SOCIAL ENGINEERING

behavioral research for the
design and implementation
of low-cost housing and
infrastructure in developing
countries

Jacob J. Bijl
April, 1975
Metro Center, JHU

Draft Version
INTRODUCTION

Subject
In this paper an attempt is made to understand the nature of the process of behavioral research against the background of practical day-to-day human understanding with the purpose of establishing principles for the conduct of applied research.

My main interest and background experience is in the use of social research for the design and implementation of projects for housing and urban infrastructure for the urban poor in developing countries. Although the ideas in this paper are developed in this context, they may well have a broader range of application.

1.02 Political Problem

Housing and infrastructure is part of the real income of the population, and as such, is a problem of production and distribution. Since institutional barriers on the national and international level are the major hindrance of an efficient production and distribution of real income, the problem of providing housing and infrastructure for the urban poor is essentially political.

1.03 Understanding of the Engineer

Even on the (unrealistic?) assumption of political willingness at the national and international level to remove these barriers, the sheer size of the problem remains, and any solution must rely on the active participation of the people if only to reduce costs (although
the inherent advantages, like having a bigger 'say' in the
decisions related to one's own situation, may be more important).

Realizing the cost not only of infrastructure and housing but
also of engineers and other experts hired to find solutions,
the basic attitude of an engineer must be one of "how can I
limit my interference?" This attitude goes against the grain
of traditional engineering education and practice. At school
the interesting problems are those whose solution require a
lot of engineering ingenuity, if not time. In a contracting
or consulting firm a major aim in project design is to
generate further contracts for the firm.

But even if this necessary attitude has been acquired it remains
to find an answer to the question. To understand in each
particular case what can be done by the population and what must
be done by experts requires not only engineering knowledge, but
also an awareness of the potential and needs of the population
the engineer is to serve.

1.04 Understanding of the Population

Even if the project is designed and implemented on the basis
of a through acquaintance with the population, limited means
will be a constraint on the engineer's choice of materials,
techniques, and design patterns and, as a consequence, the
settlement and future living patterns of the people. The
people, if they are to fully appreciate a project, must understand the position of the engineer.

1.05 **Conditions**

There are three necessary conditions for the solution of problems related to housing and infrastructure for the urban poor:

1. Removal of national and international institutional barriers to provide an efficient production and distribution of real income.

2. An understanding on behalf of the engineer of the potential and needs of the population to be provided for.

3. An understanding on behalf of the population of the constraints of the engineer.

In this paper I concentrate on the second and the third condition. The first condition, although recognized as the most important, is only implicitly treated. [see 4.02 Ethical Implications]

1.06 **Social and Cultural Distance**

In actual practice engineers engaged in design and implementation of low cost housing and infrastructure are mostly Westerners, working for European or American consulting or contracting firms, for international agencies or as counselors to governments. Their education is Western and their income, even in their own countries, is relatively high. Thus there generally is a big cultural and social gap between the engineer and the urban poor.*
If the engineer is born and educated in the developing country, the cultural distance may be smaller, but the social distance resulting from education and a high income level remains.

1.07 Behavioral Scientist
To establish mutual understanding a specialist, a behavioral scientist, is required to help in the process of design and implementation. The knowledge and experience of the behavioral scientist should enable him to relate the situation of the urban poor to the engineer and relate back to the former the situation of the engineer in terms the poor can understand.

1.08 Social Engineering
The knowledge and experience of the behavioral scientist applied within the context of engineering is the subject of this paper. I could not resist the temptation to call this activity social engineering.

1.09 Outline
The paper is divided into three parts:
1. In Chapter Two a conceptual framework is provided to describe the conditions that enable any two individuals to relate to each other.
2. Chapter Three describes, in terms of the conceptual framework developed in Chapter Two, how common day-to-day understanding (practical understanding) between any two people is possible.
Through a discussion of some aspects of the development of a newborn human being into a full participant in society, the concept of practical understanding and its verification in the process of common activity is developed.

3. Chapter Four treats the process of social research as part of the process of design and implementation.

It is based on the assumption that the product of social research is verbalized practical understanding, i.e., theoretical understanding. Here again the major point is the idea of verification of human understanding as only possible in the context of a process of common activity. The process of common activity is design and implementation of housing and infrastructure. The understanding is obtained in the process of social research as part of the total process of design and implementation. The correctness of this understanding is verified by the satisfaction, or lack thereof, with the process and its results as expressed by the participants.

*This paper was written by a Dutchman at an American University for an English speaking and limited audience. It is, of course, a symptom of institutional barriers and an illustration of a social and cultural distance from the urban poor whose problems the author pretends to discuss.
2.03 A System

"...a motorcycle can be divided according to its components and according to its functions. When I (Pirsig) said that suddenly I created a set of boxes with the following arrangement:

MOTORCYCLE

COMPONENTS  FUNCTIONS

And when I said the components may be subdivided into a power assembly and a running assembly, there suddenly appear some more little boxes:

MOTORCYCLE

COMPONENTS  FUNCTIONS

POWER ASSEMBLY  RUNNING ASSEMBLY

And you see that every time I made a further division, up came more boxes based on these divisions until I had a huge pyramid of boxes. Finally you see that while I was splitting the cycle up into finer and finer pieces, I was also building a structure.

This structure of concepts is formally called a hierarchy and since ancient times has been a basic structure for all Western knowledge. Kingdoms, empires, churches, armies have all been structured into hierarchies. Modern businesses are so structured. Tables of contents of reference materials are so structured, mechanical assemblies, computer software, all scientific and technical knowledge is so structured--so much so that in some
fields such as biology, the hierarchy of phylum-order-class-genus-species is almost an icon.

The box 'motorcycle' contains the boxes 'components' and 'functions.' The box components' contains the boxes 'power assembly' and 'running assembly' and so on. There are many other kinds of structures produced by other operators such as 'causes' which produce long chain structures of the form 'A causes B which causes C which causes D' and so on. A functional description of a motorcycle uses this structure. The operator's 'exists', 'equals' and 'implies' produce still other structures.

These structures are normally interrelated in patterns and paths so complex and so enormous no one person can understand more than a small part of them in his lifetime.

The overall name of these interrelated structures, the genus of which the hierarchy of containment and structure of causation are just species, is system. The motorcycle is a system. A real system." (Pirsig, 1974: 92-94)

2.04 Living Systems

Living systems are systems that can reproduce their parts and thus, ultimately, themselves.

"Although this copying process of patterns and its various derivative manifestations, such as the highly specific catalysis of
further macro-molecular species through the enzymatic action of proteins, is often referred to by verbs with the anthropomorphic prefix 'self'-, these processes are no more 'self'- engendered than a (motorcycle) can be 'self'-building; for in order to occur at all, they require the specific cooperation of their own terminal products--the enzyme systems which, being indispensable pre-requisites for all the links in the metabolic chains, including those for their own formation, thus close the circle of inter-dependent component processes to a coherent integrated system. Only the integral totality of such a system could with some justification be called 'self-contained', 'self-perpetuating' and 'self-sustaining'." (Weiss, 1969: 19)

2.05 An Egg

"Now let us start our consideration of the time continuum of living generations with a particular egg, containing in its nucleus the inner sanctum, the chromosomes with their genes. An egg is not a nutrient solution for a genome to feed on, but it is a full fledged organism, equivalent in its systematic features with other single celled organisms, having derived these features directly from its prior existence as a germ cell in the maternal body. We know that in its crust, the egg cytoplasm consists of an orderly mosaic pattern of fields, the typically different properties of which map out the dynamics of specific organ districts. As the egg nucleus divides, the derivative daughter-nuclei, therefore,
or its parts ever losing their free systemic dynamics entirely while they are alive. The loss of those integrative dynamics is the mark of death." (Weiss, 1969: 38-39)

2.06 A Motorcycle

The building of the system motorcycle can also only be understood in the context of a structured living environment.

There must be human beings to make it. There must be a physical environment to provide the raw materials. There must be a system of interrelated activities. There must be a hierarchy of tools. There must be a system of knowledge and belief. There must be a hierarchy of languages for the transmission of knowledge and belief. There must be a hierarchy of social environments to organize the human beings, the raw materials, the activities, the tools and the transmission of the system of knowledge and belief.

Only in the macro-determination of this environment can the micro-determinacy of the design of a motorcycle or an earlier motorcycle or the idea of a motorcycle be translated into a new motorcycle.

2.07 Behaving Systems

Behavior is the movement of systems. In living systems we can distinguish things done to and things done by the system, i.e., the organism (Harre and Secord, 1973: 148)
come to lie in specifically disparate domains, which later, in their ensuing interactions with the nuclear genome, become further modified, and as this interplay between plasma and nucleus in the steadily increasing cell population continues, the genic environment becomes progressively diversified. In all this, the genes themselves do not significantly change; their pattern is replicated stereotypically in practically all cells of a given individual throughout development. Yet each cell's genome is, and always has been, a captive of an ordered environment.

While the genome contributes to the specific properties of that environment in mutual interactions with it during the whole course of embryogenesis, it is only by virtue of the primordial frame of organization of the cytoplasm of the egg that an individual can maintain from the very start the unity of overall design, to which the masses of freely mobile scalar entities of lower order, including the cells and nuclei with their chromosomes and genes, owe the 'microdeterminacy' of their eventual fates.

The dynamism of organization is dualistic. The coarse-grain macro-determinacy of the systemic plasmadomains, in which the genomes reside, is through the interactions with the fine-grain micro-determinacy of the rigorously structured genes, progressively translated and consolidated into more detailed and specific definition--'from the general to the specific'--without the organism
Behavior done by the system is animal behavior. This has been defined as follows:

"An item of behavior is a sequence of movements of and/or in a particular animal of a particular type occuring over a connected interval of space and time, such that there is in force a presumption, based on our common experience with the type of animal in question, that such creatures, when placed in circumstances of the kind in question, could have been so trained that, being so disposed in advance, they could, be exercise of sufficient attention and expenditure of energy, have arrested or inhibited movements of the kind in question on occasions like that in question." (Shwayder, 1965: 21)

2.08 Innate and learned behavior

"The innate is not only what is not learned, but what must be in existence before all individual learning in order to make learning possible." (Lorenz, 1965:44)

"What ever else learning may be, it certainly is an adaptive modification of behavior, and its adaptiveness, that is, its ability to adapt behavior needs a causal explanation. There is an infinitesimally small chance that modification, as such is adaptive to the particular environmental influence that happened to bring it about. Indeed this chance is not greater than that of a mutation being adaptive. Geneticists rate this likelihood at
about $10^{-8}$. Whenever we do find a clearly adaptive range of modifiability we know that these achievements of adaptation are not exclusively due to environmental influences, but just as much to a very specialized range of modifiability which has been selected in the pre-history of the species." (Lorenz, 1965: 11-12)

In terms of Paul Weiss (see 2.05) the macro-determinacy of the environment and the micro-determinacy of the innate learning program determine the form of behavior of the organism in question.

The innate learning program and innate behavior are the result of the learning of the species and are coded in the genes. Behavior of the organism at any moment in life is acquired through the interactions of the phenotype with the environment. This behavior has been learned on the basis of prior behavior and ultimately on the basis of innate behavior whereby the innate behavior and the range of modifiability was determined by the genotype.

Thus the rigorously structured genotype interacts through the phenotype with the environment. Therefore, any behavior can be analyzed as the end of a hierarchically structured learning process with innate behavior and an innate learning program at the start. Since other organisms of the same species are elements of the environment having their own hierarchically structured behavior, the behavior (the activities) of the species can be described as a system of behavior.
The system (order) I find useful for a description of the study of human behavior is as follows:

1. Human Beings

The genotype of a human system (individual) is a particular combination of genes from the gene pool of the human species. The gene pool, the totality of the genes of a given species existing at a given time, is the result of evolution and represents the "learning" of the species. The genotype or genome in interaction with the structured environment of the womb (2.05) results in the phenotype of the newborn, with his innate behavior and his innate learning program. (2.08)

Since the genotype of each individual is a combination of genes out of the gene pool of the species any two genotypes will have different elements as well as elements that are the same. The environment of the womb will also have a structural sameness for all individuals of the species but still show individual differences. This explains both the common elements and the differences in the newborn human systems and makes it possible to speak of many different interrelated human systems (John Doe, Henrich Boll, Francois Dupont, Lin Piao, Abdoulaye Diop, etc.)

2. Physical Environment

The physical environment of mankind is the surface of the planet
earth. As it is clear that different areas on the globe have elements in common and differences, I think it is justified to speak of the physical environment as a system of interrelated environmental systems. (Africa, Los Angeles, a room, Amazon river, etc.)

3. Behavior
The hierarchical structure of behavior has been shown in paragraph 2.08. Different human systems in interaction with different environmental systems will produce different interrelated systems of behavior (driving, reading, ploughing, eating, etc.)

4. Objects
One of the results of man's activities in his physical environment is the production and the use of objects ranging from digging sticks to computer software and from domesticated animals to jewelry. Different combinations of human beings, environments and behavior will produce different interrelated systems of tools. (hammers, books, masks, roads, cigarettes, etc.)

5. Social Environment
Another aspect of human behavior is the creation of organizations, i.e., a structured social environment. This leads to interrelated systems of organization. (church, school, age group, family, etc.)
6. Language

   Language is a form of behavior and as such it is easy to see how it has developed into a set of interrelated systems of language (English, papua, engineer's language, hippie language, etc.)

7. Knowledge and Belief

   Finally language permits reflection on all the aforementioned systems within the context of those systems, enabling me to speak of many interrelated systems of knowledge and belief. (sociology, Islam, physics, witchcraft, etc.)

2.10 The Argument

1. The universe is a whole.

2. When we conceptually cut that whole into parts meaning is the conceptual relation between the parts.

3. The first and major cut any human being makes is between himself and the rest of the universe.

4. This cut is his consciousness of his interaction with his environment. That is his behavior becomes conscious behavior and by the same token meaningful behavior.

5. Thus his conscious behavior implicitly has meaning.

6. His action in the context of the seven enumerated systems will change parts of all of them including himself.

7. In this process he acquires a system of behavior, of language, and of knowledge and belief.
8. Because of the interrelatedness of all the systems involved the meaning of anybody's behavior is related to the meaning of anybody else's behavior.

9. Thus any individual can relate to, that is, understand or misunderstand, any other individual.

10. Since meaning is found only in behavior the correctness or incorrectness of understanding between two individuals can only be verified in the process of a common activity. They will have to engage in the behavior they want to understand. In this process all the systems involved will change.
3.00 PRACTICAL UNDERSTANDING

3.01 Practical Understanding

In this chapter I want to illustrate some aspects of the development of the newborn into an adult participant in human society. In the course of this process the infant acquires the practical understanding necessary for his day-to-day interaction with other people. The fact that society functions shows that it works; the fact that society doesn't function smoothly shows that it doesn't work perfectly i.e., there is understanding and misunderstanding, harmony and conflict, certainty and doubt and continuity and change. Practical understanding as an adult member of society is seen as a prerequisite to becoming a behavioral scientist.

3.02 Continuity and Change

The development of any newborn takes place in the context of sub-systems of all the six systems. In this process he changes himself, learning new things on the basis of old. But in doing so he changes and contributes to the very systems he interacts with. Using English he changes the English language, as a member of a social institution he changes its workings, as a believer he changes the religion or as a scientist branch of science, etc. The process of interaction produces new situations, new systems on the basis of the old. This means that some elements are maintained while others are changed, that some structures remain intact while others break down. The number of elements (and their relations) that change
may be great or small, but other elements (and relations) will continue. That I think, is the main characteristic of the total process.

If we consider the development of a newborn individual in this context, it is important to remember that many different hierarchies of skills develop simultaneously and are mutually related in the individual. The following is essentially a string of quotations illustrating aspects of the development of the infant in society. The understanding of this process is still very fragmented and most research seems to concentrate on the rational aspects.

3.03 Developmental Psychology

Developmental psychology is the science that studies the development of the child. Its method is best stated by one of its major practitioners, Barbel Inhelder:

"This is the method of developmental psychology in which we follow step by step the formation and then the progressive interiorization of actions in our child subjects. This enables us to think of our adult attitudes as the result of a long development, rather than let these attitudes condition our interpretation of the facts. When we proceed this way we make three fundamental observations.

The first is that during the first year of life all actions show interdependence between the subjects and the objects, which are bound together with no pre-established frontier separating them.
There are as yet no objects independent of the subject (object permanence only starts around 9-10 months) and reciprocally, the subject does not know himself as such, but only in reference to his successive actions.

This initial level of complete interaction or radical inability to differentiate between the subject and the object is important. It is not a question of trying to establish how the subject is going to adapt himself to a reality looked at from the outside, but on the contrary, to understand how the succession of action patterns is going to lead to an objectivization of reality (therefore, to a construction of objective relations) and to an internal organization of actions.

The second observation is that an action consists in transforming reality rather than simply discovering its existence: for each new action the acts of discovering and transforming are in fact inseparable.

Thirdly, this active nature is inherent in all and not solely the motor aspects of an action. It would thus be very misleading to contrast perception and action as if perception informed us about the world such as it 'is in reality' while action alone succeeded in transforming it."

We must, therefore, conclude from these three observations that an organization of actions, much deeper and richer than a simple set
of 'associations' between perceptions and movements, is constituted very early on in life." (Inhelder 1969: 127-128)

3.04 Jerome Bruner

Jerome Bruner has done research, in the abovementioned tradition, on the intellectual and perceptual development in children. In his paper 'On voluntary action and its hierarchical structure' he discusses some of the features of organization of voluntary systems of action:

"We know extraordinary little about systems that acquire their organization in contrast to those that have much of it built in from the start. I believe that it is of great importance to examine the former type of system with especial care, for it is in such systems that one finds maximum plasticity, a maximum modeling of the most variable features of the environment, and a maximum amount of information processing. These are the systems of action that, I believe, become generative in the linguistic sense—capable of being employed in a variety of contexts by the use of a minimum set of elementary operations combined and recombined by rule-governed programs." (Bruner, 1969:162)

3.05 Bernstein's Model

Bruner uses a model of voluntary activity of Nicolai Bernstein as a starting point:
"All systems that are self-regulating for any given parameter, constant or variable must incorporate the following elements as minimum requirements:

1. Effector (motor) activity, which is to be regulated along the given parameter,

2. A control element which conveys to the system in one way or another the required value of the parameter which is to be regulated,

3. A receptor which perceives the factual course of the value of the parameter and signals it by some means to

4. A comparator device which perceives the discrepancy between the factual and required values with its magnitude and sign;

5. An apparatus which recodes the data provided by the comparator device into correctional impulses which are transmitted by feedback linkages to

6. A regulator which controls the function of the effector along the given parameter. (Bernstein quoted in Bruner, 1969:175)

"Note that activity contrasts with mere movement in that the former requires that coordination and regulation of the latter in the attainment of some particular objective." (Bruner, 1969: 175)

3.06 Bruner's Additions

"For Bernstein, the achievement of control always involves a reduction of or 'mastery' over degrees of freedom in the action-system being regulated.
I (Bruner) shall argue in what follows that the mastery of intelligent, visually-guided manipulation in infancy and childhood involves a cycle of brute restrictions of forms of movement and of programmatic skill formation within the limits of that restriction, with skill moving to a next step only when restriction is altered. Any given program of skilled voluntary action is gradually consolidated within its own restrictions. Its consolidation is signalled by the well-known plateau in the learning curve. Progress points in the infant's development are qualitative rather than quantitative changes of skill. These involve not consolidation, but the formulation of new strategies or programs of action which in turn must be consolidated. Each new program of action involves an increment or actuation of degrees of freedom. The process moreover continues through life.

Now return to Bernstein's diagram. What it lacks is some specifications about the nature of programs in the so-called command system. These must be generative in several ways. They must contain equivalence rules concerning substitutable types of acts, they must specify sequence, types of acts to be carried out in certain privileged orders. They must specify delay procedures and rules for bracketing in the event of encountering difficulty. As Piaget (1954) would rightly insist, the programs must be promised on some stored and/or innate model of space and objects."
But before such programmatic voluntary action can get under way... there must first be a recession of reflex control over the acts that are governed by a program. The beginning of skill is diffusely organized awkwardness guided by a small number of directional specifications. Diffuse awkwardness is then replaced by stiff awkwardness. The system gets stiff, but it gets vastly more effective. And when it does so, when it becomes 'reinforced', it then changes."
(Bruner, 1969: 175-176)

3.07 Hierarchic Organization

From the above it becomes clearer how an innate learning program of the human organism can be the starting point, in an appropriate environment, of the formation of hierarchies of voluntary action. Each acquired program being the starting point for a new learning cycle in interaction with the environment.

When one realizes how a variety of such hierarchies of voluntary action are built up simultaneously and interdependently, the richness in variety and redundancy of the possibilities of action of the human being becomes a little bit more understandable.

To illustrate an aspect of this process an abstract is given below (3.09-3.10) of Jerome Bruner's account of the integration of eye and hand, an important part of the development of the sensory motor period. This period is considered by some (Sinclair de Zwart, 1969:330) sufficient and by others at least a necessary condition for the acquisition of language (McNeill, 1970: 73-74)
Four Traditional Questions

Bruner hopes to explore some of the preliminaries of the growth of mind. These matters in the aggregate (intention, skill, attention, and integration) do not sum into language or tool use. But they may give clues in their development, "that presage those higher order functions that link the child with its culture."

1. Intention.

"The growth of voluntary self-initiated activity...it concerns the regulation of anticipatory behavior by corollary discharge or 'feed forward' mechanisms.

2. Skill.

"The growth of skill and (or) the forms of growth and learning that permit the child to overcome the three major sources of human awkwardness:

Grossness of movement that violates the fine structure of the task,
Contradictory systems of action clamoring for a single common path, and
Imperfect or faltering sequencing of component acts required to carry out a skilled task.

3. Attention.

"...the organization of perception and attention. How the perceptual world of the infant, first governed by the features of stimulation, comes eventually to reflect the requirements of manipulation."
4. Integration.

"How the growing infant learns in time to orchestrate several previously separate enterprises synergically, whereas at the outset he is so one-track that he can scarcely both look and suck at once."

3.09 Visual Guidance of Hand Movements

The process of the integration of voluntary hand movements and of relating one hand to the other under visual guidance, takes at least two years to complete.

1. The growth of visual attention, from a diffuse distractability (first weeks after birth) to a stage of "stuckness" where attention has an obligatory character (by six weeks) to a stage in which it becomes anticipatory and predictive, (by fifteen weeks) involving placing, withdrawing, and shifting of attention.

2. The growth of hand-mouth coordination, the baby being able to get hand to mouth in some erratic path by the fifth or sixth day and having the movement well perfected even before guarded prehension is on the scene.

3. The growth of vision-mouth anticipation, again the baby is learning very early to open his mouth when the appropriate object is visually apprehended.

(1), (2), and (3) are preliminaries for a Reach-Capture-Retrieve-Mouth Sequence under visual inspection. (1) provides an orientative visual matrix in which the seen movement of the hand can be
appreciated. (2) and (3) makes the mouth serve as a tertium quid between vision and the hand.

4. The first analogue of reaching is a general 'pumping up' or activation response with rough 'swiping' movements that constitute a diffuse reaching. If the hand (or hands) happens to strike an object while unfisted, there will be a grasping and retrieval of the object to the mouth (by six to eight weeks).

5. Development of the sequence Reach-Capture-Retrieve-Mouth. The two hands are not acting to complement each other, but are in synchrony at the midline. One hand will not cross over the midline to help the other.

A successful carrying out of the sequence seems to preactivate repetition of the sequence through a corollary discharge or 'feed forward' to the components of the act.

6. Until the sixth month a better and better coordination of the four-part invariant sequence. With time there is more feed-forward and priming so that the hand is shaped to grasping as the reach is going forward. The mouth seems to prime the sequence by opening in advance. The sequence always ends at the mouth. It seems to require constant visual surveillance. During the development the act seems to require cessation of all other enterprises.

7. At about eight months, attention moves to a phase where it is alternatively leading and tracking the moving hand, again the mouth as terminus.
8.0 At this stage final "maturing" begins with the following five characteristics:

8.1 Rendering the sequence less awkward (fewer distinctive steps, each successive step is primed one or two steps ahead, the steps overlap in time, and give an increasing sense of smoothness and speed, a gradual dropping out of the first activation).

8.2 A freeing of the sequence from mouthing as its terminal phase (beginning of tactual, visual or kinesthetic exploration).

8.3 A gradual freeing of the act from the redundancy of input that was originally needed to sustain it. The first effort is to map the kinesthetic proprioceptive field of the hand on the visual orientation field (with the help of the mouth). The second task is to utilize the redundancy of the two fields to free the task from constant visual supervision, so that visual anticipation may develop.

8.4 A gradual process of learning bimanual, complementary activity.

8.5 A slow but steady disassociation of the gestural components involved in visually guided reaching from the goal directed sequence (to be recombined with other gestural components of other sequences for new purposes). (Bruner, 1969)

3.10 Significant Gesture

At the end of the sensory-motor phase the stage is set for the understanding of the possibility of Mead's significant gesture:
"When in any given social act or situation, one individual indicates by a gesture to another individual what this other individual is to do, the first individual is conscious of the meaning of his own gesture—or the meaning of his gesture appears in his own experience—in so far as he takes the attitude of the second individual toward that gesture, and tends to respond to it implicitly in the same way that the second individual responds to it explicitly."

(Mead, 1934: 47)

A hint of the possibility of this is given in a remark by Inhelder: "...from the neuropsychological point of view, using the EEG or electro-myographic methods, we find in the imagined representations the same motor impulses as in the actual carrying out of actions."

We are only one step from language:

"It is this which gives such peculiar importance to the vocal gesture: it is one of those social stimuli which affect the form that makes it in the same fashion that it affects the form when made by another. That is we can here ourselves talking and the import of what we say is the same to ourselves that it is to others."

(Mead, 1934: 62)

"It is true that the language of the hands is of the same character. One sees one's self using the gestures which those who are deaf make use of. Of course the same is true for any form of script."

(Mead, 1934: 67)
In the light of these last remarks it is interesting to know that
the two most successful attempts at learning "language" by
chimpanzees have made use of sign language for the deaf and of a
script of variously shaped pieces of plastic respectively.
(Jolly, 1972:328)

3.11 Communication

Before a discussion of language proper, it should be pointed out
that speech is only one means of communication. "In fact, most
personal communication is mediated nonverbally. Although we value
love sonnets and love letters, courtship can do without them. In
fact the content of conversation may be quite irrelevant to the
relationship between the speakers: they mean only 'Please pay
attention to me while I am noticing you,' which is what van Hooff (1967)
calls 'grooming talk'." (Jolly, 1972:142

Michael Argyle (1967:36) in his book on the psychology of inter-
personal behavior has devoted a whole chapter on verbal and non-
verbal communication. He distinguishes the following kinds of
social (communicative) acts:

1. Bodily contact
2. Physical proximity
3. Orientation
4. Bodily posture
5. Gestures
6. Head-nods
7. Facial expression
8. Eye-movement
9. Appearance
10. Non-linguistic aspects of speech
And finally
11. Speech
Perhaps choice of place and time for the act should be added.

Argyle distinguishes further three different roles of non-verbal communication:

1. Communicating interpersonal attitudes and emotions.

"There is probably an innate biological basis to certain non-verbal signals which evoke an immediate and powerful emotional response--as in animals. In human social behavior it looks as if the non-verbal channel is used for negotiating interpersonal attitudes, while the verbal channel is used primarily for conveying information."

(note the existence of another hierarchy of voluntary action. How this action works in daily life is neatly described by Irving Goffman)

2. Supporting verbal communication.

Timing, pitch, and stress provide punctuation. Completing the meaning of utterances. Controlling synchronizing (taking turns to speak). Obtaining feedback (am I understood, believed, boring, pleasing, annoying, etc.) signaling attentiveness.

3. Replacing speech.

When speech is impossible gesture languages develop.

3.12 Language

The foregoing paragraph has been inserted to stress the point that speech, important as it is, is part of a total social act, is always embedded in non-verbal communication and has many possible contexts at the same time.
There is a second related point to be made about language concerning its 'nature.' In developmental psychology and psycholinguistics one gets the impression that the child develops to become a strictly logical thinker; this logical thinking being the 'deep structure' of Chomsky's linguistics theory. Now this impression may very well have been created because of my superficial acquaintance with these theories. Moreover the concept of 'deep structure' leaves room for other interpretations. However, the point I want to stress has best been made by Wittgenstein:

"Here we come up against the great question that lies behind all these considerations--for someone might object against me: You take the easy way out! 'You talk about all sorts of language-games, but have nowhere said what the essence of a language-game, and hence of language, is: What is common to all these activities, and what makes them into language or parts of language. So you let yourself off the very part of the investigation that once gave yourself most headache, the part about the general form of propositions and of language.' And this is true--instead of producing something common to all that we call language, I am saying that these phenomena have no one thing in common which makes us use the same word for all, but that they are related to one another in many different ways. And it is because of this relationship or these relationships that we call them all 'language'. I will try to explain this." (Wittgenstein, 1953: 65)
"I can think of no better expression to characterize these similarities than 'family resemblances;' for the various resemblances between members of a family: build, features, color of eyes, gait, temperament, etc., overlap and criss-cross in the same way."
(Mittgenstein, 1953: 67)

I think that this concept of 'languages form a family' is compatible with its acquisition in the context of interrelated systems, based on interrelated innate learning programs. I want to look at the specialist's description of language and language acquisition against the background of 3.11 and 3.12.

3.13 Design Features of Language

Jolly (1972) gives the following list of design features of language:

1. Vocal-auditory channel
2. Broadcast transmission and directional reception
3. Rapid fading (the sound of speech does not hover in the air)
4. Interchangeability (adult members of any speech community are interchangeably transmitters and receivers of linguistic signals)
5. Complete feedback (the speaker hears everything relevant to what he says).
6. Specialization (the direct energetic consequences of linguistic signals are biologically unimportant; only the triggering consequences are important.)
Design features 2 through 6 are shared with much animal communication.

7. Semanticity (linguistic signals function to correlate and organize the life of a community because there are associative ties between signal elements and features of the world; in short, some linguistic forms have denotations.)

8. Arbitrariness (the relation between a meaningful element in a language and its denotation is independent of any physical or geometrical resemblance between the two).

9. Discreteness (the possible messages in any language constitute a discrete repertoire rather than a continuous one).

10. Displacement (we can talk about things that are remote in time space or both from the site of communicative transaction).

There are a few animal parallels with design features 7 through 10.

11. Openness (new linguistic messages are coined freely and easily and, in context, are usually understood).

12. Tradition (the conventions of any one human language are passed down by teaching and learning, not through the germ plasm).

13. Duality of patterning (every language has a patterning in terms of arbitrary but stable meaningless signal-elements and also a patterning in terms of minimum meaningful arrangements of those elements).

14. Prevarication (we can say things that are false or meaningless).

15. Reflexiveness (in a language, we can communicate about the very system in which we are communicating).

16. Learnability (a speaker of a language can learn another language).
Gramar

Linguistics aims to describe the specialized form of knowledge that we bring to bear in the comprehension and production of sentences. Language is a system whereby sound and meaning are related to each other. The same meaning may be expressed by different patterns of sounds (paraphrase) and the same pattern of sound may represent different meanings (ambiguity). Syntax is the relation between sound and meaning. Competence is the knowledge of syntax that makes linguistic behavior (performance) possible. Competence is knowledge of the principle that determines which strings are sentences and which not. A systematic characterization of linguistic knowledge is a grammar. A grammar is an empirical hypothesis that deals with mental phenomena of a particular kind. It is either true or false. Speakers do not know the rules of the grammar of their language, but what they do is represented by these rules.

In transformational grammar one distinguishes deep structure, transformations and surface structure. The deep structure is associated with meaning or content and the surface structure with sound or expression. The deep structure is generated by phrase-structure rules. It is abstract in the sense that it never appears overtly. The deep structure must therefore be transformed by the transformation rules in order to obtain the surface structure. These transformation rules make no contribution to the meaning. They exist only to state the relation between meaning and sound, between deep structure and surface structure. If transformations are
correctly stated in a grammar they apply automatically whenever the proper conditions exist in the deep structure. (McNeill, 1970: 144-164)

3.15 Language acquisition

A child hears a corpus of utterances, many of which are grammatical sentences in the language to which he is exposed. The corpus may be large, but it is not unlimited in size. The child can develop grammatical competence so that he becomes able to go far beyond the corpus with which he began. The child can distinguish the many grammatical sentences in his language from the many non-grammatical alternatives. The problem of how a child given a corpus develops competence requires understanding of his internal structure. The child may have at his disposal a set of procedures for discovering a grammar or a set of assumptions about the form of grammar or both. Whatever the child uses, however, must be universally applicable and it could contain nothing that is inconsistent with any particular language, for the child must be able to learn any language.

The following remarks are related to the possibility that a child has universal linguistic information. The description of linguistic universals is included in the theory of universal grammar. The purpose is to state the universal conditions that the grammars describing individual languages must meet. McNeill's theory of language acquisition is that the theory of grammar and its universal constraints describe the internal structure of children.

(McNeill, 1970: 70-71)
3.16 Language Universals

"What are the universals mentioned in the theory of grammar, which we now presume to be a reflection of children's linguistic capacities?" Some are phonological. Every language, for example, employs consonants and vowels, syllabic structure and a handful of distinctive features. In the case of syntax, every language utilizes the same basic grammatical categories, arranged in the same way--sentences, noun phrases, verb phrases, etc. Every language utilizes the same grammatical relations among these categories--subject and predicate, verb and object, etc. All of these are characteristics of the abstract underlying structure of sentences. The transformations of a language on the other hand present much more idiosyncracy, . . . Transformational idiosyncracy arises from the way a few universal transformational types are exploited. Assuming that linguistic theory describes linguistic abilities, we can say that the abstractions of the underlying structure reflect children's linguistic capacities, and are made abstract by children discovering the transformations of their language. Once can say that children begin speaking underlying structure directly.

What changes is the child's method of expressing the underlying structure of sentences in speech. First single words convey underlying structures, then simple P-O (Pivot-Open) or appositional combinations, then more complex combinations. There is a constant elaboration of the relation between the underlying and surface
structures of sentences, i.e., a constant elaboration of the transformational structure." (McNeill, 1970: 71-72)

"Children form relationships with ease, but require time to learn the restrictions on relationships. The contribution of experience will therefore be largest in those regions of grammar where general rules apply least. The meanings of individual words are merely the most extreme form of linguistic information not covered by general rules; there are many less extreme cases and we can draw a continuum between the lexicon at one end and the most general rules at the other for each language separately. If the principle suggested by the examples of the last chapter is correct, the order of acquisition will correspond to the order of rules along this continuum, with the most general rules being learned first and dictionary entries being completed last. The observations of C. S. Chomsky (1969) show this order of acquisition." (McNeill, 1970: 104)

"This observation brings us to a clearer understanding of what it means to have learned a word in one's language, i.e., the nature of the information about a word which the speaker of a language has available when he knows the word. There are two aspects to this knowledge, which are distinct from one another. On the one hand, the speaker knows the concept attached to the word, and secondly he knows the constructions into which the word can enter." (Chomsky, 1969:5).
3.17 Self-consciousness

The acquisition of language is a necessary condition for what could be called the next step in the process of growing up in society, the rise of self-consciousness.

"Conscious communication--conscious conversation of gestures--arises when gestures become signs, that is, when they come to carry for the individuals making them and the individuals responding to them, definite meanings in terms of the subsequent behavior of the individuals making them, they make possible the mutual adjustment of the various individual components of the social act to one another, and also by calling forth on the individuals making them the same response implicitly that they call forth explicitly in the individuals to whom they are made, they render possible the rise of self-consciousness in connection with this mutual adjustment."
(Mead, 1934:69)

3.18 Meaning

"Meaning can be described, accounted for, or stated in terms of symbols or language at its highest and most complex stage of development (the stage it reaches in human experience), but language simply lifts out of the social process a situation which is logically or implicitly there already. The language symbol is simply a significant or conscious gesture.
Two main points are made here: (1) that the social process, through the communication which it makes possible among the individuals implicated in it, is responsible for the appearance of a whole set of new objects in nature, which exist in relation to it (objects, namely, of 'common sense'); and (2) that the gesture of one organism and the adjustive response of another organism to that gesture within any given social act bring out the relationship that exists between the gesture as the beginning of the given act and the completion or resultant of the given act to which the gesture refers. These are the two basic and complementary logical aspects of the social process. (Mead, 1934:79)

3.19 Universe of Discourse

"The significant gesture always presupposes for its significance the social process of experience and behavior in which it arises; or, as the logicians say, a universe of discourse is always implied as the context in terms of which, or as the field within which, significant gestures or symbols do in fact have significance. This universe of discourse is constituted by a group of individuals carrying on and participating in a common social process of experience and behavior, within which these gestures or symbols have the same or common meanings for all members of that group, whether they make them or address them to other individuals, or whether they overtly respond to them as made or addressed to them by other individuals." (Mead, 1934:89)
3.20 Family resemblances

The fact that an individual participates in the activities and communication of many different, more or less, interconnected groups in many different, more or less, interconnected settings explains why the meanings of the words of his (and everybody else's) language show "family resemblances" and not necessarily something common to them all. This doesn't exclude but even presupposes some universal common experiences. But those experiences are linked to language phenomena by convention. Those conventions are different for different groups and developed in different contexts of experience.
To the extent that these common elements of experience are lacking, understanding is excluded. That is why we wouldn't understand a lion, even if he could talk. "The common behavior of mankind is the system of references by means of which we interpret an unknown language." (Wittgenstein, 1953:205)

3.21 Knowledge and Belief

In the process of learning a language the structure necessary for theoretical understanding is acquired. The individual acquires a system of knowledge and belief.

"When a child learns a language it learns at the same time what is to be investigated and what not. When it learns that there is a cupboard in the room, it isn't taught to doubt whether what it sees later on is still a cupboard or only a kind of stage set." (Wittgenstein, 1972:472)
The acquisition of a system of knowledge and belief by a particular individual is strongly related to the existing system of language, knowledge and belief of his particular society.

"If I now say "I know that the water in the kettle on the gas flame will not freeze but boil," I seem to be as justified in this "I know" as I am in any." If I know anything I know this."--Or do I know with still greater certainty that the person opposite me is my old friend so-and-so? And how does that compare with the proposition that I am seeing with two eyes and shall see them if I look in the glass?--I don't know confidently what I am to answer here.--But still there is a difference between the cases. If the water over the gas freezes, of course, I shall be as astonished as can be, but I shall assume some factor I don't know of, and perhaps leave the matter to physicists to judge. But what could make me doubt whether this person here is N. N., whom I have known for years? Here a doubt would seem to drag everything with it and plunge it into chaos. (Wittgenstein, 1972:613)

The idea will perhaps be still clearer if contrasted with a 'non-Western' system of knowledge and belief, the witchcraft, oracles and magic among the Azande, as described by E. E. Evans-Pritchard. Evans-Pritchard makes the following observation; quoted by Winch:

"Azande observe the action of the poison oracle as we observe it, but their observations are always subordinated to their beliefs and are
incorporated into their beliefs and made to explain and justify them. Let the reader consider any argument that would utterly demolish all Zande claims for the power of the oracle. If it were translated into Zande modes of thought it would serve to support their entire structure of belief. For their mystical notions are eminently coherent, being interrelated by a network of logical ties, and are so ordered that they never too crudely contradict sensory experience but instead experience seems to justify them. The Zande is immersed in a sea of mystical notions, and if he speaks about his poison oracle he must speak in mystical idiom." (Minch, 1964:312)

Minch's parody of this observation, although made for a different, though related purpose, shows the sameness and the differences of the two systems:

"Europeans observe the action of the poison oracle just as Azande observe it, but their observations are always subordinated to their beliefs and are incorporated into their beliefs and made to explain them and justify them. Let a Zande consider any argument that would utterly refute all European scepticism about the power of the oracle. If it were translated into European modes of thought it would serve to support their entire structure of belief. For their scientific notions are eminently coherent, being interrelated by a network of logical ties, and are so ordered that they never too crudely contradict mystical experience but, instead, experience seems to justify them. The European is immersed in a sea of scientific
notions, and if he speaks about the Zande poison oracle he must speak in scientific idiom." (Winch, 1964:313)

Wittgenstein characterizes all of these interrelated systems in one phrase: "At the bottom of well-founded belief lies belief that is not founded." (Wittgenstein, 1972:253)

3.22 Anticipation

So individuals acquire a system of knowledge and belief in the process of their development in the context of the set of systems described in paragraph 2.09. As a function of the common elements in different systems any two individuals will more or less understand each other's system of knowledge and belief. No two systems will be entirely the same nor will they have no elements in common. Why do individuals develop a system of knowledge and belief? George Kelly's personality theory of personal constructs describes such systems and gives the need to anticipate, to predict events for the subsequent control of these events. (Kelly, 1955:12) This is consistent with Bruner's account of the system of voluntary actions (see 3.09-10) The fact now is that our possession of language makes conscious anticipation, i.e., prediction, possible and thus influences our actions. "People's behavior (becomes) determined by the manner in which they 'anticipate' events using their own conceptual model of the world." (Hogan, 1975:227) The problem of behavioral science or of a theoretical understanding
is the fact that the description of practical understanding immediately becomes theoretical understanding because it is written down. "It is in language that an expectation and its fulfillment make contact." (Wittgenstein, 1953:445)

The important point now is that we will change our system of knowledge and belief or personal constructus or conceptual models of the world when something unexpected happens. This change may be more or less difficult to the extent that a person relates the event to concepts that are more or less close to the basis of the conceptual system. (People don't seem to have names anymore or water doesn't cook when heated.)

3.23 Understanding and Misunderstanding

Thus it becomes clear why a system of knowledge and belief, developed in a certain context in the process of experience, that has served as a basis for useful prediction of events, may be a hindrance to an understanding of new events in other contexts. The very condition of understanding may be a source of misunderstanding.

The Western social scientist who looks at witchcraft understand it just as badly as the witchdoctor who takes a look at social science. In daily life understanding is verified in the process of activity. The businessman after a promotion; the child when he first goes to school; the immigrant when he arrives; the lovers that get married; the engineer who wants to become a zen buddhist; the housewife who has to attend cocktail parties. Everybody has to 'face' new
situations and 'grasp' what is going on. The misconceptions that he or she have will become obvious in the process of participation. To the extent that adaptation of the relevant parts of the conceptual system is not possible the participation will be less successful or break down. But in this process it is not only one person who changes. All people involved change somewhat and the situation changes as well. The missionary may make converts; he will also change his own ideas in the process.

It is important to keep in mind that only the relevant parts of the system of knowledge and belief are verified in a particular activity. Other parts remain untouched and may even change, as a consequence of the structure of the system, in a way that may hinder further understanding of other activities. Thus practical understanding is a process. Its verification is in the success of the activities engaged in as observed by the participants. On the basis of similarities in their systems any two individuals can get to understand each other in the process of common activities. They will understand each other to the extent that their previously acquired systems of knowledge and belief lend themselves to change and to the period of time spent in some activities as opposed to others. In this process all systems change i.e., the actors, their physical environment, their behavior, their objects, their social environment, their language, their knowledge and belief.
4.00 THEORETICAL UNDERSTANDING

4.01 Theoretical Knowledge

"One has theoretical knowledge only if he has retained information previously acquired and is capable of giving verbal expression to that information" [Shwayder, 1965: 206].

An individual who wants to become a social scientist will have to put his understanding of human behavior into words. This has far-reaching implications, ethical, theoretical and practical.

4.02 Ethical Implications

In the ethics of social research at least two things should be distinguished: (1) the consequences of verbalizing human behavior, and (2) the consent of the human beings involved.

It should be noted that both problems as such are relatively independent of the validity of the data, the analysis or the conclusion, though the practical consequences are not. This is particularly relevant to problems of applied social research.

The fact that verbally expressed information about human behavior differs from human understanding as such means that its expression changes the system of knowledge and belief relevant to the individuals and groups involved in the process of social research.

As a first approximation the following groups can be distinguished as such: the social scientist or the team of social scientists doing
the research, the institute or institutes they belong to, the sponsoring agency, the larger community of social scientists, other groups or institutes with an interest in the group or problem studied and the publisher.

Depending on the nature of the problem studied and the language, the medium, the time and the place of publication (expression), different parts of the system of knowledge and belief of some or all of these groups will be affected.

In the first place it is of course the intention of social research to change (to "contribute" to) the existing body of knowledge and belief known as psychology, sociology, economy, history or anthropology.

Communications may have far-reaching and unintended consequences in the society at large even when they are by choice of language, medium and place of publication focused on the scientific community. This is illustrated by psychoanalysts, logical-positivism culture of poverty, etc., and also by concepts and vocabulary disseminated by the formal and informal educational system attested to by expressions such as inferiority complex, class, trade-offs, etc. In this way the ideas and concepts of the scientific community influence slowly but surely the perception and thereby the human relations in the explicit and implicit policies of the society at large.

In the second place one should think of the individual or group of individuals studied. A change in the system of knowledge and belief
may be intended (as in psychoanalysis or in Marxist sociology and economy) or not, but will certainly occur if the findings are published in a language, a place and a time accessible to them.

This is clearly not the case in history (time) and was until recently not generally the case in anthropology (place), but in psychology, sociology and economy these effects are well known, most explicitly as self-fulfilling and self-denying prophecies. (R.K. Merton)

Policies that are very real in their negative consequences for the lives of people studied or discussed in anthropological or sociological literature may be thoroughly influenced by the 'myths' created by those behavioral scientists. The myth of marginality seems a nice case in point. (Perlman, 1975)

This is not only relevant to problems of truth and falsehood (false descriptions coming true or true description becoming false), but also to the possibility of continued social research. Certain groups may never again want to have a relationship with sociologists not even for observation or for an interview after reading the publication of the results. (Vidich and Bensman, 1968)

Finally the influence on the knowledge and belief system of other groups enumerated may be particularly relevant to the social scientist's relation to them and implicitly on his further career. He may win or lose the sympathy of colleagues, and the support of research institutes, sponsoring agencies, publishers and last but not least friends and family.
Theoretical Implications

The understanding between people in ordinary day to day interaction is 'verified' in the process of their common activities and 'measured' by the 'success' of those activities.

This practical understanding is described, verbalized in the process of behavioral research and thus becomes theoretical understanding. The common activity of the behavioral scientist and the people he studies is research (field work, interview observation, etc.). But the behavioral scientist is generally not primarily interested in studying this process, he wants to understand the activities he has defined as his research object.

So a social scientist tries to understand one social process (his problem) while being engaged in another (his research). This fact is in itself not unusual. It is very often possible to engage in one social relationship in order to obtain information about another. But the short duration and the unique character of social research separates it from the daily life of the researched and thus excludes it from normal verification within the local community.

The social scientist takes his verbalized information to another community, the scientific one, where purely on the basis of words the quality of the research is judged.

It is true that another or the same researcher may engage in subsequent research in the same community, in experiments or in comparative
research, but the two basic facts remain the same:
Theoretical understanding is obtained in a social process largely, but
not entirely, divorced from the social processes it seeks to understand.
The quality of the understanding is judged not in action, but in words,
not in the community studied, but in the community of the students.

4.04 Practical Implications
The practical implications of verbalization of human understanding
come out most clearly in a comparison between behavioral science and
physical science.

Atoms or molecules don't change their behavior because of the books
that have been published about them, though the scientist's perception
of their behavior might change. This is not true of social science.
As mentioned above the system of belief and knowledge of the observed
may change sooner or later. Depending on the language, the medium,
the time and the place of the communication, the results of the study
may reach the people studied and change their ideas and as a consequence their behavior.

Depending on previous experience and many other factors the very
experience of undergoing social research may also itself induce changes.

4.05 Applied Social Research
My concern is not with social research as such, but with the use of
social research in practice, applied social research or social
engineering.
An illustration may make clear what is meant: In certain agricultural and pastoral communities all over the world a man builds his own home when he needs one. He knows what materials and techniques are available, he knows where and how he and his family and his community want it, and if he makes mistakes he suffers the consequences himself and may tell his son not to be as stupid as he once was.

A change in the available time or materials or techniques or values may cause the appearance in the community of the profession of home builder, a specialist. Being a specialist he may have a thorough knowledge of available materials and techniques, climate and soil conditions. Being a member of the community he will still know where and how to build the house to the satisfaction of the community and his client and he will probably know what it is to live in one.

As the country 'develops' the professional builder differentiates. Someone or some group specializes in building materials, another one in their distribution, a fourth in the carpentry, a fifth in masonry, a sixth in painting. The design of the house may be made by an architect belonging to another class or culture than the man and his family who will have to live in the house, and the chances are that they will never meet each other. Finally, the site and the orientation may have been decided by a government planner.

All this may greatly improve the physical quality of the product, bringing together as it does the specialized knowledge and belief
of many groups of the society and the material resources from all parts of the country.

This knowledge may even be necessary because of the sheer size of the enterprise and its many links with other sectors of the economy.

If the education of the architect/planner is imported, as it often is in Asia and Africa and to a lesser degree Latin America, the social and cultural distance between designer and user may become so great that the design of the house, the plot and the neighborhood, and the process of its realization fit so badly the needs and potentials of the inhabitants that a social scientist sees a market for his products of theoretical understanding.

He presents himself to the architect or the government planner as someone who is equipped to study and describe the needs of the people they want to serve. Thus his social science will be applied.

4.06 Engineering

Any engineering design of a product has to take into account: how the product is going to be made; how it is going to be used; and, nowadays, how it is going to be disposed of.

For any product it is not too difficult to imagine that knowledge and belief about human behavior are very important factors in all of these stages.
Engineering assumes in its designs many things about human behavior implicitly and explicitly. In their interaction with makers and users of their products, engineers obtain a certain amount of practical understanding which they try, successfully or not, to incorporate in the design, and any product of engineering will change social reality.

Therefore any engineering in my opinion is social engineering.

Because of the ease whereby products and ideas (designs) can travel engineers very often don't know the makers and still less the users of their products.

Even in the case of proximity in place and time engineers as professionals are not makers nor users, but they interact with both groups in the process of design, just as sociologists don't engage in the activities they want to understand but in the activity of social research.

To the extent that engineers share systems of knowledge and belief, activities, language, physical and social environment with the makers and users of their products the chances of satisfaction are bigger.

The common elements become fewer in the case of design for the poor, especially when these poor live in non-western countries, because engineers tend to be well off and their education at least is western. Thus the need for a behavioral scientist is felt.
4.07 Application and Verification

In acknowledging explicitly the social aspects of engineering by incorporating behavioral research in the design process, theoretical understanding is reinitiated in a process whereby the end product is not a publication to be judged in a scientific community, but a physical object to be made and used by the groups studied for just that reason.

In this sense the theoretical understanding obtained in the process of behavioral research as part of the process of design is verified in the same manner as practical understanding: in practice, in its use.

But it should be remembered that practical understanding is only verified to the extent that there is a process of common activity.

Thus the theoretical understanding obtained in the process of design and expressed in the form and realization of the product is only verified to the extent that the process of design and implementation is a common activity of all the groups involved.

It should also be remembered that practical understanding as part of a common activity changes in the process (by the very fact of its being verified) and creates a new social reality.

In the same way it must be recognized that social science as part of social engineering creates a new social reality.

In this perspective applied social research is a step in the process of design implementation and use of engineering products (infrastructure,
housing, etc.) and its task is the enhancing of understanding between the people involved in the process and understanding of the process itself in the larger context of the society, so that the greatest possible use value (satisfaction) is obtained by the participants in the process and especially by the sub-group of makers and users of the product.

That not only the product but also the process of obtaining it is important becomes clear from the simple example of an object you own, say a chair. It is a different chair depending on if you got it as a present, from someone you like, or not, from someone who asked you what make, model or colors you like, or if you bought it, if you had much or little money at that moment, if you had choice, and all these chairs are still different from the one you designed or built yourself, although they all look like the same chair to someone who comes into your room for the first time.

4.08 Sets of Relations

If a behavioral scientist has decided to accept the invitation to get involved in a particular game of designing and implementing low cost infrastructure or housing for the poor in a particular developing country he thereby acquires a new set of social relations that are all in varying degrees relevant for the conduct and the results of his research.
Even if he is hired by the consultant, the international agency, or the government agency involved in this particular project and not working for a university or research institute he will bring with him the system of knowledge and belief, methods, techniques, and procedures that he has acquired in his education as anthropologist, sociologist, political scientist, social psychologist, or economist as the case may be. It is assumed that this is the first time the behavioral scientist engages in applied research. Otherwise he would bring with him his experience previously acquired in similar research.

Very probably he will have acquainted himself in more detail by study of the literature of that part of the tradition that is considered particularly relevant to the country, culture and problem area he expects to be studying.

Depending on whether or not he wants to make an academic career, members of the community of social scientists have sanctions to keep his ideas and methods in the accepted tradition of the social sciences. He also brings with him the language of social science combined with the language of his own culture and social position and a system of knowledge and belief that goes with it.

If he is hired for the project, the first new set of relations will be with the people that pay him. As mentioned, this may be the national government, an international organization, or a consulting firm, or perhaps a local university or research institute.
This group, its political position and strength and the set of relations with this group, will have an important influence on how the research is going to be conducted and what are going to be the results.

The second set of new relations will be with different groups and individuals he will have to work with, the colleagues, government officials, international officials, consultants, team members.

It is probably here that the 'job description' of the behavioral scientist is determined. Although these people can be seen as a group they are related to different local hierarchies with different systems of knowledge and belief, and different languages (although they have many words in common).

Finally, there is a third set of new relations, the relations with the makers and users of the product (the target population), the people to be studied.

It is my contention that the first two sets of relations are most important for the definition of the problem, the choice of techniques, the form of questionnaires, the type and method of observation and interview, the analysis of data and the form and content of the publication of results, i.e. that the behavioral scientist shares with those groups the biggest part of his activities, his knowledge and belief, his language and his objects.
It is from this position that the social scientist takes a shot at the 'target population', after having read about them and discussed them.

But it is his set of relations with this last group that is most discussed in the literature under the heading methodology, or research techniques.

Perhaps the least ambiguous way of stating my point is to say that the behavioral scientist can only do useful research if he considers the population he studies equally as a group of colleagues.

Only thus may the target population participate in the process that is to lead to a product for their use and may the process of social research contribute to a satisfactory result.

4.09 Study of Behavior
It follows from what has been said in the preceding chapter that the understanding between individuals is greater the more they share common activities. Thus children are best understood by their playmates, housewives by housewives, carpenters by carpenters, middle class Americans by middle class Americans, Eskimo seal hunters by Eskimo seal hunters, etc.

In any one social situation the first classification that comes to mind is men/women and age groups. From then on all kinds of social categories that are meaningful in the particular society observed can be relevant to a greater understanding of the society.
In the study of behavior it is not only a matter of understanding; the understanding must be verbalized.

This in itself limits the number of potential observers even if the verbalizing is registered on a tape recorder and not on paper. The observer must be able to express his understanding in language and often he must be able to write it down, or at least handle a tape recorder.*

The most adequate language to express the behavior of an individual as another member of his group (the observer) understands it is of course their language. This is the language that has shown its usefulness in their daily lives as a medium for understanding and only a registration in this language will make a first direct verification by the observed or a comparison between the account of the observer and the possible account of the actor possible.

The foregoing is, with some added elaboration, the situation investigated by D.S. Shwayder:

"A is an animal imagined to be moving in certain ways. O is an imagined

---

*A camera doesn't understand what happens. Someone seeing the film only gets a particular set of images. He will be an observer with blinders and his head rigidly fixed.
conceptualizing observer of A, whom we are to think of as reporting what he sees A doing. We is a theoretical commentator on the reported observations of O. We is supposed to have available the apparatus of (the ensuing) theory. He applies that by drawing out the implications of O's report. On the assumption that what O reports is true, We's observations contribute to a theoretical analysis of A's movements.

O says that A is eating: We says that what A is doing is an act.

O says that A is wiring a circuit: We says that A must know how to wire electrical circuits.

O says that A is kicking a ball: We says that A thinks there is a ball in his immediate vicinity.

O says that A thinks that there is a ball in his immediate vicinity: We says that A may be meaning to kick a ball. (Shwayder, 1965: 14)

The technical notions fixed by such terms as 'behavior,' 'action,' 'condition of success,' 'conventional,' etc., pertain to the activities of the meta-theoretical commentator, We, on the reports of an imagined conceptualizing observer, O." (Shwayder, 1965: 14)

4.10 Two Sets of Relations

The situation as described by Shwayder and elaborated in 4.09, and the many sets of relations described in 4.08 set, I think, the correct stage for a discussion of Peter Winch's idea of social science:
"(So) to understand the activities of an individual scientific investigator we must take account of two sets of relations; first, his relation to the phenomena which he investigates; second, his relation to his fellow scientists." (Winch, 1968: 84)

And:

"The concepts and criteria according to which the sociologist judges that, in two situations, the same thing has happened, or the same action performed, must be understood in relation to the rules governing sociological investigation. But here we run against a difficulty: for whereas in the case of the natural scientist we have to deal with only one set of rules, namely those governing the scientific investigation itself, here what the sociologist is studying, as well as his study of it, is a human activity and is therefore carried on according to rules. And it is these rules, rather than those which, govern the sociologist's investigation, which specify what is to count as 'doing the same kind of thing' in relation to that kind of activity."

(Winch; 1958: 87)

Although there is an unnecessary stress on the idea of following a rule and although there are not only two sets of relations relevant to the understanding of the activity of an individual scientific investigator and although there is a too heavy emphasis on the last set of rules all leading to the kind of behavioral research that Harris criticizes so eloquently (Harris, 1968: 590) all these criticisms are only criticism of emphasis and I completely agree with the main point.
This point I think can be illustrated with a picture, the picture of a portrait painter. The likeness of the portrait to the subject is best judged by the people who know the model (and not necessarily the model itself, who mostly sees his face in mirrors) and the quality of the painting is best judged by the other painters.

First there is the painting of the portrait, comparable to the activity of social research. This relation is clearly brought out by both Winch and Shwayder. Then there is the judgement of the quality of the painting. This is done by the other painters, comparable to the fellow scientists mentioned by Winch, implicit on Shwayder's meta theory. Finally there is the judgement of the likeness of the painting, the correctness of the data, that can only be judged by the people that know the model, the members of the group studied. This last relation is implicit in Winch and explicit in Shwayder.

The representatives of two social groups each with its associated set of system meet each other in the activity of portrait painting or behavioral science. In both cases the process and the result can only be understood and judged as a whole by both groups, where it will lead to changes in the systems related to this judgement.

Since the times of Rembrandt the consumers of the portraits are not often the same as the model or his friends and relatives, just as the buyers and consumers of products of behavioral science are often not the people studied. This leads to a neglect of the judgement of the observed as a contribution to the evaluation of the quality of the product.
Thus participation from the beginning to the end by the population to be studied in the process of research is not only ethically and politically desirable (in my opinion), but also necessary for the quality of the product, not only in applied research, but in any behavioral research.

The difference between theoretical and applied research is that one will suffer the consequences of bad research if it is applied research, although the fact that behavioral research in general can create its own reality may in many cases blur the discrepancies.

4.11 Definition of the Problem

To be a bit more explicit, we now have the following description of the study of behavior:

There is a group of people to be studied. These people are engaged in ongoing activities, between them and with people outside the group. These activities take place in many different interrelated physical and social environments using different interrelated system of knowledge and belief, language and tools.

There is a group of people that wants the other group studied (for a particular purpose) with the same story. And there is a behavioral scientist from the community of behavioral scientists with his particular set of systems.

All the different systems of the different groups are interrelated. But they may be inter-related in many different ways in any particular situation and in many different degrees.
All the people in the three groups may live in the same country, all speaking the same mother tongue, although they differ in class or age or city or religious belief or in jargon, etc.

Now the people who want a study done ask a behavioral scientist to do that study. To the extent that the behavioral scientist's and his clients' set of systems cover each other, understanding will be easier to attain. There will first be some correspondence or some meetings.

Even if all partners think they understand each other from the start, they will only find out if this understanding is correct to the extent that they work and continue to work together, i.e., engage in a common activity. In this process the behavioral scientist must not only find what their problem is, but also what language they understand, otherwise his answer or series of answers is not going to be understood. Even if everybody speaks English some people speak economics, others law and still others engineering, whereas the behavioral scientist may tend to express himself in anthropology. The best way to learn these languages is, of course, participant observation, but this is usually only possible after being hired.

In any case the conception of the problem, the question, and its content will change from the beginning to the end of participation and so will the knowledge of the language. This understanding will only get better (continuously verified) to the extent that collaboration is maintained in the process.
As soon as possible the behavioral scientist will try to get to know the people he has been asked to study. In a sense he already knows them since they have been mentioned in the context of the question under consideration.

He will generally not go to meet these people immediately. Apart from the questions as to whom he would want to meet, being an anthropologist he will have learned about the importance of the first introduction in the field and if he is in any other branch of behavioral science he will first go to the library anyway.

This, of course, makes sense. Only it is good to realize that it would have made sense for the establishment of the relations with the first group also.

In the process of social research an understanding of all the groups involved is necessary. The only difference is that there is one group that is reported on and another that is reported to. Since his basic data will be in the language of the people studied (see 4.09) the scientist will have to learn this language and understand its context. That means again participant observation.

As a result of this process of interaction with all the groups related to this research the behavioral scientist can formulate the question as he understands it and define the people he needs to find its solution.
4.12 Choice of the Observers

At this point it may be useful to reintroduce Shwayder's terminology: We, the behavioral scientist, O, the observer, and A the observed (human) animal, (that may be O himself). We knows what he wants and what O's he is looking for. He now has to convince O's to participate, i.e., answer his questions.

That asking questions is not always appreciated has been known since Socrates at least, and it is clear that not only methodological but also ethical and political questions are involved in this relationship We-O-A.

We feels justified to ask a particular set of questions (observations) and O may feel justified not to give answers to them.

In some western countries this problem of giving, getting, and storing information is demanding increased attention and the "general public" is more and more aware of what it is engaging in when answering questions, accepting observation, giving access to correspondence and diaries etc.

Behavioral scientists who engage in research for the benefit of the poor of urban areas (my special concern here) don't face a public with any means of repraisal. The anthropologist comes, chooses the right type of introduction, observes and participates for two years and leaves the place and the people, perhaps never to come back again. He will publish an article or a book, most probably not in the
language of the people studied with at best a word of recognition for their kindness in the preface. Also the language of the publication will probably make it accessible to the government of the people studied permitting its use for their benefit or to their disadvantage (perhaps improvement of education or of tax gathering techniques). The consultant reports directly to people who expressly want to change the social or physical environment of the people studied. His research may be needed to design a drinking water system (question: how much water consumption may be expected?) or to design housing (question: how do people live their daily lives in and around the house?). In both cases the information gathered may even, in the context of the question itself, be used to the people's benefit or their disadvantage, apart from the fact that the information may be used for other unstated purposes. Of course there are hardly ever clear cut cases. The problems are nearly always of degree, and a decision has to be made weighing as precisely as possible the value of obtaining the information against the value of not obtaining it. In case of refusal or unwillingness to cooperate on behalf of 0, "We" must first inquire into his reasons or possible reasons before he can make a decision to resort to unobtrusive measures or to publish already obtained information, and he will have to justify in his publication his decision to do so.

4.13 Getting the Data

In the treatment of interview and observation techniques, the two major methods to obtain data in behavioral science, much attention is
paid, of course, to the problem of getting the right answers. Although the respondent (O) is not treated as basically dishonest I think it is fair to say that a major concern on behalf of behavioral scientists is conscious and "unconscious" "distortion" of information on behalf of the respondents. We has learned, when he wants to know how many journals you read, to ask which journals do you read. This is an innocent example. There are also questions for verification, order of questions, phrasing of questions, tone of questions, etc. It is not always realized that the measures to obtain the desired answers, i.e., the measures against conscious and "unconscious" cheating, are cheating on behalf of the behavioral scientist. And just as the cheating of the respondent, this may to a greater or lesser degree be conscious and/or unconscious.

Here as before I think that ethical and methodological requirements both point in the same direction. The behavioral scientist engages in the research because he thinks it is a good thing to do. After his preparatory period of participant observation in both groups of people related to this research he must be able to explain this to them. The people, to be studied, very probably have a clear idea of their situation and their interests and since they are supposedly studied for their benefit they will be willing to cooperate, that is:

1. if the behavioral scientist is able to understand them and communicate, make himself understood. Which is a necessary condition for good research, and

2. if the research is in their interest. Which is an ethical condition.
I don't want to deny that the discussions with the people or representatives of the people he wants to study will change the scientist's or the people's perception of what their interests are. On the contrary, I think that the process of social research will do exactly that. It will change relevant parts of the systems of knowledge and belief of all the groups related to this process. If understanding can only be obtained in the process of a common activity then the people studied should, as much as possible, be involved in the definition of the problem, the fieldwork, the analysis of the data and the publications of the results.

This I think is the only way to obtain good results in the ethical and methodological sense of good.

Just as the behavioral scientist will realize in analyzing his data that he didn't ask the right questions, so his respondents will realize when they see the results, what the scientist was up to and that they didn't always give the right answers. This doesn't mean that the initial questions and answers were not correct, they were necessary to bring the existing misunderstandings in the open in the process of inquiry thus creating a new situation where rethinking by all participants is possible.

4.14 Observer's Report

I think that the situation as investigated by Shwayder, (see 4.09) in his book "The Stratification of Behavior" is the basic one for the
study of human behavior and that all other techniques in the field or the laboratory are only substitutes adopted for (the very important) reasons of lack of time, manpower, money and opportunity.

In this situation (behaving agent observed by conceptualizing observer who produces an account to be analyzed by the behavioral scientist) the basic datum is the observer's report. This implies that I see this "technique" as a standard for the study of human behavior and thus the value of other techniques as to be evaluated according to their degree of closeness to the standard.

In this situation (behaving agent observed by conceptualizing observer who produces an account to be analyzed by the behavioral scientist) the basic datum is the observer's report (Shwayder) or account (Harre and Secord) or specimen record (Barker and Wright). This report is the link between the group studied and the group of students. To be able to make it the observer has to be a member of the group studied and he has to be able to write in this group's language or handle a tape recorder.

To be able to read the report, the behavioral scientist, must understand its language and thus have spent a shorter or longer time of participant observation.

To analyze the report and to put it in a theoretical context the behavioral scientist must be a member of the group of students, the behavioral scientists.
This language question is not addressed by either Shwayder, Harre & Secord, or Barker & Wright, but I think it is essential for the practical solution of Winch's problem of "understanding a primitive society." In an article with this title he discusses E. E. Evans-Pritchard's approach in his book Witchcraft, Oracles, and Magic Among the Azande.

The report represents the theoretical understanding of a member of the community studied. Thus it expresses in his language his rationality. The behavioral scientist's analysis and the theoretical context he provides expresses in his language his rationality for the same behavior. The different spheres of understanding are thus neatly separated and the kind of conceptual confusion Winch is concerned with can more easily be avoided. (Winch, 1964)

A slightly different but related problem, the one of emic and etic explanation in anthropology, can be clarified at this point. Harris (Harris, 1968:571) gives the following definitions:

"Emic statements refer to logico-empirical systems whose phenomenal distinctions or 'things' are built up of contrasts and discriminations significant, meaningful, real, accurate, or in some other fashion regarded as appropriate by the actors themselves. An emic statement can be falsified if it can be shown that it contradicts the cognitive calculus by which relevant actors judge that entities are similar or different, real, meaningful, significant, or in some other sense 'appropriate' or 'acceptable.'"
"Etic statements depend upon phenomenal distinctions judged appropriate by the community of scientific observers. Etic statements cannot be falsified if they do not conform to the actor's notion of what is significant, real, meaningful, or appropriate. Etic statements are verified when independent observers using similar operations agree that a given event has occurred. An ethnography carried out according to etic principles is thus a corpus of predictions about the behavior of classes of people. Predictive failures on that corpus of predictions about the behavior of classes of people. Predictive failures in that corpus require the reformulation of the probabilities or the description as a whole."

It is my contention that the observer's report represents the only possible form of emic explanation, that is a description of behavior of a member of the community by another member of the same community who understand it. On the other hand the behavioral scientist's analysis in the context of his theory is the only possible form of etic explanation. To be able to do his analysis the behavioral scientist has gone through a period of participant observation in both the "community of observing scientists" and the community of the actors. Although members of the community studied may be behavioral scientists, only members of the community of actors can give emic explanations and only emic explanations whereas only behavioral scientists can give etic explanations and only etic explanations.
If as is often the case in psychology or sociology, the behavioral scientist studies his own community; this point has to be explicitly stressed. Thus one finds in H. F. Wright's Recording and Analyzing Child Behavior (p. 38):

"The observer is not asked to theorize; he is asked not to theorize. He is asked to suspend biases from formal psychological training, and to fall back upon the elementary, garden variety, spur-of-the-moment notions and hunches about behavior that are common to man as a socialized being, that could never be abolished or appreciably suppressed if this should seem desirable, and that cannot help but astonish anyone who stops to reflect on them with their high ratios of accuracy to error."

Finally it is important to realize again that any verbalization of practical understanding is theoretical understanding. The observer's report thus structures the agent's behavior according to a pattern of rationality, that must of necessity be the rationality of their community. It is not necessary that the acting agent has theoretical knowledge of his behavior, while acting he only needs practical knowledge, though the theoretical knowledge may come in retrospect. (Shwayder 1965:71-72)

4.15 Analysis of Behavior

Before a description is made of the technique of making an observer's report, a short analysis of behavior is necessary. As
a starting point, we have behavior as movement of bodies.

Movement of bodies can be divided into two categories—(1) movement done to the body and (2) movement done by the body.

This is what Shwayder calls behavior:

"A sequence of movements of and/or in a particular animal of a particular type occurring over a connected interval of space and time, such that there is in force a presumption, based on our common experience with the type of animal in question, that such creatures, when placed in circumstances of the kind in question, could have been so trained that, being so disposed in advance, they could, be exercise of sufficient attention and expenditure of energy, have arrested or inhibited movements of the kind in question on occasions like that in question." (Shwayder, 1965:21)

This behavior can then be divided in behavior with and behavior without a purpose. Purposeful behavior is called action.

Any action can be analyzed into elements of four kinds:

1. Elements of the agent
2. Elements of movement
3. Elements of occasion
4. Elements of a present purpose

Elements of each of these kinds must be coordinately present if an act is to exist. The agent can be categorized in many different ways by both observer and later the behavioral scientists.
Name, age, sex, ancestry are only among the more obvious. Much will depend on the particular theoretical framework the scientist applies to the case in his analysis. The elements of movement, or actones as Barker and Wright call them, are more difficult to categorize. Their importance is that they individuate the act. Their description by the observer shows how the act is done.

Elements of movement may always ultimately be specified kinematically.

As an example of movement description (description of actones) H. F. Wrights gives:

George, with his lips quivering, his brows knit, and the corners of his mouth turned down, took a basket from the kitchen table, and his feet dragging, walked outdoors, where he mounted his bicycle and, with his head still bent, went to pick berries for his mother.

Elements of the occasion constitute what Barker and Wright call the behavior setting. Apart from time and place, the elements, persons, and objects of the setting relevant to the action depend upon the action and have to be established by the observer. At this point it becomes particularly clear why an observer of the same community as the agent should be chosen who is very familiar with the kind of behavior the behavioral scientist is interested in. Only experience can teach which, of the infinitely many elements of the occasion are relevant to the description of the ongoing activity. The purpose defines the type of act and thus the enumeration of the elements
of purpose typifies the act. Here again only a member of the community of the agent can be expected to know what the agent intends to do. To permit an independent description of purpose, Shwayder defines a purpose as the sufficient conditions of failure of the act. A certain purpose is present only if the agent believes that these conditions do not obtain. The elements of the presence of purpose, therefore, are beliefs that certain conditions are not satisfied (or conversely that necessary conditions of success are satisfied).

(Shwayder, 1965:115)

4.16 Procedural Routines for Observer's Reports

R. G. Barker and H. F. Wright have nearly 25 years experience in observing, recording, and analyzing child behavior in the manner described by D. F. Shwayder. They give the following suggestions for procedural routines. (Wright, 1967:75):

1. Observational period

   The observer must perceive and remember a multitude of simultaneous and sequential occurrences. This task is fatiguing and no one can maintain for long the steady alertness it requires. Experience has shown that the maximum length of time for efficient observation is 30 minutes. This means that long records necessitate a corps of observers who take turns; at least six are needed for a day's records.

2. Notes

   The observer should take notes on the scene of the observed behavior. Sufficiently detailed and accurate reporting of events and circumstances in their true order is otherwise impossible.

3. Timing
Observation should be timed so that the duration of reported episodes may later be determined. Indications of the time at intervals of approximately one minute are sufficient for most purposes. For note taking and timing observers use a 10 by 14 inch (25 x 35 cm) writing board with a metal clasp, to which a watch is attached. The use of a stopwatch was not found practicable.

4. Dictation

Observations should be recorded by dictation immediately after each observation period. Following his notes, the observer narrates sequentially what he has observed. Not infrequently, an action or circumstance will remind him of something that occurred earlier. In this case, the observer should dictate a description of the earlier occurrence at the point of recollection. Strictly sequential ordering can come later.

5. Interrogation

It has proved valuable to provide an interrogator who listens to the original dictation and at the conclusion of the report questions the observer on unclear points and asks for elaboration where the account is lean. This allows both for spontaneity in the original narration and for subsequent corrections and additions.

6. Written revision

After the dictated report has been transcribed, it should be revised by the original observer as soon as practicable. The revision should include deletion of duplications, correction of unclear or inaccurate statements, placement of all incidents in their proper order and, above all, filling in of newly recalled details that did not occur to the observer at the time of the dictated narration. This step is of the utmost importance. Often it makes the difference between a clear and rich report and one that is unclear and poor.

7. Supplementary interrogation

Experience has shown that further interrogation is indispensable after the observer has revised his report. This seems to be even more profitable than interrogation when a report is first dictated. The interrogator raises questions about parts of the account that remain unclear or call for elaboration.

When the report has been modified to meet these questions, it
is ready for final typing. Even during the subsequent analysis of the record, however, the observer may be called upon to fill in gaps or to clarify unclear statements."

From our theoretical considerations (see 4.14) it follows that

8. The language of the observer's report must be the language of the actors and the observer.

In a situation where the observer can't write or where there is no written language, the notes on the scene (2) should be dictated.

A time indication (3) is no problem on a tape recorder and a watch wouldn't be necessary in this case. From my own field experience I learned the importance of graphic material in the description of the occasion (behavior setting and its objects) if the behavior analysis is to be applied to environmental design (Bijl, 1974):

9. Graphic material

Drawings of the objects used and plans and elevations of the setting can be made in advance so that the observer may indicate the position and orientation of the agent and relevant actors and objects at different points of his account. Relevant elements of the occasion (see 4.15) that lend themselves for graphic representation can thus often be more clearly represented (sun shadow, color, etc.).

Plans and drawings are generally better than pictures because the relevant elements can be accentuated and irrelevant elements left out. (Relevant and irrelevant to be establish, of course, in the account by the observer).

In addition, Wright gives eleven rules of reporting worth repeating here. (Wright, 1967:48)

1. Focus upon the behavior and situation of the subject

2. Observe and report as fully as possible the situation of the subject.

3. Never make interpretations carry the burden of descriptions.
In the written revisions, all interpretative comments should be bracketed.

4. Give the "how" of everything the subject does.

5. Give the "how" of everything done by any person who interacts with the subject.

6. Report in order, in the final writing, all of the main steps through the course of every action by the subject.

7. Wherever possible, state descriptions of behavior positively.

8. Describe in some detail the scene as it is when each behavior setting is entered.

9. Put no more than one unit of molar behavior (act) in one sentence.

10. Put in one sentence no more than one thing done by a person in the situation of the child (agent).

11. Do not report observations in terms of time intervals.

4.17 Checking the Authenticity of an Account

The authenticity of the observer's account can only be judged by the observer, the agent, and by the persons the agent interacted with. Since these people all belong to the same community and are commonly engaged in the activities studied (the observer having been singled out as observer only for the particular purpose of research) they have the same language and the same rationality of description of behavior. Moreover the ethical acceptability of the content and form should be judged by these same people since it is their life that is described. Thus I submit that the written revision (4.16:6) should not only be made by the observer, but also and independently by the agent and the people he interacted
with during the observation. The transcription of the observer's original dictation (4.16:4) plus the results of the interrogation (4.16:5) serve as a basis for evaluation of changes made by the different "revisors." For such an evaluation, it is necessary to have a description of each of the revisors. Since the decision to choose a particular person or activity for study and the decision to choose a particular observation have been made in the preparatory period of participant observation, the behavioral scientist already has such descriptions. In the ongoing process of the research additional information will be available and will be added to the existing descriptions (the original descriptions will not be changed but maintained). The second interrogation by We (the behavioral scientist) (4.16:7) will be held with all the revisors on the basis of all the written revisions.

On the basis of his own observations, the behavioral scientist knows what actor made what movements, that is, he can establish the identity of an action. This, plus the experience and language obtained in his period of participant observation and the written revisions enable him (the behavioral scientist) to ask questions and understand the answers.

The result of this interrogation is a methodologically and ethically satisfying account. The people observed know what data the behavioral scientist disposes of and they have been able to make clear what may and what may not be used and for what reasons. The behavioral
scientist has his descriptions of the behavior he is interested in, plus its meaning for the people concerned and he knows step by step how and from whom he obtained it.

4.18 Analysis

On the basis of his understanding of the problem as has been established in his interaction (participant observation) with the different groups related to the research (sec 4.10), the social scientist will have chosen a theory and obtained other data considered relevant to the understanding of the problem, as a basis and a context for the analysis of the account(s).

In this activity his most important relation is the one with the community of behavioral scientists. It is their accumulated body of knowledge and belief that determines what is to be considered good and bad analysis.

4.19 Results

For a correct presentation of his results or conclusions the behavioral scientist must make himself understandable to three groups and thus in three languages. Although each groups has an interest in all aspects, a major aspect can be distinguished for each.

1. The relevancy of the results to their problem will have to be judged by the people who asked him to do the research.

2. The correctness of the analysis and the legitimacy of the conclusions will have to be judged by the community of scientists.
3. The correctness of the data as presented and their relevancy to the conclusions will have to be judged by the community studied.

In general the members of all three groups and the behavioral scientist will only be able to reflect upon their "stake" in the research in the "light" of the results.

1. The people who asked for the research may very well reformulate their problem.

2. The community of scientists may suggest other useful theories or contexts of data.

3. The community studied may indicate other relevant aspects of its daily life and environment.

4.20 Application

The legislator or the engineer or any other user or group of users of the results and evaluation of the results by the relevant groups (see above) will now use those results in a new context particular to their techniques and their problem. Because of this shift in context, a continued communication must be maintained between him and the behavioral scientist.

This continued common activity is not only necessary for a correct interpretation of the results by the engineer, but also indispensable to a fruitful collaboration in the last stage, implementation, when the product (the solution to the problem) will be introduced to the community studied.
(Apart from the fact that this collaboration will make subsequent applied research more effective, both in the formulation of the question by the engineer and in the formulation of the answer by the behavioral scientist.)

4.21 Implementation

As in the case with the results of the behavioral scientist, the design of the engineer was not known to him until he made it. Because the behavioral scientist participated in the process of design, especially in the problem formulation (4.11) and the final design (4.20), he understands the "why" of its form. This, plus the experience obtained from the community the design is supposed to serve, in the course of his participant observation (4.11) research (4.12-17) and presentation of results (4.19) makes the behavioral scientist the appropriate person to help establish the communication between engineer and community on the subject of the design.

This communication will correct false expectations of members of the community, partially created by the behavioral scientist himself through his own lack of understanding, partially created by other sources and finally because of the difficult of knowing in advance what the design will be like. It will also result in changes in the design and the program of implementation.

Since the members of the community are only now fully aware (if the behavioral scientist explained the design well) of the consequences
of the research, they will be able to give additional information on
the basis of their new insight in what was needed.

When the final design and its program of implementation has been
established the behavioral scientist will be able to participate
in the organization of the project, the training of personnel and
in the preparation of procedures and contracts for the community
concerned. The process of research will be finished when the
process of design and implementation is finished. The research
has been correct to the extent that the product and the process
of its realization satisfies the people it was intended to serve.
BIBLIOGRAPHY


Bijl, Jacob J., 1974. L'Habitat du Grand Nombre. IFAN, Dakar (3 vols.).


