaii, for example, people were urged to leave low-lying areas in anticipation of a tsunami that never came. When, some weeks later, a second warning was issued people did not take it seriously, with the result that when the tsunami arrived it incurred heavy loss of life. With incidents such as this in mind, American earth scientists have proceeded cautiously, making predictions but not announcing them publicly. A fifty-mile stretch of the San Andreas Fault east of Hollister has been closely observed for over two years by the Geological Survey and a number of accurate earthquake predictions have been made. But these predictions have not been generally released.

The Chinese, on the other hand, "have leapt boldly into operational prediction."[42] The Chinese program is elaborate, utilizing every known predictive method and employing 10,000 specialists. The Chinese program has also been extremely successful, apparently for two reasons. The first is that a number of earthquakes, such as that in Liaoning in February 1975, have been accurately forecast. The second is that it is part of the Chinese approach to encourage the populace to engage in the prediction process. For instance, in earthquake-prone areas, schoolteachers encourage their classes to make observations of crustal movement, using locally made instruments. One considerable advantage of this participatory approach, according to visitors to China, is that "a false alarm in which a large segment of the population had participated produced less backlash than would be the case in countries where only 'experts' were to blame."[43]

Earthquake prediction is only one example and an inconclusive one at that. The general problem of "foreknowing" has not been resolved in environmental planning. But an adequate paradigm will certainly be measured in large part by the power of the predictive behaviors which can be derived from it.

The Cultural Fallacy: The final obstacle to paradigm formation in environmental planning is the "cultural fallacy," the widely held view that Western culture is inherently and uniquely hostile to nature. Or rather, that the Judeo-Christian cultural tradition dictates relentless exploitation of the earth's resources and that members of Western societies are, therefore, infected at birth with a malignant and abusive attitude toward the natural environment. Other cultures, in contrast, are believed to have developed "benign" or "sane" environmental values. And the terrible paradox thus arises that the culture which developed the intellectual tradition --broadly, science--in which the problem

of finitude may be most exactly and systematically defined is precisely the wrong culture to solve the problem--at least until that culture has cast out the Judeo-Christian values which deform it.

If all this sounds a bit much, it is. But it is the essence of a position which is being argued ever more widely and stridently. For example, Ian McHarg writes:

> Whatever the earliest roots of the western attitude to nature it is clear that they were confirmed in Judaism. ...On the subject of man-nature...the Biblical creation story of the first chapter of Genesis, the source of the most generally accepted description of man's role and powers, not only fails to correspond to reality as we observe it, but in its insistence upon dominion and subjugation of nature, encourages the most exploitative and destructive instincts in man rather than those that are deferential and creative.... Here in Genesis can be found the sanction and the injunction to conquer nature--the enemy, the threat to Jehovah.[44]

This point of view is certainly extravagant and, I think, irresponsible. More than that, however, the point of view is harmful to the general purpose which McHarg wishes to serve. For McHarg and others who share his views are significant figures in the development of the environmental disciplines and command broad public and professioanl respect. The position which they have taken, that Western culture is intrinsically criminal with respect to nature, has led quite naturally to the idea that its distinctive artifacts, such as science and technology, are also morally suspect. This contention is expressed by Lynn White, Jr. in an article in Science. White claims that both science and technology, as distinctly Western inventions, have been "tinctured with orthodox Christian arrogance toward nature" and that, short of a fundamental religio-cultural revolution which must affect science along with everything else, science and technology are of little use in coping with the "ecologic crisis."[45]

That this general argument is wrong has been convincingly demonstrated by John Passmore. Every major cultural tradition has its share of ambivalence toward nature, though it would require a paper longer than the present one to document the dual impulses of exploitation and harmony which have arisen in every known culture. But perhaps it will suffice for present purposes to quote the following verses. They are Taoist, putatively one of the gentlest religions.

> You glorify Nature and meditate on her:
> Why not domesticate her and regulate her?
> You depend on things and marvel at them:
> Why not unfold your own ability and transform them?[46]

As Passmore concludes, in a chapter aptly titled "Removing the Rubbish":

> If, a century hence, men live worse lives than they do today, that will not be because the traditions of the West have bemused them: greed, ignorance, shortsightedness, fanaticism, are not Western inventions. How in fact they will live I have not dared to guess. My sole concern is that we should do nothing which will reduce their freedom of thought and action, whether by destroying the natural world which makes that freedom possible or the social traditions which permit and encourage it.[47]

CONCLUDING NOTE:

I have tried to establish a framework within which to address a number of fundamental questions about the nature of environmental planning. In my view, environmental planning is not a profession but an occupation practiced by specialists from a variety of professions. This is not wholly or even mainly an evil; it may be the best way to proceed.

But then again it may not, for I have also suggested that a paradigm of environmental planning is possible, if a single behavior of inquiry, analysis, and decision can be found which deals with the problems of finitude and prediction and overcomes the cultural fallacy. As a summary speculation, it seems to me that such a behavior will be found, if at all, within what C. West Churchman calls the "Systems Approach." It may or may not evolve from dynamic systems theory (The Limits to Growth), but, because the problems of environmental planning are so numerous and complex, it will surely have to comprise a body of systematic theoretical constructs which will discuss the general relationships of the empirical world. The paradigm will have to, in Kenneth Boulding's words, "provide a framework or structure of systems on which to hang the flesh and blood of particular disciplines and particular subject matters in an orderly and coherent corpus of knowledge."[48]

FOOTNOTES

1. Margaret Masterman, "The Nature of a Paradigm," in Criticism and the Growth of Knowledge, Imre Lakatos and Alan Musgrave (eds.) (London: Cambridge University Press, 1974), 60.

2. K. R. Popper, "Normal Science and its Dangers," in Lakatos and Musgrave (1974), 56.

3. J. W. N. Watkins, "Against 'Normal Science,'" in Lakatos and Musgrave (1974), 26.

4. J. W. N. Watkins, "Metaphysics and the Advancement of Science," British Journal for the Philosophy of Science, 26, June, 1975, 91-121.

5. Michael Polanyi, Science, Faith and Society (Chicago: University of Chicago Press, 1946). For example (89):

   There is in fact no aspect of science, including even mathematics, in which the fundamental presuppositions, the methods of investigation, and the criteria used for verification have not undergone a series of marked changes since the inception of modern science 300 years ago. ...

   It is frequently said that the facts of science remain and only the interpretations change. This is not true or is at least very misleading. If we still recognize many of the facts which were collected, say by astronomers, 300 years ago, it is because in these cases we share their basic interpretation of the sensory experience which they described as facts. But while to Kepler in 1596 it appeared as an indubitable fact that the planetary orbits are related to the geometry of perfect solids, we regard this today as mere fancy. Or to take another example: Newton observed that even after repeated distillation water always left a slight residue behind and described it as a fact that water on evaporation is partly transmuted into earth. Though we accept Newton's experience as true, and could reproduce it in similar circumstances, we do not now consider that it established the fact which he claimed to have observed. Apart from meaningless sense impressions there is no experience that abides as a 'fact' without an element of valid interpretation having been imparted to it. This is true even of facts of everday life, the nature of which depends on the accepted interpretation of events --whether magical, astrological, mythological, naturalistic, etc.

6. Masterman (1974), 61.

7. Richard L. Meier, personal communication.

8. Thomas S. Kuhn, The Structure of Scientific Revolutions (Chicago: University of Chicago Press, 1962 and 1970), 11.

9. Charles T. Tart, "States of Consciousness and State-Specific Sciences," in The Nature of Human Consciousness, Robert E. Ornstein (ed.) (San Francisco: W. H. Freeman and Co., 1973), 41-60.

10. Thomas Pyles, The Origin and Development of the English Language (New York: Harcourt, Brace and World, Inc., 1964). For example (190): English had to wait until the latter years of the seventeenth century for the rise of the schoolmaster's attitude toward language which was to become predominant in the eighteenth century and is still so--a relatively new thing, be it noted, which has given us a codified set of rules, some of them based on an arbitrary appeal to logic and "reason," but having very little relevance to older usage.

11. Kuhn (1970), 200.

12. Ibid., 182.

13. Ernest Jones, The Life and Work of Sigmund Freud (Harmondsworth: Penguin Books, 1964), 276.

14. Quoted by Jones (1964), 221.

15. Masterman (1974), 65.

16. Kuhn (1970), 117.

17. Ibid., 10.

18. Quoted by Jones (1964), 350.

19. Diana Crane, Invisible Colleges: Diffusion of Knowledge in Scientific Communities (Chicago: University of Chicago Press, 1972), 136.

20. Watkins (1975), 92.

21. Willard C. Humphreys, Anomalies and Scientific Theories (San Francisco: Freeman, Cooper and Co., 1968). Humphreys' book is particularly interesting because it was written (initially as a doctoral dissertation) at the height of the Popper Kuhn debate and it rejects the Popperian view. But what Humphreys takes Kuhn's position to be is hard to make out. The book demonstrates again that Kuhn has been nearly as widely misunderstood as read (e.g., p. 299).

22. Crane (1972), 129-142.

23. William E. Snizek, "Halls Professionalism Scale: an Empirical Reassessment," American Sociological Review, 37, February 1975, 109-114.

24. Asher Derman, "Summary of Responses to the 1974 AIA/ACSA Teachers Seminar Survey of the Concerns and Interests of Architectural

Educators," Journal of Architectural Education, 28, February 1974, 11.

25. Hymphreys (1968), 34-42.

26. Alan Altshuler, The City Planning Process: A Political Analysis (Ithaca: Cornell University Press, 1965), 405.

27. Donella Meadows, Dennis Meadows, Jorgen Randers, and William W. Behrens III, The Limits to Growth (New York: Universe Books, 1972), 21-22.

28. Gunnar Myrdal, in Who Cares for the Earth?, Robert Linton (ed.) (New York: Basic Books, 1974).

29. New York Times, April 14, 1976.

30. New York Times, April 17, 1976.

31. Meadows (1972), 22.

32. Nicholas Georgescu-Roegen, The Entropy Law and the Economic Process (Cambridge: Harvard University Press, 1971), 304.

33. Joan Robinson, Economic Heresies (New York: Basic Books, 1971), 3.

34. Roy Harrod, Economic Dynamics (London: The MacMillan Press, 1973). The basic form of the Harrod's model is given by the equation:

$G = \frac{s}{C}$ where: G is a growth rate per unit of time
s is the fraction of income that is saved per unit of time
C is the accretion of capital per unit of time divided by the increment of goods produced per unit of time

There are two variants of this equation which determine the "warranted" rate of growth (G_w) and the "natural" rate of growth (G_n).

35. Ibid., 24.

36. Ibid., 170.

37. Nicholas Kaldor, Essays on Economic Stability and Growth (London: Gerald Duckworth & Co., Ltd., 1960), 293.

38. E. J. Mishan, The Costs of Economic Growth (London: Staples Press, 1967).

39. Georgescu-Roegen (1971), 269.

40. Ibid., 302.

41. Ibid., 304.

42. New York Times, April 25, 1976.

43. New York Times, April 25, 1976.

44. Ian McHarg, Design with Nature (Garden City: The Natural History Press, 1969), 26.

45. Lynn White, Jr., "The Historical Roots of our Ecological Crisis," Science, 155, 10 March 1967, 1207.

46. Quoted by John Passmore, Man's Responsibility for Nature (London: Gerald Duckworth & Co., Ltd., 1974, 26.

47. Ibid., 195.

48. Kenneth Boulding, "General Systems Theory--The Skeleton of Science," Management Science, 2, 1956, 208.

A THEORY OF CRITICAL REFLECTION IN THE PLANNING PROCESS

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INTRODUCTION

In recent years, the validity of improving or inventing new theories has been questioned. It has been suggested that the primary focus of inquiry should shift from the production of explanatory systems to the development of a process for examining these explanatory systems as objects of thought (knowledge) in themselves. Recognition has grown that no theory in any discipline will ever be adequate to account for all of the phenomena with which the discipline is concerned.

Heisenberg has remarked of natural science that

> ...We can no longer consider 'in themselves' those building-stones of matter which we originally held to be the last objective of reality. This is so because they defy all forms of objective locations in space and time, and since basically it is always our knowledge of these particles along which we can make the object of science... Thus, even in science the object of research is no longer nature itself but man's investigation of nature. Here, again, man confronts himself alone. (Heisenberg, 1958, p. 14 emphasis in original)

This point of view has become prominent not only in the natural sciences but in the social sciences as well. Merton has warned that:

> All virtues can easily become vices merely by being carried to excess, and this applies to the sociological paradigm. It is a temptation to mental indolence. Equipped with his paradigm, the sociologist may shut his eyes to strategic data not expressly called for by the paradigm. Thus it can be turned from a sociological field-glass into a sociological blinder. Misuse results from absolutizing the paradigm rather than using it as a tentative point of departure. (Merton, 1968)

Planning, an extremely eclectic discipline, is conspicuous in failing to recognize the limited and provisional character of the explanatory systems it sometimes invents and often borrows. It seems timely for planning to recognize the need to develop a process of internal criticism similar to those that recently have evolved in the sciences. The answer to this requirement is not merely the invention of new and better theories but the critical, conscious selection and use of them.

The method advocated in this paper for coping with the uncertainties inherent in the use of any explanatory system in planning is to increase the capacity for critical reflection in the process, that is, to encourage the participants to engage in a rigorous examination of both the problems which are identified and the theories and derived strategies which are then applied to their resolution. It is argued that by formally establishing critical reflection through structured internal evaluation and debate in the planning process, both the process itself and its outcomes will be considerably improved.

In summary, the two central hypothese of

this paper are:

1) It is necessary for the planning process to reflect critically on the explanatory systems it employs;

2) A procedure based on argumentation can provide the basis for critical reflection in planning.

The paper's structure is in two principal parts. In the first, we distinguish three interdependent levels of planning: minimal, formal, and meta-planning. The initial three sections of the paper are developed as an hierarchical logical structure based on the interdependence of these three levels and the dilemmas which induce decision-makers to move from one level to another. This form of presentation is explicitly a device used for simplicity and clarity of the argument. However, the interconnections between minimal, formal and meta-planning are complex and in fact they cannot practically be separated from each other. In Section Three the intricate interconnections among the three are briefly indicated.

In the second part, an argumentative procedure for the planning process is developed. In Sections Four and Five the need for such a technique is presented and elaborated, and the structure of the procedure, a protocol, is explained and illustrated. Finally, in Section Six, the assets and liabilities of the procedure and its potential applicability to planning and decision-making in general, are examined.

1. The "Paradox" of Minimal Planning

Any discussion of what planning is or ought to be must make explicit at the outset what are taken to be the necessary characteristics of any particular activity of planning. Three central premises are accepted:

The first premise is that human actions are purposeful. Every human action has a particular and distinct reason for being taken. This is not to say that all human actions are "rational" or even conscious. Nor is it to accept a reductionist argument for the existence of a single and imperative purpose in all human actions, such as the "elimination of conflict" or the satisfaction of "organic drives." Rather, the contention is that every human action has a cause, and every cause a content which is susceptible to description. This content constitutes a purpose. It is surely true that most purposes are complex and that many are difficult, if not impossible, to state unequivocally. But these dilemmas are not a present concern. The point remains that all human action is purposeful, from well-informed calculation of future action under explicit means-ends assumptions to subconscious reaction.

The second premise is that human actions produce change. Actions have (or, more properly, are) both antecedents and consequences: action is change, generated by and generating change.

The third premise is that human beings attempt to monitor and evaluate change in terms of whether or not the new state is more or less desirable than that which preceded it. The question is pertinent "Did the change produced by an act satisfy its purpose?" The answer will never be free from the old definitional difficulties --how to specify adequately the act itself, the purpose, and the change produced. But an answer of some sort will always be given and it will necessarily concern itself with the evaluation of change.

This issue may or may not be raised explicitly. An agent producing change that fails to satisfy his purpose may simply, without thinking about it, initiate a second action which, it is expected, will be somehow more successful. When, however, an agent does raise the question, when he acts and evaluates action consciously, he requires an apparatus of concepts and criteria. He must be able to discriminate explicitly between more and less desirable states, must assume that the universe of things and events -- or some portion of it -- is "knowable," must assume that it is susceptible to change, must believe that he is capable of producing change or sequences of change in it that would achieve his original purposes. He will be, in short, engaged in the construction of a "plan."

Among the meanings of the word "plan" given by Webster's, all of which imply "mental formulation," are: "a method of carrying out a design," "a detailed program of action," "an orderly arrangement of parts of an overall design or objective."

Planning theorists would find these definitions of a "plan" simplistic or even impoverished. In its traditional rationalist formulation, planning is an orderly sequence of actions, based on complete and accurate information and certainty of control over events, which guarantees a perfectly predictable and universally desirable outcome. (Harris,1960; Chapin, 1965; Seeley, 1962; Banfield, 1959).

The incrementalist formulation of planning views it as a piecemeal procedure, without a predefined, comprehensive plan and without assuming or attempting overall control of the future (Dahl and Lindblom, 1953, Hirschman and Lindblom, 1962; Lindblom, 1968). Various alternative formulations have also been proposed, among them, planning as utopian design (Jarvie, 1966; Goodman, 1947), as an anarchic process (Sennett, 1970), as a work of art (Vickers,

1963; Ozbekhan 1969), etc.

All of these definitions of planning, while enlarging upon it, presuppose the process of purposeful, change-producing behavior discussed above, and the presence in the human agent, or planner, of values, knowledge (however imperfect), and a belief in the possibility of implementing intended changes. Purposeful, change-producing action can be viewed as a necessary precondition for any version of planning. Therefore, the following is offered as a definition of planning in its minimal sense:

> Minimal Planning is the discovery of a discrepancy between the state of a thing as it is (or is not) and the state of a thing as it ought (or ought not) to be, and the design of a strategy to resolve the discrepancy.

This definition of planning* presupposes the following:

1) A perception of the state of things as they are.
2) A conception of the state of things as they ought to be.
3) The belief that it is possible to act to resolve the discrepancy.
4) A strategy for resolving the discrepancy.

But minimal planning imposes a contradiction. Planning in the minimal sense is a usual, and perhaps inevitable, human activity, both individually and collectively. It is also, however, necessarily an uncertain activity for the following reasons (Rittel, Webber 1973):

1) It is impossible to know completely and with certainty the state of a thing as it is because the set of potentially relevant information is (virtually) inexhaustible and also subject to misinterpretation. It is always possible for the planner to discover more than he already knows about the state of things as they are -- but he cannot know all that there is to know (Simon 1957; Popper 1964). But even if the planner were to attempt to increase his knowledge of the present state, he would encounter a number of dilemmas. Much of the new information might be unreliable, misleading, or irrelevant to his purposes, although it would be difficult to determine what was and what was not reliable or relevant. And certainly, the costs in time and effort of obtaining and evaluating additional information would be high.

2) It is impossible to prove the possibility and/or desirability of any conception of the state of a thing as it ought to be. It is a matter of conviction, supported by and expressed through a system of values, that any future state of a thing is more desirable or satisfactory than the present state. In fact, it is also a matter of conviction that the desired future state is possible to attain.

The identification of discrepancies thus is essentially an artificial and highly ambiguous procedure.

3) Even if it is assumed, as indeed it inevitably must be, that particular discrepancies are real and adequately identified, it is impossible to establish beyond doubt that any given strategy designed to resolve them will be successful. It is of course possible to design a particular strategy more or less carefully, or to consider more than one. But it is impossible to foresee their outcomes with certainty. Tracing the consequences of alternative strategies is a highly uncertain procedure.

4) There is no certain way of knowing what the universe of discrepancies or resolutions is at any given point in time, or which discrepancies are most "significant" and which resolutions most "powerful." It is impossible to sustain that a given discrepancy is the "right one" at a given moment. Furthermore, there are other discrepancies than the one which preoccupies the planner, discrepancies which affect and would surely concern him, of which he knows nothing yet or might fail to notice because of his particular explanatory system or ideology.

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*Under the definition, four types of discrepancy can be identified:
1) The "positive change" discrepancy: (A) is the case but (B) ought to be the case.
2) The "negative change" discrepancy: (A) is not the case but (A) ought to be the case.
3) The "status quo" discrepancy: (A) is the case and (B) ought not to be the case.
4) The "indeterminate" discrepancy: (A) is not the case but (B) ought not to be the case, either.

In cases (1) and (2), minimal planning becomes the process of deliberate change, from state (A) to state (B) -- case (1) -- or achieving state (A) which does not pesently hold -- case (2). Minimal planning, however, can also be concerned with the maintenance of the status quo, that is, the state of a thing as it is, given the identification of an alternative state of the thing as it ought not to be -- case (3). Finally, minimal planning can occur in conditions of indeterminacy, where it is clear what the state of a thing is not and, equally, what it ought not to be -- case (4).

Therefore, minimal planning as it is defined here produces the following paradox: human beings must plan but cannot plan; minimal planning is both inevitable and impossible. A perception of the state of things as they are is required, but it is impossible to know completely and with certainty the state of things as they are. A conception of the state of things as they ought to be is required, but it is impossible to prove its validity. A strategy for resolving the discrepancy is required, but it is impossible to establish that it will be successful.

2. The "Paradox" of Formal Planning

The dilemmas of minimal planning lead to the development of formal planning, or the creation of models to systematize the process of resolving discrepancies. Because of the complexity of man's experience he must attempt systematically to simplify and order phenomena. The construction of rules, paradigms or models as more organized explanatory systems, is therefore also a usual and inevitable human activity. As Kuhn has noted in discussing the history of science:

> In the absence of a paradigm or some candidate for paradigm, all of the facts that could possibly pertain to the development of a given science are likely to seem equally relevant. (Kuhn 1962)

A model or paradigm in this sense of the term is a systematic, internally consistent account of phenomena which may or may not be consciously held.* The conjunction of the dilemmas posed by minimal planning and the need for a systematic account of phenomena leads to what is here defined as formal planning:

> Formal planning is the construction of a rule or set of rules or models according to which discrepancies are identified and the selection of plausible alternatives for their resolution is carried out.

Planners use different models for identifying discrepancies and strategies for their resolution, according to the specific planning theory they hold (as discussed above). One possible alternative is a form of deterministic/predictive model. This model assumes that the future can be foretold, based on present data analysis. Under the model, such data, together with extraordinary foresight, enable the planner to plan and act with the expectation of near certainty. The dilemma associated with this first model, however, is that data, and planner's foresight are not entirely reliable.

An alternative is what has been called the bounded rationality model (cf. Simon 1957). Frequently compelled to make decisions based upon limited and dubious information, the planner nonetheless identifies and weighs what he perceives as the available alternatives before acting. Within the limits imposed by circumstances and uncertainty, it is nonetheless possible to identify options, to pose and evaluate them. The process of reasoning cannot be extended infinitely; no final outcome can be determined. But given the constraints, it seems wiser for the planner to deliberate the problem as fully as his resources and inadequate information will permit before acting. This he does, and decides accordingly.

A third alternative is the incremental model. The salient point about this procedure is that it identifies the wisest course of action as the one that:

1) assumes the least about the adequacy of the available information. In the face of extreme uncertainty, no piece of information is either accepted or rejected out of hand.

2) It assumes nothing about the "shape" or nature of the future.

3) It entails no commitment to understanding and controlling an extended chain or sequence of actions, with the concomitant investment of substantial resources.

4) It leaves open all the identifiable options. The planner "cannot think it through a better way." (cf. Hirschman and Lindblom 1962.)

These three models, upon which planners variously or, sometimes, in combination rely, by no means exhaust all the possibilities, though they are common and familiar ones. A planner could not do without them -- or at least one of them --

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*There exist of course many alternative and compelling definitions of the word "paradigm" (in various disciplines the word is substituted for "model"). Kuhn (1962) for example, defines a paradigm as "a set of recurrent and quasi-standard illustrations of various theories in their conceptual, observational and instrumental applications" (p. 43). Merton (1968) describes paradigms in terms of five closely related functions. Principally, they "provide a compact arrangement of the central concepts (of a discipline) and their interrelations that are utilized for description and analysis" (p. 70. Foucault (1966) in turn, uses the term epistemes, that is, "dans l'espace du savoir, les configurations qui ont donne lieu aux formes diverses de la connaissaince empirique." The varieties of meaning imposed upon the paradigm idea are discussed in the first paper of this issue.

for each provides the rules according to which "relevant" discrepancies are distinguished from "irrelevant" ones and "plausible" resolution strategies are selected and implemented. The procedures of formal planning resemble laws or legal principles, just as the acts of minimal planning resemble the particular cases in which those laws are applied. In fact, it is useful to look at the construction or the models or systematic procedures of formal planning as an attempt to "legislate away," as it were, the contradictions and uncertainties which create the paradox of minimal planning:

1) A formal planning model establishes a convention for identifying the state of a thing as it is, thereby "abolishing" minimal planning's first dilemma. Under the provisions of the deterministic/predictive model, for example, the state of a thing is, quite simply, what the "scientifically collected data" specify.

2) A formal planning model establishes a convention for identifying the state of a thing as it ought to be, thereby "abolishing" the second dilemma in minimal planning. Returning to the deterministic/predictive procedure, the state of a thing as it ought to be is revealed and ordained through the combination of data and the planner's foresight in predicting the future. Through the establishment of conventions for identifying both what is and what ought to be, the discovery of discrepancies becomes in most cases a straightforward activity. Different procedures will generate different versions of the "is" and of the "ought to be." A major discrepancy for a planner operating with a deterministic model may not even be noticed by another employing the incremental model. But the use of a model, with its paraphernalia of conventions and rules, eliminates or reduces the uncertainties noted in the first two dilemmas of minimal planning. Formal procedure or model may be said to exist in large measure exactly for this purpose.

3) All planning models include mechanisms not only for identifying discrepancies but for specifying resolutions, and techniques for attaining them, as well. A "resolution" in the terms of one systematic procedure may very well not be considered such in the terms of another. But all systematic procedures, include some limiting conception, some notion of what the termination of a discrepancy is; and all provide or prescribe strategies for "removing the discrepancy," "solving the problem," "reaching a stopping point," etc.

4) The problem of an infinite universe of discrepancies and resolutions is thus also "solved," because every model defines and so limits it. Some planning models are more cautious or tentative than others about the claim that the identified universe of discourse is in fact the universe of all phenomena, but all set a boundary of some sort. Of course, the universe of different general conceptual systems also differ: the Christian universe is not the same as the astronomer's, and, for that matter, the post-Einsteinian astronomer's is not the same as the Copernican astronomer's. But each conceptual system identifies a universe, a subset of phenomena, which is asserted to be real and within which the system has explanatory and prescriptive authority and may be applied.

Whether or not, or in what sense, the models of formal planning "solve" the dilemmas of minimal planning is clearly a highly debatable matter. But in any case the models create two dilemmas which are peculiarly their own:

First, planning models, intended to simplify reality, in some cases oversimplify it and neglect aspects of it essential to the problems that the models were designed to address.

Second, and conversely, planning models may overcomplicate reality. This is frequently the case when the users of a planning model, confronted with new and intractable data, are forced to elaborate it extravagantly for the sake of preserving the model's internal consistency. As Kuhn has remarked of the Ptolemaic system,

> Given a particular discrepancy, astronomers were invariably able to eliminate it by making some particular adjustment in Ptolemy's system of compounded circles. But as time went on, a man looking at the net result of the normal research effort of many astronomers could observe that astronomy's complexity was increasing far more rapidly than its accuracy and that a discrepancy corrected in one place was likely to show up in another. (Kuhn 1962, p. 68)

If the theories and models in use at any given time were ever completely sufficient for describing phenomenal experience, obviously systems representing reality would cease to evolve. There would be no need for further refinements or transformations in the existing models. But such a point has never been reached and seems highly improbable, even logically impossible. As Foucault (1966) has demonstrated, the history of Western thought can be described as an accretion of epistemological layers (epistemes) which cannot be expected to have a completion. Thus, human beings must formulate models to govern the activity of minimal planning, but the rules cannot be adequate; Formal Planning is both inevitable and impossible. Conceptual systems will always be required for the

identification of discrepancies and strategies for their resolution, but conceptual systems change and there is no objective way to prove their universal validity or sufficiency.

3. The "Paradox" of Meta-planning

The fact that the models and systematic procedures of formal planning undergo continuous revision and change demonstrates their inherently provisional character. Models, because they must maintain internal structural coherence, inevitably either over-simplify or over-complicate reality and therefore they are sooner or later modified or replaced.

Because in the final analysis there is no objective way to prove the validity or sufficiency of a given model, its power depends upon some source of authority which is itself not subject to verification but which is held as a matter of belief -- an "absolute presupposition" in R. G. Collingwood's phrase:

> An absolute presupposition is one which stands, relatively to all questions to which it is related, as a presupposition, never as an answer. Thus if you were talking to a pathologist about a certain disease and asked him 'What is the cause of the event E which you say sometimes happens in this disease?' he will reply 'The cause of E is C'; and if he were in a communicative mood he might go on to say 'That was established by So-and-So, in a piece of research that is now regarded as classical.' You might go on to ask: 'I suppose before So-and-So found out what the cause of E was, he was quite sure it had a cause?' The answer would be 'Quite sure, of course.' If you now say 'Why?' he will probably answer 'Because everything that happens has a cause.' If you are importunate enough to ask 'But how do you know that everything that happens has a cause?' he will probably blow up right in your face, because you have put your finger on one of his absolute presuppositions, and people are apt to be ticklish in their absolute presuppositions. But if he keeps his temper and gives you a civil and candid answer, it will be to the following effect. 'That is a thing we take for granted in my job. We don't question it. We don't try to verify it. It isn't a thing anybody has discovered, like microbes or the circulation of the blood. It is a thing we just take for granted.' (Collingwood 1961, p. 31 emphasis in original)

In Collingwood's example the two modes of planning already discussed in this paper can be recognized. The discovered discrepancy is the event E, and at the level of minimal planning the discrepancy is explained simply by an assertion, namely, "The cause of E is C." Formal planning, as the use of a rule or model, is present in the pathologist's explanation that C is known to be the cause of E because So-and-So has conducted an experiment according to certain accepted conventions which proves it to be so. A third model of planning appears with the appeal to an ultimate, though inverifiable, sanction -- "everything that happens has a cause... That is a thing we take for granted in my job."

This third model of planning may be called meta-planning and may now be tentatively defined:

> Meta-planning is the commitment to an ultimate authority which justifies the construction of a particular set of rules or models according to which discrepancies are identified and the selection of plausible alternatives for their resolution is carried out.

It should be noted that the idea of ultimate authority has been defined in a variety of ways. The equivalence is not exact, but a "constellation of absolute presuppositions" performs a similar to that function of a weltanschauung (world-view), a set of categorical principles, or a cosmology. All these concepts have in common the characteristic that they are simultaneously unquestionable and unverifiable.

By invoking the ultimate authority of a weltanschauung, meta-planning attempts to solve the dilemmas of formal planning -- that models or paradigms oversimplify and/or overcomplicate reality. A weltanschauung provides an unequivocal basis for disregarding the consequences of oversimplification or over complication. It is the peculiar power of this ultimate authority to dictate that the problems of the models which it sanctions are due to their imperfect or incomplete state of development, rather than to any inherent flaws. For example, the medieval christian weltanschauung insisted on an anthropocentric universe, and hence on the central position of the Earth in the planetary system. The Ptolemaic model, conveniently adopted by the Church, was not fundamentally questioned. Rather, it was required to elaborate itself continuously in order to account for newly observed phenomena. The resulting complication was assumed as a necessary concomitant of the model's refinement, rather than a cause for questioning the validity of the model or the weltanschauung which sanctioned it.

However, meta-planning produces an obvious "paradox" of its own: It necessarily entails absolute commitment to the validity of presuppositions which can neither be proved nor disproved. This inherently unverifiable character of weltanschauungen radically impairs the integrity and usefulness of the very models they sanction. For if a model is based on premises which are not subject to refutation, the explanation provided by the model can only be regarded as tentatively true. Certainly, a given model may be judged to be more or less "good" according to the degree of its internal consistency and refinement, but nonetheless no indisputable assessment can be made of the model's adequacy as an accurate account of the phenomena it purports to explain. Thus, human beings must resort to belief in absolute presuppositions in order to sanction the models used to govern the activity of minimal planning, but the validity of the sanction is always in doubt. Meta-Planning is both inevitable and impossible.

Thus far, we have used a deliberately artificial schema, in order to demonstrate the dilemmas and inherent uncertainties of the planning process. We have constructed a hierarchical typology which implies that minimal planning necessarily leads to formal planning, and formal planning to meta-planning. In fact, however, these three types are primarily conceptual devices rather than empirically identifiable forms of planning practice. Furthermore in the activity of planning, these "ideal-types" -- in Weber's sense -- always function interdependently and in a non-hierarchical fashion. A planner engaged in "minimal planning," attempting to resolve a simple discrepancy, cannot proceed without at least a minimal model which specifies what is and is not possible, and a weltanchauung which justifies that particular model. In fact, a weltanchauung was necessary to identify the discrepancy in the first place. Notions of what "is" and what "ought to be" do not occur in vacuo. They are derived from the system of beliefs and knowledge which constitutes a weltanschauung.

Conversely, a world-view is constructed precisely to account for the flow of discrepancies encountered in all human experience. Moreover, the constant friction between absolute belief and experience compels modification, and, in extreme cases, abandonment of a particular world-view. This is true not only of individuals but also of whole cultures.

It is beyond the scope of this paper to worry the question whether experience is temporally and logically prior to the formulation of world-views, or the reverse. In either case, the fact is that belief and experience always interact in a circular way. Engels has described this interaction clearly:

> ...The economic situation is the basis, but the various elements of the superstructure -- political forms of the class struggle and its results, to wit: constitutions established by the victorious class after a successful battle, etc., juridical forms, and even the reflects of all these actual struggles in the brains of the participants, political juristic, philosophical theories, religious views and their further development into systems of dogmas -- also exercise their influence upon the course of the historical struggles and in many cases preponderate in determining their form. There is an interaction of all these elements... (Engels 1968, p. 692)

The dilemmas which afflict all planning, and which have been discussed in the first three sections of this paper, impose the conclusion that substantive improvement in planning theory and practice will not result from the formulation of new and "better" explanatory systems and theories or even from some radical event of paradigm shift. Rather, it seems a more promising approach to develop a method for critically and self-consciously examining the explanatory systems which, out of habit, intuition, or logic, appear to be appropriate in a given planning context. Such a method is formulated and discussed in the next three sections of the paper.

4. Critical Reflection in Planning

There are three possible reactions to the "paradoxes" posed by minimal, formal, and meta-planning.

1) To deny the existence of the paradoxes because of the deterministic nature of the world. If it is true that events are entirely predetermined, then planning is irrelevant, because the course of events cannot be altered. According to a "Democritean" image of the world:

> ...there exists a sufficient amount of information concerning the atoms of the world so that in principle all of their movements are predictable in the future and describable in the past...(this image) has been the Weltanschauung of the physical sciences, kinematics, mechanics, nuclear physics, etc., as well as chemistry and the many branches of biology in which biological change is described in terms of predictable changes of certain elements of the organism. (Churchman 1971, p. 209-210)

2) To deny the existence of the paradoxes because of the random nature of the world. If events are entirely random, then planning is also irrelevant because complete uncertainty prevails and it will be impossible to identify discrepancies let alone prescribe their resolutions. Uncertainty is so great and pervasive that any discrepancy is as likely to be significant as any other and, moreoever, any model for explaining and resolving discrepancies is as likely to be effective as any other. In this case both the identification of the most relevant discrepancy and the selection of a model for explaining and resolving it will most rationally be solved by tossing a coin or consulting a table of random numbers. Or, alternatively, to refuse the possibility of change altogether and resort to what Donald Schon calls "the belief in the stable state":

> The feeling of uncertainty is anguish. The depth of anguish increases as the threatening changes strike at more central regions of the self. In the last analysis, the degree of threat presented by a change depends on its connection to self-identity. Against all of this we have erected our belief to the stable state.
> (Schon, 1971, p. 14)

3) To accept the existence of the paradoxes and to develop a strategy for containing their effects. The method advocated in this paper for coping with the paradoxes is to increase the capacity for critical reflection in the planning process, that is, to encourage the participants in planning to think about thinking, to discourse about discourse. If we must plan, then we must creat explanatory systems to guide planning. Since our plans and our theories are always inadequate, we must learn to use them self-consciously, cautiously, and even skeptically. The method involves a continuous process of critical, argumentative examination of both the discrepancies which are identified and the models and derived strategies which are then applied. The goal of this method is not simply to contain uncertainty, but rather to increase it, through the deliberate exposition of as many unknowns as possible, in terms of problems, information, strategies, and consequences.

"Critical reflection" is here intended to denote a process of self-conscious evaluation of the mechanisms of problem-solving. Allison provides a description of this process in his analysis of the conceptual models applicable to the Cuban missile crisis:

> This study proceeds from the premise that marked improvement in our understanding of such events (as the Cuban missile crisis) depends critically on more self-consciousness about what observers bring to the analysis. What each analyst sees and judges to be important is a function not only of the evidence about what happened but also of the 'conceptual lenses' through which he looks at the evidence.
> (Allison, 1969, p. 610, emphasis added)

As the paradoxes of minimal, formal and meta-planning show, although it is impossible to know if the most significant discrepancy has been identified and to discover a "best resolution" of the discrepancy, it is equally impossible to refrain from trying. "Planners" will continue to identify problems and explanatory systems for constructing solutions to these problems, for which there can be no absolute criteria of validity.

The paradoxes of minimal, formal and meta-planning can be tolerated not merely by the invention of new and better explanatory systems, but by the critical, conscious selection and use of these systems. The problem calls for discovery of the assumptions and principles underlying particular planning models and techniques and the rigorous application to each model of the questions, "What if...?" What is likely to happen in the case of a given discrepancy if model (X) is assumed and strategy (y) implemented? In auch a framework, planning becomes a dialectical process, the purpose of which, it can be argued,

> ...is not the establishment of a solution, but the creation of a more knowledgeable political process in which the opposing parties are more fully aware of each other's Weltanschauungen and the role of data in the battle for power. This argument is plausible if one accepts the world view that through conflict of ideas comes greater enlightment, a world view which must have its own deadly enemy, of course.
> (Churchman 1971, p. 185).

This added dimension of the planning process can be tentatively defined as follows:

> Critical reflection involves the continuous evaluation and adaption of the explanatory systems according to which discrepancies and strategies for resolving them are identified (formal planning) as well as the principles for locating the discrepancies and strategies themselves (minimal planning).

It is of course true that the process of critical reflection is logically vulnerable to the dilemma of the infinite regress; that is, it can be argued that

any critical reflection may properly itself be the subject of further critical reflection and so on, ad infinitum. This is clearly the case when the focus of the inquiry is on final outcomes: the attainment of a certain level of "objectivity" through such a process:

> The pathway of objectivity seems to be either an infinite regress or a vicious circle. It would be an infinite regress if the designer were always to evoke a new master observer to legislate over the old master and his subject ('Jones is an expert because Smith says he is, and Smith is an expert on Jones' expertness because Brown says he is and...'). (Churchman 1971, p. 169)

It ceases to be so, however, when the focus is on the process itself. Then, indeed, the possibility of critical reflection becoming itself the subject of further critical reflection is simply a manifestation of an ongoing process. Furthermore, all human behavior is obviously constrainted by scarce resources. This is no less true of intellectual than of political, economic and social processes. Therefore, it is explicitly recognized that the process of critical reflection can never be, and should never be, logically ecomplete but that it will be in each case subject to limitations of time, ability, money, institutional tolerance, i.e., "field dependent."

But the logically incomplete character of the process of critical reflection may be seen as its peculiar power. If final goals are unattainable in human experience, nevertheless the attempt to plan for and reach those goals is unavoidable and, in the end, itself of the greatest value.

5. Argument as a Method of Critical Reflection

To increase the capacity for critical reflection in the planning process requires a method of argumentative examination of both the discrepancies which are identified and the models and derived strategies which are then applied.

The question that must be asked is not whether one specification of discrepancy/model/strategy is "true" in any final sense, but rather, whether it is a better account of the dilemma than any of the competing specifications of discrepancy/model/strategy which can be discovered in the limited time available. As Landau has observed:

> Accordingly, it must be understood that every theoretical choice and every empirical assertion is to be regarded as risky...Even theories (let us now substitute policy) that have been proved out are to be subject to re-examination. The way to do this is to frame alternative, even competing policies and apply them to the same problem areas. These competitions provide an additional (redundant) criticism -- a criticism that can even be sharper than the comparison of a policy with the field of experience it is to order. For however successful a policy appears to be, its adequacy should only be established after a confrontation with strong alterantives. (Landau 1973, p. 541)

If follows from what has been said previously that there is never a unique perception of a given discrepancy. Or, more precisely, each analyst of a problem or "planner" will define the discrepancy that constitutes the problem in at least slightly different terms from others'. Therefore, there can never be a unique strategy for resolving a given discrepancy. This fact necessarily produces conflict, either latent or overt. If a decision is to be made, the "planners" must devise methods for coping with this conflict. One possible method might be to try all proposed solutions simultaneously, provided that they are compatible to some extent. Schelling has remarked that:

> Pure conflict, in which the interest of two antagonists are completely opposed, is a special case; it would arise in a war of complete extermination, otherwise not even in war. For this reason 'winning' in a conflict does not have a strictly competitive meaning; it is not winning relative to one's adversary. It means gaining relative to one's own value-system; and this may be done by bargaining, by mutual accommodation, and by the avoidance of mutually damaging behavior. (Schelling, 1963, pp. 4-5)

Pondy (1972) has divided conflict into five discrete stages (latent, perceived, felt, manifest, and conflict aftermath). It should be noted that conflict is not necessarily a pathological or destructive process. As Deutsch observes,

> (Conflict's) very pervasiveness suggests that it has many positive functions. It prevents stagnation, it stimulates interest and curiosity, it is a medium through which problems can be aired and solutions arrived at, it is the root of personal and social change. (Deutsch, 1972, p. 381)

Obviously, there are many modes of conflict, ranging from violent confrontation to playing chess. The argumentative method of critical reflection in planning

entails the model "argument," and more particularly, the derivative "dialectical argument." In order to define the latter, it is first necessary to define the former, the genus of which dialectical argument is a species.

A succinct and adequate definition of an argument is not possible. The Shorter Oxford Dictionary lists seven meanings of the word, of which the most useful, for present purposes, is that an argument is: "a connected series of statements intended to establish (or subvert) a position; a process of reasoning; argumentation." An argument requires:

1) A minimum of two points of view which are in disagreement about at least one aspect of a discrepancy (or issues).
2) A motive for terminating the disagreement (winning, compromising, suspending) which acts on both points of view; willingness to act on behalf of each point of view.
3) A set of rules -- formal or informal -- according to which the argument may begin, proceed, and come to a close.
4) A change in consciousness. Either one side persuades the other or some third, or nth, position, distinct from the original two is reached.
5) A willingness among participants to change their initial points of view through the argumentative process or at least to accept as reasonable outcomes that are incompatible with their original positions.

Edelman notes that:

> Public controversy over an issue functions to help participants in the debate accept an outcome that deviates from their beliefs about the optimum policy. It offers an opportunity for the interested individual to rationalize his acceptance of an outcome he does not like (or to expect such rationalizations of his opponents) on the ground that acceptance is necessary to social adjustment and coexistence. (Edelman 1971, p. 45-46)

It follows that an argument always has a non-random component -- i.e., a structure -- which can be agreed upon even if it is not made explicit by the participants in the argument.

An argument does not require more than one participating person. It may be an internalized debate. Moreover, an argument does not require speech. It can be written or conducted in gestures or played on a game board.

Argument as we have defined it may be a way of resolving issues. In order to generate the critically reflective process -- dialectical argument -- it is necessary to impose additional requirements.

The dialectical argument must reveal the conceptual and belief systems underlying the points of view advocated in the argument and insure examination of these systems. As Merton has observed,

> Since sound sociological interpretation inevitably implies some theoretical paradigm, it seems the better part of wisdom to bring it out into the open. If true art consists in concealing all signs of art, true science consists in revealing its scaffolding as well as its finished structure.

The need for a dialectical argumentative method fostering critical reflection about the models used in decision-making has been widely recognized in recent years. For example, Churchman (1971), Mason (1968, 1969), and Mitroff (1972) have written extensively on the subject. Mason (1969) has argued that the principle failing of traditional decision-making techniques in management science is that they "do not expose the assumptions underlying a proposed plan so that management can reconsider them."

A second requirement for dialectical argument is that it must also pose and deliberate the question "What if...?" More precisely, "What is likely to be the outcome if this model and these strategies are applied to the identified discrepancy?" It is by no means clear that the process of raising and considering this question will necessarily result in a process of revealing the structure of the model or the intellectual and value commitments underlying it. Tracing the consequences of using any given model, however, may easily produce a more complete understanding of what the model itself is and presupposes.

Given the above considerations of conflict and dialectical argument as the basis for the argumentative method of planning, a procedural protocol can be described as follows:*

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*An example of an actual argumentative decision-making process that, in its principal parts and sequence, closely resembles the protocol is presented in a subsequent paper of this issue: "The Cuban Missile Crisis: A Case Study of Argumentation in the Planning and Decision-Making Process."

1) identification of the most "significant" discrepancy;

2) identification of a model(s) which explains the discrepancy and from which a strategy for resolving it can be derived;

3) recognition of the uncertainties to which (1) and (2) are liable;

4) generation of competing alternatives for both the most significant discrepancy and the model(s) which best explicates it, and from which alterantive strategies can be derived;

5) explicit dialectical competition between the original discrepancy/model/strategy and the alternative ones;

6) procedural rules for initiating, conducting, and arriving at a conclusion of the dialectical argument, in terms of selecting the discrepancy/model/strategy which will guide or establish purposeful action;

7) After such change-producing action has been taken, a next round of "identification of the most significant discrepancy," and so on.

As it has been noted earlier, the above protocol should itself be subject to critical examination, through a similarly searching and challenging argument. This protocol is by no means unique as an argumentative method. Several alternative possibilities exist in different processes, such as the development of constitutions, parliamentary rules, rhetoric, etc. The method advocated here is thus an attempt to introduce in the planning process a resource which has not been systematically exploited.

The "planners" engaged in dialectical argument must initiate a sequence of questioning. The first round consists of challenging and justifying the models which each "planner" holds. This has the effect not only of initiating bargaining, but also of making explicit the "conceptual lenses," in Allison's phrase, that each "planner" is employing. Making the models explicit has the value, not of subjecting the models to proof or disproof of their absolute validity, but of making it possible to determine which is most applicable to the particular set of circumstances.

The "planners," having gone through a conscious process of reflection and debate, have produced knowledge* in making the first decision. They have begun to develop expertise, that "...as Walter Lippmann once defined it, (is) the multiplication of the number of aspects we are prepared to discover plus the habit of discounting our expectations. To discount here means to make allowance for error" (Landau 1973, p. 536). With our "planners" this newly acquired expertise** permits three operations: awareness and identification of new information; the ability to question the model in terms of which the new information can most relevantly be used; and a method for reaching agreement about both the existence of new information and the model in which it may best be used.

In summary, the argumentative method proposed as a means for critical reflection involves the continuous application of the following procedures: identification of a "plausible" discrepancy/model/strategy for the problem at hand; development of alternative sets of discrepancies/models/strategies; a sequence of questioning for disclosing and analyzing conflicts among the alternative sets; procedural rules for resolving the conflicts; and finally, application of the knowledge and expertise produced in this conscious process of reflection and debate, in further rounds of analysis and decision.

6. In lieu of a conclusion: Assets and liabilities of the argumentative method of planning

We have so far discussed the characteristics and dilemmas of three "levels" of planning, their interrelationships, and their respective limitations and impossibilities. We have identified the need for an increase in the capacity for critical reflection in the planning process, and proposed a method for promoting such an increase. This method is based on dialectical argument among various participants, on the discrepancies (planning problems), explanatory systems (theories and values) and strategies (alternative actions) that apply to planning issues. It is obvious that this method exhibits certain serious problems, as well as some important advantages. To understand and evaluate the method better, as well as to compare it with more traditional planning procedures, a discussion

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* We may designate as "knowledge" anything that is known by somebody, and as "production of knowledge" any activity by which someone learns of something he has not knwon before even if others have.
In this sense, disclosure, dissemination, transmission, and communication become parts of a wider concept of "production of knowledge." (Machlup, 1972, p. 7).

** Lippmann did not intend, nor do we imply, that expertise is an absolute quality. Rather the term is here used to denote the ability to reflect critically and even skeptically about problems and their possible solution.

of these problems and advantages is necessary. The following can be identified as assets or advantages of the argumentative method of planning:

1) Explicitness of the process. The "planners" or "decision-makers" participating in dialectical argument, must become explicit regarding their assumptions of fact and value about both the present and the desirable future. In short, they must present and defend the explanatory system that guides them in identifying discrepancies and selecting strategies, as well as stating their expectations regarding the outcome of the specific course of action they are advocating. It is of course debatable whether or not the process of dialectical argument might achieve such explicitness simply by declaring the need for it. Political decicion-makers are notorious in avoiding such explicitness, and indeed a substantial part of their performance is oriented towards a disguise of their "real" motives or expectations. It could also be argued, however, that the argumentative process institutionalizes the need for explicitness and makes it a necessary and legitimate part of the process. It is generally true, nevertheless, that for argumentative planning to become an explicit process, a long and possibly difficult tradition must be established. It is also true that at various points in the process, different levels of explicitness will be achieved (and possibly never "total" excplicitness), depending on the willingness of the participants or the implications and consequences of the issue at hand.

2) Participation of a plurality and diversity of points of view. A fundamental requirement of dialectical argument is not simply the allowance, but the necessity of alternative, and opposite, points of view. The "planners" do not simply turn a sympathetic ear (as in advocacy planning) towards explanatory systems different from their own; they must go out and find them, and make their adherents full participants in the process. The more the diverse and conflicting the points of view represented, the more successful the argumentative process is considered to be.

3) The process considers, or develops, more factual knowledge.* The development of opposite and conflicting points of view provides, almost de facto, an enlargement of the factual base of the process. The conflict between alternative discrepancies and strategies can be presented and resolved only by asking the opposing points of view to produce factual support of their position. A complimentary asset, is that the argumentative process makes a more efficient use of its factual base. Indeed, in the dialectical argument only information which is pertinent to the discrepancies at hand is originally used and expanded as required. There is no need for any initial stage of "information collection and analysis" in vacuo as in more traditional planning procedures.

4) The process provides for increased co-operation in implementing the alternative course of action chosen. Increased co-operation is achieved in two ways: first, the "non-committed" participants (who were not advocating either the decision taken or its major alternative) understand better the assumptions, value-systems, and possible flaws of the decision arrived at. They will be more willing to cooperate in carrying out the decision taken.

Second, the "conflicting" members also profit from this understanding, because it helps them rationalize acceptance of an outcome they do not like (cf. Edelman, 1971).

5) The process provides a more comprehensive schema for the evaluation of the results of the selected course of action. The introduction of diverse viewpoints in the initial decision-making stage, provides an enriched set of criteria to be applied, in the evaluation stage, to the effects of the implemented action. If, for example, an objection was raised in the course of argumentation against a strategy which nevertheless was finally implemented, this objection will be included in the criteria used to evaluate the results of the strategy.

6) Similarly, the process provides for the accommodation of negative feed-back. If the strategy implemented proves to be a mistake or an unsuccessful attempt to resolve the discrepancy, then the dialectical argument which provided the basis for the decision in the first place, can now be used as the starting point for the next round of reversing or modifying the initial "wrong" decision (see Protocol, (7), above). Such reconsideration will be more articulate and the subsequent extension of the argument more promising for a successful second attempt, rather than starting again from a tabula rasa position.

7) The process contains the uncertainty to which all planning is vulnerable. It is never possible to entirely eliminate uncertainty, but through dialectical

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* We wish to side-step the many appropriate objections to our use of the word "factual." We mean by it: representations of the phenomenal world which are generally accepted as valid. Whether the validity is a matter of correspondence, or coherence or, merely, convention is an epistemological dilemma beyond the scope of this paper.

argument it is likely that the "planners" will be able to specify where the major uncertainties -- factual and valuational -- lie, and how serious they are or may become.

The advantages of the argumentative method are, however, obtained at a cost. Specifically, the liabilities of the method include the following:

1) The problem of more resources, in terms of time, information, and money, necessary to arrive at a decision through dialectical argument rather than through any more "authoritarian" style.

2) Though it is the very essence of the argumentative method, explicitness creates a number of significant problems:

a) It is possible, indeed likely, that participants in the process will resist exposing, let alone examining critically, the intricate web of values, beliefs, experiences, which form their weltanschauungen.

b) Once a position has been explicitly stated, it is probably that its proponent will feel obliged to defend it, simply in order not to appear inconsistent.

c) It has been noted that the fundamental assumptions of a weltanschauung are inherently inverifiable. In the event that one of these assumptions is explicitly challenged, its proponent has only two choices: He may agree, not to relinquish it, but to suspend it for the sake of the argument. On the other hand, he may simply refuse to budge, he may insist on the absolute rightness of his position, thus making it non-negotiable. This is of course in conflict with a basic presupposition of dialectal argument, but it is a probably outcome nevertheless and "too bad for dialectics!"

3) Another liability is the opportunity for some participants to obstruct the process by introducing irrelevant positions or by employing delaying tactics.

4) A major problem is the impossibility of truly "dialectical" rules for the opening, conduct, and resolution of the argument. Any rules adopted (majority rule, unanimity or Pareto optimum, random) will by definition be non-dialectical. On the other hand, no argumentative process can occur without previously establishing operating rules. This vicious circle of infinite regress can be reasonably modified in reality by allowing the rules to change frequently within the process, as experience dictates.

5) The issue of unequal expertise is a persistent obstacle to the fulfillment of the aims of the dialectical process. Some participants will always have more experience, skill in argument, or charisma than others. These personal assets may outweight intrinsic merits in a particular line of argument, and thus distort the dialectical process.

6) Possibly the "deadliest enemy" of the dialectical argumentative method is the problem of power. There are two interrelated issues: first, in any society, and therefore in any argumentative planning process, power (economic or political, and usually both) will be unequally distributed among participants. How can the assumptions of the process work smoothly in such a framework? Second, the planning and decision-making processes now operating, by definition fit the existing power structure. Why should the now powerful yield some of their power in an argumentative process? How can it be expected that the now powerful will contribute to, or in any way facilitate, a process the outcome of which may well be a "loss" rather than a "win." Inevitably, any attempt at creating an argumentative planning method must also make certain assumptions about a redistribution of economic and political power, or at least about a minimization of their interference, both rather defeating assumptions in reality.

No definite answer can be given to these questions and dilemmas. The argumentative method requires of its users the suspension, at least temporarily, of their respective prerogatives. This requirement is ordinarily satisfied only by motivations arising from crisis -- a necessary though by no means always sufficient condition. Whether this requirement will, or can be applied, is an issue that depends for its resolution upon particular political structures.

Whether in response to extraordinary pressure generated within or outside a particular institution, or out of a sense of responsibility aroused by a threat to the common good or, ironically, as a result of a demand imposed by a higher level of authority, planners and decision-makers may, and often do, employ some form of the argumentative method. It has been the contention of this paper that more systematic use of the argumentative method will substantially improve the planning and decision-making processes.

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THE CASE AGAINST PLANNING: THE BELOVED COMMUNITY*

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It is probably safe to begin with a truism, in order to start this thoroughly speculative exploration on a sound footing. The truism says that in the last two decades there has been a dramatic shift in management philosophy, from the dynamic, forceful, follow-the leader type to the reflective, perspicacious, evaluative type. In the good-and-bad old days, managers thought of themselves as forceful decision makers--the best of them avoiding the hesitant, I'm-not-so-sure posture. The better managers of today see that their role is in part to ask good questions, and not simply to provide definitive answers. "Ought we to be restricting ourselves to domestic markets?" is a more appropriate beginning than "Our policy is to avoid international entanglements, and by God we're going to stick to it!"

Along with the more hesitant, reflective and evaluative mood of today's management has come a broadening of the base of good management. The old time manager could expect his staff to provide the essential data for his decision making: accounting data, market potential, etc. But the kind of data he needed depended very much on his personal style and perspective; if he concentrated on share-of-the-market, he got share-of-the-market data. If he concentrated on cost-savings, he got cost-savings data. No one suggested to him that his data base was incorrect. The more reflective manager of today does ask what kind of data he really needs in order to manage well, and consequently his staff can be far more diversified in terms of its intellectual background: economic forecasters, demographic experts, social psychologists, operations researchers--and planners.

Planning can be regarded as the ultimate stage in the evolution of reflective management; its goal is to expose all the facets of organizational structure, opportunity and goals. Properly conceived, it is a marriage of traditional managerial talents with the various types of expertise that are relevant to the organization's objectives. Planning should not "take over" decision making, but rather should supplement the role of action by adding the essential dimension of reflection. No sound enthusiast of planning argues that every action must be thoroughly planned, nor that all facets of the situation must be examined; such an extension of reflection is idiotic, as idiotic as attempting to minimize costs. There is but one way to minimize costs, and that is suicide. According to one view of the hereafter, when you're dead, your costs are nil. According to another view, there is but one way to maximize reflection, and that is suicide. When you're dead, you'll have eternity to reflect in.

No, sound planning is an elegant balance of the need to act and the need to reflect. Planning, being self-reflective, reflects on the questions of when to plan, how deeply to plan, how long to plan, and so on.

The truism that began this discussion has turned into another truism. The first truism said that management philosophy had changed in the last two decades. The second truism says that it ought to have changed--that reflective management is better than forceful management.

And indeed this seems almost obviously to be the case. If there is no opportunity to scan alternatives more deeply, to reflect on goals, to use the power of intelligence and intellect before taking

*This paper was revised from a talk presented at the University of Pennsylvania, Wharton School, January, 1968.

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THE DESIGN METHODS GROUP PUBLISHED THE DMG NEWSLETTER DURING THE YEARS 1966 THROUGH 1971; THE DMG-DRS JOURNAL: DESIGN RESEARCH AND METHODS DURING THE YEARS 1972 THROUGH 1975; AND HAS PUBLISHED THE PRESENT JOURNAL, DESIGN METHODS AND THEORIES SINCE 1976. OTHER, IRREGULAR PUBLICATIONS HAVE INCLUDED THE DMG OCCASIONAL PAPERS NUMBERS ONE AND TWO, THE DMG BULLETIN, AND VARIOUS CONFERENCE PROCEEDINGS IN ADDITION TO THOSE INCLUDED IN THE JOURNAL. THESE IRREGULAR PUBLICATIONS ARE NOT INCLUDED IN THIS LIST OF TABLES OF CONTENTS, BUT WILL BE THE SUBJECT OF A LATER LISTING. ALSO TO FOLLOW WILL BE A COMPREHENSIVE INDEX OF THE FIRST TWELVE VOLUMES AND IRREGULAR PUBLICATIONS, LISTINGS OF ABSTRACTS AND BOOK REVIEWS PUBLISHED DURING THE PAST TWELVE YEARS, AND REVIEW ARTICLES ON TOPICS PUBLISHED.

CURRENT PUBLICATIONS OF THE DESIGN METHODS GROUP ARE THE JOURNAL, DESIGN METHODS AND THEORIES, AND AN IRREGULAR SERIES OF REFERENCE SHEETS FOR NEW STUDENTS OF DESIGN.

DONALD P. GRANT, CHAIRMAN, THE DESIGN METHODS GROUP, AUGUST 1978

DMG NEWSLETTER - VOLUME ONE (1966) THROUGH VOLUME FIVE (1971)
DMG-DRS JOURNAL: DESIGN RESEARCH AND METHODS - VOLUME SIX (1972) THROUGH VOLUME NINE (1975)
DESIGN METHODS AND THEORIES - VOLUME TEN (1976) THROUGH VOLUME TWELVE (1978)

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VOLUME ONE NUMBER TWELVE - DECEMBER 1967

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THE DESIGN METHODS GROUP C/O J.P.PROTZEN, DEPT. OF ARCHITECTURE, UNIV. OF CALIFORNIA, BERKELEY

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Jean-Pierre Protzen, Editor
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action, who but a fool would scorn the opportunity? The second truism is surely true, is it not? Can we afford not to plan?

A century and a half ago, Hegel wrote a very beautiful and compelling account of the development of the human spirit, The Phenomenology of Spirit. In his story, he tells how we come to change our attitude, and how, as we do so, we come to have a strong conviction in the correctness of the change. The conviction is grounded in the mood of looking backward. When we look backward, we see where we were, and that our new perspective encompasses all that was good in our prior existence, but at the same time removes all the narrowness and inconsistencies of the past. It is because we thus look backward that we become so convinced that our present stage is correct. Above all, the present stage can observe both its present self and its past self, and realizes that its new powers of self-observation are fantastically richer than its old powers.

In Hegel's terminology, the old self is called the thesis and the new self the anti-thesis. The antithesis stands head and shoulders above the thesis--or we might better say that it stand on the shoulders of the thesis and makes a far finer head. It is not really an opposite of the thesis--it is a reflective emanation of the past.

So I have been exploring a bit of Hegelian dialectic. Old-time forceful management represented the thesis, current reflective management the antithesis. The truism I arrived at is illustrative of Hegel's psychological theory; it becomes a truism because we look backwards and compare ourselves with a prior stage. We keep all that was good and essential in the forceful manager, and add the enormous powers of expert reflection. We can see that the old-time manager was like--his virtues and his evils, and plan to keep the best of him and discard the rest. In planning wisely, we are correct.

But there is another stage in Hegel's story of the evolution of the human spirit, the stage that is coming, the synthesis stage that will look back on both thesis and antithesis with a far deeper insight than either attained. This is a stage that is much more difficult to face, because it means looking ahead--but not looking ahead in the sense of forecasting or reading-the-future which belongs to planning and "futurology" as we know it today.[1] No, it means looking ahead to another attitude or perspective of the world, to another way of viewing reality in order to act. It is a dangerous adventure, this kind of looking ahead, because it threatens to shatter our confidence in our own current outlook.

Yet it is possible to start out on this adventure in a less-than-serious mood, in the mood of an adventurous game whose outcome one need not accept on the morrow when again he returns to planning and meaning. So for entertainment's sake, only, I ask you to imagine with me the attitude of a manager of tomorrow as he looks back on the planning enthusiasts of the 1960's.

Since our pleasure is entertainment, we can allow speculation to take over completely, storing the luggage of fact and theory in their dreary locker rooms, being sure to retain the soiled ticket for later retrieval.

In order that speculation have some food to eat, I'll begin by setting down some assertions that go along with the "truism" of today's management philosophy:

1. Everyone in the system should have some contribution to make to the development of the system's plan. This is the "democratic" assumption so dear to our culture, though few of us understand what it really means.

2. The contributions of each person can be classified, and separated out so that in each segment the contribution can be offered independently of what is going on in other segments.

This merely says that the economist gives economic advice, the lawyer legal advice, and the manager takes action. Generally, the economic or legal advice can be given independently.

3. There should be one group in the system--call them the "public"--who do not contribute directly; instead their contribution is made by an elected representative, who is an expert on the optimal service rendered to the public.

The public may be the stockholders, or the citizens, or the rank-and-file union members. The only expertise the public offers is some say in who shall represent them. Their representatives may be industrial managers, union leaders, elected legislators, judges, etc.

4. The contribution of experts can be ranked in terms of their importance: The top manager is most important, middle management next, scientific and planning experts next, and the public is the least important.

This axiom of our truism may not seem so true to everyone, but I introduce it in order to play the game in an entertaining way. It is in fact true,

[1] See, for example, "The Year 2000" by Herman Kahn and Anthony J. Wiener, New York: The Macmillan Company, 1967.

i.e., the President is generally regarded as the most important figure, Congress and the Judiciary next, the Executive offices next, the public least. Of course, whether this is a right way for things to be, would not receive a unanimous vote.

5. The role of reflection in the system is to ascertain the long and short range goals and to determine which policies will maximize the total value of the system: service to the public is the standard.

Here at last the public emerges as the important figure. In the planning process the public is the servant who follows the policies set forth by the "experts," including the managers and politicians. In the end, the public is the master whose "interests" are served by the policies.

I'll now ask you to imagine a manager of the future who looks on these almost obvious axioms of planning of 1968 as interesting curiosities of the past. In his superior position, looking backward he can see how 1968 management was--not completely wrong--but fundamentally wrong, because all but the first axion are false --dangerously false.

In brief, before I develop the details, this manager sees what no manager of today even suspects, that the whole 1968 planning process is predicated on the false and untenable position of serving the public's interests by means of expert representation. This old-fashioned assumption of 1968 is false because in reality the public's "interest" is to plan, to mean something in the planning process, to be a master not a servant in the planning of the system. 1968's management philosopher is disciple of Jeremy Bentham, who said that Legislature should serve the greatest good of the greatest number. But who decides what legislative act will serve the greatest good of the greatest number? In 1968 the experts decide: the representatives and their advisers. But suppose the greatest good of the greatest number consists in everyone's deciding without representation; then the 1968 policy of planning can never serve the public's interests, because it distorts the true social values.

I realize that some who are good at looking backwards will sense a long past stage of management in this brief summary--the disastrous "communes" of the last and present century--and will be ready to accuse me of forecasting a reactionary management philosophy in the future. You will hope, therefore, that I am wrong. But this adventure, remember, is entertainment. So hold on a bit until the details are worked out, and you'll see why the philosophy I'm describing is quite new.

The details, in fact, are fantastic and beyond imagination. We are about to deny the four truisms that followed the first which made the rather moderate claim that everyone shall be heard. Indeed, we are about to see how a future attitude towards managing may significantly enrich the concept of a democratic society.

2'. (the denial of the second assumption) Expertise cannot be segmented and separated.

Thus the lawyer must see in what way he is being an economist or a manager; the manager must see in what way he is a scientist; and so on. Every contributor to the plan must realize that there are many dimensions of his contribution and that his contribution makes a difference in each dimension. To illustrate the difference between the present and future philosophies, consider the way we use the medical doctor in planning our lives. We feel bad, we go to see the doctor, he says, "You have a fever. There's a lot of this going around. If I were you I'd take two aspirins and go to bed." To us in 1968, it seems like common sense to say that the doctor has merely contributed medical advice, which we add to our data bank as a separate piece of information, and we then decide what to do. But suppose that the doctor knew that you could not possibly go to bed, because of a serious commitment of your time that cannot be broken. Then by giving his "advice" he has put you under even greater stress; he is in fact not merely contributing medical information, but is also meddling with the psyche. The manager of the future sees that it is impossible "merely" to give advice; whenever you advise, you also in part decide.

How can the expert of the future comprehend the real nature of his contribution? I don't really know, nor can I make very clear what this means. If I could, I'd set up a business to market this kind of "management information." A management information system that could really tell us what each one of us is contributing to the planning of a system would be worth quite a lot, I should think.

The third truism of 1968 becomes the following in the management philosophy of the future:

3'. No one's contribution can be represented (there is no "public" in the sense of a group of persons whose interests are represented by politicians, managers or experts).

This is perhaps the most fantastic of all the changes, because it contradicts what we today take to be a cornerstone of democracy. We believe that legislators represent the public,

that industrial managers represent the stockholders, that labor leaders represent the rank-and-file. The future will believe that this bit of common sense of 1968 is antique nonsense. No one can be represented by another, because representation always implies distortion, mostly serious distortion. This will be the future's answer to the debate about whether the representative should vote as the majority would vote if it could, or whether the representative should serve the public's real interest (i.e., the majority may be in error, and the representative should rectify the error). Tomorrow's philosophy creates the synthesis: both sides are wrong, and there is to be no representation.

But is a social system without representation at all feasible? The technologists among us may speculate about a future communication system, in which the entire nation--or world for that matter since speculation is not to be bound in this exploration--will be like the old town meeting--open debate, free voting, and all. But occasional "voting" is a very crude way of contributing to an organization's plan, because each individual's contribution is so restricted. Some better way of contributing to planning will be found, I'm sure. But it is for a more astute scenario writer than I to describe the technology of a society without representation.

It may be possible, however, to develop a strong feeling toward this assumption of the future. All of us feel the frustrations of today's organizational life. There's very little we as individuals can do about Vietnam, the draft, the war on poverty, or whatever. We may not like the CIA, but we have absolutely no basis for deciding on the wisdom of its actions; it must represent our interest in deep secrecy. Similarly in firms and universities, every reflective person realizes the futility of even attempting to change what appear to him to be the irrationalities of organizational behavior. A society without representation would remove the frustrations of isolation and lack of contribution that most of us feel.

The fourth truism of 1968 goes out almost automatically once the third is abolished.

4'. Contributions to the plan of social systems cannot be ranked.

Wonderful! No more very important people! Today we are fascinated by brilliance and forcefulness. But the wiser philosophers of tomorrow will see that brilliance is not to be equated with goodness: brilliant men are not necessarily good men. To the extent that they are evil, they are brilliantly evil; to the extent that they are forceful, they are evilly forceful. A less forceful, less brilliant spirit can contribute a quality to the plan that the brilliant forceful mind cannot. Which is just another way of saying that each individual is unique and that his uniqueness is as important as the uniqueness of anyone else. Thus tomorrow's management philosophers will see the really serious defect in our attitude towards poverty and underdeveloped nations: we fail to see in what ways the so-called affluent sector of our society is poor and underdeveloped. If tomorrow's philosophy were prevalent today, then the negroes of Watts would be setting up retraining centers in Beverly Hills and Orange County to educate the whites about some of the facts of life better known by the negroes, and India would send us aid to try to raise the level of our underdeveloped culture.

5'. The role of reflection in planning is to maximize the contributions to the plan.

This final reversal is perhaps the hardest of all to comprehend. We are so used to thinking in terms of goals and attainment, that it's like imagining the fourth dimension to think otherwise. We want to seek the contributions to planning that will maximize the chances of attaining our goals. Hence we rank the contributions in importance, and use cost-benefit to see which are the ones we really need. But we've got means and ends twisted about. The so-called goals (profit, pleasure, learning, etc.) are really the means, the means whereby people can contribute to life's plans. It is contribution which is the goal, because contribution is the full expression of each one's individuality. We create problems and attempt to solve them in order to contribute.

This assumption of the future is so difficult for us to even imagine because we are used to thinking in terms of satisfaction (or satisficing) as an ultimate goal. We assume that "problem" must be "solved," and once solved they go away, and everyone is happier. The future will see that problems should not "go away" because problems are the means by which individuals can contribute to social planning and action. The creative act of society is to invent problems that maximize the joy and pain of contribution.

Of course the big question is what "contribution" means. I have suggested a necessary, but not a sufficient, element of its definition: if someone is contributing to a plan, then his natural and unique expression is a part of the total plan, and as important a part as that of anyone else.

A brief illustration may help to shed some light on the future's management philosophy. Imagine, if you will, a university planned along the lines of this philosophy. We see at once that the distinction between student, faculty

and administration disappears; everyone is all three in his contribution. The students teach and administer, the faculty learn and administer, the administration learns (fantastic!) and teaches. Furthermore, there are no representative bodies, no academic senate, no student association, no administrative committees. Everyone has equal rank (call them all full professors or empty professors, depending on the time of day, after or before a meal). And the old-fashioned university goal of "learning and adding to knowledge" becomes instead the means by which the whole educational system can attain maximal contributions from each member. Thus "learning" is a marvelous human invention of a set of problems which produces real individual contribution to the planning and deciding of a social system.

One final point. It is likely that the manager of the future will be far more honest about deception than is the manager of today. Today's manager keeps deception at the unconscious level; he pretends that he is frank and honest, whereas in his heart he knows that he must deceive because the life of all human social systems depends on a certain amount of deception being there. Tomorrow's manager will be far more self-conscious about the role of deception in the planning of the system.

And I have used deception in this essay to lure the reader on. Earlier I said that the speculations about the philosophy of future management were "pure entertainment" which one can forget tomorrow. But I don't believe any such thing. I really think everyone ought to take them quite seriously.

THE POVERTY OF THE PATTERN LANGUAGE

A book review by J.P. Protzen

Christopher Alexander, et al., "A Pattern Language, Towns, Buildings, Construction", Oxford University Press, New York, 1977. ($27.50)

Shocked by what they see to be the brutality and fragmentation of our built environment, the inhumanity and unnaturalness of modern architecture, and the incoherence of present-day society, the authors of "A Pattern Language" have set out to devise a theory, "The Timeless Way of Building", and a practice of planning and design, "A Pattern Language", by which our towns and buildings would become "alive" and we would feel "whole" and human again. "A Pattern Language" is meant to be a sourcebook in which designers can find practical advice on how to repair any portion of the environment. The advice comes in the form of patterns, each of which describes a recurrent environmental problem and the solution to this problem.

About the nature of these patterns the authors make two major claims, neither of which, I will contend, is valid. First, it is asserted that in any pattern the solution to a problem is described "in such a way that you can use this solution a million times over, without ever doing it the same way twice." (Emphases here and in following quotes are mine.) The solution merely "gives the essential field of relationships needed to solve the problem, but in a very general and abstract way - so that you can solve the problem for yourself, in your own way, by adapting it to your preferences, and local condition at the place where you are making it." Thus, the solution "imposes nothing on you."

Secondly, although they believe that for some patterns they have succeeded in stating "a property common to all possible ways of solving the stated problem," the authors assert that "... the patterns are ... hypotheses, all 253 of them - and therefore tentative, all free to evolve under the impact of new experience and observation. And just as the hypotheses of science, the patterns are subject to testing.

"The empirical questions center on the problem -- does it occur and is it felt in the way we have described it? -- and the solution -- does the arrangement we propose in fact resolve the problem?"

As to the first claim, it is simply not true that the patterns allow you to solve problems according to your preferences or to adapt it to local conditions. The patterns, if applied, do indeed impose very specific and detailed solutions, and they leave no significant choices to the users of the patterns. (The etymology of the word "pattern" is the ME patron from the Latin Patronus, meaning protector.) In each pattern, the solution to the problem dealt with is presented in the form of an instruction "so that you know exactly what to do, to build a pattern." Furthermore, patterns are not isolated entities. Each pattern is connected to other patterns "above", "beside", and "below" it. That "means in practical terms that, if you want to lay out" a particular pattern, "you must follow not only the instructions which describe the pattern itself, but must try to embed" this pattern in those connected to it (emphasis mine).

Let's take as an example the design of a common space within a house. According to the pattern language it should be, among other things, at the heart of the activities, should have "varied ceiling heights and a ceiling which is vaulted should have window seats, light from two sides and wooden windows with small panes; it should have alcoves and a fireplace, soft walls, half-inch trim where different materials meet, a soft tiled floor, and a host of different chairs. All this is very well for somebody who likes the atmosphere that is conjured by these patterns, and I am sure that for such people no two spaces designed according to these patterns need ever look alike. An infinite variety could indeed be achieved. But what kind of choices does this language offer to those who do not appreciate gingerbread dollhouses? What kind of options does it leave to those who find virtue in a common space that is large, generous, and unadorned; a space with uninterrupted hard walls, level floors and ceilings, no nooks, no crannies, no trim; that has a terrazo floor and a glass ceiling, the

orientation of which is not confused by light from two sides; and which has no window, neither to the inside nor to the outside, and no fireplace?

This is a rough description of an actual common space in a turn-of-the-century flat in Genoa, Italy, where a friend of mine used to live. It had none, absolutely none, of the solutions called for by the pattern language. It nevertheless was an extremely successful space in that it did allow all those things to happen that according to the pattern language ought to happen in common spaces; and it was a space which, I suspect, was infinitely better adapted to local conditions than what the patterns would call for: its high ceiling, hard walls and floors and no windows allowed that room to stay cool in the extremes of summer heat.

People with such desires and such arguments will either not see any differences between any two designs produced by the pattern language (no more than a "pattern language" educated person will see differences between two tract houses by a particular developer), or, if they do perceive differences, they will certainly label these differences as trivial or incidental. In this sense, the same pattern applied a million times will always produce the same design. By staying within the pattern language you will never be able to produce a design that is radically different from the design of any other pattern language user, no matter what the personal desires or what the local conditions are.

This should not, however, come as a surprise to anybody, since it is no more than a tautology. If, as the authors say, the solution part of the pattern contains "... those essentials which cannot be avoided if you really want to solve the problem", then, obviously, when using the pattern you cannot solve the problem in an essentially different way. (Is the phrase "really want", the catch by which you will be reprimanded for not seriously wanting to solve the problem whenever you propose a solution that is radically different from that of the pattern language?)

And when the authors say "... of course, if you want to change any pattern, change them", they did not mean that you could come up with a solution that is essentially different from anybody else's. For The Timeless Way of Building says that "...in a healthy society there will be as many pattern languages as there are people - even though these languages are shared and similar." This kind of society has room only for differences that do not matter, but not for dissent.

Ironically, the authors, who set out to castigate the oppressiveness of the pattern imposed on us by the canons of modern architecture, the greediness of developers, the conservatism of financing institutions or the efficiency mindedness of the building industry, have created in "A Pattern Language" a planning practice which is even less amenable to essentially different ways of building the environment than the practices it hopes to replace. Just as before, everything is patterned, from the family picture stuck into the frame of the mirror to the structure of the world government(!), except now the patterns all come from the same perspective, the same worldview... a worldview that is oriented on the past (things were never as good as in the days when people designed unselfconsciously -- an old theme of Ch. Alexander), that is romantic and that belongs to the well-to-do, white population. The pictures which show "archetypal examples" of the patterns illustrate this point. A great many of them show medieval towns, English cottages, Swiss farmhouses, paintings by Bonnard, etc.

It is no accident that this worldview acknowledges only that part of the globe which is north of the Tropic of Cancer, i.e. that part of the world in which the sun at its zenith always shines from the south. (cf. patterns No. 161 and No. 162).

Although the argument, thus far, has revealed some very concrete consequences of the pattern language, it has been on a formal level and has not touched on the stuff of the patterns, their empirical content and its truth. This is indeed a formidable question in the face of the authors' claim that "(m)any of the patterns here are archetypal - so deep, so deeply rooted in the nature of things, that it seems likely that they will be part of human nature, and human action, as much in five hundred years as they are today. (emphasis mine) Is this truth amenable to corroboration, revision or refutation through empirical research?

I shall argue that the authors' contention - that the validity of patterns can be empirically tested - is at the least, a questionable proposition.

The 253 patterns included in "A Pattern Language" do not all share the same status. "Some are more true, more profound, more certain, than others." A varied number of asterisks used by the authors identifies the status of each pattern. Of those patterns marked by two asterisks, the authors say, "...we believe that we have succeeded in stating a true invarient; in short, that the solution we have stated summarizes a property common to all possible ways (emphasis theirs) of solving a stated problem. In those two-asterisk cases we believe, in short, that it is not possible (emphasis mine) to solve the problem properly, without shaping the environment in one way or another according to the pattern that we have given--and that, in these cases the pattern describes a deep and inescapable (emphasis mine) property of a well-formed environment."

Now, this is no modest claim, and in the face of it, the readers or the potential users of the proposed pattern language are certainly entitled to expect that--as required by Edgar Singer--the claimants have done the best that inquiry can possibly accomplish, i.e., that before reaching their conclusions they have exposed their ideas to the most severe test imaginable.

What is the evidence offered in favor of the various patterns? Does it stand up to Singer's criterion? Let's look at some examples. "Sheltering Roofs," pattern no. 117 (two asterisks): the problem part of this pattern states "If the roof is hidden, if it cannot be used, then people will lack a fundamental sense of shelter."

Two kinds of evidence are used to support this view.

First, three sources are quoted--one referring to Western cultures, the other to the U.S.A. and the third to France--which assert that pitched roofs are the strongest symbols of shelter. The authors are aware that this evidence in favor of pitched roofs "can perhaps be dismissed on the grounds that it is culturally induced." A second type of evidence is therefore introduced.

Only this second kind is no evidence at all. It is a list of three characteristics the authors assert "A roof must have in order to create an atmosphere of shelter."

> "1. .... the whole feeling of shelter comes from the fact that the roof surrounds (emph. theirs) people at the same time it covers them...."
>
> "2. Seen from afar, the roof of the building must be made to form a massive part of the building...."
>
> "3. And a sheltering roof must be placed so that one can touch it--touch it from the outside..."

These three statements may readily be accepted as reasonable departing points for an empirical inquiry by which it may be established whether or not only roofs with these characteristics impart a "feeling of shelter." (I emphasize 'only' because the authors have said that it is impossible to get a "well-formed environment" otherwise.) However, the results of such a study are not offered in "A Pattern Language," and without those results the evidence in favor of this pattern is slim indeed.

But even if the results of such a study were in, this would not do. One would want to know how the results are to be treated, what would be considered confirming evidence, and better yet, what would be considered refuting evidence. We know that roofs exist which do not correspond to the characteristics of "sheltering roof" advanced by the authors. There are flat roofs (that are neither roof gardens nor otherwise useable or accessible) such as in the Hopi village of Old Oraibi; there are roofs that slope inward, rather than cascading outwards as may be found in Peñiscola, Spain; and there are roofs that are "stuck on" very much like the "bad" example shown in the book, almost all over the southern slope of the Alps. Now, assume for a moment that all of these roof forms would pass the test of imparting a "feeling of shelter"--which is not an unreasonable assumption, since all of these examples are indigenous building forms--how would this evidence be treated? Are these examples to be declared accidents or oddities (the exception that confirms the rule), reinterpreted so that they fit the pattern, or accepted as potentially refuting evidence?

No empirical research makes sense unless the ground rules for that research are made explicit.

It may be useful and necessary at this point to remind the reader that it is not I who ask that the evidence offered in favor of the proposed patterns follow the canons of empirical research, but rather it is claimed by the authors of "A Pattern Language" that each pattern may be subject to that kind of research.

Omitting to specify what would constitute a refuting case as in the shape of a roof, is not an isolated phenomenon. It pervades many patterns. When 'positive' evidence in favor of patterns is offered, this evidence often suffers from some or all of the following weaknesses.

1. The evidence is superficial. In pattern no. 3, "City-Country Fingers," a Gallup Poll asking people where they would like to live is used "as very strong evidence for this fact..." "that people living in cities need contact with true rural land to maintain their roots with the land that supports them." In "Promenades" (pattern no. 31) a casual survey of 37 people off the streets of San Francisco is cited to demonstrate that promenades are not exclusively a Latin institution. With respect to this latter example, as with many others, one wonders why the authors of "A Pattern Language" feel such an urge to present pseudo-scientific data to support something that could be demonstrated much more simply and convincingly another way. All they had to do here, for instance, was to mention such names as Kalverstrass (Amsterdam), Rohr (Berne), or Kurfeurstendam (Berlin), which are all names of famous promenades in non-Latin countries.

2. The evidence is taken at face value, uncritically and unchecked. In many patterns the authors resort to studies made by others, a practice which is certainly legitimate and common in research. However, one expects that before such studies are introduced as evidence the authors will have checked the quality of these studies in terms of the methods used, the reliability of the data, and the soundness of the interpretation of the findings (among other things). In the pattern "Four Story Limit," Oscar Newman's work on "Defensible Space" has been introduced as evidence against high-rise buildings. This work has been thoroughly criticized by William Russell Ellis for being biased and unreliable. Furthermore, as Ellis has pointed out to me, if Newman's data and inferences were correct, they would support, rather than condemn, high-rise buildings as good defensible spaces. While I am not trying to replace one authority with another, one is led to the troubled conclusion from the arguments presented, that the authors

only seek evidence which supports the pattern, at the expense of excluding potentially contradictory facts or hypotheses.

Sometimes the evidence used is distorted as in "Parallel Roads" (pattern no. 23). Here the parallel street system of old Berne is shown as avoiding traffic congestion. Of course, there are no traffic jams in old Berne: many of its streets have been closed to car circulation!

3. The evidence is based on what I refer to as the "Consensus Theory of Truth." "Many people will agree with these arguments," is a pervasive mode of presenting evidence in "A Pattern Language." "Everybody loves window sests, ... (pattern no. 180), or "No one enjoys his work if he is a cog in a machine," (pattern no. 80), or "Who will willingly give up the degree of freedom provided by cars?" (pattern no. 11). While some of these statements are readily acceptable as common sense (whether they are empirically substantiated or not), I certainly object to the logic which would conclude that because everybody wants something we ought to have it, or, conversely, that because everybody hates something we ought to do away with it. History is witness to the fact that people can agree to do the stupidest and most horrendous things, and that they have been reinforced in that precisely because they all have been in agreement.

4. Sometimes the arguments presented in favor of one pattern contradict the arguments given for another. So it is said (pattern no. 220, "Roof Vaults") that we should not build flat roofs because these would require tension members and that it had been argued that good structures ought to work on compression only (pattern no. 206, "Efficient Structure").

But on the other hand the authors make a case of their "invention" of vaulted ceilings which allow the construction of floors that work on compression only (pattern no. 219, "Floor-Ceiling Vaults"). If we can build floors (which presumably are flat), why can't we use the same construction to build flat roofs? Obviously, the answer lies not in the "logic of things", i.e. of construction, but in the argument of "Sheltering Roofs" mentioned above.

In the discussion so far, it has been assumed that patterns could, at least in principle be tested individually by empirical research. There are, however, grounds to believe that the patterns, in isolation, escape any attempt at refuting them. It is said that "Each pattern can exist in the world, only to the extent that it is supported by other patterns: the larger patterns in which it is embedded, the patterns of the same size that surround it, and the smaller patterns which are embedded in it." And indeed this is true: I could not test the pattern "Alcove" alone since it only makes sense when connected to "Common Space at the Heart." If this latter were ill-conceived, a test of the former would be meaningless. But it is easy to see that to construct a well-conceived common space in an attempt to test "Alcove", some other patterns must be satisfied, such as "Intimacy Gradient" and "Farmhouse Kitchen." If these in turn were ill-conceived, then "Common Space" could not work, and "Alcove" could not work. For these reasons, it is clear that an individual pattern, or any subset of the language, can never conclusively be tested. Only the language as a whole may be challenged.

After having read "A Pattern Language" and having reviewed its supporting argument, I could not help but be reminded of Feyerabend's assessment of a much more powerful construct, the quantum theory in Physics: its "appearance of success cannot in the least be regarded as a sign of truth and correspondence with nature." (Emphasis here and in the remainder are in the original.) Quite the contrary, the suspicion arises that the absence of major difficulties is a result of the decrease of empirical content brought about by the elimination of alternatives, and of facts that can be discovered with their help. In other words, the suscision arises that this alleged success is due to the fact that the theory, when extended beyond its starting point (in the case of the pattern language "what makes people comfortable?) was turned into rigid ideology. Such ideology is 'successful' not because it agrees with the facts; it is successful because no facts have been specified that could constitute a test, and because some facts have been removed. Its "success" is entirely man-made. It was decided to stick to some ideas, come what may, and the result was, quite naturally, the survival of these ideas. ... This is how empirical 'evidence' may be created by a procedure which quotes as its justification the very same evidence it has produced." (Feyerabend, "Against Method").

I have attempted above to show that "A Pattern Language" is an all-encompassing theory in that you cannot refute any part of it, but must refute the whole. Feyerabend goes on to show that such a theory (which he calls a second-rate myth) can only be investigated by comparing it with "a different set of equally all-embracing principles." In the case of "A Pattern Language", it could only be investigated by comparing it to a set of principles arranged around, say, the notion that there are no invariants; i.e., no patterns; that every problem is unique, i.e. there are no recurrent problems and therefore no patent solutions, etc. But this procedure has been excluded from the very beginning. "The Timeless Way of Building" does not accept that there is any other valid way of building. The "Timeless Way of Building" is, as Feyeraband says of the quantum theory, "therefore of no objective relevance; it continues to exist solely as a result of the effort of the community of believers and of their leaders, be these now priests or Nobel prize winners. This, I think, is the most decisive argument against any method that encourages uniformity, be it empirical or not. Any such method is, in the last resort, a method of deception. It enforces an unenlightened comformism, and speaks of truth; it leads to a deterioration of intellectual capabilities, of the power of imagination, and speaks of deep insight; it destroys the most precious gift of the young--their tremendous power of imagination, and speaks of education."

THE HABITAT FOR DIFFERENT SOCIAL CATEGORIES

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The several studies collectively known as "the sociology of housing" usually hinge on the idea well expressed by Svend Riemer (1952) according to whom the social function of the home provides the family with an environment in which conflicts are minimized. Kennedy (1953), studying the activities and interrelationships among family members, emphasizes three aspects:

1) the possibility of conflict; it is vital to provide privacy areas and cooperation areas
2) cooperation
3) different degrees of intimacy

Similar aspects have been variously treated by authors such as O. Brochmann (1948), S. Riemer (1952), L. Holm (1955), R. W. Kennedy (1953), L. Rosenmayr (1956), D. M. Wilner, R. P. Walkley, T. C. Pinkerton, M. Tayback (1962), H. Lefebvre (1967), H. P. Bahrdt (1968), C. W. Hartman (1972), M. Dobrowolny Bonnes (1970).

Undoubtedly however the best known and most extensive studies in the sociology of housing have been conducted by P. H. Chombart de Lauwe, who also constructed the main conceptual framework, based on a theory of needs.

The concept of need has uncertain status and mixed fortune in the social sciences. It is central or at least present in the work of Marx, Malinowsky, Thomas, Maslow (1954), Etzioni (1968), Galtung (1975), Heller (1974); according to other writers the concept of need is mystifying and misleading; in any case, largely impervious to empirical utilization. Chombart de Lauwe has made a gallant effort in this direction, in which we are following him. In the first place he distinguishes a psychological "state of tension" and the object that allows for the overcoming of such situation, and calls them respectively "besoin-etat" and "besoin-object," state-need and object-need. He proceeds then to explain the dynamics of needs, distinguishing the two concepts "besoin-aspiration" and besoin-obligation." The former is likely to be satisfied only in a more or less near future, and entails and improvement in the position of the individual. The latter is necessary for normal living in the present condition, and must be provided for by society. A need usually starts its career as "wish" or "besoin-aspiration" and becomes then a "want" or "besoin-obligation."

1. The problem and goals of the research

The research for the actual model of habitat that a family needs requires the analysis of the economic, social, cultural, and structural situations in which the family itself and its components happen to live. Even more concretely, it means to single out those needs that can be totally or pratially fulfilled by the habitat pattern. Once it has been verified that such needs, tied to the living conditions, can be satisfied by a detailed model which shapes the habitat space, this very model, or its symbolic representation, becomes a need; thus there is no generic "need," but there is rather a precisely defined "need for." Previous to such "need for," there may exist some anxiety, uneasiness, but not a real need, i.e. not "the aiming at an object (or at its representation) in order to constitute or reconstitute a balance compromised by previous scarcity."

On the basis of such theoretical assumptions our research tried to single out the models of habitat requested by the different types of families and to interpret them in terms of needs on the basis of these families' situations, socio-economic and cultural conditions, and associative lifestyles.

A sample of 400 families, in public housing was administered a questionnaire of closed-ended (forced-choice) questions relating to the desired apartment, building and

neighborhood, and with regard to both their equipment with services and the space patterns relative to such services.

The research was carried out in the urban context of Trieste, an Italian city of 300,000, characterized by rather high standard of living (second place among Italian cities) high average age, stagnating economy and population, and usually large proportion of families in public housing (15-20%). Urbanistically, the town is cramped between the sea and the Carso plateau, and thus characterized by high density and tall apartment buildings.

The research was sponsored in 1972-73 by the local Public Housing Agency (Instituto Autonomo per le Casa Popolari di Trieste).

2. Factors of the ideal pattern of habitat (habitat pattern)

The information gathered was subjected to several methodological elaborations. By means of these we were aiming at: 1) first of all reducing the number of variables indicating attitudes towards the ideal pattern of habitat with regard to lodging, building, and neighborhood; 2) secondly, intersecting these variables reduced to indices with other independent variables relative to existential, economic, social, cultural, familiar conditions. This was done in order to verify whether these attitudes correspond to some real needs, or are rather aspirations induced by fads and are consequently "non-true" answers to real problems.

Methodologically the choice of factors analysis allows us to operate a significant reduction of the variables into a few independent dimensions of the habitat question.

Within the sphere of such factors the model gives us a chance of ascertaining the importance of each variable. Therefore, by employing factor analysis we can single out the dimensions underlying the variables examined originally.

In our case, by employing the principal factors solution and the subsequent rotation according to the "varimax" method, we synthesized the 137 variables of the questionnaire into 43 factors which account for the 71,059% of its total variance. In reality, only 28 of these 43 factors possess a good or satisfactory degree of accuracy, unidimensionality, stability, and validity in measuring the dimensions underlying the habitat theme.

In this series of factors, the most significant ones among those synthesizing the ideal habitat make reference to all three habitat levels under study. In more detail, a first factor refers to the arrangement of the dwelling space, a second to the arrangement of the communal space in the whole building, and the other three refer to the neighborhood services.

Factor V: Rooms with specific functions

The structure of the factor can be synthesized in the following chart:

Usefulness of the dining room	.65
Usefulness of the living room	.64
Usefulness of the linen room	.62
Usefulness of the working room	.60
Desired bathroom facilities	.44
Usefulness of the attic	.37
Usefulness of the drying room	.34
Usefulness of the reception room	.31
Usefulness of the garage	.29
Usefulness of the 3rd single bedroom	.29
Preference for the single family dwelling	.22
Rejection of movable walls	.22

The link of the five variables with the factor discriminates the respondents according to the emphasis put on the specialization of the different rooms with specific functions.

Such a sectorialized view of the house utilization does not mean, however, that there is a strong rejection of those rooms that, on the contrary, seem to be thought of as multi-functional such as a large reception room. As for bedrooms, people are inclined to have many of them and large ones.

Moreover, the tendency to attribute a "use-value" to so many specific rooms is accompanied by the appreciation for other additional rooms or services, outside the dwelling, able to guarantee the reduction of housework. Thus it becomes essential to possess an attic, a drying room, a garage, a large and a small cellar. Since there is a tendency to prefer a single-family dwelling, even the building and close neighborhood organization is conceived as relieving the family group, and especially the woman, of work. Indeed it is not only important for the laundromat to be located near home but also for bars, restaurants, taverns, reading rooms and meeting halls to be as close as possible.

Thus the factor emphasizes the desire of occupying a dwelling with many rooms; responding to specific functions and consequently very spacious. It is obvious that if the dwelling is arranged in many rooms, the interest in the rooms' movable walls as the family structure changes loses importance.

Factor XII - Services in the building for the socialization of dwelling functions

Reading rooms, meeting halls, etc. in the building	.71
Cafeteria in the building	.69
Laundromat in the building	.53
Children recreation and day-care services in the building	.47
Movable walls in the dwelling	.42
Usefulness of the drying room	.33
Meeting halls in the neighborhood	.29

The factor is characterized by variables referring to the plasticity of the dwelling structure and to the socialization, within the building, of functions traditionally performed within the family group.

The analysis of changes in these attitudes gives us a perspective not only to the function of the dwelling for social life of the family group, but also on the destiny of those activities highly contributing to children socialization and consolidation of the family "entente." These are, for instance, the activities relating to meals, to communal discussions, and, subsequently, with a lower importance, to children care, meals preparation and to all processes of washing, ironing, and hanging out. As it can be noticed, the absence of such activities goes well beyond the activities themselves, since it implies the attribution of a new importance to the dwelling, and, in particular, a redefinition of the roles of the different members of the family, starting out with the woman's and the children's and consequently the man's roles.

The woman will feel objectively liberated from tasks to which she has been bound for centuries (linen washing and ironing, meals preparation, children care). Moreover, even the continuous physical presence of the son/daughter in the family is reduced by delegating some segments of the socialization process to a quasi-formal organism where the child meets with several other children.

More generally, a considerable importance is attributed to those services (reading rooms) that somehow foster or make it possible the coming into existence of a communal life for people living in the same building. Therefore even in this case people appear to realize that the family group does not exhaust one's cultural and associative needs. These are rather met by communal readings, meetings, gatherings.

We are tempted to state that many people, the more progressive ones, are accepting to enlarge their idea of "home" to cover not only their own dwelling but also the larger and more comprehensive building, both for self-centered services and for more social ones.

For "progressive" people, the traditional form of housing is going through a crisis together with the corresponding family-type, and its specific structural relations.

Factor II: Proximity of the dwelling to neighborhood educational institutions and recreational facilities for children

Child-care center 500 m. from home	.92
Kindergarten 500 m. from home	.92
Primary school 500 m. from home	.92
Junior High School 500 m. from home	.86
Children recreational and care services in the building	.50
Meeting halls 500 m. from home	.28
Usefulness of a large cellar	.24

The variables loading coefficients are usually very high, especially the ones regarding school up to fifth grade. On the contrary the importance attributed to the closeness of Junior High School is relatively lower, although still high. This can probably be imputed to the thought that an eleven-twelve year old boy/girl can autonomously face the dangers of a walk over 500 meters to school.

In the factor however there is also a variable referring to child recreation and care when she/he is not protected in formal educational institutions. This is a service to be provided in the building that undoubtedly obtains a high number of assents, given its novelty and its complementary character to the above-mentioned services.

The meaning of these converging preferences is well indicative of the way the family intends to accomplish its basic functions of children care and socialization. On the other hand, these attitudes make reference to particular models of children education, well internalized by parents. Indeed they are generalized with equal intensity in both male and females, but more than anything else, they cannot be explained in terms of the mother's extra-domestic professional engagements (she is a housewife in almost the totality of cases under study) since she almost always spends her week days at home.

With regard to the usage over time of the places available for children activities: street, dwelling and protected institutions, the urban family, young and with little children, tends to leave its dwelling in order to return to the extra-family space, provided that protection and care for

children are secured. This results in a widespread interference of the values of the dominant culture with the ones originating from and expressed by the family in the process of children socialization.

Factor VI: Proximity of the dwelling to "decentralized" services, and alternative to home-performed functions.

Clothing stores 500 m. from home	.78
Household appliances stores 500 m. from home	.76
Artisans shops 500 m. from home	.70
Bars, restaurants, taverns 500 m. from home	.55
Laundry and dry cleaning 500 m. from home	.53
Administrative offices 500 m. from home	.29
Grocery stores 500 m. from home	.28
Post office 500 m. from home	.28
Meeting halls 500 m. from home	.28
Supermarket 500 m. from home	.24
Church 500 m. from home	.20
People passing-by seen from one's windows	.20

The variables composing this factor make reference to the demand of having near home those services that are usually exclusively city-center. This is generally the case because: 1) the city-center is a point of convergence for the whole area of influence (clothing and appliances stores); 2) it is the place where, thanks to a long artisan tradition, most of the city small artisan shops are still located. The same is true for bars, restaurants, and taverns.

All these variables can be summarized into a demand for (and on the opposite hand, into a disdain of) the decentralization of a big share of these services that makes going downtown indispensable and pleasant.

On the other hand, the dry cleaning in the neighborhood (and in the building) besides being attributable to such an exigence for decentralization, lays an emphasis on the will to shift outside the dwelling the activities binding the woman to clothes and linen cleaning and rearranging. The loadings that are significant but not high enough to condition the factor structure, widen this perspective of central services decentralization. In fact they refer to the considerable importance attributed to dwelling closeness to supermarkets, grocery stores, church, post-office, administrative offices, and, most of all, meeting halls.

However, the decentralization into the neighborhood of the services indicated by the factor does not result in a rejection of the city and its residents. To the contrary, one would like to see around oneself (from one's windows) just the urban view with its identifying symbols. One would feel that one's own dwelling is plunged into the flow and the words of the people. The remarkable relevance of such demand for decentralization is confirmed and even better understood if we notice that it is accompanied by a low consideration for one's own neighborhood exactly because it is scarcely equipped with the services mentioned above.

Factor VII: Proximity of the dwelling to neighborhood basic services

First aid station 500 m. from home	.75
Pharmacy 500 m. from home	.75
Post office 500 m. from home	.68
Administrative offices 500 m. from home	.42
Bus stop 500 m. from home	.33
Laundromat 500 m. from home	.33
Supermarket 500 m. from home	.30
Usefulness of a large basement in the building	.25

These variables, of which the first three are highly loaded, usually refer to socially relevant services (first aid station, post office, administrative offices) rather than to consumer services. This is true especially if we consider the drugstore as a service complementary to the equally important one regarding medical controls (checkups) and treatments. Besides, the pharmacy itself, especially in working-class neighborhoods, is more and more often becoming a bureaucratic dispenser of medicines and advice, due to the fact that drugs are free.

Beside the two "sanitary" variables, there are the other two relative to administrative services. As it is logical, a greater importance is attributed to the post office proximity since the elderly resort to it more frequently, for instance when they must cash their pensions.

The factor is not separated from those regarding the neighborhood organization. Thus it shows high loadings also with regard to the proximity of public transportation, laundromats, supermarkets, grocery stores.

3. Intensity of the housing need for different social categories

Up to this point we have contrasted the two extreme and antithetic positions of people expressing either need of, or indifference to the dwelling organization suggested by the five factors. It is evident however, that such a dichotomization can be justified only by considerations of description and simplification. In reality, the different categories of people express their judgments and demands in a much more shaded way than it may appear from a simplified descriptive model. Their location along the continuum of the need intensity scale gives us the possibility of evaluating the degree of "necessity" of a dwelling arrangement, and consequently of predicting who will be satisfied and who unsatisfied when one housing model or the other is implemented by the planner.

At the origins of such differentiated positions on the scale of need intensity is a variety of causes such as age, sex, family structure, social class, education. Of course a change in these factors involves the emergence of new needs that can be satisfied by an adequate spatial organization of the habitat.

Even such "besoin-aspirations" to use a term dear to Chombart de Lauwe, can be identified and its evolution grasped assesing the intensity of its perception by the different social categories. In this way we obtain a horizontal section of the different modalities of need perception comprised between "superfluous" and "indispensable."

3.1. Rooms with specific functions

The variables discriminating and validating such need are many, as it can be seen in Table 1, (professional stratum, attitudes towards children upbringing, type of family, age, informal acquaintances, economic well-being) and are distributed in a very wide range of need intensity. In fact we start from categories of people that tend to consider such dwelling arrangements as "very useful," to arrive, on the opposite pole, at other categories that do not attribute any relevance to this need, which thus becomes "superfluous."

The sectorialization of the dwelling space into dining room, room for small domestic activities, linen room, two or three bathroom facilities, carried out by the planner, comes to satisfy, in a decreasing order of intensity: first of all, needs and aspirations of people conceiving of children education in more democratic terms, belonging to an upper professional stratum, living in a family composed of parents and young children, young (21-35), with a comfortable income, having six - eight best friends, middle-aged (36-50), males.

Such dwelling arrangements do not satisfy the groups that are most distant from those mentioned above; therefore, the planner should think of opposite arrangements, i.e. arrangements directed towards making simpler and more communal the activities of families composed of elderly alone, aged over 65, with "very low" or "low" economic well-being, with no informal acquaintances (no friends) belonging to "lower" professional strata, showing authoritarian attitudes towards children education and, finally, females.

3.2. Services in the building

This need is identified as real in a stronger and surer way as we move from older to younger ages, from a family composed of older people alone, to another composed of parents and children; from people expressing a "low" will of participating in the neighborhood life, attending no associations and having developed no social relation network in the neighborhood, to other people who, on the opposite, live such formal and informal social relations and develop an extremely open attitude towards working together for the community they belong to. It is evident that whenever these services are actually provided in the building, these people's needs are met. On the other hand, the expectations of people not attributing a great importance to such services, will not be antagonized.

With regard to this, it is interesting to notice that the elderly, who show the strongest opposition, do not however push it towards very rigid positions. In fact, if on the one hand they are led to such opposition by a certain attachment to an already experienced habitat, on the other hand they are the ones that more than anybody else demand to live in apartment buildings. Underneath such demands there is the need of being with people that may help them to overcome their loneliness and to solve the problems constantly originating from the decline of their physical vigor. The elderly can find an adequate answer to such needs in service structure of the building. Moreover, since the neighborhood is not only made of multi-apartment buildings, but also includes single family houses, these services for the building can attract people living in the neighborhood, even if not in the building itself (it is significant that the people with friends in the neighborhood are those favoring the placement of such services in the building).

Even in the case of young families with little children, we must notice, beside the favor for these services, that although expressing a preference for a single-

family house (for objective reasons) they actually live (for equally objective reasons) in multi-apartment buildings. In such conditions the acceptance of building facilities expressed by these families will acquire a relevant weight. Indeed the testing of such services will probably lead to a revision of the attitude that now favors a single-family house, as it will probably lead also to a revision of the presently manifested attitude towards housing types.

After all, we can conclude that the need of facilities within the building can be better placed in the category of "besoins-aspiration" rather than in that of "besoins-obligations." Neighborhood needs belong rather to this second category, since they are connected with the sphere of values to which certain classes refer (socialization of family activities, establishment of a community among people living in the same building, etc.) and with a life style more or less open towards contacts with other people.

3.3. Neighborhood educational and recreational facilities for children

The need in question spreads over a relatively wide range of attitudes, since it goes from the "high importance" to the "low importance" in the need evaluation (Table 3).

The neighborhood equipment with such services comes to satisfy a need felt by young adults (21-35), by families composed of parents and young children, by people with many friends, by people with high income.

Such need is less felt as we move from a family composed of adults and older people, or of adults alone, to one composed of older people alone; from people aged 51-65 to people aged over 65; from a "low" economic well-being to a "very low" one. Moreover in the cases of "low" will of participating in the neighborhood life, of lack of friends whatsoever, of neighborhoods that are central or better equipped than the suburban ones.

Therefore we are facing a need felt by individuals involved in children upbringing, who, moreover, are involved in public life more than other people, are open to social problems and are consumers of those goods whose necessity has been highly emphasized by our affluent society.

3.4. "Decentralized" neighborhood services

The need relative to these "decentralized" services refers to a somewhat new image of the neighborhood, where one can find those things and those social life opportunities that are usually available only in the city center.

Even in this case, the neighborhood equipment with these services involves the satisfaction of a need that, from "rather" felt, becomes progressively "little" felt as we move from categories of people with a "high" will of participation in the neighborhood improvement, belonging to "middle" and "upper" professional strata, spending their spare time both at home and outside, males, to categories with "average" and "low" participative will to lower professional strata, to females, to people spending their spare time either exclusively at home or exclusively outside (Table 4).

It is therefore evident that the need for such a "decentralization" is particularly felt by people equally dividing their spare time between inside and outside activities, between the family group social life and that of either the informal acquaintance group or other more active groups.

3.5. Indispensable neighborhood services

The satisfaction of this need, i.e. the provision of all these indispensable services at short distance from one's dwelling, is advocated in the first place by people living in suburban neighborhoods, then by people expressing a "high" will of participation in neighborhood improvement (Table 5). If we move towards the most central neighborhoods and towards a "low" participative will, the need for these indispensable neighborhood services becomes less and less impellent.

In reality only the neighborhood of residence and the participative will are characters relatively differentiating this perception of such need. As for the rest, there is an unanimous agreement in attributing considerable importance to this need (in the age, sex, socio-economic condition etc.).

4. Conclusion

This sociological research started with some concerns, and hence goals, which are both theoretical and operational. They have come to their definition and development by means of a translation into operational terms of the concept of need.

Factor analysis, reducing the indicators to the essential and synthetic ones, has allowed us to single out needs fragments and complete needs, simple needs and complex needs. Among these, the main and most significant ones are the five we have discussed. All together, they convey an organic image of the habitat.

The significant correlation among the five habitat models indicates that people who prefer a dwelling divided into many rooms, also agree on installing the services for the building indicated by the second factor.

Moreover, they believe it important for the services indicated in the three corresponding models to be available in the building. On the other hand, people who prefer a dwelling reduced to a few rooms also do not think, or think "little" that the services indicated in the models should be available in the building and neighborhood. Such an opposition also indicates that the two opposed attitudes in the factors are expressed by the same categories of people. In fact, young people, males, families with many components and little children, people with friends, attending associations, willing to participate in neighborhood life, democratic, etc., show a positive attitude towards such rooms and services. On the other hand older people, females, families reduced to the married couple if not to the survivor alone, people far from both formal and informal social life do not show any particular interest in those rooms and services and prefer the second model of habitat.

The analysis of the correspondence between habitat models and categories of people has constituted the starting point for discussing the congruency of such models (habitat object-needs) with the underlying habitat status-needs. In particular the analysis of these family structures and of their members' life styles allowed us to verify the adequacy of the answer to the original stimulus, and to deny the possibility that the attitude towards such models, especially the newest ones, was determined exclusive or for the most part by a greater exposure to and favor towards new ideas regarding habitat arrangements.

The different degree of obligation that the habitat object-needs acquire for these Trieste residents, living in public houses, is indicated by the consistent inclination towards the most advanced positions of the five habitat object-needs expressed by people who are young and most favorable to social life. At the same time, it is also indicated by the different locations of these social categories on the relative need-intensity scale. The presence of different intensities in the dwelling needs, causes the discussion to shift toward needs evolution, i.e. towards their arising as "besoins-aspirations" and subsequently their becoming more and more intensively "besoins-obligations" to use Chombart de Lauwe's terminology.

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Table 1 - Social categories with differentiated need perceptions "Rooms with specific functions"

Indispensable	4,00	
Very useful	3,00	
		2,64 "high" professional status
		2,60 anti-authoritarian education
		2,46 child upbringing neither authoritarain nor democratic
		2,42 family composed of young people and adults
		2,41 "very high" economic well-being, 21-35 years
		2,40 attending associations "very or rather often"
		2,29 36-50 years
		2,28 two or three test friends, "high" economic well-being
		2,27 "sometimes" attending associations
		2,26 four or five best friends
		2,24 family composed of adults, young and old people
		2,22 six or more best friends
		2,20 males, desired crowding index 0,6/0,8
		2,19 "average" professional status
		2,17 desired crowding index 1,2/2,0
		2,05 family composed of adults and older people
		2,01 "never or rarely" attending associations
Rather useful	2,00	2,00 one best friend
		1,99 family composed of only adult
		1,97 "low" professional status
		1,95 child upbringing authoritarian
		1,94 "average" economic well-being
		1,92 females; 51-65 years; desired crowding index 1,0
		1,90 no best friends
		1,88 desired crowding index 0,4/0,5
		1,80 desired crowding index 0,2/3,0
		1,75 "low" economic well-being
		1,70 over 65 years of age
		1,61 family composed of only elderly people
		1,54 "very low" economic well-being
Superfluous	1,00	

Table 2 - Social categories with differentiated need perceptionts
Services for the building

Definitely agree	4,00	
Probably agree	3,00	
		2,90 attending associations very or rather often
		2,88 "high" participation will
		2,75 two friends in the neighborhood
		2,69 four or more friends in the neighborhood
		2,67 sometimes attending associations
		2,61 average participation will
		2,58 21-35 years of age
		2,56 six or more best friends
		2,51 suburban neighborhood
		2,48 neighborhood close to the city center
		2,47 one friend in the neighborhood
		2,44 36-50 years of age
		2,35 (neighborhood on the) outskirts; 51-65 years of age
		2,34 no friends in the neighborhood
		2,33 never or rarely attending associations
		2,27 no best friends
		2,26 low participation will
		2,19 over 65 years of age
		2,18 semi-suburban neighborhood
		2,04 central neighborhood
Probably disagree	2,00	
		1,89 three friends in the neighborhood
Definitely disagree	1,00	

Table 3 - Social categories with differentiated need perceptions
Neighborhood educational institutions and recreational services for children

Important		
Very	4,00	
		3,70 attending associations very or rather often
		3,69 high participation will
		3,64 outskirts
		3,46 sometimes attending associations
		3,44 "average" participation will
		3,40 four-five best friends, 21-35 years of age
		3,39 family composed of young people and adults
		3,38 one best friend
		3,37 36-50 years of age
		3,35 "very high" economic well-being
		3,28 six or more best friends
		3,22 "high" economic well-being
		3,21 family composed of adults, young and old people
		3,19 two or three best friends
		3,16 neighborhood close to the city center
		3,11 suburban neighborhood
		3,08 "average" economic well-being
		3,05 family composed of only adult
		3,04 never or rarely attending associations
Rather	3,00	3,00 family composed of adults and elderly
		2,98 51-63 years of age
		2,94 "low" participation will
		2,92 no best friends
		2,84 "low" economic well-being
		2,83 central neighborhood
		2,82 semi-suburban neighborhood
		2,78 family composed of only elderly people
		2,70 over 65 years of age
		2,65 "very low" economic well-being
Slightly	2,00	
Unimportant	1,00	

Table 4 - Social categories with differentiated need perceptions
"Decentralized neighborhood services

Important:

Very 4,00

Rather 3,00

2,90 central neighborhood

2,83 more than eight best friends

2,69 middle and high professional status

2,65 36-50 years old
2,64 spare time mostly at home
2,63 males, suburban neighborhood
2,62 spare time mostly outside

2,56 outskirts

2,51 neighborhood close to the city center

2,49 spare time almost always outside

2,47 no best friends

2,44 females, low professional status

2,36 over 65 years of age; spare time at home or almost always at home
2,35 semi-suburban neighborhood

Slightly 2,00

Unimportant 1,00

Table 5 - Social categories with differentiated need perceptions
"Indispensable Neighborhood services (facilities)"

Important:

Very	4,00	
		3,79 four or more friends in the neighborhood
		3,76 attending associations very or rather often
		3,74 high participation will
		3,60 outskirts
		3,58 suburbs
		3,51 city center
		3,48 sometimes attending associations
		3,47 average participation will
		3,45 no friends in the neighborhood
		3,42 never or rarely attending associations
		3,41 low participation will
		3,39 neighborhood close to the city center
		3,36 two friends in the neighborhood
		3,33 one friend in the neighborhood
		3,30 semi-suburban area
		3,19 three friends in the neighborhood
Rather	3,00	
Slightly	2,00	
Unimportant	1,00	

DESIGNING DESIGN EDUCATION - SHARED VIEWPOINTS

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Design can be thought of as just another subject taught in our schools and universities, on the same level as mathematics, English, or art. There are of course great differences between these subjects and some designers might even claim that design is quite radically dissimilar to most taught subjects. What we wish to consider in this paper however is the nature of the design process as it can be applied to education generally and in this respect, the discipline of design is no different than any other taught discipline. If we put aside considerations of specific content, every discipline can be thought of as a set of concepts, skills and attitudes which the students are to acquire or develop through a process of extended learning. Likewise the teaching of the discipline can be thought of as a design process involving the arrangement of contents and resources such that an acceptable level of learning is achieved. Teaching involves the 'elaboration of a strategy,' which is simply a convenient synonym for the design process.

It will be interesting for the reader to reflect throughout this paper on the degree of similarity which can be considered to obtain between educational design and other forms of design, as he or she may know them. If there proves to be quite a strong match, as we believe there is, the practical designer should then be in an ideal position to assimilate and evaluate the design considerations explored here as they apply to the process of designing design education.

In a precursor discussion of design education (Duchastel, 1976), the role of educational technology was presented as potentially playing a strong role in the design of design education. The concept of educational technology was identified as a set of related concepts which are useful in thinking about the design of education generally and these ideas will be taken up again here. However, we would also like to complete the picture of educational design by more strongly contrasting this view of the process with another view, more difficult to circumscribe, but which could perhaps be called the open-ended education view. It is the consideration of these two viewpoints which have led to the title of 'shared viewpoints,' for we believe that the search for excellence in design education will necessarily be based on a mix of both viewpoints.

The Make-Up of Design Education

As with most subjects in secondary and higher education, design education has something to teach and something to develop in its students. This way of putting it may seem somewhat contrived, for anything which is in the curriculum or on a course syllabus could ultimately be viewed from either angle. Thus even the most basic concepts in a course of study could be thought of as being gradually developed by the students themselves, even in a very didactic mode of teaching centered largely on a one-way communication process (such as the traditional lecture); and conversely, even the most elusive and ill-defined attitudes which teachers hope their students will develop can be expressly taught (in a subtle manner perhaps, but nevertheless taught). Yet the contrast between the curricular content which is easily defined and directly amenable to a didactic approach to education on the one hand and the more elusive content which is not identified with a network of concepts but rather with a way of thinking or a set of attitudes on the other hand is a useful one.

Design education contains both elements, as any field of study does: from simple

facts such as the names of contemporary outstanding designers to artistic and other criteria for evaluating their contributions; from the structure of formal theories of design to an application of the complexity of the design framework; from basic knowledge of the characteristics of certain materials to the evolution of a sense of good form, etc. Design education, in a simplified way, can be considered as a combination of both knowledge elements and sensibilities. The first to be mastered by most students, while the latter are to be developed in perhaps idiosyncratic and hopefully creative ways. The first can be characterized as convergent and the latter as divergent. It is important to realize, however, that we are talking about the end-points of a continuum here, for the goals of a curriculum are never as clear-cut and distinct from one another as one would like. This way of viewing design education however, has the decided advantage of bringing out the diversity of contents and their convergent/divergent natures.

One common illusion which needs to be dispelled straight away is the fallacy of the content-free (or knowledge-free) curriculum. It is sometimes maintained that design is solely a process, as thinking or creativity are, and that what is aimed for in design education is simply better and more creative design, quite irrespective of what the process is to be applied to. This is however no more than radical nonsense: can good mathematical thinking be developed without a good grasp of numbers? Hardly! Creative design is also informed design, with its roots in a design tradition even when it goes against that very tradition. Some may think that we have put up a straw man but yet the pretext of higher orders of thought ('critical thinking' and so on) which is often raised in academic circles as the ultimate aim of education all too often belittles the real value of basic (as well as not so basic) information, and design does not escape the trap of this fallacy.

The converse fallacy is just as perverse of course, although rarely espoused. A near-fully content-bound curriculum is nothing but a drudgery and a far way off from an acceptable education. It remains true however, that the knowledge elements of a curriculum are more easily specifiable in exact terms than are its elements described generally as sensibilities and modes of thought. Design educators fortunately are less prone to falling into this trap than into the previous one, becuase of the very nature of the subject.

The most fundamental question to be considered in design education, as in any educational venture of some depth, is thus the one relating to the proper mix of these two elements in the curriculum. The issue is a difficult one and may lead to greatly varying expressions from different quarters, but yet it remains the first consideration in any educational design process and all other considerations ultimately rest on it. As we shall see, the two viewpoints we explore in this paper take root in this issue. We shall first consider the role of educational technology, which is more convergent in its orientation, at least in its restricted meaning. Afterwards, we shall consider the open-ended approach, characterized by divergence.

The Role of Educational Technology

The basic model underlying educational technology is the systems approach which sets forth generalized procedures for achieving given aims. At its simplest, this model can be described as a set of three recursive components: 1. the setting of objectives; 2. the design of procedures; and 3. evaluation of the design. The recursiveness of the system lies in its fine-tuning through a process of going back through the system time and again in order to improve it. Thus the evaluation stage of the process will reveal areas in which the objectives need to be clarified and ways of improving the design. In educational terms the model corresponds to the setting of learning objectives, the design of teaching approaches and materials, and course evaluation. This characterization of educational technology remains a very global one. It is educational technology in its extended sense. A more restricted sense of educational technology is the one which identifies it with a set of more specific design concepts such as learning objectives, task analysis, criterion-referenced assessment, etc. We shall consider some of these concepts shortly. It seems relevant first however, to do away with a few of the misconceptions which often surround the term educational technology.

The first of these is the identification of educational technology with programmed instruction. This form of instruction involves a partitioning of instruction in very small steps, with active student response, feedback and often a branching sequence through the instruction. The second misconception is the identification of educational technology with the hardware technology of education such as educational television and computer-assisted instruction. A third misconception is an identification with rigid and behavioristic principles of learning based on the stimulus-response paradigm current in psychology until 10 years ago.

Educational technology has had some of its roots in each of these developments and has generally espoused the orientations inherent in them. That is the extent of it however, for educational technology involves a much broader set of concerns and flows with the intellectual movements of the day. Programmed instruction for instance is now a domain of activity which is largely restricted to training settings and educational technology has moved on further afield. The abandonment of the behaviorist paradigm in general psychology has likewise been reflected in educational technology where concerns are now much more cognitive. This is not to say however that important concepts developed in the previous fields of concern are not continually informing current practice, as we shall see shortly. Educational technology is an applied science and as such, it takes what it finds practical from other sciences and adapts it to its own concerns.

It is appropriate now to briefly review some of the concepts which make up the educational technology viewpoint, in the restricted sense of the term. These concepts are especially applicable to the convergent side of the curriculum.

Learning objectives. The concept of the learning objective was developed in response to the all-too-often-encountered fuzziness of the aims which educators are prone to in stating the outcomes of their courses. Fuzziness is the greatest pitfall of education, for after all the process of teaching (in the convergent curriculum) is one of communicating a set of aims and procedures to one's students. If this communication lacks clarity, the results will generally be less than optimal and painfully achieved.

A learning objective is a statement which describes a specific outcome of learning in terms of student achievement. Thus "The student will be able to list 3 criteria involved in the design of a good survey questionnaire' indicates in specific terms one of the things the student is supposed to be learning in mastering the art of questionnaire design. It is a far cry from the following fuzzy aim: 'The course will cover (among other things) questionnaire design.' A learning objective must be specified in terms of the student and it needs to be specific. Naturally, a set of multiple learning objectives will be required to cover the domain chosen for illustration above, that of questionnaire design.

Individualized instruction. This is another concept central to educational technology. It involves the design of a teaching system which enables students to progress through a course of study at their own individual rates of learning and which provides them with the means of periodically assessing their rate of progress. This is standard practice in teaching situations which involve but a handful or two of students, but the institutionalization of very large classes of students as is common, especially in American universities, has caused a problem not only for the pace of instruction (too fast for some, too slow for others) but also for the feeling of personal involvement in the course (how does it feel to be lectured to in a class of 200?).

Individualized instruction generally involves making available indepedent learning materials consisting in a set of units which are each framed at one end by a set of learning objectives and at the other end by an assessment test referenced to those objectives. Each student proceeds through the materials at his own pace, such that students of differing ability and motivation will take as much or as little time as they need to attain the objectives set for them. Generally also, a student is expected (or required) to achieve one set of objectives before tackling another. Numerous design possibilities are possible for such systems and the interested reader will find many case studies in Keller and Sherman (1974). A more in-depth overview is also provided in Goldschmid & Goldschmid (1974).

Our brief presentation of these two concepts illustrating educational technology will suffice to give the flavor of the orientation of educational technology and the role it can play in facilitating student learning. Further examples are provided in Duchastel (1976) and the general approach is well described in detail in numerous texts, e.g. Rowntree (1974).

In summary, educational technology is a set of design concepts aimed at maximizing student learning by emphasizing explicitness of intents and by devising means to cater for potential student difficulties in learning.

Open-Ended Education

Educational technology as reflected here involves a convergent process where certain curricular aims are to be achieved by all students, and furthermore pretty much in the same way. The divergent side of the curriculum needs now to be considered, expecially in design education which prides itself in the fostering of creativity.

An open-ended educational approach is one which specifies its aims in general terms and leaves to the student the task of devising himself what these aims will look like once they are achieved. Project

work is the prototype of this approach. Yet a more radical open-ended approach is the loose parts approach, in which only resources and opportunities are offered to the student and it is left to him or her to make use of them in a creative way in order to improve his capabilities or his person in some way. The aims in this case are usually specified in such general terms that in effect, they are not really aims at all, but rather general guidelines of action. It is up to the student to evolve specific objectives as he goes along with his work and this very fostering of initiative becomes itself one of the overriding aims of the course. The philosophy behind such an approach is illustrated in Nicholson (1976) in relation to an art and design course described in Duchastel (1976a). This constitutes the most radical version of non-directive teaching and can have tremendous impact on the students, although such as approach is also prone to lead to disillusionment in some students. Let us look at the role educational technology in its more extended form can play in designing open-ended education in the form of project work.

This brings us to another important concept in educational technology -- evaluation. In the restricted sense and in relation to the convergent aspects of the curriculum, evaluation is concerned with the extent to which students have achieved the objectives and also with identifying learning difficulties. In an open-ended, divergent curriculum aimed at fostering creativity, obviously this narrow interpretation of evaluation is inappropriate. However, illuminative evaluation (Hamilton et al 1977), with its origins in sociology and anthropology, can contribute to the improvement of open-ended or project-based learning. By attempting to describe the student experience of doing a project -- what are the problems which cause student frustration? -- illuminative evaluation can be used to improve the framework to facilitate open-ended education (Morgan 1978).

Sharing of Viewpoints

We would like to conclude our discussion of design education by emphasizing the need for taking into account the two viewpoints we presented in this paper in any practical design of design education. On the one hand, educational technology offers a set of design concepts applied to education which provide practical means through which design educators can think out the convergent side of their course in explicit and communicable terms and plan student learning such that learning objectives are attained. On the other hand, an open-ended approach to educational design is especially appropriate to provide the student with some leeway which will enable him or her to pursue matters of special interest to more depth and with more personal relevance.

The two approaches are never mutually exclusive; quite to the contrary! Too tight a curriculum centered solely on the acquisition of knowledge elements (a convergent focus) would strangle any personal development aimed ultimately at professional autonomy and initiative. Or in the least, students would be required to develop their sensibilities on their own, outside of their formal education, on a hit or miss basis. Conversely, too loose a curriculum with an overly divergent focus will eventually lead to eager but ill-prepared graduates who will come to resent their free-for-all education. These of course are extremes and few design educators will espouse either of them. A balanced view will lead to a curriculum which will incorporate both viewpoints. Illustrations of such a balance are not rare and the reader can consult the description of one of our Open University design courses which was described in this journal (Cross, 1977).

What we have strived to do in this paper is to bring out the recurrent conflict in design education, as in education generally, between the conception of teaching as technique and the conception of teaching as art. Like midwifery, teaching shares in both worlds. We feel however that there is a constant tendency in education generally, especially with disillusioned teachers, to just let education happen; in other words, to just let the students pick up the threads of what is offered and hope for the best. Hope is never an appropriate substitute for strategy. It is unfortunate also that improper educational design often gets flaunted around as serious open-ended education. The open-ended approach has never been clear-cut nor as explicit in its aims and strategies as its companion approach and for this reason, the pappagalli of education often hide behind its cloak.

Whatever balance is achieved in any educational design, the need for systematic planning will predominate. Even the design of project work will require a careful and recurring thinking out of its aims and the strategies which are to be put in motion. The systems approach which underlies educational technology constitutes a general form of planning which is applicable to both sides of the curriculum. In its extended sense, educational technology thus becomes the process of pre-planning educational systems. Design education warrants nothing less.

The starting point for design educators is an examination of the aims of their curricula. Once these are sorted out and made explicit, the rest can follow on naturally.

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INTERRELATIONS AMONG THEORY, RESEARCH AND PRACTICE

ARCHITECTURAL DESIGN

15-17 MAY, 1978
ISTANBUL TECHNICAL UNIVERSITY (ITU)
ISTANBUL-TURKEY

Nigân Bayazit, Abstracts Editor
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DESIGN AND THEORY BUILDING

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This paper is summarised from a forthcoming book, The Nature of Architectural Revolutions (Wiley and Sons Limited). It deals with the nature of theory in design with reference to the philosophy of science. The stylistic changes which occur in design from time to time are equated with paradigm changes in science as discussed by Thomas Kuhn in The Nature of Scientific Revolutions (1962). The paradigm, basically, being that set of social pressures which act on scientists (and it is agreed, designers) to work within a series of established conventions. Kuhn's paradigm is reduced to his four basic components including those laws of nature which should underly design, the professional skills shared by the community of designers, ideologies which motivate their work and the examples on which they draw from the "form givers". It is suggested that, according to the strictest of definitions, theory has a place in the first of these, the only aspects of design which can be described in terms of physical components -and physically analysable- such as structure, construction, enviromental control etc.. The other components of Kuhn's paradigm, especially its ideological content will depend, not so much on true theory -in the Popperian sense- as on 'pseude-theory' of the kind which he detects in psychology (Freud, Adler) and politics (Marx). It is argued that design will be motivated by 'visions' of the kind which pseude-theory presents, but tempered -hopefully- against the physical realities described by true theory.

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ARCHITECTURE, SCIENTIFIC THOUGHT AND DESIGN PROCEDURES, A REASSESSMENT

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The concern of this presentation is with the past decade and a half of experimentation with design methods in architectural education. Its thesis is that architecture, in its most fundamental sense, has an equivalency with the preparatory and creative aspects of basic science and that procedures can be similar. An understanding of process and method is essential; however, their misapplication to unstable problems, such as those architectural, has led to disappointing results and unproductive labor. A rationalization has then been required to exalt process and dismiss its result, or product.

Definition is given terms related to architecture, art, design and science. The meanings of 'analysis, 'deduction' and 'induction' in the dialectic are reviewed. Three-, four- and five-stage descriptions of the creative process are given. A more detailed description of eight stages is proposed. Conceptual creativity is shown to occur in only three of the eight stages. An application of the process to a small design problem is illustrated.

Because of the profession's frustration and sense of relative impotence, the proposition to give scientific legitimacy to the design process has been seductive. The desire for a system which will guarantee "success" is well recognized in many beginning architectural students. Further, as projects become more complex, with group rather than individual clients, a methodical programming device to give the impression of full participation in design has been widely touted.

The current disarray of architectural thought exemplified by such misnomers as "post-modernism" (really neo-eclecticism) and its celebration of complexity and confusion, belies the beauty of creative science. The hope of the design methodists was to engender logical, verifiable, elegant solutions similar to creative science. Have those hopes been vain?

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IN DEFENSE OF RATIONALITY IN DESIGN

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The author detects a growing popular reaction against rationality in design based on a number of misconceptions concerning the nature of rationality and its assumed role in the Modern Movement in architecture. The author argues that the forms of modern architecture and town planning are the product of aesthetic preferences, not of rational design. Consequently it is incorrect to conclude that the failings of the Modern Movement imply a failure of rationality as such. The author argues further that man's relation to his environment is primarily a "thinking" relation and any approach to design which ignores this dimension is literally meaningless. Following Mead (Mind, Self and Society, 1934), the author links the uniquely human capacity for thought with the power of human language which enables men to "take the role of the other" and so bring his own social experience into conscious awareness and critical control. The essential criteria for rational design are defined in these terms. The designer, through taking the attitudes of others involved in the social act of building, adjusts his own behaviour as a designer in the light of a critical awareness of the meaning his designs have for other persons. He becomes a self-conscious designer. The products of self-conscious, i.e. rational design, are significant symbols (in Mead's sense) in built form. Against Mead's criteria for rationality the products of the Modern Movement are revealed as wholly irrational. As example the author quotes Boudon's analysis (Lived-in Architecture, 1969) of Le Corbusier's dwellings at Pessac and his description of the unintended responses of the residents to Le Corbusier's designs. The author concludes by arguing that in an age of social uncertainty efficacy of meaning may only be established in a rational process of design which facilitates the adjustment of design decisions according to the search for social communication.

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PRODIGALITY AND CONSCIENSE IN PROJECT DESIGN

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Design in architecture is nowadays carried out individually thus remaining behind the age. Architectural project design must be adapted as it is to methods ruling industrial projecting and be destined to production series. Actually it is not possible to secure extensively firstclass buildings from millions of constructions erected as well by millions of standart level project designers.

Generally structural forms are being neglected, forms, lines, decorations and colours are misused, resulting in unlimited prodigality. With such particulars there appears to be the viewpoint of conscience.

Project designers must be gathered in groups within not later than ten years, individual projects must be omitted, constructions must be made in accordance with definite types and standards so that, in conclusion, constructional work must be industrialized.

Project groups must be made dependent on a high council to which immunity is granted in each country.

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ARCHITECTURAL DESIGN EDUCATION

THE TEACHING OF ARCHITECTURAL THEORY CURRENT THINKING IN THE UNIVERSITY OF MANCHESTER

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Recent discussions of architectural competence have drawn attention to the importance of a theoretic base for architectural thought and design. This paper describes one approach to an intellectual understanding of architectural theory and method which is currently being presented in the University of Manchester school.

The inadequacy of architectural theory is expressed in confused objectives, conflicting aesthetics and problems of the classification of architects, their tasks and their buildings. As a result there are recurring requests for an organising structure of theory and method which can be related to day-to-day architectural activities.

The Manchester approach to this problem comprises lectures, required readings, and course work, using specially prepared teaching material, and deliberately separates theory of architecture from theory and method of architectural design.

The course presents an account of the historical emphases and patterns of human knowledge, the consequent intellectual disciplines, and their differing aims and degrees of precision. The problem of locating the integrative discipline of architecture within these formulations leads to a discussion of the terms in which architecture may be defined, and understood.

Theory in general is introduced, in its broad and narrow senses, and the elements of a philosophy of architecture are discussed. A second structure of theories is used to relate architectural observation, description, explanation., evaluation and creation, and a recognition of the complexity of this descriptive yet speculative and constructive metaphysics is intended to emerge.

The inseparable nature of theory and method is stressed; theory needs method to test its hypotheses: method needs theory on which to base its modes of activity. Reminders of rationalism, empiricism and scientific method as it is now seen serve to organise thought and discussion an architectural method, and identify its hierarchical structure.

Finally the course examines the concept of structure, asessing its origin, key meanin and recent application in other disciplines; a review of the key role of concepts in architectural thought and design concludes this section, which leads into the study of the organising concepts of current architectural activity during the period of course work.

The paper summarises the educational objectives, content, and contrasted philosophical attitudes exemplified in the course and reviews the results, and lessons learned from its first presentation in the current session.

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NEW POSSIBILITIES IN ARCHITECTURAL DESIGN EDUCATION

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Erewhon, the nineteenth century satirical novel by Samuel Butler contains the following passage.

"The main feature in their system is the prominence which they give to a study which I can only translate by the work 'hypothetics'. They argue thus - that to teach a boy merely the nature of the things which exist in the world around him, and about which he will have to be conversant during his whole life, would be giving him a narrow and shallow conception of the universe, which it is urged might contain all manner of things which are not now to be found therein. To open his eyes to these possibilities, and so to prepare him for all sorts of emergencies, is the object of this system of hypothetics. To imagine a set of utterly strange and impossible contingencies and require the youths to give intelligent answers to the questions that arise there-from, is reckoned the fittest conceivable way of preparing them for the actual conduct of their affairs in after life."

The book was written between 1863 and 1870 and in that year -1870- the first education statute was passed, the Elementary Education act, whose fundamental purpose was to ensure that all children attended school. The Victorians made a clear distinction between education and life. Charles Lamb described a typical day in a grammar school as revolving "in a perpetual cycle of declensions, conjugations, syntaxes and prosodies." While at elementary school the children were regimented into conformity by rod and rote of the 3 R's. Why was this so? Professor Sir Edmund Leach has suggested in a recent article that-

"This operation was the work of Christian missionaries who believed that in order to achieve personal salvation it is necessary to read the Bible. The practical effect of such education was to destroy the existing indegenous arts and crafts, which the school children concerned might otherwise have learnt, and to produce a superfluity of cheap labour for the white colonialists."

The combination of this form of universal education and the ability to print text rapidly gave the rise of course to the mass circulation newspaper, the dubious benefits of which we have to this day, so that commerce has aided education in training the population to a large extent to see with words.

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DESIGN SYSTEMS STUDIES AT PORTSMOUTH: THEORY AND PRACTICE AT WORK IN ARCHITECTURAL EDUCATION

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The paper gives an account of the introduction of general systems theory as a conceptual tool in a postgraduate architectural course option. The educational method is described and examples given to demonstrate the value of GST as a relational tool in unifying both new disciplines and traditional approaches, and the importance of a holistic view for designers.

The systems approach raises questions of relevance what is to be included and what excluded. This is of particular importance for designers since such questions frame the design problem, the opportunities it presents and the approach adopted. Three levels may be differentiated:

1. The making of architecture itself- its materials and techniques.
2. The relation of architecture to those who use, experience and pay for it.
3. The cultural and symbolic environment of which all building forms a part.

In the educational setting each of the levels will have its own frame of reference. The educational code, with its references to the implicit principles which shape learning reinforce the assumptions of the level adopted. In this way the boundaries of knowledge and the settings used to convey that knowledge stand in a close relation.

The paper questions architectural education's claims of total inclusion and aims to demonstrate an awareness that it is the specific inclusions and exclusions of the knowledge code that creates meaning, convey our own values and, ultimately, those of society. In this way theory and practice can be unified in a meaningful context which values both but denigrates neither.

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TASK ENVIRONMENT OF ARCHITECTURE:
A REVISED THEORY COURSE IN ARCHITECTURAL EDUCATION

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The following paper discusses the necessity of incorporating social scientific knowledge into architectural education in a manner which makes architect-social scientist collaboration possible and effective.

Its point of departure is the desired state of professional practice; and the corresponding desired state of architectural education.

Central thesis of the paper is that the social scientific knowledge should be presented to the student body as a 'going concern' in a disciplined mode of argument within the sphere of architecture; that the logic and methodology of architecture should be revised with respect to the concepts of variability and temporality inherent in the personality structure and social organization of man; and that a central course should be established in the architectural curriculum to transmit an integrated theory of architecture which duely attends to the logistic questions of architecture as well as the traditional question of 'how'. The purpose is to counteract the misinterpreted social scientific knowledge, biased methodologies of architecture, misguided creativity and descriptive architectural theories;

The proposed course which consist of universal, local and case levels, and automatically unites the theory and practice of workshops at its third level is coherent with the views of referenced social scientists and educational psychologists.

The solution sought here in to the multi-faceted problem raised in this paper is based, also, on the previous observations and research of the author on the content and conduct of existing theory courses in architectural curricula.

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ALTERNATIVE APPROACHES IN DESIGN EDUCATION

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Present paper outlines a method derived from the evaluation of two different approaches to architectural design education, namely the individual tutorial and the jury system. Evaluation is based on the method of selecting the design problem, procedure followed during the design process and the method of assessment.

The proposed method is discussed in relation to the above mentioned criteria and the results of assessment are presented. Findings of the student questionnaire indicate that multidisciplinary juries are found extremely useful by the students. Freedom in choosing the design problem and a certain degree of participation in assessment are also desired by the students. It is hoped that studies of similar type will give way to the development of new methods in architectural design education.

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THE PROBLEMS AND PROPOSALS ON ARCHITECTURAL DESIGN EDUCATION (WITH SPECIFIC REFERENCE TO TURKEY)

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Problems in Architectural Design Education can be categorized as follows:

1. Problems related to the form/status of institutions of architectural education (e.g. faculties or departments within the universities, departments of fine arts academies, state highschools/colleges of engineering and architecture,etc..).

Consequences of above-described situation; title problems in professional practice.

2. Problems related to the education/curricula of architectural design. General; relevance of education to the relates of the country. Specific; theory-practice integration and its various forms.

Proposals for the solutions to above given problems of architectural design education can also be discussed in two levels:

1. Discussions on general principles of curricular set-up; such as, to educate "generalist" versus "specialist", proportions of universal and local information/knowledge as well as socio-economic, technical esthetic aspects with the curriculum, etc...

2. Discussions on specific principles of curricular set-up; such as, problem-oriented approach v.s. topic-oriented approach in design, criteria of choice in problems of architectural design (realities of country), sources and types of problems (government agencies in general) as well as understanding of realistic approach in the choice of design problems. Research and its importance in design.

Prospects on a common basic curricula for the entire Architectural Design Education in the country; of cource with some differences based upon the regional qualities and characters.

Emerging real problems of the country as the point of departure as well as objectives to achieve. Level of "specialization" in discipline and its relevance to the general level of specialization (most important indicator of development) in the country.

Discussions on above listed prospects/views with specific emphasis on their advantages and disadvantages.

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EDUCATION FOR DESIGN IN THE BUILT ENVIRONMENT

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It takes the form of a report on an experimental system of architectural education combining University and practice. The Department of Architecture was recently chosen by the Council of Europe as being one where innovations in architectural education were taking place. A Working Party was set up upon which Professor Baines served and he has indicated that the group expressed positive and negative interest in bringing together academic and professional interests in a manner leading to the enhancement of design standards.

As the number of Higher Education institutions dealing with formal architecture has risen it has become clear that there has not been a corresponding increase in the quality of architecture. Indeed, some would say that quality of building has diminished as the number of such institutions has risen.

A brief survey of the great buildings of the past has showed that their designers were not the products of Universities and Polytechnics but rather had a much closer relationship with the building process and also with their clients. It thus seems likely that education has occupied territory which it did not formerly cover.

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A DESIGN THEORY IN ARCHITECTURE AND ITS REFLECTION ON EDUCATION

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Theory which can be defined as an assumption that has been found to be true after it has gone through the sieve of reasoning and experimental criticism could not be dealt with as general approach in architecture following early 1900.

The styles of the past centuries following unifying symbols made their exit from the stage of architecture after the last and short paced dashes of the Art Nouveau. Architects who had through the centuries reserved a most respectable place to the twins form and space, observed a shift in preference of their employers from grandeur to profitable productivity and had to adopt this century's motto of from as a result of function.

Solutions to problems of shaping of buildings giving priorty to function were tried through the universal and syntactic relationships of geometry. Thus such approaches formed a universal expression which reduced visual signs to syntactic level. The personal styles of the practising architects developed and proposed within this framework infact reflected the discrepancies between the socio-economic environment in which they lived and practised.

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THE "ENVIRONMENT" AND "EXPERIENCE" DIMENSIONS IN ARCHITECTURAL DESIGN EDUCATION - AN EXAMPLE OF THE INTEGRATION OF EDUCATION - RESEARCH - APPLICATION

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In the paper, after the fundamental problems of architectural design-education in the school of architecture have been investigated shortly, the studio experiences of the authors in I.T.Ü. Faculty of Architecture are summarized and the problems of these works, which are developed especially in historical environments, like the uses of environment, function, program dimensions and experience accumulations are analyzed. At the last part of the paper, the corresponding relati-

onships of research and application programs of these works and the subjects of contributions to the student and to the selected environment are examined.

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HOW TO CONDUCT AN ARCHITECTURAL DESIGN STUDIO

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It seems that the most useful work to do today is to write a text book an architectural design. A text book that a student may use in the design studio, a kind of book he may refer to while solving his design problem. Based on this main idea, I am treating a series of subjects. How to conduct an architectural design studio is part of this job.

After establishing the relationship between design and other courses; the interrelation between design and research is largely explained. The main heading shows that the general application of the process of research (analysis) followed by design (synthesis) is a wrong approach and that research and design should go hand in hand. A design without research is not scientific, while research without design is an unrewarding and endless effort.

The second theme treated is how to begin the design. It is always difficult to begin any subject. It is even more difficult to begin design, since both measurable and unmeasurable values are involved. The student will tend to concentrate more on research and move away from design. On this point an analogy between nature, social life and design is shown and the concept of main idea, main scheme, main theme is evaluated.

In the paper, the design process is explained before the design beginning. Chronologically this may seem to be rather contradictory; but although the beginning is difficult, the process is more important. This is why the design process is treated primarily. The reader will remember, what he read earlier and make the necessary connections.

Under the heading of design process the main proposal "define and design" is largely investigated. What is more important than the correct definition of the problem is the shaping of idea on paper, even if this definition is wrong.

A short explanation is also given on programming. The proposed system includes the trinity formed by the beginning, the process and the evaluation.

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DESIGN THINKING AND METHODS

A SYSTEM PROPOSAL ON PLANIMETRIC POSSIBILITIES IN ARCHITECTURAL DESIGN

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In architectural creation, we believe to have to deal with a 3-stage design process.

The first of them includes an activity period which could be called the 'Determination of the Data Concerning the Subject'. Here are generally elaborated needs and requirements. In formulating them, the consumer is mostly placed at the foreground; whereas the architect who will conceive the building is either still absent or -as experienced in the most positive cases- plays a fairly passive role as the counsellor of his employer. On the other hand, in cases where the architect has to be selected by competition, we have to do with an initially data-formulating, and then project-selecting committee or jury.

After having determined a data-list which we could concisely call the 'programme', architectural designing enters its second phase. Here the responsible person appears to be directly the architect himself which assumes the job. His main duty in this stage is to evaluate needs and requirements transmitted to him, in order to obtain a distribution and function scheme which has to be scientifically adequate and satisfactory.

As to the third stage, the problem consists here in transforming the abstract scheme into a concrete space-organization, that is into a spatial order. We observe that this task was resolved in quite restricted way in the architecture of the past, and with great liberty by the contemporary movements. However, a formal plurality in architectural design should have -in our opinion- a solid scientific basis, in order not to become a pure formalism. In the system which we have developed according to such a point of view, we tried to establish a relation between the notion of 'architectural subject' on one hand, and the problem of 'knowledge' in philosophy on the other. In fact, each of them is nothing else than a 'resultant-reality' composed itself of various 'reality-components'. This result, called 'knowledge' in philosophy, corresponds in architectural design to the resultant-form or Gestalt. So, it must exist a similarity between the way conducting to the knowledge, and that one leading to the resultant-form (Gestalt).

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THE CONCEPT OF MULTIDIMENSIONAL SPACE AND ITS APPLICATION TO DESIGN PROCESS THROUGH AN IRREVERSIBLE MODEL

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The one and only concept that seemed agreeable by design theorists for the constitution of a generalised integrative theory of design was space. Space as a conceptual entity has been thought to be the most important and the only common thing in the multitude of design activities. In its general context, space has the adaptability of transformation into various meanings. Space is, probably, the unique concept that can cover the totality of different activities in the design process. Even though this could be done with some modifications, or at times with deformations, both on the part of the concept or the content. The concept of space, as a matter of fact, did not assist much for the theorisation of design, to promote the present normative, speculative theory to, at least, a descriptive level. This failure has been due to the following conceptual drawbacks:

First of all, the available general theory of space is far from being relevant for architectural fields, as it has been developed for certain other, comparitively more concrete fields of science, i.e. physical sciences. Consequently, the generalised conceptualisation of space, theorywise contain such a wide variety of fields to integrate that makes such an inference virtually impossible. Then, the specialised theories of space have already attained a considerable degree of sophistication in that their findings can hardly be utilised in a formal identity with the fields conceiving space in certain other contexts. e.g. Space in physical sense and space in behavioural sense.

THE GENERATIVE APPROACH TO DESIGN AND THE THERMAL FORM

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It is possible to analyse the architecural form and consider it to be the resultant of a number of component forms. These are the socio-cultural, economical, technological, functional and environmental component forms, which in turn can be divided to other components. The conventional design process, which is basicaly a trial and error process, is an inherited method less suitable for the present circumstances.

The generative process discussed by this paper is based on the definition that a building is a modifier of the environment. It starts by a study of the existing conditions, the required conditions and a deduction of the needed modifications which the building have to produce. For a component form, e.g. the thermal form, this can be expressed mathematically by the following:

$$TE_1 = TF \cdot (TE_0)$$

Where TE_1 is the thermal environment required inside the building, TF is the thermal form of the building, or the component form, and TE_0 is the thermal environment outside the building.

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PROBLEM OF TERMINOLOGY: PROPOSED TERMINOLOGY FOR DESIGN THEORIES AND METHODS

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Since the beginning of a new wave of Design Methods and Theories many methods have been developed and several theories of the Design-Process hypothesised, but no attempt has been made to formulate a terminology acceptable to researchers and theorists. As more designers accept new methods, it is important to have a unified glossary in order to avoid confusion and misinterpretation. There are, at present, several terms like variables and criteria that are wrongly used; many interpretations of the same term like designing, performance, evaluation, etc; and a number of terms to represent the same activity like evaluation. In an attempt to provide all designers and researchers an unambiguous glossary of terms this paper is submitted as a working paper, and it is hoped that criticism and improvement on these terms will be received from all concerned until a generally acceptable glossary generates. Just as all attempts made to give "a definition" to the term "to design" generated more thought and more definitions, ad infinitum, it will be foolish to attempt "to define" the terms. Instead, it is attempted here to unfold the meaning by discussing the design process or act of designing, and explaining to the reader reason (s) for choosing a term to represent a particular activity o phenomenon, giving examples where appropriate. It is when we all understand and accept a term to represent one and only one activity that ambiguity and confusion will cease to exist. Once we reach that stage, formal definitions can be provided to terms, though this is not necessary.

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RELATIONS BETWEEN RESEARCH METHODOLOGY AND PRACTICE

DEMANDS ON DESIGN METHODS IN ARCHITECTURAL PRACTICE

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1. Analysis of the design proces shows three main dynamic moments, which are constitutive for that proces.

A structuring moment, characterized not only by imposing structure on a structured environment, but also by the structural laws, controlling this activity.

A creative moment alternating between rational perfection and intuitive mastership.

A moment of communication, whereby the reciprocity of message (the 'what') and medium (the 'how') is essential.

It is argued that design methods used in practice have to keep a firm hand on these three moments, in order to be of an operational capability to cope with real design problems.

These demands on design methods arise from a theoretical insight: they define a set of conditions derived from design theory.

2. Analysis of the practical use of design methods over the last thirty years indicates an important shift into the designer's objectives for using particular methods (see Foqué, 1st European Design Research Conference, Portsmouth, invited paper).

Three main aims were distinguished: to obtain a "better" insight, to activate "better" participation.

This paper argues that such a changing operational perspective provides a general framework of conditions, to be applied to every design method in practice.

The second kind of demands proceed from an operational viewpoint: they define a set of conditions derived from design practice.

Both sets of conditions are essential to make a design method work in practice.

DESIGN PROCEDURES FOR BUILDINGS OF QUALITY

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This investigation is approaching completion. A study has been made of buildings in the U.K. which have featured in lists of awards made by the RIBA and other public bodies, and the list of the practices that produced the design was acquired for

source material. A questionaire to architects in the U.K. was circulated and the answers used to establish buildings considered to be of significance and of high quality. Six buildings were selected and the architectural practices agreed to a retrospective investigation of the design procedures used. The offices vary from large inter-disciplinary firms to the small practice of an extremely individual designer responsible for major buildings of international significance.

The techniques were appropriate to the investigation and included interviews with individual designers and team members, who were responsible for initial design decision. This allowed definition of the fundaments of the methodology used. The progress of the design processes was followed through to the final result.

A number of significant findings have been made.

1. Major design decisions appear to be taken very quickly and once 'fixed' remain virtually unchanged throughout the following stages.
2. There is little apparent difference in method between individual architects and design teams. Relationships and responsibilities may be different but very often very similar procedures are used.
3. The relationship with clients has been revealed to be of importance in the design of high quality buildings and the examples should all include procedure design management seems to be the process whereby refinement role in the process.
4. A major role for design management seems to be the process whereby refinement of the initial design takes place without diluting the effect of early decisions.

There are implications for the design professions in the results. The question of payment of fees for example may be related to the work an architect actually does. One of the reasons for failure of major design is that too little time is allowed in the refinement process which is seen to be so important yet has to be acoounted for in design costs.

The findings explain to some extent the reasons for the differences between Architects drawings and schemes as implemented, and may be the reason for the relative failure of the competition system.

BUILT CUES AND PERSONALIZATION OF SPACE

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The need for a Laboratory of architectural experimentation (L.A.E.):

Architectural space, and the elements which define it, form the shell of our daily existence. Each building demands that we make choices regarding spaces, forms, geometries, textures, colours, control of light, etc.

The variations and possible combinations of these parameters are without limit. The problems confronting the architect doing a project are to some extent new each time. Each building necessarily involves a certain amount of experimentation. The L.A.E. allows us to explore new horizons and to contribute to this experimental aspect of architecture by encouraging further reasoning and creative thinking before the act of building.

In practice, each built project can be a happy surprise or disappointment not only for user or client, but for its author as well. The architect designs a project over a period of several months, relying on plans and three dimensional models to study alternatives. Yet only after the construction is finished do the architect and his client discover disparities between original intentions and the reality now perceived.

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DESIGN TECHNIQUE FOR ACHIEVING INTERNAL VALIDITY

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One of the most important tasks confronting the designer is to insure that the design is internally valid. To attain internal validity, the designer must control the influence of variables which are not of interest to the designer in a particular design (extraneous variables) but which could have an influence on the variables used to measure the effect (dependent variables) of the conditions manipulated by the designer (independent variables)

This control could serve as rival hypotheses for explaining the effects produced by the independent variables. Ideally, attaining the desired control involves complete elimination of the influence of all extraneous variables. This, however, is impossible in most cases. Control, therefore, almost always refers to holding the influence of the extraneous variables constant across the various levels of the independent variables. The task of maintaining constancy is difficult for some variables since they may vary as the design progresses. The influence of these variables could be and must be controlled or at least held constant in order to achieve internal validity and true causation for any design manipulation.

Several techniques could be considered for a particular design study but even then the designer can not be sure that all the variables will be controlled but only a better control over these variables will be reached.

The paper would be elaborating on the isolation of controllable variables, control techniques and their effectiveness.

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THE REFLECTION OF THE PROBLEMS OF APPLICATION ON DESIGN

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It is indeed a gladdening event that design is being brought up for discussion at a time when the act of architecture is under the effect of various factors outside its essence. It is usual for us, the implementers, who are toiling and living with design, to acquire set ideas and be conditioned in certain aspects of architecture. We are hopeful that this meeting will be useful in providing an opportunity for us to reconsider our ideas and therefore thank its organizers.

We see that the thinkers on this subject are making efforts with every passing day, to bring new methods and logical and scientific bases to the act of designing: "We need to bring clarity to this process which is gradually becoming more chaotic in order to save the process from haphazard effects, to bring certainty to the solutions and to institute a system of values according to knowledge." The assumptions of thinkers are to the effect that the architect has a new approach with every new project design. They also hold the view that designing should start with the assessment of technical and legal limitations and therefore decide in the light of concrete data as to which alternative to adopt.

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A DECISION MAKING STRUCTURE FOR A COMPREHENSIVE DESIGN PROCESS

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The above title describes the nature of a design method in which a design program is used as a vehicle for establishing a decision-making framework for architectural design synthesis. Emphasis is placed on developing an understanding of, a theoretical attitude to, the integration of the complex functional, formal and physical systems existing in any man-made environmental sutiation, rather than on just producing a design or on studying a building type or a stylistic approach.

The structure of the design process is understandable. It consists of both objective and subjective decisions and insights. The objective decision structure can be taught, the subjective decision structure can be indicated and described.

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A STUDY OF THE HOUSES OF LOUIS I. KAHN ANALYSIS, SYNTHESIS AND THE ANATOMY OF FORM

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While Kahn himself made no claim during his lifetime that he employed any kind of design method, as such, his work is, nevertheless, amenable to analysis. Kahn affirms that order is the first principle and space the unique determinant. Where he rejects on the one hand the notion of functionalism, he accepts, on the other, an interplay between what the building wants to be and specific circumstances of programme, site and client. Thus Kahn's thoughts about the needs of a building are synthesised in terms of the character of spaces rather than their function.

This is an important distinction which Kahn calls 'servant' and 'served' space. His proposition is that 'architecture is the justification of what space wants to be - a space element, a solid (supporting) element, or a dividing element.' These assertions will be tested in this present study. Kahn's spatial logic will be examined in these terms and his contention that both 'dividing elements and supporting elements tend to become space elements' systematically analysed.

Using the published material as a springboard for research, it should be possible to test this concept objectively. The study will be limited to Kahn's designs for houses; the simple configuration of the Trenton Bath House, 1956, will form the basis for comparison. An opportunity is presented to open up the design process to better understanding and trace back to its roots the anatomy of form.

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HUMAN CONSEQUENCES ON DESIGN

DESIGN METHODS ACCESSIBLE FOR THE LAYMAN

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Design methods today can be discussed only if it is specified who is supposed to make use of them. Methods differ according whether they are to be implemented by the engineer, by the artist, by the future user or by the legislator.

This question is often disguised by design method theorists, when they insist that methods should be used by a multi-disciplinary planning team. We better have to be precautious with this kind of ideas (even admitting that they are well-intentioned, as multidisciplinary teams cannot produce good designs if priorities are not clearly pre-determined: each specialist of a multidisciplinary team considers his field as prioritary, and there is no known method existing which could be considered as "multi-prioritary".

I think, it is both morally and practically right to assign first priority to the "future user of the design product": his ideas, good or bad, are the important ones, as he is supposed to live with both his ideas and with the designed object in the future, thus the objects should not be in contradiction to his ideas. Design methods for producing objects are really useful, if they can signal for the future user, in advance, whether his expectations about the object designed will be satisfied or not. Once such warning methods are conceived, the future user can become his own designer. This approach to design could be called "self-design".

Design methods supposed to be made use of by the future user are thus self-design, and they will be our concern in this paper.

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UTILIZING GAMING METHODS IN DEVELOPMENTAL PLANNING

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This study was based on the belief that the user was central to the planning process. In conjunction with a local historical association, the task was undertaken to devise a plan to make effective decisions and direct the future of a historic district.

By identifying the important issues, and outlining specific alternatives and implementation procedu-

res, the users could change the plan as they felt it should change. The town of Murfreesboro had a local historic district and a historical association (Murfreesboro Historical Association MHA). Reasons that served as a guide for the goal-based developmental plan included Cultural Memory, Successful Proxemics, Environmental Diversity and Economic Gain. The plan approach was designed to reflect current attitudes by attempting to keep abreast of citizen goals.

Saving old buildings is a growing concern of many small towns throughout the country. The increasing demand for residential and commercial development, coupled with the continual deterioration of older structures within a community, has raised questions concerning the importance of conserving old buildings. The dozens of reasons presented for preservation can be grouped into four main headings: cultural memory, successful proxemics, environmental diversity, and economic gain. Each of these four arguments are presented below in order to show the value of saving old buildings.

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DESIGN PARTICIPATION AS A TOOL TOWARDS MASS-CONSCIOUSNESS İZMİT INNOVATIVE SETTLEMENTS PROJECT

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The Case Study, tries to summarize, namely the "İzmit Innovative Settlements Project" has been a stimulating experience in public participation as far as the planning phase is concerned. The project in which users participation in planning decisions was taken as a political choice, aims to house 30.000 low-income families most of which are workers in manufacturing industry.

After 3 years of planning phase in which a large number of future users were involved in the decision making process and as the project began to establish interrelationship with the motion of the society generating horizontal communications, the operation was blocked by the hierchical control mechanisms and was left to wither in the impasse of bureaucratic immobility.

To start with, the aim of the Local Administration of İzmit was to construct low-cost houses on a total of 744 Ha. of expropriated land. As the magnitude of the operation seemed to be a breakthrought in town and country planning practice in Turkey the administrators and planners ventured to develop a social and economic organization aiming to follow the changing life patterns and to formulate a just distribution of benefits through the social and economic cooperation of the future inhabitants, which in turn brought the quest for popular involvment in debating and deciding all matters concerning society.

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THE RECOGNITION OF BUILDING FUNCTIONS - AN EXPERIMENT IN ARCHITECTURAL SEMIOLOGY

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35 students from the School of Architecture at the Universty of Geneva were asked to sort pictures of buildings into the six categories of office building, factory, tenement house, church, school and house. Three sets of pictures were traced off the original set of 35 photographs, each set containing a different degree of details. The first set consisted only of building outlines, the second set gave indications of the number of storeys, the third added windows and the fourth set consisted of the original photographs.

From the data analysis it became apparent that the information provided by the first two levels of detail was insufficient to enable the subjects to produce the required six categories. The third level was sufficiently detailed for the subjects to form 5 of the 6 categories. Only on the last level where the original photographs were presented, were all six categories produced.

The pictures comprising the different categories were then examined in terms of their distinctive design features.

The basic finding was that the cues on the outside of a building which convey information about the building's function are size (defined by the number, size and distribution of windows per story and the horizontal or vertical extensions of the building), homogeneity of building volume and form and various stylistic features. A new definition of the concept 'building function' was then derived from the axiom that man produces the conditions of human life through co-operative work. The co-operative nature of work implies that productive labour is performed in groups which may or may not be co-ordinated in space and time and hence requires particular types of layouts.

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HOUSING OR HABITABLE SPACE?

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A case study of the application of desing theory to the problem of habitable space and urban place. It focuses attention on the insights and rationality guiding the development of an explorative technique for reality capable of integrating iconography with the reality of use. In essence the study analyses the semiology of an abstract structure; being a syntax of space-time integration becoming subject to function of a semantic process of content-boundary differentiation.

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SOCIAL CHANGE AND NEW TYPES OF DWELLINGS IN TURKEY

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Squatter settlements and the special types of dwellings are called squatter housing which appears only in societies where agricultural sector is changing faster than non-agricultural sectors, such as industry and services within complex organizations. The peasants in the city who are set free from land permenantly, are subject to various processes of modernization in agriculture and are not easily assimilated into urban occupational structure. The migrant with a history of almost a quarter of a century behind him has a socio-economic mobility which is only a pendulum movement in the lowest categories of the underdeveloped countries occupational structure. The squatter housing is a true reflection of this mobility and in the literature it is expressed with the word "flexibility". A squatter house also serves for the need of security of the ex-peasant and for a feeling of relative well-being as opposed to relative deprivation.

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PSYCHOLOGICAL DETERMINANTS IN DESIGN PROCESS

PSYCHOLOGICAL DETERMINANTS OF THE SUCCESS IN ARCHITECTURAL STUDIES : A LONGITUDINAL RESEARCH

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The paper presents results of longitudinal research on determinants of the success in architectural studies in the Warsaw Institute of Technology. The theoretical background of the study takes a dynamic frame of reference -it is posited that intellectual and personality factors form a structured whole and should be taken together in foreseeing for success in designing. The selection of intellectual factors is based on Guilford's structure-of-intellect model, and choice of personality factors is based on a review of previous research. All 43 independent variables have been correlated with 7 criteria of success in studies. The main results include differences in the configuration of predictors of success in the first and last year of studies. Intellectual variables important in the first year include: 1. General reasoning/CMS/; 2. Spatial imagination/CFT/-measured by two-dimensional problems; 3. Abstract reasoning/CFR/, But in the final year the following factors are important: 1. Spatial imagination-measured by three-dimensional problems; 2. Flexibility of closure/NFT/; 3. Adaptive flexibility of thinking/DFT/. These differences are paralled by differences in the important personality factors. In the first year successful student are: 1. Serious minded; 2. Self-controlled; 3. Insensitive to other criticism; 4. Tolerant in human relations, socially at ease. In the final year success is influenced by: 1. The ability to concentrate on a problem; 2. Reflectiveness; 3. Productivity, energy, vitality.

Looking at the configuration of variables on the first and last year of studies, the different stylistic structure in the behaviour of students can be observed. In the first years students are more cognitively oriented and they are more dominated by the desire to match the standards of peers - one can say they are more dominated by the super-ego and more inhibited. In the final year, the behaviour of students is changing in the direction of more personal freedom and productivity, and at the same time, of flexibility.

The practical consequencies of the obtained results are discussed and some reflextions about the education of architecture at the university level are presented.

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PROBLEMS AND PROPOSALS IN ARCHITECTURAL DESIGN EDUCATION

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Our country has started out for development. As is the case with societies striving for development, our country also must make well balanced plans, especially of the manpower being educated, considering interests and abilities primarily and the other factors too. In that case it will be possible to use the human resources in the most favorable and profitable way, as far as social needs are concerned. Whereas, there is no active planning of manpower in our country. The students are ignorant of the meaning and level of their own abilities and interests; very often the professions they chose as a result of social inter-communication, and their personal abilites, are not concommitant, especially in the case of architectural education. Therefore, the rate of success of many students, falls down both during the process of education and during the professional life. In order to prevent this, if the choice of those who can be succesful in that area is realized on a sound level before professional education is initiated, the time, money and manpower generally wasted away by those who are liable to fail, may be economized. Starting from this point of view, in consideration of architectural education, important factors will be studied; proposals comprising sound and effective criteria for the preparation and choice of architectural education, will be put forth.

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EXPLORATION OF THE DESIGN PROCESS

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This study explores the architectural design process. The premise of the study is that the behaviors of designers can be explained as a form of information processing. Plans, a concept for representing human goal directed behavior, are used to analyse the behavior of a designer under laboratory conditions. The patterns of plans observed suggest that intuitive design has properties that are radically different from those assumed in devising rational design methods.

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THE EFFECT OF FAME AND NATIONALITY OF THE ARCHITECT ON EVALUATION OF INTERIORS BY BEGINNER AND ADVANCED ARCHITECTURE STUDENTS

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The present study is concerned with the question of the interplay between certain preconceptions of the students of architecture concerning the identity evaluative dimension plus the three spaciousness factors.

Basically, the experiment had a 2 (educational level: beginner-advanced) X 2 (fame: well-known-unknown) X 2 (nationality: Turkish-foreigner) X 3 (spaciousness factors: appeal-planning-space freedom) factorial design with repeated measures on the last three factors. The effects of nationality and fame of the supposed architects on the evaluations of four slides showing interiors of art galleries and museums by 128 students of architecture were measured. Each subject evaluated each of the four slides; however, the script indicating the names of the supposed architects of the interiors were varied systematically such that each slide appeared an equal number of times with each of the four names of Le Corbusier, Turgut Cansever, John Benz and Ahmet Engin. Moreover, a control group of students evaluated the same slides without receiving any information concerning the names of the architects.

Results of the ANOVA analyses indicated a tendency for both the beginner and advanced groups to evaluate interiors attributed to the foreign architects more favourably than those attributed to the Turkish ones;similarly, interiors attributed to unknown architects were evaluated less favourably than those attributed to well-known architects, particularly in relation to the appeal and planning factors. The results were interpreted in terms of Heider's "balance principles" and some implications for architectural education were drawn.

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APPLICABILITY OF MODELS AND TECHNIQUES IN DESIGN ACTIVITY

ARCHITECTURAL VERSUS STRUCTURAL DESIGN

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The present paper follows in the line of research initiated by the Author in 1958 with the proposal of a "Vitruvian matrix" as a possible framework for building science and as the infrastructure of a systematic design methodology: research continued over the past twenty years in forty papers. Some of these, in particular, demonstrate how some well known methods of artistic production or mathematical invention are applicable to architectural design: in this paper with reference to Pask's morphological method.

For this purpose it is necessary of define a double series of models which come into design procedure with differing functions: (a) working models (static, physical, distributional, etc.) which are the object of the alphanumerical procedure; (b) gestaltic models (constructional, environmental, etc.) which act as morphological paradigms of the design.

The Author therefore proposes a method of architectural analysis suitable for obtaining the above models from the examination (carried out by successive abstractions) of present-day buildings and/or architectural monuments typical of specific cultures or geographical areas.

The paper describes a practical technique of this analysis under the functional-distributional aspect, reserving for other papers the analysis of the constructional-static, physical and psycho-physical aspects of the buildings. Subsequently the author discusses relationships between built space and functional and/or aesthetic space in order to arrive at a design method of a semi-inverse type which will allow the results of the said analysis to be used to best advantage.

The main features of the present paper are:

(i) the classification of models (both alphanumerical and gestaltic) in "topological" or abstract and "geometrical" or formal;
(ii) a technique, called "of Euclidian network", suitable for passing from the formal to the abstract model and vice versa: inverse operations which occur respectively in architectural analysis and in design;
(iii) a technique for the comparison (i.e. the examination of compatibility) between constructional and functional models: technique characterised by the fact that it must be carried out at both abstract and formal levels.

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THE CONCEPT OF MODELLING IN ARCHITECTURAL DESIGN

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Within the last few years a new generation of predictive and dynamic computer-based models for use by architects has emerged. Currently, evidence is being collected on the influence of these models on the design activity and on the quality of design solutions. This paper attempts to classifiy the models, to present an account of their use in practice and to look to a future in architectural design which extrapolates optimistically from this point in time, in terms of new technology, new modes of professional working, and, indeed a new philosophy of architectural design.

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THE EVALUATION OF CIRCULATION IN MULTI-STOREY BUILDINGS

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In this paper an algorithm for the evaluation of circulation in multi-sotery buildings is presented. The model which is explained throughout the paper comprises two different but related stages. In the first stage the built form is described, in the second stage the expected performance characteristics of the building are predicted. In the description technique it is assumed that the building comprises "n" disconnected sets. The constituent elements of these sets are rectangular cells which may have different dimensions determined by the two dimensioning sets. Each cell is defined by the coordinates of one of its vertices and the name of the set which it belongs to. The input data is checked as two-dimensional drawings of floor plans which are either drawn on the visual display screen or on plotter.

The calculation of circulation distances is carried out for the activity areas which have space-to-space relationships. In the measurements the gravity centers of two related activity areas are the origin and the destination of the journey. In order to measure the real circulation distances inside a building, heuristic search is employed for circulation simulation and the shortest routes between the activity areas are determined by hill-climbing.

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SOME OPTIMIZATION CONCEPTS FOR ARCHITECTURAL DESIGN

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Design synthesis techniques, still very much in their infancy in our country, are proving to be useful in architectural design as well as in civil engineering structures. Between concept and analysis, design is a hierarchy of judgements and decisions, some quantitative and others qualitative. Insofar as the qualitative judgements can be expressed quantitatively, one can set the computer to help in evaluating the design, thus shifting the boundary between what the machine can do in design and what must be reserved to the designer. This metamorphosis has already begun;in a very real sense, yesterdays qualitative judgements are becoming tomorrow's automated decisions.

In this paper, the optimization problem is reviewed shortly in relevance to architectural design. Some factors and reasons for optimization are cited, along with constraints frequently met in architectural design.

The objective portion of the resulting optimization problem can be treated by mathematical means, for which the general expressions are given, while the subjective criteria can be handled through teamwork and designer - computer interaction. When the problem involves a high number of variables which hinder efficient mathematical solution, approximate models, that may be subjected to progressive refinement, become handy. Some applications from the existing literature, to load carrying system layouts and do building site layouts are discussed, and some considerations involving constructional aspects are noted.

THE IDEA OF THE OPTIMUM; IS COST-BENEFIT ANALYSIS POSSIBLE IN ARCHITECTURE?

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The task of the designer can be variously described; as problem-solving; as bringing order out of chaos; as reaching toward new horizons with creations which expand the known boundaries of thought and experience. But each of these views acknowledges that it is a difficult task; that the answer is elusive and reaching a conclusion is reaching the end of a search process. So we commonly think of the designer a being engaged in a search. A search implies a goal; and also requires some means for recognising when that goal is being approached or has been reached.

Anyone engaged in a search of this kind must have an idea of the nature of the object of the search. This will give an idea of the good, or the best (optimum). Many formal design techniques purport to be optimisation techniques, and this paper examines some of the underlying assumptions and problems of these techniques and suggests some ways forward. It uses cost-benefit analysis as one specific example of such techniques and asks some critical questions about it.

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INFORMATION FLOW IN THE PLANNING PROCESS: ROOM DATA BOOKS

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In 1968 the CIB called together a steering group (S 47) which was concerned with data co-ordination in coding with the aid of EDP and with the information flow in Planning, design and building. The author has worked with schedules and room data books for many years in order to implement these planning aids in practice. By performing a research task of the German Ministry of Building (B II 5 - 80 01 74 - 125) about 50 room data books were collected and evaluated. They had been established for various types of buildings, in different stages of the design process and for different parts of interior works (finishes, built-in furniture, radiators,etc.).

The solution was to condense those voluminous "folies" into handy pamphlets and schedules. They consisted ideally of only few pages by reduction of information. This goal was accomplished by prevention of redundancies in order to retrieve easily essential data. Data were only collected for room types, not for every single room. The advantages of the condensed presentation were nevertheless valid even if there are minor variations in equipment and surfaces that belong to rooms of one type.

Updating was recognized to be the most important constraint in the planning process. Schedules should be preferred for the early stages of the planning process, while room data books seem to be advantageous for maintenance and use. Room specifications can be combined with the Bills of Quantities, with cost planning as well as with network planning and accounting thus creating a total system of integrated design.

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A MORPHOLOGICAL AND EVALUATIVE APPROACH TO COMBINATORIAL UNIT DESIGN

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A repertory model has been developed for the solution and evaluation of type building projects which are being widely used in public sector in Turkey. This approach is compulsory in the case of complex design problems where such mistakes are caused by the use of type plans and projects which seems to be the easiest way for state authority investments. For different purposes various state authorities are developing type plans which are far from being adaptable to the environment and local building industry. These type plans and projects should be put into more healthier conditions.

In the proposed model firstly levels of morphological hierarchy are identified in relation to various parameters. Secondly weights of each parameter level and the probability of its use are obtained. Evaluation and decision phases follow. In accordance with the possibility of application and decision process, participatory or organized oriented change programs are chosen, for the definition of weights and probabilities which are used in the evaluation process. Lexicographic evaluation process is accepted for the elemination of combinations.

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THE USE OF THRESHOLD TECHNIQUES IN PROGRAMMING

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Depending upon the functional and the technical context of a subject, to define activities, user needs and requirements, some techniques are used in programming. The use of these techniques depend the idea that the changes in programming are linear. But quantitative dimensions of the problems are not unlimited. Many of these dimensions form the thresholds, which will be overcome by a certain level of cost increase.

The thresholds can be used in defining decision points pertaining the organization systems, the capacities, and the cost limits of flexibility.

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THE PROBLEM IDENTIFICATION IN DESIGN PROCESS

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In design studies, the complexity of the problems require the understanding of the main problems, sub-problems and their interrelations, mainly the structure of the problem. Problems which arise in a conceptual built-human-environment system will have complex relation-ships. Also problems and sub-problems will have different weights and different relations according to the organizational objectives and the design situation. For this reason, it is necessary to idendifiy the decision areas which is formed by the interrelated problems.

The solutions of the main decisions area will effect the problems and their solutions in the sub-decision areas. Therefore the problem identification will continue throughout the design process.

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TECHNOLOGY ASSESSMENT

A QUALITATIVE SYSTEM OF PROJECT ALTERNATIVES FOR THE SELECTION OF ADEQUATE TECHNOLOGIES

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The variety of constructive technologies, with heavy restraints for correct usage, which has developed in the last few years, emphasizes the problem of selecting a constructive system during the preliminary project. This involves the estimation -also an approximation- of the reference system or systems so as to avoid unrealistic projects. At the same time, the danger of planning a particular technology, thus being passively subject to the imposed productive restraints, leads to an unacceptable sterility of the project and the acceptance of more or less fixed schemes.

We have therefore studied a series of procedures which, starting from a preliminary study, allows the production of project alternatives as well as an evaluation system, within the proceedings, of estimating the alternatives in order to identify a solution associated with the selected technology.

The system is composed of four parts: schematizing, optimizing, applicability and evaluation. During the schematizing phase, the project is transformed into a scheme which renders the subsequent operations more rapid and immediate. In the next phase, precise optimizing operations are effected by means of an analysis of special qualitative parameters and the production of "better" alternatives. The next phase is the study of the applicability of technological alternatives selected from the system prepared by the same study group. The final phase of evaluation, within the project selections, allows the identification of the preperable alternative. The system, limitedly developed in the field of housing planning, was tested by students of a university course with positive teaching results.

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TECHNOLOGY ASSESMENT IN DESIGN: ARCHITECTURAL MANAGEMENT

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Criteria for evaluating or designing a building production system to achieve a specific goal are classified under two main categories. The first category controls the approprietness of the product (building) to users' requirements. The second group is about the criteria of resource utilization.

The criteria of resource utilization such as technological and economic criteria, are used as a tool to be applied during the all stages of building process. In order to obtain an appropriate building system, it is necessary to arrange the interrelations of product and process properly. This activity of organizing the whole process is considered as the main objective of management.

In this paper, firstly the importance of being aware of resource utilization in all through the stages of building process is mentioned. Considering that it is the task of "Architectural Management", this concept is defined later some major problems of this field is indicated.

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