The Establishment of Connections

Since the assignment is the establishment of connections, the establishment of connections is the assignment. *Herbert Brün*

Kenneth Wilson

The Establishment of Connections.

Part One:

There are established and establishable connections

Connections are established causal links between events, objects, subjects, and ideas

Established connections are established

The U.S. government is an establishment with many connections

The connections established by the U.S. government are said to be established

These connections are established as present day reality and facts

establish the connections

There are no established connections

Connections are to be established

The invitation is to establish connections

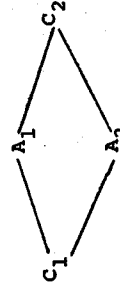The postulate is that we may establish connections between any two things: All things are connected

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Part Two:

List all of the words that you would use to state or to imply connections

Language is connections made whether intended or not

In a closed contextural situation we can model language in the following form

$$C_1 \diagdown A_1 \diagup C_2$$
$$C_1 \diagup A_2 \diagdown C_2$$

where the "A"s refer to things that are connected and the "C"s refer to the connectives

To establish one set as objects and another set as connectives is arbitrary

Part Three:
The following graph represents the establishment of some of the connections that I would like to make between my areas of interest.

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Barbara J. Ford

The Establishment of Connections.

Connections are established. Which connections are established or recognized, and how they are established or recognized, depends upon each individual. Connections must be established, and cannot be ignored, because they join or relate the various aspects of our lives. It is essential that we become aware of and recognize the connections that we are establishing and that we would want to establish or recognize.

THE ESTABLISHMENT OF CONNECTIONS   Herbert Brün

1) The Establishment of Connections into which I am born is its legally and militarily protected linguistic image. No connection is missing. If I look for the connections that form the Establishment I shall eventually find them. The language of the Establishment teaches me, at home, at school, through books, newspapers, and all means of successful communication, to look only for the connections of the Establishment. If I am a good student and if I believe in communication I shall find no connection missing and I shall miss no connection.

If I find no connection missing, then I have no motivation to try the Establishment of Connections.

If, however, I cannot find an urgently needed or wanted connection, then I can establish it, and if I can, I need to establish it, so that there exist a neither legally nor militarily protected linguistic image of that Establishment of Connections which is not the Establishment of Connections into which I am born.
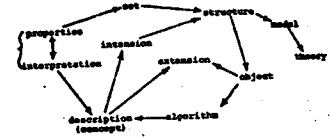
Whenever I say that I am bored, exploited, victimized, facing undesired authority, misunderstood, etc., I say, by implication, that I fail to establish the missing connections that would counter, not the undesirability, but the causes and consequences of boredom, exploitation, victimization, authoritarianism, ill presented messages, etc.

2) In trying to list all words I would use to state or imply a connection, I discovered that all communicative languages, and thus all words, inevitably trace all already established, if not always implemented, connections. Communicative language is the image of the legally and militarily protected establishment of connections into which I am born. So I found myself trying to list all words that use me to state or imply a connection. But that was not the assignment.
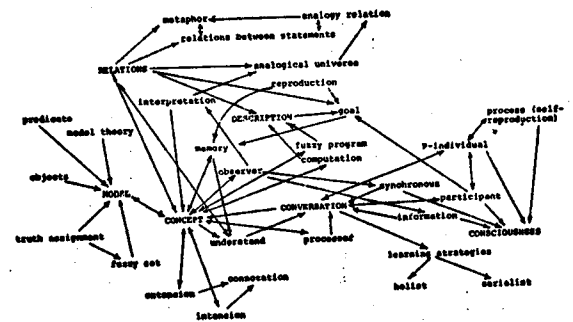
Nor was it to list no words or no words, although I find myself tempted, like some friends, to turn no words into words of a less or not communicative language in order to solve the problem. I admit the necessity of coining new words, but shall admit the need for it only after all other resources have been exhausted. In the meantime I use, for example:

I	instead of	it
it be	"	it is
I need	"	it needs, I must
I want	"	it wants, I should
I desire	"	it should, I ought to
I require	"	it requires
is to input	"	will output
so that	"	thus, therefore, because
premiss	"	result
if then...what now?	"	if now...what then?
needed by	"	needed for

This list, which I need to continue, I require to be applied so that it be not communicative, nor incommunicative, but anticommunicative, so that if it then be understood it now be an input of my desire for connections yet untraced and to be established as needed by all who want the fulfillment of their needs to be a premiss for, and not a result of, their desires.

Herbert Brün.

INTENSION

Intension of a concept is the set of properties possed by every member of the extension of the concept. For example, the intension of 'triangle' contains the properties 'having three sides', 'being connected' and so forth. If the intension of a concept is large, its extension is small, and vice versa. Thus the intension is maximal for specific, concrete objects which have minimal extension. [L.L.]
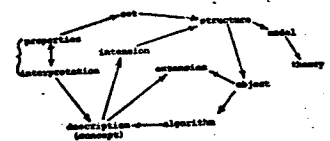
INTENSION, EXTENSION

The intension of any concept is a program (not, as often supposed, an arbitrary cluster of predicates). The extension or denotation of this concept is its semantic interpretation; only synthetic concepts (in the sense of Kant or Hartmann) need observable extensions; the analytic concepts have compilations only; simply a listing of R_i as a Cartesian Product in the abstract; a formal and private entity. The connotation of a concept involves the intension and the extension due to pragmatic criteria (developed below) bearing upon the use of the concept or the user who has the concept under discussion. [G.P.]

EXTENSION

Extension of a concept is the set of all objects, real or unreal, to which the concept applies. The extension of the concept 'triangle' thus is the set of all triangles. [L.L.]
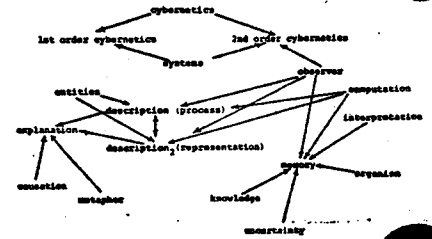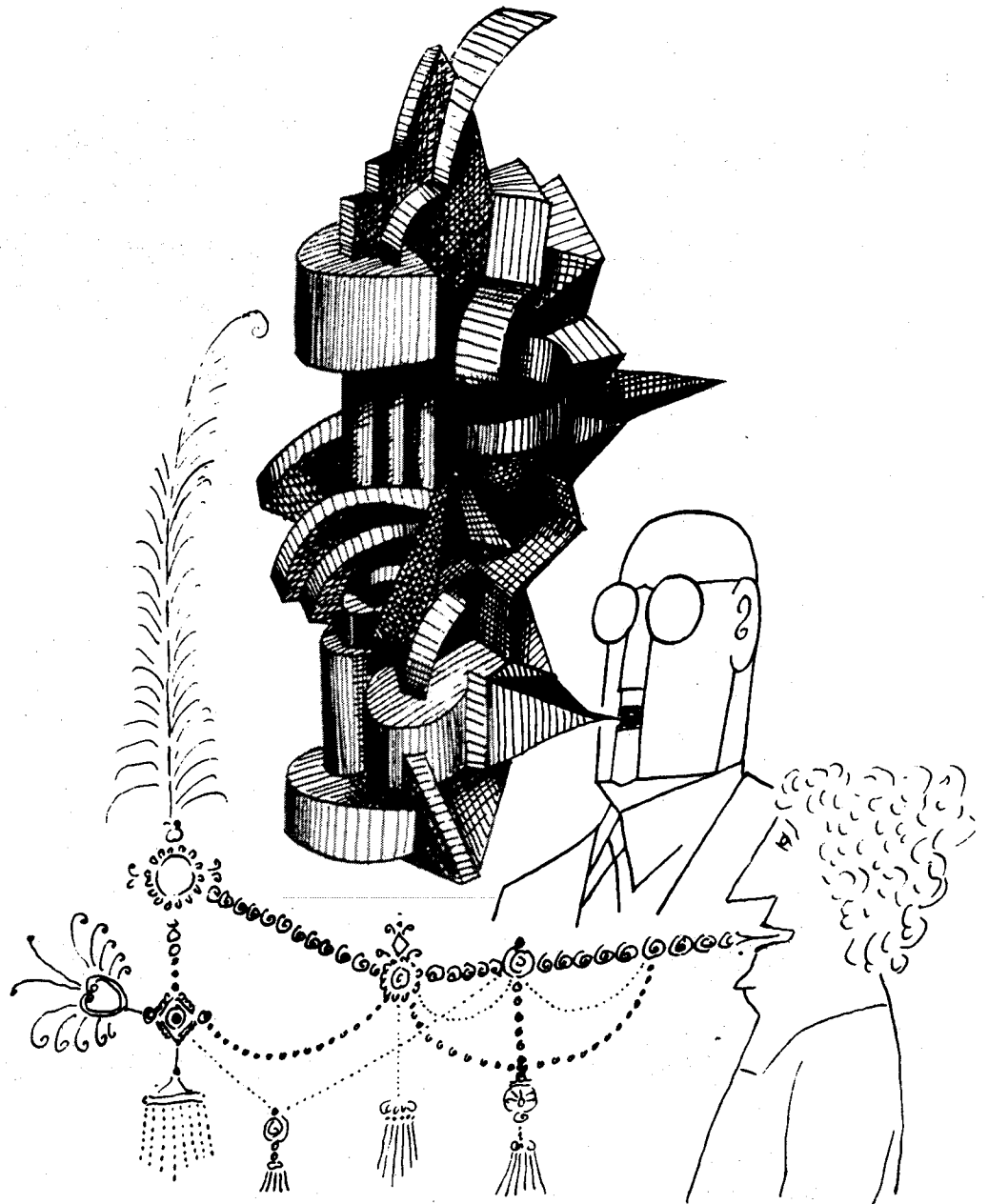
Description$_1$ (process): A computation by which entities, or relations between entities, perceived in one domain appear (to an observer) to be represented (description$_2$) in another (or the same) domain.
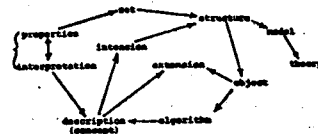
Description$_2$ (representation): The representation of a computation that furnishes descriptions$_2$, or the results of this computation (description$_1$). [H.V.F.]

DESCRIPTION

One or several linguistic sentences with an intended inter-
pretation, namely that which is described. The relation between
the description and that described is usually thought of as effec-
tive (algorithmic). The extension of a concept is described by
the intension of the concept. A description of a concrete object
('the present President of the USA') may thus have a unique inter-
pretation, whereas a description of an abstract
object ('triangle') may specify several ob-
jects. A theory is sometimes said to describe
its models (relative to an interpretation the-
ory). [L.L.]

AN APPROACH TO FORMAL PSYCHIATRY

HOWARD T. HERMANN, M.D., and *JOHN CHRISTOPHER KOTELLY*†

The following essay, condensed from a forthcoming book, lacks full annotation and clinical illustrations. In cursory form, it presents the essence of an approach. The infinite, permutative nuances of the clinic should, in principle, be derivable from such an idealized schema. However, as can readily be seen in the treatment of affects, the system is not fully developed.

This is no compendium of psychopathology; rather, it is an attempt to construct a formal language (and, therefore, theory) for psychiatry. Section I develops the formal expressions. It uses a variation of the language of model theory [1]. Context and metaphoric identification are formally defined and their central role introduced. From this base, we construct a value theory whose explicit inclusion of a context operator relaxes some of the constraints of current value theory. In Section II, after a phenomenological treatment of induction and evocation of models, we outline application of the language to "mental regulatory mechanisms." Emotions, or "affects," are then developed in Section III; and finally, in Section IV, a formal schema for pathology ("psychiatry") is presented, with some sample classifications.

If our work stimulates efforts to devise a more objective representation of psychiatric phenomena so that students of behavior can talk to each other objectively, it will have served its purpose.

For readers unfamiliar with the mathematics of Section I, we suggest a quick initial pass and a more detailed reading on completion of the article.

In the following work, we shall be concerned with a fundamental aspect of biological systems, namely, the plasticity that allows them to mold themselves to the ever changing relationships of nature. This is particularly exemplified by the central nervous system. We believe that one can best describe and analyze this plasticity by a language of model formation. "Models" need in no way be similar to their causes, the "real thing." They arise from the interaction or coupling between "real things" (including other models) and a modeling system. They need only obey the rule of lawfully correlating themselves in such a way that they express all differences and relations of "real things." We propose a formal definition of models in which all these correlative aspects are represented. We shall develop the representations so as to be useful in describing human mental functions.

I. The Formal System

A model is an ordered set (B, X, h, H^t, B^t, X^t), denoted by $\mathrm{Mod}(B, X, h)$, to be read "B models X relative to h," where (1) X is the set being modeled, (2) B is the modeling set, and (3) h is a map from X to B, written

$$X \xrightarrow{\ h\ } B,$$

or, equivalently, $h:X \to B$, where h is called the filter and $h^t:X^t \to B^t$.

A map is defined as a relation between two sets, where elements of the first set are given correspondences to those in the second set. X^t is the set of all mappings of X into X, that is, the set of all possible changes that can be made within the set, X. Similarly, B^t is the set of all mappings of B into B. Each is closed under a single-valued, binary, associative operation, o, with a unit element [respectively, $Id(X^t)$ and $Id(B^t)$], where Id equals, by definition, identity. B^t and X^t satisfy the conditions of a semigroup, and $h^t:X^t \to B^t$ is a homomorphism. Definition: Given two models, $\mathrm{Mod}(B_1,X,h_1)$ and $\mathrm{Mod}(B_2,X,h_2)$, the "sum" of the two models is denoted by $\mathrm{Mod}(B_1, X, h_1)$, $\mathrm{Mod}(B_2, X, h_2) \triangleq \mathrm{Mod}(B_1 \oplus B_2, X, h_1 \oplus h_2)$. From the definition of model, it can be proven that the sum of two models, $\mathrm{Mod}(B_1 \oplus B_2, X, h_1 \oplus h_2)$, is also a model.

A. Composition of Models

Given two models, $\mathrm{Mod}(B, X, h)$ and $\mathrm{Mod}(B', B, h')$, where $h:X \to B$ and $h':B \to B'$, it can be verified that their composition, $\mathrm{Mod}(B',$

$X, h' \circ h) \triangleq \mathrm{Mod}(B', B, h') \circ \mathrm{Mod}(B, X, h)$, where $h' \circ h: X \to B'$, and $[h' \circ h]^f \triangleq (h')^f \circ h^f$. This composition or cascading of models into hierarchical sets allows a biological system to attain greater degrees of complexity and abstraction. There are numerous other possible manipulations of models, which for reasons of brevity we shall not consider in this article.

We would now like to consider the mapping of one model into another model. These mappings are called "entailments." The restriction upon these mappings is that there must exist relevance between some aspect of the antecedent model and some aspect of the consequent model. We propose to define $\mathrm{Mod}(B, X, h) \to \mathrm{Mod}(B, X', h')$, read as "Mod $B, X, h)$ entails . . . ," by the following: $\mathrm{Mod}(B, X, h) \to \mathrm{Mod}(B, X', h') = (\exists\varphi)\,[[\mathrm{Mod}(B, X, h)] \subseteq \mathrm{Mod}(B, X', h')]$, that is, "there exists a φ such that φ maps $\mathrm{Mod}(B, X, h)$ into a subset of $\mathrm{Mod}(B, X', h')$. There may exist many different maps that satisfy the above definition; the particular φ is determined by the relevance criteria, which will be discussed in the following section on context. Entailment may be viewed as a restricted form of implication. Prediction, which is the implication of a future event, based on a present or past event, depends upon the existence of such entailment diagrams.

B. Formal Definition of Context and Metaphor

We formally state the interrelational dependency of context to meanings (entailments on a given model). Context is an operator that selects entailment(s) or meaning(s) to be used in an entailment diagram from the set of all possible entailments (or meanings) existent on some given model. That is, under a given context $\mathfrak{C}^*$, all entailments are carried into a null set save those appropriate to the context. Formally, this is represented as follows: $\mathfrak{C}^*(\mathrm{Mod}\,h_j):\mathrm{Mod}\,h_j \to M_{rg}(\mathrm{Mod}\,h_j)$. The subset determined by the above mapping will be denoted by $\varphi(\mathrm{Mod}\,h_j)$, such that any element φ in $\varphi(\mathrm{Mod}\,h_j)$ satisfies the condition that $\varphi:\mathrm{Mod}\,h_j \to \mathrm{Mod}\,h_i$, that is, the particular entailment, φ, applied to $\mathrm{Mod}\,h_j$ yields $\mathrm{Mod}\,h_i$.

$M_{rg}(\mathrm{Mod}\,h_j)$, defined to be the set of all entailments from the model $\mathrm{Mod}\,h_j$, corresponds to the set of all meanings of $\mathrm{Mod}\,h_j$. The meaning of a model corresponds to that to which the model refers (that which connects it to some other model). If a model is viewed ostensively, that is,

"points to something," then one of its meanings is simply the item it models or "points to." Yet, the meaning of a model is a function of its correspondence to some other model or diagram.

Let us consider the following scene: A man, aged thirty, asks a woman, aged twenty-seven, to take off her clothes. In the context determined by a physician's examining room, the young lady would find little about which to remark. One would ordinarily predict that this was the opening of a physical examination for medical reasons. In the context determined by a wild cocktail party, the young lady might treat the same request as a joke or a dare. In the context determined by a central street in a city at the height of the rush hour, the young woman might regard the man as being struck with a bizarre thought and perhaps mentally deranged. In the context determined by her boudoir, any other request might be regarded as out of place. We see that context is an operator that selects from all possible implications relevant to an object the subset relevant to a given situation. Obviously, a given object may be subject to many different contexts. In the above example, the context is determined by the social situation. Thus, should it select out sexual implications, the young lady would be just as startled by the event of finding herself being given a physical examination as she would be if, having come to a physician's office determined by a medical context, the young men proceeded to make love. Note that, when we predict something in context, we are startled, or alerted, by a discrepancy between the actual unfolding events and the predicted events.

We shall limit ourselves to the following properties of the operator context: contextual nesting, intersection, and union.

1. CONTEXTUAL NESTING

Given two contexts, $\mathfrak{C}_i^*$ and $\mathfrak{C}_j^*$, $\mathfrak{C}_i^* \subset \mathfrak{C}_j^*$, $\mathfrak{C}_i^*$ is contained in $\mathfrak{C}_j^*$, if for a model $\mathrm{Mod}\,h_i$, $\mathfrak{C}_i^*(\mathrm{Mod}\,h_i) \subset \mathfrak{C}_j^*(\mathrm{Mod}\,h_i)$. That is, any entailments that the context $\mathfrak{C}_j^*$ selects from those on $\mathrm{Mod}\,h_i$ contain the entailments that $\mathfrak{C}_i^*$ would select. We can see this in our introductory example of the man asking the young lady to undress. In the context determined by a doctor's office, the presentation of a stethoscope by the man would cause the girl no alarm, for the context determined by the stethoscope is a subset of that determined by the doctor's office, that is, $\mathfrak{C}^*(\text{Stethoscope}) \subset \mathfrak{C}^*(\text{Doctor's office})$.

2. INTERSECTION OF CONTEXTS

Symbolized by "$\cap$," intersection is defined as those elements that are shared by two or more sets. Continuing our example, viewing the context determined by the girl's boudoir, C_j^*, and the context determined by a wild party, C_i^*, we see that $C_i^* \cap C_j^* \equiv C_k^*$ when C_k^* is the context that selects sexual relevance.

3. UNION OF CONTEXTS

The union of two contexts, written $C_i^* \cup C_j^*$, is the context that chooses as a subset of all entailments on a model the set consisting of the entailments determined by C_i^* "union" (joined to) the entailments determined by C_j^*. They need not have anything in common. Thus, letting the context determined by a stethoscope be C_a^* and the context determined by a boudoir be C_b^*, the man requesting the disrobement of the young lady in a boudoir while brandishing a stethoscope would allow the lady to entail either an examination or lovemaking. Since they seem to have not much in common, she might be unable to predict what would happen. By the addition of contexts, one allows more freedom of choice in the entailment of models.

C. METAPHOR

Metaphor may be characterized as a transference of a characteristic from one model to another relative to a context. More rigorously, metaphor consists of an identification of one model with another within some context. Any formal definition of a metaphor must preserve these properties. For convenience, we shall here refer to models in the abbreviated form Mod₁, Mod₂, Mod₃, etc. Definition: Two models, Mod₁ and Mod₂, are metaphorically equivalent, relative to a given context C^*, written Met (Mod₁, Mod₂, C^*), if there exist two entailments φ and ψ determined by the context C^*, such that the following meta diagram holds:
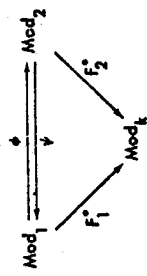

FIG. 1

where C^* determines Mod₁, that is, $C^*(Mod_1) = F_1^*$ and $C^*(Mod_2) = F_2^*$, such that $F_1^* \circ \varphi = F_2^*$ and $F_2^* \circ \psi = F_1^*$. Starting from model Mod₁, we may get to model Mod₂ along either the route F_1^* or the longer route, φ, and then F_2^*. Similarly for Mod₂. Once the identification is made, there may turn out to be many contexts in which an identification is possible. Therein lies the power of metaphor. It can be shown that the operator, Met, is reflexive, transitive, and symmetric, that is, Met(Mod₁, Mod₁, C^*) exists; given Met(Mod₁, Mod₂, C^*) and Met(Mod₂, Mod₃, C^*), we have Met(Mod₁, Mod₃, C^*); and Met(Mod₁, Mod₂, C^*) = Met(Mod₂, Mod₁, C^*). Since this is so, the set of all models metaphorically equivalent relative to a given context forms an equivalence class.

D. GENUS AND DIFFERENTIA

The genus of a set of models, written Gen{Mod(B, X_i, h_i)}, is the Model Mod₁ which determines the context C^* under which the given set of models is metaphorically equivalent. This generic model represents a classificatory partitioning of the models. Embodied within the definition is the concept that classification is always dependent on "gathering together" a separable set of ideas under some single idea. One may classify animals by skeletal structure, by body shape, or, as did Aesop, by anthropomorphized properties.

The differentiae then become the parts of the above model that "are not completely matchable" under the identification, that is, given Met (Mod₁, Mod₂, C^*), then Gen(Mod₁, Mod₂) = Mod₁. The differentia of model Mod₁ is the model Dif[Mod₁, φ(Mod₂)]; the differentia of model Mod₂ is Dif[Mod₂, ψ(Mod₁)]. Were models representable by Venn diagrams, "Dif" would correspond to the complements of Mod₁ in the universe of Mod₂. That is, we wish to establish a mutually exclusive and exhaustive partitioning relative to the generic. Formally, we define Dif(Mod₁, Mod₂), where Mod₁ ⊂ Mod₂, to be the model Mod₃, such that the following condition holds: Mod₁ ⊂ Mod₂ but not Mod₃ ⊂ Mod₁, and we can find no Mod₃ such that Mod₁ ⊂ Mod₃ and yet satisfies this condition. This says that Mod₃ is the "total" difference between Mod₂ and Mod₁. Thus, we have partitioned Mod₂ into two disjoint models, ψ(Mod₂) and Dif[Mod₂, ψ(Mod₁)]. It is obvious that ψ(Mod₂) ⊕ Dif[Mod₁, ψ(Mod₂)] = Mod₁. Similarly for Mod₂. This says that the

parts that φ or ψ do not map onto are what differentiates them relative to the context $\mathfrak{C}^*$.

E. EXTENSIONALITY

From the definition of Gen, we observe that if $Gen(Mod_i, Mod_j)$ = Mod_k, and if $Ge^{-}(Mod_i, Mod_j, Mod_k)$ = Mod_j, then $Mod_j \subseteq Mod_k$. This says that the more models we have, the less they have in common. When we consider a given model, we say that its relationship to its generic model goes by way of the extension of the generic model. For example, the class of Europeans may be thought of as "extending over," or "including in the extension," the class of Frenchmen. We pass from the smaller, but more general, generic model of "European" (with its fewer restrictive properties) to the larger (but more restricted) generic model of "Frenchman." Clearly, the concept of European applies to more elements than that of Frenchman. However, the generic model of European is a subset of that of Frenchman.

Definition: The extension of a generic model, Mod_k, written $Ext(Mod_k)$, is the set of all models that are metaphorically equivalent under the context determined by Mod_k, that is, the $\{Mod(B, X_i, h_i)\}$ such that $Gen\{Mod(B, X_i, h_i)\} \equiv Mod_k$. In the above example, the extensions of the generic model Frenchman are the models of the actual entities that are French.

Given two generics, Gen_1 = $Gen\{Mod(B, X_i, h_i)\}$ and Gen_2 = $Gen\{Mod(B, X_j, h_j)\}$; if $Gen_1 \subset Gen_2$, then $Ext(Gen_2) \subset Ext(Gen_1)$ that is, diagrammatically,

$$
\begin{array}{ccc}
Gen_j & \xrightarrow{int_i} & Gen_2 \\
\downarrow{\scriptstyle Ext} & & \downarrow{\scriptstyle Ext} \\
\{Mod(B, X_i, h_i)\} & \xrightarrow{ext_i} & \{Mod(B, X_p, h_p)\}
\end{array}
$$

FIG. 2

where int_i is the inclusion map corresponding to "C." Similarly for ext_i. If Gen_1 = "Europeans" and Gen_2 = "Frenchmen," it is clear that, in the extension, the class of Frenchmen is part of the class of Europeans. That is,

$$Ext(Frenchmen) \xrightarrow{ext_i} Ext(Europeans).$$

But the property of being a European is a part of being a Frenchman. (A Frenchman is a European and also a person with a geographic locus and also . . . and so forth.)

$$Gen(Europeans) \xrightarrow{int_i} Gen(Frenchmen).$$

F. INTENSIONALITY

The relation int_i is defined to be an intensional map, and the diagram

$$Gen_1 \xrightarrow{int_i} Gen_2$$

is read as "Gen_1 is included in Gen_2 in the intension." We can pick out a particular individual by intensionally making more specific generics, that is,

$$Gen_1 \xrightarrow{int_1} Gen_2 \xrightarrow{int_2} Gen_3 \dashrightarrow \xrightarrow{int_{n-1}} Gen_n.$$

For example: Gen_1 = "Being European," Gen_2 = "Being Greek," Gen_3 = "Being Spartan," and Gen_n = "Being Joe Steriopoulos," in increasing specification. The intension "being a European" is contained in "being Joe Steriopoulos." In the extension, Joe Steriopoulos is a member of the class Europeans, that is,

$$European \xleftarrow{ext_1} Greek \xleftarrow{ext_2} Spartan \dashleftarrow \xleftarrow{ext_{n-1}} Joe\ Steriopoulos.$$

The sequence

$$Gen_1 \xrightarrow{int_1} \dashrightarrow \xrightarrow{int_{(n-1)}} Gen_n$$

varies contravariantly as the sequence

$$Ext(Gen_1) \xleftarrow{ext_1} \dashleftarrow \xleftarrow{ext_{(n-1)}} Ext(Gen_n).$$

As the intension increases the extension decreases.

G. CONSCIOUSNESS AND PRECONSCIOUSNESS

Whenever a system forms a model, we say that it has formed its model. Any degree of modeling up to and including multiplication of models, entailments from models, and metaphoric identification of models remains a preconscious awareness. However, once the modeling system has modeled its own modeling and/or diagrams, then we say it is consciously aware.

The formal statement that "a modeling system, B, is preconsciously

aware of X" is equivalent to stating that B has formed $Mod(B, X, h)$. Awareness implies modeling. Conscious awareness is equivalent to stating that the modeling system, B, has filters H, such that it can model its models and/or the diagrams of these models, that is, $Mod(B, D, H)$, where D is any model or diagram.

Our concept c. consciousness may be likened to the capacity of a servo system to monitor its parameters, thus permitting reseting as a function on the models at the awareness levels (adaptive servo). In particular, for a mismatch between the entailed response and the next incoming sample point, the system can reset its parameters appropriately. A grading of consciousness may be obtained as a function of the number of possible parameter changes open to the system. The human mind is a mechanism with a very large number of such parameter adjustments open to it.

Based on the capacity to reset parameters, which we hypothesize to be a fundament of consciousness, we would suggest the following schema. Three parameters of our hypothesized modeling mechanism are: (1) sets of generic models, (2) sets of intensional maps, (3) partial gradings of contexts that contain a priori probabilistic selections of entailments on (1) and (2). They would operate as follows: (a) An input datum evokes a generic model. (b) The context selects a sequence of intensional maps and a total model hypothesized to be the model of the datum by means of a Bayesian statistical decision. (c) Matching on subsequent sample points confirms, or disconfirms, the model. The over-all monitoring of this processing is consciousness. In its most developed form, the human mind, this would correspond to the cognitive subjective experience of being conscious. If we were not to hypothesize such a mechanism, we would be forced to store every possible model and its variation as distinct entities in a deterministic tree structure. Regardless of refinement, complexity, or generality of the tree structure, it could not possibly take into account every variation in the incoming data.

An area in which this representation of consciousness and awareness might play an interesting role is the analysis of the concepts of time and distance. If time is viewed as a filter T between some transformation set P^t and a modeling set, that is,

$$P^t \xrightarrow{T} B,$$

where B is the modeling set, then if $Mod(B, P^t, T)$ is metaphorically

identified to the models of any set of transformation sets $\{P_i^t\}$, we term $Mod(B, P^t, T)$ a clock. A priori, a swinging pendulum is not a clock until a correspondency is made between the models of its periodicity and the models of some motion, $P_s^t \in \{P_i^t\}$. Thus, B is aware of some motion set $\{P_i^t\}$, via the filter "time," T. If the modeling system models its awareness of T, that is, $Mod(B, T, h)$, then this would give rise to a measure in the modeling system.

We take our argument from what we presume to be a primary experiential ordering of time. That is, we assume a sense of elapsed serial ordering to be present in our modeling system. Its earliest experiences assign a list of a priori time intervals (serial ordering) to a visual, tactile (and so forth) set of models. These become the generic (or, in this case, normative) models for all later metaphoric identification. As we generate more sophisticated measures of time and distance, we employ both comparisons of internal serial ordering (primary time sense) assigned to generated models and comparisons of tactile-visual models among themselves. But primary to all of this is our elapsed time sense. Distance can only be a mapping between images (visual, tactile) and our time sense.

Where does the model of serial ordering arise? We hypothesize that it arises out of the differentia produced by metaphoric identification of clocks as defined above. More formally: From the definition of time, as represented in the diagram

$$P^t \xrightarrow{T} B,$$

we obtained the definition of a clock as $Mod(B, P^t, T)$, which arose out of the metaphorical identification of a set $\{Mod(B, P_i^t, T)\}$, where $Mod(B, P^t, T) \equiv Gen\{Mod(B, P_i^t, T)\}$. The set $\{Dif_k\}$, corresponding to each $Mod(B, P_k^t, T) \in \{Mod(B, P_i^t, T)\}$, generates a serial ordering. The conscious monitoring (modeling) of the differentiae gives rise to a metric.

Distance arises out of a metaphorical identification of these metrics with visual-tactile models. (Of course, via metaphoric identification, other sense modalities can be used to generate distance.) That is, there exists the set $\{Mod(B, Dif_k, H)\}$, where each $Mod(B, Dif, H)$ is termed a time interval. The metaphorical identification of this set of monitored temporal differentiae with sets of visual-tactile models turns that set into a ruler. By defining time as a filter, we allow the existence of a multidimensioned

time (e.g., biological clocks, the totality of which makes up the basic clock of a biosystem).

H. FORMAL VALUE THEORY [2]

Our discussion of model evocation proposed an appropriate mechanism based on a Bayesian decision. That is, we suggest that every input evokes a generic model; the Bayesian choice is concerned with a possible model derivable from that input. The model is constructed by mapping the generics via a combination of intensional maps into the projected model (presumed to be matchable). The predicted model is the relative normative model against which the incoming actual model is checked. This comparison is the plinth of valuation, giving rise to value terms. In this article, we shall concern ourselves with only four value terms ("good," "bad," "better than," "worse than") and one value proposition ("ought").

1. GOOD

Given two models, Mod_1 and Mod_2, and a context $\mathfrak{G}^*$, Mod_1 is a "good" Mod_2 relative to $\mathfrak{G}^*$, represented by $G(Mod_1, Mod_2, \mathfrak{G}^*)$, if the following two conditions hold: (a) $Met(Mod_1, Mod_2, \mathfrak{G}^*) = 0$. Condition (a) states that a metaphoric identification of Mod_1 to Mod_2 is made in the context $\mathfrak{G}^*$. *In the absence of a common ground provided by the context $\mathfrak{G}^*$, no comparison whatsoever can be made.* When valuing systems do not state explicitly which $\mathfrak{G}^*$ they use, invariably an implicit $\mathfrak{G}^*$ may be found. This can be shown by furnishing an alternative $\mathfrak{G}^*$ under which the statement is falsified. Condition (b) states that the match, relative to the context $\mathfrak{G}^*$, is complete. That is, the differentiae between $[F_1^*(Mod_2)]$ and $[F_1^*(Mod_1)]$ are zero. In this case, Mod_1 has filled exhaustively every criterion of Mod_2 relative to a context $\mathfrak{G}^*$. In the context $\mathfrak{G}^*$, Mod_1 is the normative model.

2. BAD

Mod_1 is a bad Mod_2 relative to the context $\mathfrak{G}^*$, written $B(Mod_1, Mod_2, \mathfrak{G}^*)$ subject to the conditions: (a) $Met(Mod_1, Mod_2, \mathfrak{G}^*)$ and (b) $Dif[F_2^*(Mod_2), F_1^*(Mod_1)] \equiv [F_2^*(Mod_2) - \epsilon]$, where $[F_2^*(Mod_2) - \epsilon]$, states that both Mod_1 and Mod_2 have maximal differentiae, that is, the difference being an ϵ short of the total model $(F_1^* Mod_1)$. If $Dif[F_2^*$ $(Mod_1), F_1^*(Mod_1)] \equiv F_2^*(Mod_2)$, then, relative to $\mathfrak{G}^*$, no comparison can be made since the two models would not be metaphorically equivalent.

3. BETTER THAN

$BT(Mod_1, Mod_2, Mod_3, \mathfrak{G}^*)$, to be read as "$Mod_2$ is a better Mod_3 than Mod_1 in the context of $\mathfrak{G}^*$," subject to the conditions: (a) $Met(Mod_1, Mod_3, \mathfrak{G}^*)$ and $Met(Mod_2, Mod_3, \mathfrak{G}^*)$ and (b) $Dif[F_3^*(Mod_3), F_2^*(Mod_2)] < Dif[F_3^*(Mod_3), F_1^*(Mod_1)]$. Condition (a) determines a domain of comparison relative to a norm. Condition (b) states that the difference between $F_3^*(Mod_3)$ and $F_2^*(Mod_2)$ is less than the difference between $F_3^*(Mod_3)$ and $F_1^*(Mod_1)$.

4. WORSE THAN

Similarly, we can define the converse of "better than," $WT(Mod_1, Mod_2, Mod_3, \mathfrak{G}^*)$, to be read as "$Mod_1$ is a worse Mod_3 than Mod_2 (relative to $\mathfrak{G}^*$)," subject to the same conditions as in "better than." Thus, "x is better than y" is equivalent to the statement "y is worse than x."

5. OUGHT

Our definition and use of the value term "ought" goes far beyond the customary analysis of this propositional term. Not only do we consider its role in value propositions but also we shall represent the dynamic convergence of models by means of this propositional term. In particular, in the application of our modeling system to the ordering of psychological phenomena, "ought" is the essential component in the formal representation of the affect (emotional) states. Definition: Mod_1 ought to be Mod_2 relative to the context $\mathfrak{G}^*$, to be written as: $Db(Mod_1, Mod_2, \mathfrak{G}^*)$ (where Db from *debeo* = "ought") subject to the following conditions: (a) $Met(Mod_1, Mod_2, \mathfrak{G}^*)$, (b) not $G(Mod_1, Mod_2, \mathfrak{G}^*)$, that is, $Dif[F_2^*(Mod_2), F_1^*(Mod_1)] \neq 0$, and (c) $\exists \ \varphi'$ mapping, such that

$$Mod_1 \ \frac{\varphi'}{\psi} \ Mod_2$$

in the context $\mathfrak{G}^*$ implies $G(Mod_1, Mod_2, \mathfrak{G}^*)$; that is, $BT[\varphi'(Mod_1), \varphi(Mod_2), \mathfrak{G}^*]$. Thus, we can define an ordering on the metaphorical φ maps, $>$, such that $\varphi' > \varphi \triangleq BT[\varphi'(Mod_1), \varphi(Mod_2), \mathfrak{G}^*]$.

II. *Induction, Evocation, Mismatch, and Regulation of Models*

A central nervous system is probably always in a state of model formation [3]. Constantly deluged with incoming sensory data, it is attempting to structure that data in terms of the existing possible modes of deformation open to it. Consequent to each structure, if an entailment exists, the entailment predicts the next set of sensory data (in time). New entailments are induced so as to minimize mismatch.

Even the most simple case of entailment induction in higher animals requires a modeling process of vast composite complexity. The most obvious examples of experimentation in this area are the Pavlov and Skinner conditioning paradigms. Let us examine their relatively simple cases of experimental induction of behavior from a formal standpoint.

Whenever we are presented with two (or more) objects at the same time, we hypothesize that the modeling system attempts to arrange them with some shared meaning structure. That is, a selection of possible meanings for each object is taken, and only those meanings common to the setting are used in the modeling of the objects. This is equivalent to one's frame of reference or, formally, context operation.

The Pavlovian paradigm may be sketched as follows:

1. In the mind of the experimenter is an entailment he wishes to induce into the mind of the experimental animal. For example, $Mod(Bell) \rightarrow$ Salivation may be the entailment diagram to be induced in a dog, that is, "when the bell rings, react by salivating."

2. (As a result of a priori experience) the dog recognizes food. That is, there exists a representation (model) for the composite arrival of visual, olfactory, sensory, and so forth, lower-order models which, in itself, is a model. For simplicity, we shall write only the composite model, omitting the filters, $[Mod(Dog, Food)]$ in a G^*. Now, consequent to the matching of the composite model of food are the entailments that lead to salivation. They are usually hereditary reflexes (in Pavlovian terminology, "unconditioned reflexes"). That is, $Mod(Dog, Food) \rightarrow$ Salivate, to be read, "the model, in the brain of the dog, of food (as filtered by visual, olfactory, and so forth, pathways) entails salivation."

3. A contextual setting G^*, not usually explicitly stated, is constructed (namely, that determined by feeding). Generally, this is developed or induced by the repeated use of the experimental setting as a feeding situation in the repeated states of hunger in the animal.

4. Simultaneous pairing of a signal and of food are made, represented by $[Mod(Dog, Food)] \oplus [Mod(Dog, Bell)]$.

5. Presentation of the signal alone evokes the automatic reflex of salivation. However, the model now induced is $[Mod(Dog, Food)] \oplus [Mod(Dog, Bell)] \rightarrow$ Salivate (in the context determined by hunger).

6. The dog hears the bell in the context determined by hunger: $[Mod(Dog, Bell)] \rightarrow [Mod(Dog, Bell)] \oplus Mod(Dog, Food)] \rightarrow$ Salivate. Again, the context operator has selected from the possible entailments or predictions generated by bell only those consistent with the feeding diagram. (That is, in other contexts, $Mod[Dog, Bell]$ could conceivably have other meanings.) Thus, Pavlov was attempting to prove that animals can form novel, ad hoc entailment diagrams of their environment. He showed that, in the presence of a given (sensory realizable) input (the bell), there exists an output. Furthermore, a logical transformation exists that maps fluctuation in the sound domain to two points (response or no response) in the salivation domain. This is the transformation map of a decision element (h^*).

From the viewpoint of entailment induction, Pavlov also demonstrated the following: (a) Animals model in context. (b) Models can be entailed from generated models. (In particular, in Pavlov's experimental paradigm, the entailment was an autonomic reflex.) (c) Transitivity of entailments exists. (d) The multiplication of models is also a model. (That is, the model that the autonomic reflex generates from the output of the central nervous system's auditory processing is its model of the auditory input signal.)

What Skinnerian conditioning has added to the Pavlovian paradigm is an explicit amplification of points (b), (c), and (d), but again overlooking the fundamental role of context in experimental psychology. (The importance of context has been recognized in experiments on "set" [4].)

Manipulation of points (b), (c), and (d) permitted important generalization of the Pavlovian paradigm. In the Skinner paradigm, the generalized model is of the form: ("My doing something" → Food reward) (in the context determined by hunger). A further generalization of the original paradigm was added by Olds, who showed that the context can be enlarged to include "that which I desire." That is, ("My doing something" → Reward) (in the context determined by the availability of that which I desire).

A. MODEL EVOCATION

Let us imagine the operation of matching to a model generated by the brain from an incoming set of data. Some subset of the incoming set of events has called forth a provisional total model by the generic and differential procedure outlined in the formalism. Auditory recognition illustrates this well, for the event set is well ordered. Time ordering stretches out the process along a convenient dimension. For example, recognition of a musical composition may be achieved by hearing a few notes or, more rarely, a single note. Nonetheless, certainty may require additional listening. By the term, "recognition" we refer to the evocation of a model or (as in the case of a musical recognition game) many alternative models. It is obvious that such model evocation may be conveniently regarded as a Bayesian statistical decision. In effect, it is as if the mind has said, "Given Mod γ, an element of Model A, what is the probability that the Model A is present?" (Mod γ being also an element of Models B, C, ... and so forth.)

Wholly formed models may be evoked by quasi-random organizations of input. The Rorschach is such an example. What is of interest to us here is that in the Rorschach test, for example, when the person is asked to identify those parts of the inkblots that evoke the ideation, he has little trouble in pointing out what he sees as the relevant elements of the inkblot. The ambiguity of the blot contains an enormous model formation potential, its low intensionality permitting a large extensionality. Statistical predominance of certain responses over others attests to the common phylogenetic and cultural-historical background of the people taking these tests. However, it is of importance to note that the model in the mind, evoked by aspects of the input, structures the otherwise unorganized material into an ordering compatible with the evoked model.

As the elements that evoke a model become increasingly non-specific, that is, have more randomness in their structure, it appears increasingly self-evident to an observer that the imposition of order on these elements must come from an internal model of the subject. An observer then can say more readily, "Of course, this is the model that is in the subject's mind."

It is much more difficult to be conscious of the presence of a model in a subject's mind when the set of elements that evokes the model has a powerful organizational effect on the observer's mind. For then, the amount of consistency in the model matching is so high for both parties viewing the input set that it is felt to be obviously there and not perceivable (modelable) as a model in the person's brain. The more obviously there the model matching is felt to be, the more extensionality exists in the subject's model; the less obvious, the more intensionality.

An interesting grading can be set up regarding evocation of models in terms of intensionality and extensionality. Human thinking may be conveniently partitioned into three types of model evocation: *formal, expositional,* and *associative.* Formal evocation has minimal intensionality; expositional an interplay of intension and extension; and associative evocation, maximal intensionality. Associative models are the core of poetic and artistic expression and, of course, characteristic of idea trains in psychoanalysis. They are hallmarked by the unique signature meanings each person assigns to them. They are of marked importance and interest to psychiatry. For much superficially inexplicable psychotic and neurotic behavior is determined by highly intensional, very private associations with given evoked models. Only when these have been made conscious is it possible to alter the behavior. The reason for the preponderance of associative metaphoric thinking in dreams, psychotic states, and poetry is yet to be explored. It should be noted that *d*-lysergic acid gives rise to very intense metaphoric identification in a dislocated contextual hierarchy and that this peculiar intensity is sensed as a mystical experience.

B. PHENOMENOLOGY OF MISMATCH

We have advanced the hypothesis that a generic element evokes in context a whole model against which differentiae are checked in confirmation and continuity of that model. In this sense, mismatch is the existence of novelty or differentiae between a model of an incoming set of events and a generated model. Important from a phenomenological point of view, the presence of mismatch produces alertness in the modeling system. In any case, as one turns a conscious ear to (forms a model of) the inner workings of one's mind, it becomes evident that the process of matching a set of events to some internally generatable model involves not only evocation of an entire model but also a subsequent sampling by which elements of the generated model are repeatedly matched to the elements in the event set. For example, if one is sitting in a room containing desks,

chairs, and so forth, it is only if a change in the input set is made that one becomes conscious that one has been repeatedly checking the presence of the structuring of the room. (Many seriously disturbed psychiatric patients in psychotherapy demonstrate a remarkable ability to detect very slight changes in office arrangement.)

Imagine a scene of (1) a famous symphony orchestra, (2) a well-known conductor, and (3) a typical audience for such occasions. Should the conductor, at the moment the hush falls on the audience, break into a soft-shoe routine, a stir of arousal would very likely appear in the audience. In this bizarre scene, the conductor has still retained his image as conductor; the orchestra and audience also have maintained their correspondency to their prior model structure. What has appeared is not changes in the categories of the subunits but, rather, an incompatibility in the entailment sets applicable to the conductor. The structure of the model, conductor, in the context determined by a musical performance of classical symphony is incompatible with the soft-shoe routine. No one would begrudge a conductor such playfulness in his home. Evidently, concurrent with the models-in-context is a very long sequence of predictable events, which must follow, one on the other, with great precision; otherwise, a sense of mismatch is perceived.

Consciousness of discordance commands a focusing of attention; the effect of every mismatch is the swinging over of the conscious modeling faculty so as to scrutinize that mismatch. The amount of mental function assignable to focused conscious attention seems to be limited. It follows that issues of mental fatigue and rate of change of models are related to the handling of mismatch.

Let us imagine that one is tying his shoelaces, and suddenly the shoelace breaks. Up to the moment of the breaking, one can perform other tasks at ease. For example, one can carry on conversations or accurately observe a visual scene, unconscious of the fact that one is tying a shoelace. Indeed, one might go through an entire morning ritual of preparations of dressing and arriving at work without being conscious of the huge amount of modeling and predicting necessary to prepare for the day's work. It is perfectly clear that a brain system must be preconsciously aware in tying a shoelace. The task of following one convolution and movement after another with precise repeatability despite changes in length, positioning,

and so forth requires massive organization of the motor control system. Nevertheless, it is equally evident that no consciousness of the underlying modeling process exists until a mismatch, the breaking of the lace, appears.

The modeling of the modeling process, that is, the formation of a higher-order model (which we have above defined as consciousness) appears whenever a break occurs in the matching of incoming elements to some inner generatable model. It is also generally accompanied by a degree of alertness. One fairly common entailment on mismatch is that of danger; from this latter situation arises vigilance. Apparently, a novel event arouses both an alerting response and an entailed further question of "safe or dangerous?" It implies that some kind of matching to a generatable model that entails safety is an invariant part of brain function; without this matching, the alerting vigilance sequence starts.

C. MODEL-FORMING RATE

Regardless of the route(s) chosen, once mismatch appears the mind works to resolve it. Resultant shifts in context or model are reflected in the structure of the subsequent model generated. The number of model changes over a given time interval determines a model-forming rate.

A continued chaotic input of any kind (equivalently, one productive of a high modeling rate), whether it be white noise (sensory monotony) or simply a previously unmodelable set of events, could be viewed as exhausting the model-matching system. A soldier on watch for a guerrilla attack in a jungle battle line cannot easily determine whether an enemy is present. He is being required to match nearly subliminal sensory events to a model entailing grave danger, all at a high rate. For every novel visual or auditory input (differentia), he is asking the question, "Is this part of the model of an enemy attacker?" The familiar "battle fatigue" is one of the outcomes of such continuous need to check. The concept of model-forming rate may be useful in quantifying the effects of disturbing inputs such as sonic booms, administrative interruptions, and so forth.

A low modeling rate, relative to the input data, appears when the number of variations (per time interval) on the models is low. This is commonly called boredom. Discussion of quantification of modeling rate lies beyond the scope of this paper.

mization of mismatch share much with our regulation of the affect states.

On the basis of our proposed modeling schema, only three types of responses to a mismatch are possible. (1) The incoming data may be changed, so that their structure matches to the inner generated model. For example, if, during an illustrated lecture, we pick up a slide to be projected on the screen and the picture appears reversed or upside down, we manipulate the slide until the elements match our generated model. (2) The filters $\{h'\}$ may be changed by a suitable second choice. Let us imagine that the slide we choose is correctly oriented but is not the one we wanted. The filters $\{h'\}$ at this level of brain function consist of our repertory of intermediate models. The model evoked by the generic content of the projected slide will generate a model of a slide other than that which was predicted by the incumbent model. As the differentiae reveal the mismatch, we become conscious of the error, recognize the slide (another model is evoked), and zero the differentiae by generation of the proper model. (3) We may change the context. For example, unable to make a proper match between any model generatable in the mind and the slide projected on the screen, we state: "We just did this to see if you were on your toes."

The foregoing three-element schema permits us to generate the concepts of mental mechanisms of defense [5] We regard these mental regulatory mechanisms as normal functions. As is always the case in clinical examples, we do not deal with neatly partitioned entities such as in the above schema. Actual regulatory maneuvers combine these elements in various ways. (In addition, it must be noted that metaphoric identification is essential to some defense mechanisms, such as sublimation.) But their resultant action is always to reduce the state of mismatch. We shall see in the discussion on affect states that the same maneuvers are available for regulation of affect states (by altering the model structure that entails the affect state). The question of pathological modeling is of a wholly different nature and will be discussed in Section IV (Pathology).

1. CHANGE OF INPUT ELEMENTS

An important category of maneuvers by which the human mind can control-valve its acceptance of data could be called constrictive maneuvers. That is, the mind reduces unpredictability simply by turning its attention to predicable events. For example, when dependence on another person

D. REGULATION OF MODELING RATE

From casual observation, it appears that organisms attempt to regulate their input rate somewhere between the levels of a highly structured, redundant, low-novelty, boredom situation and a chaotic level that saturates the model-evocation system.

A repertory of adequate models must, in principle, permit a lower model-forming rate than a poor set. In particular, encoding of models reduces the modeling rate. Thus, a medical student performing a medical diagnostic examination and interview must laboriously sort through many items that an experienced physician would discard at a glance.

Members of any society would be subjected to an excessive modeling rate if the societies in which they operated did not induce common rules and models with which members could reduce the unpredictable by structuring the roles of the various individuals in terms of codes, morals, and so forth. When the role structure is disrupted, as by the aberrant behavior of psychotic individuals, the reaction of the members is generally either (1) flight from the chaotic behavior, (2) vigorous control and suppressive acts, or (3) structuring of the behavior with mystic significance (formation of a new ad hoc predictive model).

Boredom, the state of a low modeling rate, has attracted few experimentalists. Boredom does not evoke immediate remedial action as does a state of mismatch. Perhaps this is why it has been ignored. Nonetheless, animals (man in particular) go to great lengths to reduce boredom. In man, the efforts to introduce novelty are legion, from new sexual liaisons to reading books, gambling, fighting, wandering, and so on. Play is a particularly interesting form of encountering novelty and building a repertory of models.

E. PEREMPTORY QUALITIES OF MISMATCH

Our emotional states contain a peremptory quality; not only do we feel but also, simultaneously, we wish "to do something" relative to the emotional state. If angered, we wish to strike out; if enamored, to embrace; if anxious, to run. Mismatch, too, has a peremptory quality; we strive to reduce the discrepancy. The reader may recall this quality in the previous "thought experiments." In exploring the state of mismatch, we will at the same time be entering the area of emotions. For, as will be seen, the mental regulatory mechanisms at our disposal for the mini-

entails a high degree of unpredictability, as with a child whose parents are fluctuating in their regard for him, there appears a strong attachment to controllable (usually inanimate) objects. These transitional objects often share some characteristics of the person on whom the child was originally dependent [6]. Rather than be faced with the distress of repeated abandonment by the original, unpredictable object of affection, the child substitutes objects (metaphoric identification) that are more likely to match his wishes.

Another form of minimizing mismatch by means of changing input elements is the set of active-mastery maneuvers. For example, skiing or mountain climbing, attendance at horror shows, fun parks, roller coasters, and so forth, offer controlled exposure to a limited-threat unpredictability. The sense of mastery and pleasure that accompanies the ability to predict or order a situation that has some elements of threatening unpredictability in it (or elements of predictable danger) seems to have an exhilarating emotional effect. It is as if the person temporarily replaced his vulnerability to unpredictable damage or difficulties by means of demonstrating his ability to master a limited safe set of unpredictable events. Patients with brain damage are striking in the degree to which they narrow their social interaction. Indeed, by this narrowing, one can, at times, diagnose an organic lesion before neurological signs appear. Such patients minimize the element input rate in order to reduce the appearance of mismatch and thereby reduce the painful mental state caused by a high modeling rate.

2. CHANGE IN FILTERS h_i^t

Another way of controlling model-formation rate is to change the intensionality of the model while preserving its extensionality. If the rate is too high, one remodels events in such a way as to construct something of a non-discordant nature. This is often seen in the familiar reaction to news that someone close has died in battle. Relatives frequently are convinced that these are errors in telegrams, that the body was not properly identified, and so forth. This is the clinical defense of denial.

Rationalization is another variety of filter changing. The fable of the "sour grapes" or the story of the "emperor's new clothes" are well-known examples of fitting sensory data to special models. In these cases, the implications of the models, "sour grapes" or "special cloth," are such that

less personal discomfort is sensed. Pathologic lying is a clinical example of this nature. The few elements of reality are nested inside a model whose entailments are more compatible with the wishes of the liar. However, it often requires, in addition, the fabrication of input elements (the enlargement of the model) and so represents a hybrid change of both input elements and filter.

Scapegoating or blaming is another device by which people reduce the amount of data they feel it is necessary to process. A simple model provided for ordering events casts bad characteristics on the scapegoat and reserves the self for highly valued characteristics. Groups can often provide mutually supported models that avoid the threat of intrapsychic conflict in values in its members. Groups guarantee mutual support and esteem, fulfilling vital needs for the individual, and support themselves in what might otherwise be unacceptable behavior.

3. CHANGE IN CONTEXT

Formal religions determine contexts that reduce the amount of mismatch encountered in daily living. All major religions (a) negate the endedness of death, (b) prohibit the promptings of certain emotions, and (c) insert supposed predictability into a world where dangers and the unpredictable, in fact, abound on all sides. Many religions insist not only on an absolute ordering but also on a set of rules by which the ordering can be manipulated. The prophets in the Old Testament predict misfortune as resulting from failure to follow the rules of the Lord as expressed in Abrahamitic and Mosaic covenants. In the context of a reward-and-punishment schema for keeping the true faith, misfortune is believed to be predictable. In the utterances of the prophets, we see an insistence on a well-ordering of the future despite the fact that the future is increasingly unpredictable as one looks ahead. The prophets claimed to possess the capacity both to peer into the future and to detect the rules by which events can be manipulated.

III. Affect States

Phenomena such as pain, hunger, sexual lust, pleasure, satiety, and so forth, are evidently over-all mental states that are not models of any specific set of events. They are representations of inner mental states associated with the set of entailments on a given model in a given context.

We call these phenomena our "feelings" or "emotions." Emotions serve as a useful means of classifying models according to their predictions or entailment sets. Preliminary to an understanding of affect states, we require formal representations within a modeling system of (1) integrity, (2) need fulfilment, and (3) ego boundary. The affect states are determined by varying degrees of fulfilment of these concepts in varying combinations.

A. DEFINITIONS

1. INTEGRITY

We start from the tautologic center that a modeling system, in order to maintain its integrity, must form models. Stated formally: given a modeling set B, a set X, and a filter h, there then exists an induced filter h' between the X' and B' that fulfils the model conditions. If the above holds, then the system can be said to have integrity. That is, $\text{Mod}(B, X, h)$ exists.

2. NEED FULFILMENT

Given an organizing system P, which forms a model of itself, defined as $\text{Mod}(B, P, h)$, then $NF(P)$, to be read "the need fulfilment of an organizing system, P," $\triangleq \{Db[\text{Mod}(B, P, h), \text{Mod}(B, X_i, h_i), \mathfrak{C}_i^*]\}$ for each i (refer to the definition of "ought" in the value-theory section). That is, the need fulfilment of a biological system is defined to be the set of all ought propositions that state "the model of my self (Mod, B, P, h) ought to be some other model." One notices here that the proposition "ought" conveys both the lack of the desired state of the system and the need to match the desired model.

We make no attempt to explain why the subjective mental state of an ought proposition may be metaphorically described as a pressure or a tension. We wish only to recognize the phenomenon and provide an adequate representation. Ought propositions clearly lead to a change from one state of a system to another, and that is sufficient.

3. EGO BOUNDARY

By the term "ego boundary," we refer to that which a person considers a part of himself. One's body image is an obvious component of one's ego boundary. Metaphoric identification of self and object results in other ego-boundary inclusions. An example is a mother bear's shared identity with her cubs; she responds to an attack on them as she would to an attack on herself. Another is the joys and hurts one feels when his team wins or loses. Loyalty to country, epitomized in the heroic self-sacrificial defense of a symbolic banner, reveals the extent to which such ego-boundary inclusion may go. But, by the very nature of metaphor, such identifications are always less than total. Further, one person possesses numerous identifications, many of which may overlap one another.

Ego-boundary inclusion at times also connotes the concept of possession. We usually wish to possess or be possessed by what we love. By possession we refer to the existence of a potential of maximal fulfilment of needs. In addition, possession often connotes the capacity to alter some of the behavior (or structure) of the object so as to make it conform to selected valued inner models.

Formally stated, EB, to be read as "ego boundary," is the equivalence class of models metaphorically identified with the model of self, relative to the need fulfilments, that is, $EB \triangleq \{\text{Mod}(B, X_i, h_i)\}$ such that, for each i, $\text{Met}[\text{Mod}(B, P, h), \text{Mod}(B, X_i, h_i), \mathfrak{C}_i^*]$ holds. While ego-boundary figures prominently in all of the affect states, it is particularly relevant to that of the love affects.

B. EXAMPLES

1. LOVE

We define the love affects in terms of the presence of (a) the promise of satisfying need fulfilment (often, but not necessarily, bilateral) and the assurance that the need-fulfilling supplies guaranteed by the object will be present in the foreseeable future; and (b) a sense of inclusion of the object into the ego boundary. Before we enter into a discussion of the love affect, let us present the underlying logical structure formally.

Definition of "love."—$Lv(P, X)$ to be read "P loves X," satisfies the set of the following conditions: (i) $\text{Mod}(B, P, h)$ is a member of $EB(P)$; (ii) there exists an ought diagram $Db[\text{Mod}(B, P, h), \text{Mod}(B, X_i, h_i), \mathfrak{C}_i^*] \in NF(P)$; and (iii) $\text{Mod}(B, X, h) \to \mathscr{V}'$, such that, under $\mathscr{V}'$, $G[\text{Mod}(B, P, h), \text{Mod}(B, X_i, h_i), \mathfrak{C}_i^*]$. Let us expand on this formal representation. Condition (i) states that the first prerequisite for P's loving X is its having the model of X as part of P's ego boundary. Condition (ii) indicates that P has an "ought diagram" that has to be fulfilled in the set

{NF}. Condition (iii) says that φ' is the ingredient that makes Mod(B, P, h) a good Mod(B, X_i, h_i).

As in any affect state, the intensity of the affect is graded. With regard to love, the grading depends on the value of the anticipated need fulfilment as well as the enhancement of personal value via mutual identification. When, for example, the needs to be gratified are limited largely to immediate erotic sexual pleasure and do not encompass broader tender and/or supportive considerations, the love tends to be readily displaced and the concern for the partner to be limited in scope. Thus, prostitutes are more readily replaced as love objects than spouses whose marriages have been harmonious, that is, Mod(B, Wife, h) → $\{\varphi_k\}$, where $\{\varphi_k\}$ has more "completion maps" than φ_a from Mod(B, Prostitute, h) → $\{\varphi_a\}$, formally, $k \gg a$; that is, prostitutes offer fewer fulfilments than a spouse, owing to the central role of metaphorical identification in the love affect. Narcissistic as opposed to object love is a value grading in this sense.

While sexuality is a frequent accompaniment of the love affect, it is obviously not an invariant component—at least in the context of our very broad definition. Nonetheless, sexual interaction readily fulfils the criteria of need-fulfilment "ought diagrams." It is self-evident that love may exist for friends, groups, objects, and so forth. *The opposite of love is not hate but, rather, an absence of any metaphorical identification whatsoever, namely, indifference.*

The foregoing formal representations of integrity, need fulfilment, ego boundary, and love affect are prerequisites for the development of the remainder of our theory of affects. We view the other affect states as entailed by interferences of one kind or another with the smooth completion of a need fulfilment.

2. ANXIETY

Given a model, designated Mod, that entails a threat to the integrity as defined above, represented by the entailment diagram Mod, → (Threat to integrity), anxiety is the affect state entailed by this diagram: [Mod, → (Threat to integrity)] → Anxiety. Two cases may be distinguished.

a) The first are models whose predictions entail malfunctioning filters, represented as: [Mod, → $No(h)$] → Anxiety. Anxiety, which may be subdivided further into: (i) when Mod, entails physical damage to an organism directly (e.g., prediction of loss of a hand is an obvious prediction of a loss of a need-filling component inside the ego boundary), (ii) when Mod, entails loss of need-filling supplies. This latter would be equivalent to stating, "It is false that there exists $\varphi' > \varphi$ in the ought diagram of need fulfilment." Therefore, we have both "$\varphi' > \varphi$ must exist" and "it is false that there exists a $\varphi' > \varphi$." This contradiction prohibits modeling.

b) The second case is chaotic non-modelable inputs represented as: [Mod, → $No(h')$] → Anxiety. That is, the prediction is made that no map h' exists and therefore that no model can be formed. As we noted in the previous section, chaotic inputs of a prolonged nature generate this prediction, which, in turn, may be attended by maximum anxiety (terror, panic). We observe this in natural catastrophes, celestial displays, some psychotic states, and so forth. From the concept of the multiplicability of models, it follows that the integrity of the over-all system is a function of the integrity of local regions. This could explain why even a small threat (mismatch) can command immediate corrective attention at the highest levels of a person's awareness.

Anxiety, as such, is sensed directly both in terms of the underlying physiology of flight and in terms of appropriate avoidance imagery. Pharmacologic dissection of the anxiety affect appears to be possible by means of tranquilizers and hormones. Thus, trifluoperazine can reduce greatly the sensations of anxiety but still permit avoidance thinking to operate. The sensation of anxiety may be produced by l-thyroxine in excess (as in Grave's disease) without avoidance imagery [7]. (Interestingly enough, without the sensation of anxiety, avoidance thinking feels less intense and proportionately weakens avoidance of hazard.) For example, under the anxiety-allaying influence of alcohol, people may not avoid an otherwise apprehensively regarded situation, to their later chagrin. Anxiety affects promote behavior that attempts to forestall a threat to the integrity of the organism. Anticipating the rest of our treatment of the affect states, we note that after such a threat has been carried out the depressive affect predominates; when integrity is not threatened, but avenues of achieving need fulfilment are temporarily blocked, anger results.

Models that predict immediate situations of threat to one's integrity evoke anxiety graded proportionally to the amount of damage predicted. If non-immediate threat is anticipated, we experience worry, apprehension, dread, and so forth. Fear of the dark is a common form of anxiety;

the inputs are insufficiently clear to evoke and hold a model. Bereft of a context of safety, mismatching often moves to fear of danger and then to threats to the integrity of the organism.

In situations such as a child's fear of stairs consequent to having fallen and hurt himself, or his apprehension at the arrival of a babysitter who portends the loss of comfort of the parents' presence, the anxiety manifested is usually regarded as appropriate or understandable. However, if an adult is fearful of traveling alone, or even of taking a taxi unless accompanied by his or her spouse, he or she is usually regarded as neurotic. The defensive response is unchanged; however, the representational nature of the situation is no longer obvious. In other words, the anxiety manifested is normal; however, the entailments of the model that gave rise to this anxiety in our adult phobic personality are at fault.

The ways in which an organism protects itself against anticipated damage are the same, whether the expected damage be of a specific physical nature or of the more representational symbolic threat of loss of caretaking. Immediate avoidance, withdrawal, or constriction of general activity so as to minimize or eliminate the predicted danger is typical. However, if it is not possible to eliminate the threat by avoidance behavior (e.g., where the threat is intrapsychic), the organism has resort to the mental regulatory mechanisms mentioned above in the discussion of regulation of mismatch. The "counterphobic" daredevil repeats a situation fraught with peril in order to demonstrate to himself that he is not afraid. That is, the entailment of the danger is negated by denial and changed to one of safety: "You see, I was not injured after all." He is altering the structure of the model entailments, whereas the "phobic" response removes the person from the input elements that generate the model and its entailments of danger.

3. GUILT

Guilt is in the same general category as anxiety. While evidently it carries an anticipation of threat to the integrity of the organism (punishment), the structure of the punishment is internalized; that is, the punishment is carried out, in effect, by the person on himself. Observation of children leads one to recognize that the formation of the sense of guilt is a latecomer to the scene of mental development. (In fact, in some individuals, it never seems to appear.) Freud was the first to recognize that

the sense of guilt was related to the internalization of the value schema (approval or disapproval manifested in the rewarding and punitive behavior) of the parents or parent surrogates [8].

Before the sense of guilt appears, the child anxiously anticipates externally originated punishment for a misdeed; in contrast, the conscience-stricken child no longer loves himself. That is, he predicts that some of his need-fulfilment diagrams (induced by identification with parental figures) are incapable of completion. The puzzling paradoxical "needless" provocation of punishment by a child is often caused by the need to assuage a sense of guilt. For punishment by a parent generally also has a prediction of "after the punishment, you will be loved and comforted again." (The need-fulfilment diagrams will be completed.) The punitive act on the one hand is a threat to the integrity of the person, but, on the other hand, it recalls the person to the fold. Thus, penance and the confessional hold their promise. The alternative, namely, the inability to regain the parental type of love, is far more terrifying. This can produce massive anxiety or (as will be seen in the next section) depression as well as guilt. The child punishes himself to relieve the oppressive sense of a loss of self- (= parental) esteem; in adults, we call the behavior masochism.

In summary, the sense of guilt is, like anxiety, a prediction of a loss of love supply (= threat to integrity); but, in contrast to anxiety, the threat is intrapsychic, consisting of diminished regard for oneself. Thus, in order for guilt to appear, the child must identify himself with the parent.

4. ANGER

Another important category of models are those that predict blocking of, or incompleteness of, an ought diagram. The incompletion is predicted for the immediate foreseeable future but is not sensed as "forever."

Such predictions of incompletions correspond to the disappointments of common experience. The resultant affect constitutes the irritation-anger-rage group.

Anger and rage are brute-force means of attempting to manipulate events so as to fulfil some ought diagram in the situation where ordinary solutions have failed. The diagram may call for physical freedom, or relief from hunger, or diminution of fear, and so forth. Whatever it might be, we regard the incompleteness of the need-fulfilling ought

diagram as generating the state of anger. An example evocative of the anger-rage group is the failure to obtain a desired response when heretofore the demand for succor was followed reliably by fulfilment. The kicking of the coin-dispensing machine when it fails to perform adequately is an example of brute force, an angry approach to a failure to complete an ought diagram.

Of course, other affective states may occur on ought incompletion. For example, if consciousness of anger itself has the predictive set, loss of parental love, it may pose a major threat to the individual. He then experiences anxiety as well as rage. Jealousy and envy also involve incompleted ought diagrams.

Suicidal and homicidal impulses are extreme examples of such conditions. Thus, the spouse who sees his mate taken from him by another may respond with intense homicidal rage because of the threatened major loss of supplies of love. It follows that one means of quantifying how angry a person might be is related to the grading of the values involved. A non-parametric value grading would provide a means of ordering anger responses.

5. DEPRESSION

Depression is generated by the category of models that entail the prediction: "The need fulfilment that is desired is hopeless of being achieved." The hopelessness must not only hold for the immediate foreseeable future but also be sensed as "forever hopeless." Thus, when needed love, esteem, or succor are sensed as having been irretrievably lost, the feeling tone that results is one of profound depression. Preconscious awareness of a loss may be seen clinically in apathy, complaints of fatigue, boredom, and so forth; in these conditions, conscious modeling of a sense of hopelessness does not exist. Only after construction of a model explaining the current behavior is the issue of hopelessness brought to light (and, with it, the sense of grief or depression). The de facto state of "no solution" to any problem (or, alternatively, the fact that the reaching of a desired goal is viewed as impossible) is attended with the affect of depression, in proportion to the need-fulfilment investment of the problem.

The depressive affect state resembles in structure the affect state of anger. Both affect states ensue from the prediction of a failure to reach a desired goal (complete a need-fulfilment diagram). The intensity of both is proportional to the value attendant on completion of the diagram. However, where the anger response follows a model that predicts the failure in "immediate future only," the depressive response follows on a prediction set, which, in effect, states "failure for foreseeable future (i.e., forever)."

The clinical entity of "depression," then, is not an illness but, rather, an appropriate (total) response in mental programing to the perception that, somewhere, some vital need, some desired goal is hopeless of being achieved. Similar to anger, the physiological concomitants to the mental state are appropriate, here being adjustments to the condition of energy conservation and watchful waiting. The illness, if any should exist, lies in the falsity of the modeling process.

As with any affect state, when appropriate behavior does not ameliorate the affect, the defensive power of the mental regulatory mechanisms is brought to bear. Denials of the model that predicted hopeless loss of integrity, change in scene to avoid input that calls up the loss, change in context so as to diminish the value ($\equiv$ intensity) of the loss—all may be employed.

Finally, the loss of integrity can be anything included in the ego boundary, the value of which is largely proportional to the number of diagrams rendered non-commutative by its loss; that is, the value of k in $\{\varphi_k\}$.

IV. Pathology

S is pathological to P, in the context $\mathfrak{G}^*$, to be written as $\pi(S, P, \mathfrak{G}^*)$ if, and only if, (1) the following models exist: (a) $Mod(P, R, h')$, the model normative valuer's model of the situation R; (b) $Mod(S, R, h)$, the model an S has of R, hereafter symbolized by $\Omega(R)$; (c) $Mod[P, \Omega(R), \varphi]$ the normative valuer's model of S's model in the context $\mathfrak{G}^*$; (2) $B\{Mod[P, \Omega(R), \varphi], Mod(P, R, h), \mathfrak{G}^*\}$, that is, "$S$'s model of R is bad"; (3) $\Omega(R)$ is a threat to P's integrity.

Given conditions (1) and (2), condition (3) determines whether or not P considers S pathological. Many situations arise in which S considers S to have "bad" models of a situation. For example, P may consider S's taste in music (R) as execrable, yet not class S as pathological. P regards S as a pathological modeler only when P can say, "If I were to model that music like S, my integrity would be threatened (I would be a pathological modeler)."

Our definition of pathology is based on the concept of "incorrect" match. More precisely, from condition (2) we notice that, with respect to the two systems involved, the model of an event, R, generated by one of the systems, S, is valued as a "bad" model by the other system, P. In the context of a psychiatric setting, the normative model of R is held by P. In our schema, pathological diagnosis is always a function of the viewer; we conclude that *nothing is intrinsically pathological*.

When the consensus of the professional viewers is very high, one can easily lose sight of this relativistic framework of the diagnostic operation. Thus, little disagreement exists regarding the diagnosis "bitemporal hemianopsia." The question whether such a visual field defect was pathological generally would be regarded as absurd. On the other hand, where poor consensus exists, the question, "Is it pathological?" evokes heated controversy. Whether shaking one's fist is pathological may depend on whether one is a Kleinian, orthodox Freudian, or a Jungian psychoanalyst.

To summarize: (1) Both diagnosee and diagnoser must each have a model that maps a mutually viewed domain; (2) the normative comparison model the diagnoser uses, regardless of its relative complexity, is taken as "more correct" (i.e., he regards S's model largely from the point of view of discrepancies or differences from his own model); (3) the "incorrect" model so judged by the diagnoser is regarded (via identification) as a threat to his own integrity; and (4) the diagnosee person, S, operating under the aegis of the model in question, if conscious of the model, perceives it as a correct match to events; if not conscious, but preconsciously aware, he operates in complete concordance with the presumed presence of the "incorrect" model. Pathology then follows the value paradigm of "my model is better than your model" (relative to some context).

The decision as to what constitutes a threat to integrity has been presented as being based on the viewer's need-fulfilment systems. A person is often his own viewer, making value judgments on his own behavior. One frequently encounters a situation in which the patient views his own behavior as pathologic but the psychiatrist differs. The patient might view his own thoughts of envy as, say, dangerous, threatening loss of self- or others' respect and so forth. The psychiatrist, in contrast, may regard the envy not as pathologic but, rather, as a healthy state. He might say, "After all, as we review the situation, there is good reason for you to feel envious; you would not want to be a stony, indifferent, narrow

person. Perhaps it is better to have this unpleasant mental state than to pay the price of its prevention (by denial, isolation, and so forth)." Which one, psychiatrist or patient, is right depends on the evaluation of which specific needs must be fulfilled to insure the integrity in question. Everyone is his own or someone else's psychiatrist at one time or another.

In clinical practice, both psychiatrist and patient-modeling systems generally choose as their criterion of value the predictive utility of a proposed model regarding the patient's behavior in the future. They assume continuing reformulation of models by both therapist and doctor, so that a composite identity map will result in each area discussed. Of course, many other criteria are used: freedom from painful affects, increased work productivity, more pleasurable sexual intercourse, and so forth.

The psychiatrist's modeling system is generally viewed, a priori, as the better one, and its rules are treated as paradigms for the modeling. The task is for the patient to reorganize parts of his thinking into an identity with parts of the psychiatrist's thinking. The doctor is implicitly nearly always right (even if he does not explicitly state so). The sicker the patient, the more likely are the doctor and the community to believe that their model of reality is correct as opposed to the patient's. The consequences can be tragic when the socially structured models are in error.

Frequently, in therapy, both modeling systems (patient and doctor) view themselves, a priori, as possessing the correct model, and the task of collaboration is seen then as one of inducing into the partner the identical model one has in mind. This is, of course, the condition of stalemate. A particularly unfortunate example is the situation where, owing to a failure to grasp different meanings for the same words, neither partner recognizes the fundamental mismatch in their respective models. Both register an identity between their respective models; nonetheless, the identity is achieved only by means of a non-isomorphic transformation between the language of the patient and the doctor. In any case, the psychiatric setting always carries the implicit context that the aim of the communication exchange is to arrive at some agreement on "what is so." The patient may not have agreed to this contract, but the psychiatrist certainly holds this goal.

All the above applies to any interaction that aims at mutual understanding. In the diplomatic setting, the question of which side models correctly

often takes on the religiosity of the value system of each participant. The problem of making exact isomorphic transformational intermediates between two such systems as well as *quantification* of such intermediates is yet to be explored. One cannot help thinking that such analysis would promote human survival and international co-operation.

CATEGORIES OF PATHOLOGY

Since valuation and need fulfilment are relative, pathological diagnosis based on differences in estimate of a threat to one's integrity constitutes moral valuation. We shall not expand this aspect of mental function in the present essay. Rather, we assume, first, that the question of threat to integrity is established—being a meta statement in any case—and, second, that the viewing system has performed the valuation that X's model is a bad model. We recognize that all categories of pathology are, in principle, arbitrary in their subdivision. Their acceptance rests on their workability and utility.

We distinguish first two broad classes: (1) ineffectual modeling owing to the presence of a learned modeling procedure in a physiologically normal brain and (2) ineffectual modeling in a brain damaged structurally or biochemically. The attempts to regulate model-formation rate, affect states, and so forth, still go on in a structurally or biochemically defective brain. But, clinically, the distinction of "organic" versus "functional" pathology remains a useful one. We shall examine first the functional pathologies, then the organic states.

1. FUNCTIONAL PATHOLOGY CHARACTERIZED BY THE OPERATION OF AN INAPPROPRIATE CONTEXT

Two forms may be distinguished: (a) $\{h^t\}$ are inappropriate, and an incorrect model ensues; (b) modeling is correct, but the entailments drawn from the model are inappropriate.

a) When selections of incoming elements are viewed as threatening the integrity of a person, an h^t may be selected that blocks construction of a threatening model. Expressions like "he sees only what he wants to see" and "look at the good side of it" are familiar to all. Cases of amnestic fugues, hysterical blindness, and posthypnotic suggestion may not "see" what is obvious to all.

Some cultures classify the presence of certain signals in the mind as taboo events. In these cultures, one must not covet, lust, feel anger, and

so forth. The presence in the mind of, say, lustful thoughts is seen as pathologic by the culture. Thus, in the book *The Devils of Loudun* [9], the Mother Superior's lustful thoughts were viewed as signs of evilry, that is, pathologic. If we regard such affective states as lust, envy, hate, depression, satiety, and so forth, to be signals telling the conscious perceptive mind how it stands regarding its needs, we would classify as pathologic all efforts to exclude affect states from the conscious mind. Such suppression of affective signals would be akin to forbidding perception of the pain of a sprained ankle or a pang of hunger; tissue damage invariably follows suppression of such informative signals. Failure to solve emotional problems with subsequent social decompensation or psychosomatic illness conceivably could be the result of forbidding perception of affect states. We wish to emphasize here that what one feels is entirely different from what one does.

On the other hand, in a context where affective sensitivity is a hazard, the presence in the mind of these emotional signals might be regarded as pathologic. A monastery, a nunnery, or a submarine imposes limits in tolerable affective states that are far more stringent than in looser societies. In a busy admitting room of a hospital, a physician probably would be overwhelmed with painful affects were he not able to protect himself by means of the mental regulatory mechanisms. In these cultures, the emergence of the affect states would be regarded as pathological. Again, *pathology is always relative.*

It appears that many intense affect states, if prolonged, evoke characteristic defensive thinking. An example of this may be seen in the defensive efforts against the pain of loss of a loved object. In the mind of the bereaved person, there usually appears some form of the idea that death did not mean, in fact, a loss. It is often held that the person who died goes on living somewhere, or he is considered to be living in his children, his political party, his works, or his students, and so forth. The sense of his presence is maintained by the bereaved, denying the true impact of the irrevocable loss of affection and interaction with the deceased. Denials may appear in the form just indicated, or, in pathologic extreme, global denial of the death occurs; the person is literally believed to be alive. A curious example of this inability to accept the reality of death is seen in those people who have made serious attempts at suicide, surviving only by accident. Almost always, the fantasy of the suicidal person has carried

the conviction that somehow he would be aware of the behavior of the bereaved. The suicide becomes a retaliation against the bereaved-to-be. By his own death, he often feels that he deprives the bereaved of a sense of needed supplies and, in so doing, reverses the condition of having lost a love at the hands of the bereaved and forces the bereaved to be the one who feels the depression [10].

Denial requires continuous work on the part of the person who maintains such a denial. The breakdown of the defense, seen in psychotherapy when the person begins talking in earnest about the loss, is a dramatic event. Grief, previously held in check, pours out. The necessary reconstruction of the patient's love relationship frees him from the restraints of the denial. For, to the degree that the lost object remains an active participant in the emotional transactions of the mind, the patient is not free to form new love relationships.

b) *"Incorrect" entailment.*—We ask the reader at this point to call to mind the imaginary experiment described in the introduction. In this thought experiment, we introduced the idea of mismatch between internally generated models and sample models generated by later events in a given contextual framework. We noted that in the experiment one's response to the mismatch was to seek a change in context. Faced with a mismatch between prediction and actual event, the ongoing context is discarded and a new one sought whose selected predictions would eliminate further discrepancy.

Let us recognize first that such mismatch must not be momentary. How prolonged it must be is uncertain. It is our hypothesis that nature has already supplied us with many such experiments in the schizophrenic population, particularly the chronic paranoid state.

Catatonic chaos frequently ushers in a functional schizophrenic psychosis. After a period of mounting psychic tension, a break occurs, at which point every evasive mental maneuver possessed by the patient is pressed into action. The hormone profile reflects the profound terror of the patient. Before the era of pharmacologic intervention, catatonic furor could terminate in fatal exhaustion. More usually, by dint of wet packs, hydrotherapy, patience, and reassurance, the furor subsided, only to be replaced by a fixed paranoid system. (Here, too, the endocrine profile parallels the behavioral shift [11].)

We hypothesize that the clinical schizophrenic psychosis is a normal reaction to chaotic inputs. The generative cause of the chaotic material hardly matters, so long as the material that appears and remains in consciousness cannot be integrated into the rest of the person's modeling system. Some examples follow.

A patient, attempting desperately to evade a growing consciousness of his homosexual wishes, suddenly hears a voice calling him a "queer"; a young man (whose mother, a seductive divorcee, was wholly enthralled with her son) is overwhelmed with utterly impermissible incestuous strivings and develops an acute hallucinosis of a clearly sexual genital nature; an army inductee, bayoneting a dummy victim, suddenly realizes he would like to do the same to his father and breaks into catatonic furor and then catatonia. All these are schizophrenic reactions.

But, also, a heretofore stable professional man with a cerebral arteriosclerosis develops Grave's disease and with it an acute paranoid psychosis; a fifty-eight-year-old lady develops insidious myxedema and a similar psychosis; and an alcoholic develops his first hallucinatory attack. These patients also exhibit schizophrenic symptoms. However, when their metabolic and enzymatic defects are corrected, the latter group recovers. But also, when the "functional" patients worked out the issues of their earlier unacceptable impulses and could find tolerance and understanding for them in an everyday world, they too recovered. How are we to explain recovery in these widely varied situations?

We hypothesize that a schizophrenic patient possesses a conventional repertory of filters $\{h^i\}$ with which to order routine events but in the acute state is faced with a chaotic ordering of inputs from parts of his brain in the form of part-model fragments. These fragments may appear as a result of the failure of previously successful mental regulatory mechanisms, which, up to that point, had screened intolerable material from consciousness. Or they might be due to biochemical, metabolic, or structural derangements in neuronal function, resulting in generation of spurious models. Such intrapsychic events must be structured by the victim, that is, framed by a compatible context in order to have a coherent matching program continue. Either way, the amount of mismatch would be large, and therefore the amount of attention to it would be very great. Consequently, fatigue, initial excitement, panic, and so forth, which are seen clinically, would be accounted for. The delusions would be seen as normal attempts of arriving at a stable model for the chaotic event structure of the mind.

Delusions are similar to plausible models generated in a normal mind and tentatively held as explanations of an unpredicted event. The fact that reversible psychoses due to temporary hormonal, pharmacological, or metabolic derangements are virtually indistinguishable from functional schizophrenic psychoses lends support to our view of schizophrenia; namely, *any* disordering of mental function productive of inner mental chaotic experiences, if prolonged, leads to an urgent need to structure the experiences and in so doing, generates psychotic delusional behavior. It is not that the brain as a whole is disordered but only that chaotic inputs to one's modeling system appear. The characteristic paranoid structure is the end result of model-matching in a workable (although delusional) context. It represents a relatively stable explanatory system, appearing after subsidence of the acute catatonia.

In the context of a paranoid world view, a prosaic word or gesture may occasion intense terror. For the paranoid system must serve primarily to provide an entailment schema that embraces and buffers the unacceptable ideation, be it a product of incompatible wishes or disordered physiology. But its own strange, contextual structure prohibits much communication with a non-paranoid person, because the paranoid context selects out unexpected meanings from the most commonplace human communications.

2. ORGANIC PATHOLOGY

In patients with organic brain syndromes, the confrontation with discrepancies in their ideation produces consternation [12]. When confronted with the mismatch of their recollection and the presented information, they defend themselves with massive denials. Usually, they fabricate some plausible model of the past that is compatible with the current events. That is, faced with discrepancies, they generate their own input data.

The preference for the familiar and the routine on the part of the brain damaged is the obverse of their dislike of the unpredictable. The concept of a model-forming rate would provide a convenient metric for study of these phenomena. For what is common to all brain damage is the inability to switch context and models at the usual rates. Thus, the brain-damaged individual elects for increased routinization (redundancy) in his life. Novelty must be introduced in small amounts.
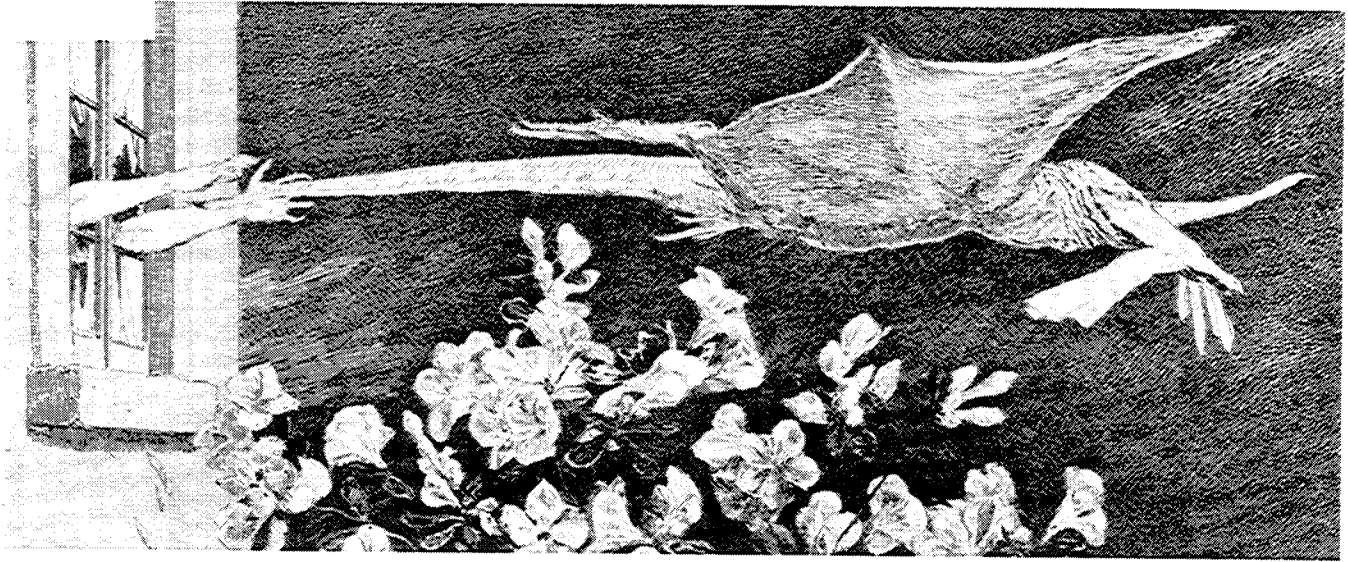
3. PSYCHOTHERAPY

In psychotherapy, the decision as to what constitutes pathology is obviously a juridical process, often with a jury of two, constituted exclusively by patient and doctor. The idiosyncratic mental voyages of such labors can, at times, touch on the most remarkable lands. What constitutes improvement is always a context-bound issue. As with diagnosis, therapeutic consensus is high in cases of severe psychotic disorders; improvement and cure are not usually debatable issues. In so-called neuroses, indexes of improvement presently lie in utter confusion. We suggest that an objective representation of pathologic diagnosis as outlined above may go a long way in establishing mutually understood criteria of improvement.

The behavioral sciences sorely need a more generally comprehensible language. We have offered the foregoing formalisms and applications of psychiatric issues in hopes of stimulating further research in this direction. Whether some, or none, of our language is useful remains to be seen. However, the importance of the problem for behavioral science, synthetic intelligence, political science, anthropology, diplomacy, and so forth, cannot be overestimated.

REFERENCES

1. A. ROBINSON. Theory of models. Amsterdam: North-Holland Press, 1965.
2. R. S. HARTMAN. The language of value, p. 206. New York: Columbia Univ. Press, 1957.
3. K. S. LASHLEY. The neuropsychology of Lashley. p. 478. New York: McGraw-Hill, 1960.
4. J. S. BRUNER and L. POSTMAN. J. Personality, 18:206, 1949.
5. A. FREUD. The ego and the mechanisms of defense. New York: International Universities Press, 1946.
6. G. ROCHLIN. Psychoanal. Stud. Children, 8:288, 1954.
7. H. T. HERMANN and G. C. QUARTON. J. Clin. Endocrinol. 25:327, 1965.
8. S. FREUD. The ego and the id, chap. iii. London: Hogarth, 1950.
9. A. HUXLEY. The devils of Loudun. New York: Harper & Row, 1952.
10. P. SIFNEOS and W. McCOURT. 3d World Congr. Psychiat., Montreal, 1960, Proc., p. 245.
11. E. J. SACHAR, J. W. MASON, H. S. KOLMER, and K. L. ARTISS. J. Psychosomatic Med. 25:511, 1963.
12. K. GOLDSTEIN. Psychiatry, 15:245, 1952.

ABDUCTION

According to W.S. McCulloch, the reticular core of the vertebrate brain, like medical diagnosticians, scientists or detectives, must use C. S. Pierce's abductive logic in order to decide how to act. By way of contrast, he maintained that motor circuits of the brain are executive (because they execute) and that they generate signal sequences by deductive logic, whereas the neocortex takes habits by inductive logic in a categorically different kind of machinery. To explicate these distinctions, I shall formalize one of McCulloch's favorite examples: let A be the proposition (x has TB), and B be the proposition (x has bumps). Then if A implies B, and A is true, we infer that B is true--that is deduction. On the other hand, we may have sufficient data about A and B to somehow inspire the guess that (A implies B)--here we make our creative leap to the rule (A implies B) by induction. Clearly, an inductive inference should never be confused with the statistical processes that engendered it.

For abduction, we refer to Bayes rule of conditional probability, which states that

$$P(AB) = \frac{P(B|A)P(A)}{P(B)} = KP(B|A)$$

for the appropriate constant K. Recalling that deduction took us from A to B, and that induction gave us the rule (A implies B); we

now define abduction as the process whereby, given B and the rule (A implies B), we decide (or guess) from $P(A|B)$ that A is either true or false, even though this decision is strictly warranted when $P(A|B)$ is not 0 or 1. Abduction, then, is a type of forced-choice diagnosis.   [W.K.]

EXPLANATION

The observer's reformulation of a phenomenon, in such a way that the parts distinguished in it appear in-terrelated (causally or otherwise). Whenever such reformulation becomes consensual at large, the explanation is part of the science corpus.

[F.V.]

EXPLANATION ·

Explanations link descriptions semantically.

(Semantic links are indicated by syntactic or ostensive flags, e.g., "because", "as...so", etc., or "see!", "hear!", etc. For instance, in the explanatory mode of causation ("p because q"): "The match is lit because he struck it." or "He struck the match because he wanted it lit"; or in the mode of metaphor ("as p so q"):

"As loud as comes the voice that is screamed out
    by a trumpet

By murderous attackers who beleager a city

So then high and clear went up the voice of Achilleus"

(Illiad, XVIII);

or in the mode of allegory ("p, see q"): "Sacred and Profane Love: see the two ladies, one dressed and the other one naked." (Titian, Galleria Borgese, Rome): etc.)   [H.V.F.]
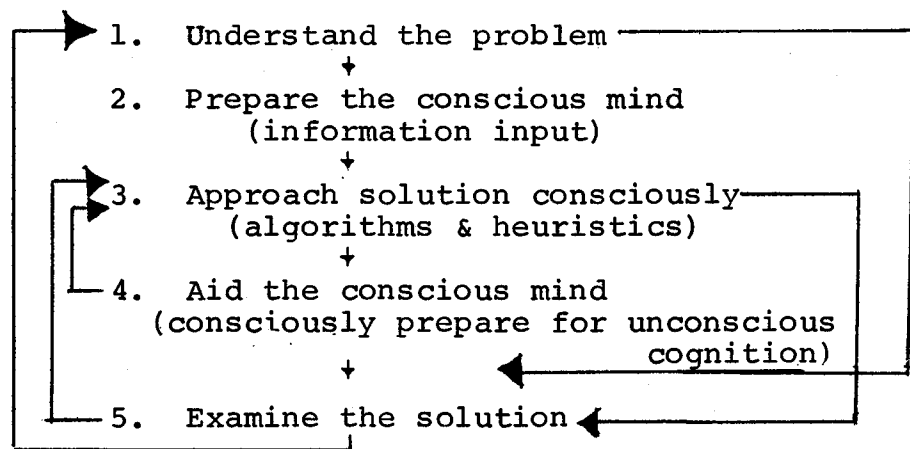
HEURISTIC

Heuristics are problem-solving strategies when no step-by-step algorithmic procedure is applicable. Polya outlines a near scientific-method heuristic in How to Solve It:

1. Understanding the Problem
2. Devising a plan (heuristically)
3. Carrying out the plan
4. Looking back

The same input-throughput-output orientation observable in the "scientific method" is clearly seen in Polya's schema, as is the last step to first step re-evaluative recursion. Polya's heuristics, as all heuristics, lend new perspectives on old problems. An heuristic creates a unique cognitive perception...an insight. Both the scientific method and Polya's first order heuristic tend to exclude unconscious cognitive activity in problem-solving situations. The reason for this oversight may be that unconscious cognitive activity is not easily consciously controlled. Such an argument is semantically contradictory. Unconscious cognitive activity may easily be put under unconscious control. A revised information-processing heuristic that infuses insight and unconscious cognitive activity with a "scientific method" paradigm might be created:

1. Understand the problem
2. Prepare the conscious mind (information input)
3. Approach solution consciously (algorithms & heuristics)
4. Aid the conscious mind (consciously prepare for unconscious cognition)
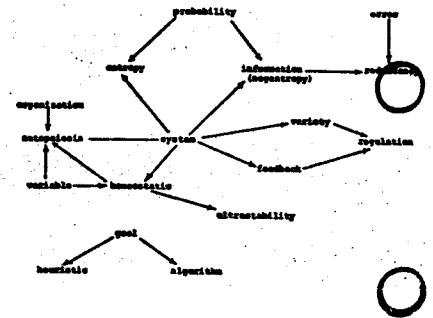5. Examine the solution

Although this algorithm conceptually overlaps with standard "scientific method" perspectives, it operates on a higher level, entailing both algorithms and heuristics, and conscious and unconscious cognition, in information flow for scientific inquiry. This second-order heuristic entails most, if not all, standard problem solving algorithms and heuristic of the first order. It models all intellectually-based creativity cybernetically. [D.S.]
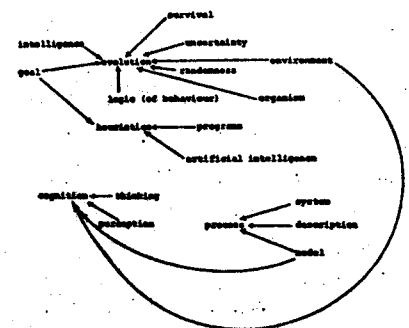
HEURISTIC

A set of instructions for searching out an <u>unknown</u> goal by incremental exploration, to some <u>known</u> criterion. To illustrate: we may reach the top of a (convex) hill in a fog, without knowing its location or height, by making every step upward.   [S.B.]

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Une nouvelle.
L'on s'occupe
activement de vous.

Renversé

Démarche sans succès
Nouvelles
peu favorables

UNE NOUVELLE

HEURISTIC

Heuristics are useful rules characteristic of purposeful behavior...methods for addressing problems of note which generally yield some degree of success. Often the heuristics are difficult to extract in that those who use them may not be aware of them. The bicyclist may not be able to explain exactly how it is that he rides.

The identification of heuristics and their replication in computer programs has yielded automata of remarkable capability in such tasks as game playing. But these programs only mimic human expertise except when they can include heuristics concerning the nature of learning. Then they may rise to a new level of artificial intelligence.   [L.F.]

Richard Herbert Howe

POSITIVISM AND REFLECTION

All models, without exception, have their origin in metaphor. A metaphor is a relationship between two substantives, namely that the one may be substituted for the other. The one substituting signifies the other. This relationship of signification requires that each substantive be non-analytic vis-à-vis the other. It requires further that the analytic predicates of each be co-extensive in part only. Owing to the requirement of partial analytic identity, establishing a metaphor requires analysis. Owing to the requirement of partial analytic non-identity, establishing a metaphor requires synthesis. Given an a priori non-identity of Subject and Object, synthesis is prior to every cognitive act with regard to both the form and the content of the act. Hence synthesis is prior to all metaphoric.

A model is a formalization of a metaphor or of a relationship between metaphors. Formalization is a metaphorical synthesis of the causality of instrumental action as embodied in instruments as objective memory of the conditions of possible instrumental action. Every instrument is thus metaphorically a model of a class of instrumental actions. A model formalizes a metaphor or a relation between metaphors in terms of the co-extensive analytic predicates of the substantives. That a model be a model requires that the model itself stand in a metaphorical relationship to the metaphor or metaphors from which it is derived. Synthesis and hence analysis are possible with regard to content only within the activity of reflection upon the phenomenology of experience. Hence all metaphoric is rooted in reflection, hence all models are rooted in reflection.

Construction of an object of experience through instrumental action in correspondence with a model results in a situation in which reflection upon the phenomenological experience of the constructed object may lead to the possibility of denying reflection. This is because the non-identical, i.e., synthetic predicates of the metaphor are eliminated in the relationship of the

object to the model. Hence in reflection upon the relationship of the phenomenological experience of the object to the model, synthesis and analysis are themselves analytic vis-à-vis one another. By Occam's Razor one of the two terms may be dropped. The causality of instrumental action is analytic. Maintenance of the object as memory and hence as the condition for possible future instrumental action requires that the term analytic be retained. Hence it is the term synthesis that may be dropped. Since synthesis is prior to every cognitive act it is prior also to the act of reflection. Dropping the term synthesis eliminates synthesis as a possible object of reflection. But reflection is itself dependent on the possibility of synthesis being an object of reflection. Hence eliminating synthesis as a possible object of reflection eliminates the possibility of reflection itself. I call this process "ontologenesis", for it describes the genesis of ontology: the view that the universe is itself in essence analytic.

Instrumental action implies control. It has its roots in modeling, metaphoric, synthesis, and reflection. Concepts arise spontaneously in the interaction of a Subject as biological mechanism with its social environment. Spontaneous, unreflected concepts are subject to the causality of their origin. The products of instrumental action are produced socially. But the relationships of the social production of such objects are not apparent in the objects themselves. To the extent that the products of instrumental action pervade not only the mediation of the relationships of social production but also the relationships of everyday life, the spontaneity of unreflected concepts will falsely subject those concepts to the analytic causality of instrumental action, and hence to the possibility of eliminating synthesis and reflection. Reflection modifies the causality of concepts. Hence reflection is a source of control of the causality of concepts, including the concepts of instrumental action. Elimination of the possibility of reflection results in relinquishing control of the products of social instrumental action to the analytic causality of the objects themselves.

In a society that produces all materials of everyday life with respect to its own self-maintenance and hence self-affirma-

tion, the spontaneity and hence all exposition and elaboration of concepts deriving only from the material exempla of everyday life will bring those concepts into an affirmative relationship to the society that produced them. The conditions for the possibility of the affirmation are given in the ontologenetic process. Through ontologenesis, mere existence becomes authoritarian. Authoritarianism is the positive identification of a subject with an object of instrumental action. This holds even when the object is itself a subject, for the relationship of control or domination excludes through its analysity the synthetic ground of all intersubjectivity, which requires the negativity inherent in the nonidentity of Subject and Object. The loss of negativity, which as condition for synthesis is condition for reflection, stands in direct proportion to the permeation of everyday life by the products of social instrumental action.
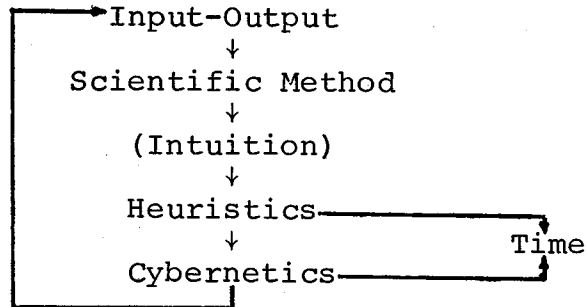
Loss of the metaphorical, synthetic, reflexive relationship through the ontologenetic permeation of everyday life by industrial and technological society lies at the root of the philosophical tendency known as Positivism. This tendency may be either manifest or latent. If latent it derives directly from the unreflected spontaneity of concepts in the ontologenetic process. This is what is called "common sense". If manifest, Positivism is the articulation of reflection upon the ontologenetic process within the frame of instrumental action. That this is so can be seen from the normative character of Positivism, which allows its subsumption under the model of negative feedback, which is the model of instrumental action. Positivism articulates the experience of common sense, it adds nothing to it.

Positivism can be reduced programmatically to the following four elements: 1) phenomenalism, which is the equation of essence and appearance; 2) nominalism, which is the denial of the reality of concepts; 3) the prohibition of value judgements in the construction of theory; 4) the assumption of the unity of science. Phenomenalism springs from the loss of the metaphorical relationship of model and object; nominalism from the loss of synthesis as a possible object of reflection; the prohibition of value judgements from the loss of negativity vis-à-vis the subject constituting the objects of theory, i.e., society. Each of these in turn

intensifies the conditions that are its source. That cannot be said of the assumption of the unity of science, although this too is a byproduct of the ontologenetic process. The assumption of the unity of science posits a substantive unity of all objects vis-à-vis which all predicates, whether of astronomy, physics, biology, or social science are analytic. This is wholly congruent with the medieval scholastic definition of God. Carried out as a strict program, the nominalism of Positivism becomes a scholastic realism; its phenomenalism and its ban on value judgements a baroque dualism;its assumption of the unity of science leads on this basis both to theodicee and to eschatology. Positivism rests on the very contradictions that the development of theology sought to exclude. In the positivistic self-reflection of science the tragedy of theology is recapitulated as farce.

*Note:
The use of the terms "synthesis" and "analysis" in this paper follows the Kantian usage. There is one meaning for the term "synthesis"; three for the term "analysis". These are as follows:

Synthesis: I synthesize the world in terms of my properties.
Analysis 1: I analyze a concept in terms of its properties.
Analysis 2: I analyze the world in terms of my properties.
Analysis 3: I analyze the world in terms of its properties.

The argument of the paper in outline is as follows: in synthesizing a world on the basis of Analysis 1 we create a situation in which Analysis 2 is replaced by Analysis 3. The consequence of this is loss of Synthesis, and History then moves behind our backs.

CONTEXT

To examine a concept, one must imbed such a concept in a context. Context can by implicit or explicit, heuristic or inhibitory, recursive or divergent. Five concepts: input-output, scientific method, heuristics, cybernetics and time can be examined in relation among themselves. Such a conceptual gestalt can be diagrammed:

```
   ┌─────►Input-Output
   │           ↓
   │      Scientific Method
   │           ↓
   │        (Intuition)
   │           ↓
   │       Heuristics──────────────┐
   │           ↓              Time  │
   └───── Cybernetics───────────────┘
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This diagram creates a schema for definitional examinations of five concepts relevant to cybernetics.
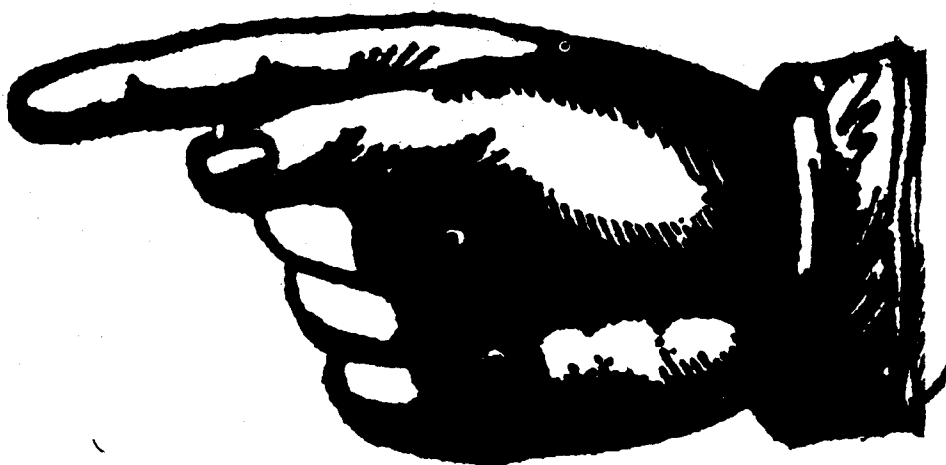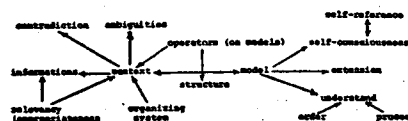
CONTEXT

The essential nature of context and its importance for effi-
cient mental organization has not been studied even though it has
been such an integral part of our thinking apparatus that we would
have had to step outside our minds in order to see how it functions.

To begin with CONTEXT has the formal, logical property of
being a selection operator on Models along with the formal struc-
ture that are attendant to formal operators. Its operational
characteristics are those of a determiner of relevancy/appropriate-
ness/sense. CONTEXT allows for the unambiguous study of ambigu-
ities or contradictions. The power of the English language is that
its seeming ambiguities are exorcised by the context they are
viewed in, thus allowing for the playing of new thoughts and the
discovery of new contexts.

CONTEXT is not background, as what determines the background
and the foreground itself is determined by the context one is func-
tioning under. CONTEXT is assigned by the organizing system to
the background so that other relevant information may be brought
to bear on the modelling of the ever changing input stream.

CONTEXT is to mental models what boundary conditions are to
differential equations (delimiting the set of all possible solu-
tions to only those that are applicable).

In order for Cybernetics to develop self-organizing systems
that mirror the organizational principles of the brain it must
first recognize the basic role of context and
then proceed to incorporate it in the method-
ology of cybernetics. [J.K.]

"Distinction is a Perfect Continence"

(G. Spencer Brown - Laws of Form)

An environment is anything not seen to be contained within a distinction.

When a distinction is made an environment is seen.

A context is a set of observed relations between an environment and that which appears to be contained within a distinction seen to be embedded in that environment.

Observers are, for our purposes, human beings. Observers can observe themselves and observe themselves observing themselves in an infinite recursive process.

All distinctions are made by an observer. The first distinction he or she must make is to distinguish his/her self from everything else.

When an observer distinguishes his/her self, he or she creates a context.

A frame of reference is a set of relations between (A) and (B). (A) is the observer's view of his/her inner state and position in the environment with respect to a distinction which appears to be outside him/her self. (B) is this other distinction and its observed context.

When an observer makes a distinction which appears to be outside him/her self, a frame of reference is created and a context is seen.

The type of distinctions made, and the nature of the observer's context and frame of reference, are determined by the purpose that the observer chooses for his/her self.

All distinctions, environments, contexts and frames of references, are always generated by an observer and are represented only in the relative states of activity of his/her nervous system.
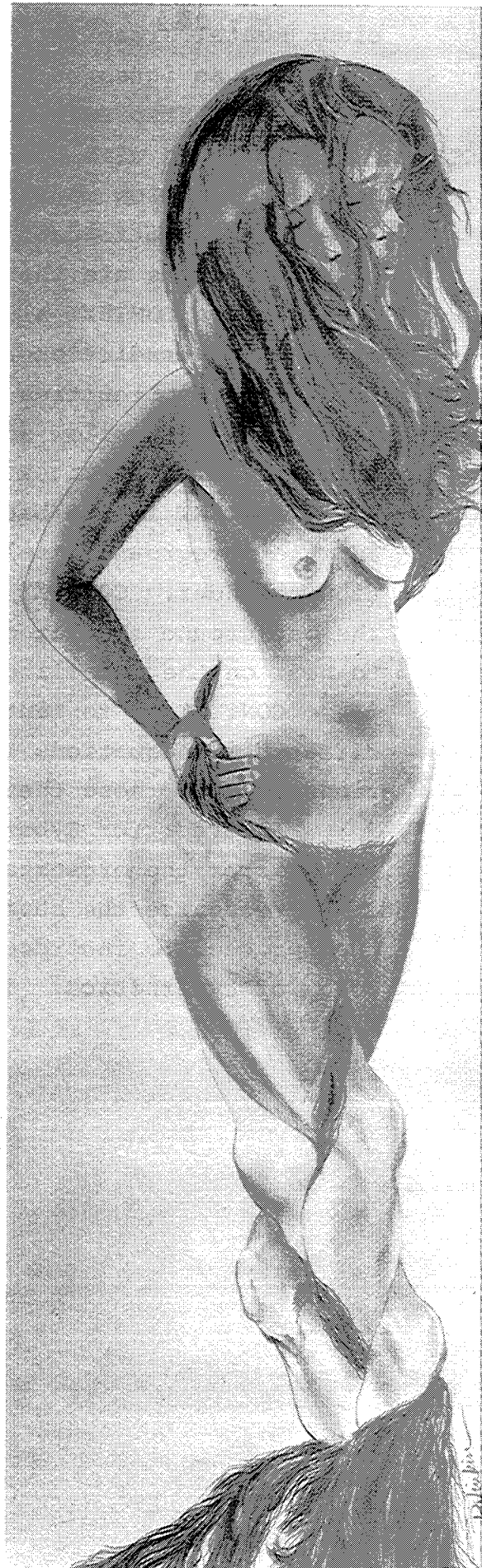
Statements imply distinctions.

If the observer's purpose is to understand a statement then he or she must generate a frame of reference. From this frame of reference he or she will observe a context in which the distinctions and the relationships implied by the statement appear to be true.

ASSIGNMENT:

In light of the above statements make a composition which can (or cannot) be understood only in ways you intend it to be. Ideally, the parts of this composition can either not be understood when taken out of the context of the whole composition, or can be understood only in ways you intend them to be.

Disagreement with the arguments presented here is no ground for rejecting the assignment. Neither is failure.

Bob and Jim Rebitzer
3/13/74
BioPhys. 199

METAFACE

Look into my eyes my friend.
    Try to see that which is me.
I am much more than a shadow
    More yet than some reflection in a mirror.
I am not a ghost
    Though perhaps that would be more easily understood.
For what a person is can be an act,
    No more than a poor illusion.
If you catch me acting
    Please tell me to stop.
Acting has its place in life's theater
    But I would not act for you.
It is hard to be a genuine person
    And still be in the play.
Perhaps that is why shadow people seem to dominate
    Or perpetuate.
See more than the appearance of a person.
    Each mask hides the same face.
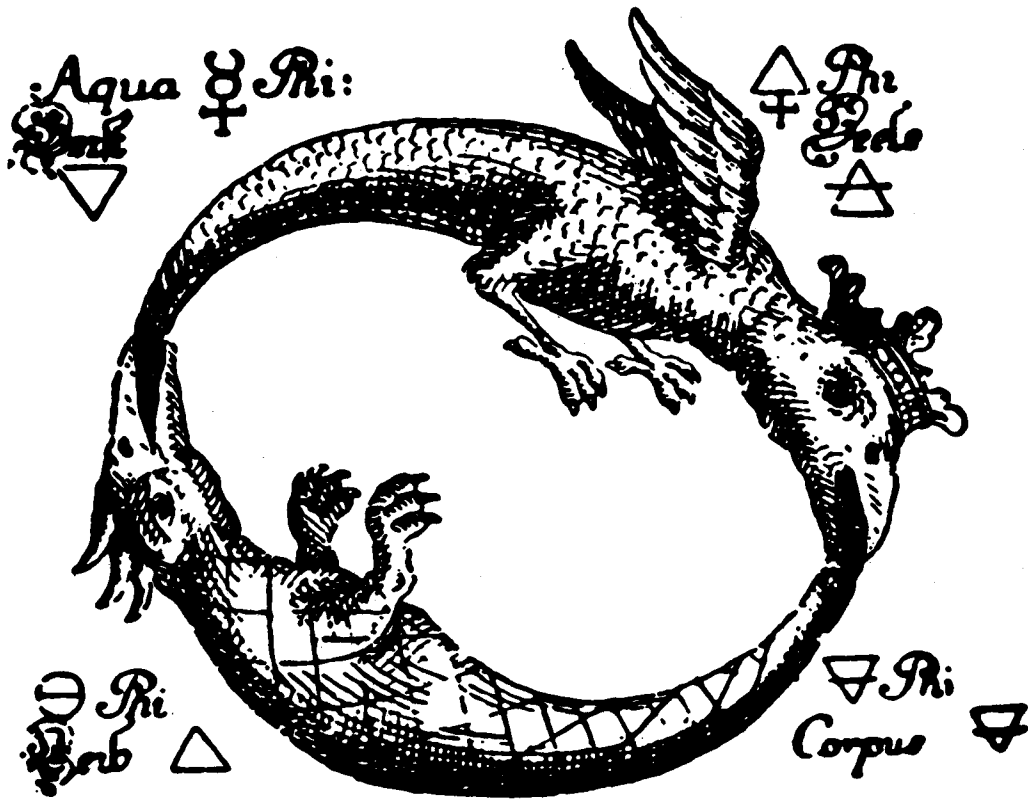
Again,

Look into my eyes my friend.
    Look through the mask
    And know that I will be looking into you.
Try to see that which is me
    And I will see you and
    That which is you in me.
I am much more than a shadow
    For though I can be seen with people,
    I do after all have life of my own.
I am More yet than some reflection in a mirror
    Though some mirrors will reflect me
    And some will reflect you.
I am not a ghost
    Yet you can choose not to see me.
    I talk to you of spirit
    And hide behind a subjective wall
    To confound your glance.
Though perhaps that would be more easily understood,
    For unlike a ghost I may be something
    Which you can not even attach a name to.
    Even as visible I remain outside your grasp.
For what a person is can be an act
    Or an Action.
No more than a poor illusion,
    I hide my illusion in a poor act
    Leaving no trace of my action.

If you catch me acting
    Know that this too may be my design.
Please tell me to stop
    So that I may change my acting
    To soothe you.
Acting has its place in life's theater
    And I choose this place in which to stand,
    For you could not bear me otherwise.
But I would not act for you
    If I thought you capable of withstanding me.
It is hard to be a genuine person
    Without rejecting me
    And becoming free.
And still, being in the play,
    You must accept me as your companion.
Perhaps that is why shadow people seem to dominate
    The world that we see in each others eyes
Or perpetuate
    This world in which I can stand.
See more than the appearance of a person
    For he will appear once and only once.
Each mask hides the same face
    But I have many masks.
    Only my eyes remain the same,
    Oppression, War, Disease, Famine.
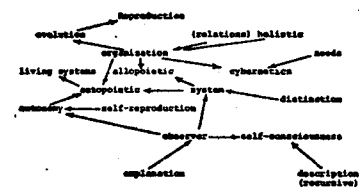
Kenneth L. Wilson

AUTONOMY

Everything said is said by an observer, yet there are systems that define their own boundaries. The concept of autonomy is thus a paradoxical relationship between an observer and such a system, which could be the observer himself.   [K.L.W.]

AUTONOMY

The quality of a system of appearing independent of the observer for its indication. An autonomous (= self-naming) system appears to be so because its realization and permanence as a system is related to its operation. Thus, autonomy is the distinctive phenomenology resulting from the autopoietic organization; its paradigm is a living system.

[F.V.]

COGNITIVE STRATEGIES

by

Humberto R. Maturana

My purpose in this article is to discuss cognition in relation to man and the unity of man, in an attempt to show that any notion that we may have about the unity of man is bound to our views about knowledge and reality. Since everything that I say is said as an observer addressing other observers, I shall consider the statement that "any human action implies knowledge" as a sufficient experiential characterization of cognition, and let any additional connotation arise in the course of the article.

A. The objectivity of knowledge.

Present views about cognition as they are generally held by scientists, both explicitly and implicitly, are founded in the following epistemological notions.

Notion 1. We exist in an objective world that can be known and about which we can make cognitive statements that reveal it as an independent reality whose validity is, therefore, independent from us as observers.

Comment: Although experientially this notion seems proven by the very circumstances that generate it, namely by our day to day manipulative experience and the predictive success of our operation as physical entities, it is an a priori notion because a successful prediction does not prove that the operation through which we make it reflects an objective reality, or constitutes an expression of our cognitive access to this reality. A prediction is a statement of what is the case within a relational matrix. Accordingly, if by some observational procedure the phenomenon considered is revealed through a projection onto a relational matrix, any statement of what is the case in that relational matrix will necessarily be observed as a state of the matrix onto which the phenomenon considered can be projected in the act of observation. Therefore, the success of a prediction only proves that a certain mapping or projection operation can be made, but does not reveal the nature of what it is that is mapped or projected.

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to a physical magnitude, even though the mathematical expression of its measure is formally similar to the expression of entropy. In engineering terms the measure of information is a measure of the frequency of occurence of a given phenomenon as a function of its probability, and as such constitutes a cognitive statement. Furthermore, it is a cognitive statement that can be used to characterize a system only a posteriori, that is, after the system has been sufficiently characterized in operational terms so that its possible states and their probabilities may be assessed.

ii) Since in order to characterize a system in informational terms one must know the system completely, doing so with an already known system is to make a trivially redundant description, and doing so with an incompletely known system as if it were known is a mistake. If, on the contrary, one attempts to design a system, the use of information concepts to assess the domain of its possible states is a non-trivial affair.

iii) Due to his cognitive operation, an observer frequently attaches semantic value to the biological phenomena considered by him as if this semantic value participated as a component in the mechanism of their realization, which cannot be the case because meaning is a contextual relation. This, for example, occurs in genetic description when one speaks about the genetic code as if the nucleic acids constituted signals in a system of communication, which is obviously not the case because they are constitutive components of the process of protein systhesis. Thus, to speak about the coding of genetic information in the nucleic acids is acceptable in a situation in which the listener essentially knows what one is talking about, but is a mistake if one wants to provide a mechanistic representation of the genetic phenomena. This problem is aggravated by a frequent confusion of notions when information and meaning are considered as equivalent in the attempt to quantify semantic problems.

iv) It is said that living systems obtain information from the environment and process it to generate their conduct, and that their organization can be characterized in terms of this capacity. That this cannot be properly be done should by now be obvious, yet let me add the following: The states and the transitions of states of any system is determined by its organization. Accordingly, the states of the sense organs and of the organism (nervous system) as well as their transitions are necessarily determined by their organizations, and the environment as a perturbing agent can only act as a historical

Notion 2. We obtain knowledge through our sense organs by a process of mapping the objective external reality onto our nervous system, accomodating our behaviour to the structure of the world revealed through this mapping.

Comment: This notion seems proven by electrophysiological experiments that show that there are nerve cells that appear to function as filters or detectors of describable environmental configurations such as edges or directions of movement. To the extent that these cells seem to reveal an independent reality, they appear as perceptual operators that represent the external world in the activity of the nervous system. The objection is rather obvious, however, that it is a general feature of all filters that their organization determines what passes through them and, hence, they can only reveal that certain mapping operations can be made. So if nerve cells do act as filters, it would not be possible to distinguish any objective feature of the outside world through them. This same criticism also applies to instruments. The genetic argument that our present day organization is the result of evolution, although valid with respect to the origin of the structure and operation of our sense organs as components of our organism, does not solve the cognitive problem. If our sense organs function as filters we cannot use them to make any objective statement about the external world--unless we possess a Maxwell's demon with access to absolute knowledge who observes the product of our sense organs' operation, and acts on this product as we supposedly do on the outside world.

Notion 3. Information represents an actual physical magnitude that can be measured objectively as a property that characterizes the organization of an observable system.

Comment: According to this notion, the organization of any system can be analyzed and described in a non-trivial manner in terms of its information content. According to this notion, also, living systems are considered to be systems that process the information that they gather through their sense organs, and thus are able to make objective statements about the outside world. The use of the notion of information for the analysis of biological systems is, however, fallacious for the following reasons:

1) The notion of information is in fact a cognitive notion that refers to the observer's uncertainty with respect to the system, situation or phenomenon under consideration, not a notion that refers

instance for their occurence, not however for their determination. Therefore any uncertainty about the course of change followed by the sense organs and the organism as a result of an interaction is merely cognitive, belonging to the domain of observation. The notion of information does not apply as a characterization of the operation of the nervous system.

B. Objective knowledge and the unity and diversity of man.
Current views about the unity and diversity of man are, generally, implicitly or explicitly, subordinated to the notions discussed above, and adopt fundamentally three forms.

Expression 1. Men are genetically equivalent to the extent that they belong to the same species, and all human diversity is either due to genetic variability within this fundamental equivalence, or to upbringing (cultural and physical environmental differences during ontogeny), or to both.

Comment: The validity of the notion of the fundamental genetic equivalence of man is not to be questioned. In fact, human membership in a single species is basic to any notion of human unity because it constitutes the condition of their possibility: Sexual recognition. Mankind is defined by the very biological operation through which men are generated. The cognitive implications, however, vary according to the notion of reality under which the biological unity of man is considered. Thus, if one accepts, as is usually done, the notion of an objective reality accessible to our cognition, human diversity, whichever way it arises, would not represent an intrinsic diversity in the cognitive domains of different men but only a circumstantial difference in their access to this objective reality. The relation between ontogeny and cognition, or between experience and cognition, under this view, is merely contingent, and not determinant.

Expression 2. Cultural differences only reflect a different mode of treating an objective reality.

Comment: If there is an objective reality, cultural differences can only represent different modes of treating it, and have no other justification than the historical contingencies of their origin associated with the basic conservatism of biological processes. Therefore, under this view the toleration of cultural differences is, by necessity, an expression of their acceptance from the perspective

of better knowledge, and not the recognition of their legitimacy as expressions of different but valid cognitive domains. Also, cultural change can only be viewed as either a social transformation towards the proper cultural treatment of the objective reality (that is, towards a society founded in scientific knowledge), or as a social transformation away from such a treatment (that is, towards a society founded on subjectivism). However, since knowledge of an objective reality could not be denied if we had it, under this view the course of cultural change can only be, in the long run, unidirectional, and social strife can only be the confrontation of truth and falsehood.

Expression 3. The cultural unity of man can only be obtained through the development of a culture in which men base their conduct on objective knowledge; that is, through the development of a culture in which men have the right way of looking at reality.

Comment: To the extent that we live in an objective world accessible to our knowledge, it seems legitimate to expect that all human differences will lose significance if indeed men learn to look at the world objectively, and to act accordingly. In fact, the belief in that this is the right approach is implicitly or explicitly present in all modern political or sociological strife, and all the parties involved adduce the argument of objectivity in support of their positions and as a justification for their intolerance and negation of other views. This is, however, the only consistent attitude possible to anyone who thinks that he has access to an objective truth, whether by revelation or through scientific inquiry.

C. Cognition as a subject dependent phenomenon.
My criticism of the notion that we have cognitive access to an objective reality is not new. In fact, philosophers, psychologists, and biologists have on many diverse occasions argued that the act of cognition is somehow bound to the knower. Unfortunately, philosophers and scientists generally feel that recognizing that cognition is a subject dependent phenomenon leads to idealism and to solipsism. I think that this should not be the case and that there are two basic sources to this fear:

i) It is difficult for us as western thinkers to imagine cognition as a subject dependent phenomenon because we live immersed in a denotative linguistic domain in which even subjective notions are

expressed denotatively, as if their existence were independent of us as observers.

ii) It seems that a biological mechanism that gives rise to an observer with a subject dependent cognitive domain in which he uses a denotative language with manipulative success is a paradox, and hence, impossible.

Although I shall not attempt in this presentation a full discussion of the problem of cognition, I shall endeavour to show that, biologically, cognition is constitutively a subject dependent process, and that solipsism arises as a problem only if we insist on demanding from a subject dependent cognitive domain the properties of subject independent cognitive domain.

Statement 1.   Cognition as a process is constitutively bound to the organization and structure of the knower because all the states and interactions in which the knower can enter are determined by his organization and structure. This statement implies the idea that cognition is a biological phenomenon.

Comment: The domain of states that a system can adopt without loss of identity is necessarily determined by the organization which defines it and the structure which realizes it. If a system is deformed in a manner not prescribed by its organization and structure it disintegrates. Accordingly, the problem of understanding the cognitive domain of a living system as the domain of its possible states is subordinated to the understanding of its organization as a living system and its structural realization as a particular concrete unity. In relation to this the following considerations are pertinent:

i) Every unity is either an unanalyzable whole (or can be treated as such) endowed with properties that define it, or it is a complex system realized through the properties of its components. If the latter is the case, the complex system is defined as a unity by the relations that its components must satisfy to constitute it, and its properties as a unity constitute its organization. Therefore, to characterize the organization of any system it is necessary and sufficient to point to the relations that define it as a unity. The components and the actual relations between components that realize a particular system as a concrete entity constitute its structure.

ii) Present day biological knowledge allows us to say that a living system considered as a unity in the physical space, that is,

as an entity topologically and operationally separable from the physical background, is defined by an organization that consists of a network of processes of production and transformation of components, molecular and otherwise, that through their interactions: a) recursively generate the same network of processes of production of components that generated them; and b) constitute the system as a physical unity by determining its boundaries in the physical space. This organization I call the autopoietic system. Due to this organization a living system is an autonomous unity, self-assertive in its dynamic capacity to withstand deformation under continuous turnover of matter while remaining invariant in its organization.

iii) Since a living system is defined as a unity by its autopoietic organization, all the transformations that it may undergo without losing its identity are transformations in which its organization remains invariant: an autopoietic system is a homeostatic system that has its own organizaton as the essential variable that it maintains constant through its operation. Therefore, all the unitary phenomena of an autopoietic system are constitutively subordinated to the maintenance of its autopoiesis.

iv) Mechanistic systems (machines) whose organization is not autopoietic do not produce the components that constitute them as unities, and, hence, the product of their operation is different from themselves. The physical unity of these systems is determined by processes that do not enter in their organization. These systems or machines, which I call allopoietic systems, have, by their constitution, input and output relations as a characteristic of their organization: their output is the product of their operation, and their input is what they transform to produce this product. The phenomenology of an allopoietic machine is the phenomenology of its input-output relations. In autopoietic systems the situation is different. For an autopoietic system as a homeostatic system that has its own organization as the essential variable that it maintains constant all the states that it can adopt without disintegration are equivalent in that they all necessarily lead to the maintenance of its organization. The product of the operation of an autopoietic system as autopoietic system is, under all circumstances, itself. Therefore, autopoietic systems are, by their constitution, closed systems without inputs or outputs. They can be perturbed by independent events, but the changes that they undergo as a result of these perturbations, as well as the relations of autopoiesis that

these changes generate, occur, by their constitution, as internal states of the system regardless of the nature of the perturbation. An observer may treat an autopoietic system as if it were an allopoietic one by considering the perturbing agent as input and the changes that the organism undergoes while maintaining its autopoiesis as output. This treatment, however, disregards the organization that defines the organism as a unity by putting it in a context in which a part of it can be defined as an allopoietic subsystem by specifying in it input and output relations.

From these considerations, it follows that since we are living systems all our phenomenology as individuals is subordinated to our autopoiesis, otherwise we disintegrate; therefore, as individuals we are closed systems. It also follows that cognition as a phenomenon of the individual is subordinated to the autopoiesis of the knower, and that all cognitive states as states of the knower are determined by the way its autopoiesis is realized, not by the ambient circumstances in which this takes place. Cognition is constitutively a subject dependent phenomenon. The changes of state that the autopoietic system undergoes while compensating for perturbations can be treated by an observer, who sees it in a context (environment), as actions exerted by the organism on the environment, and he can attach to them operational meaning in relation to the perturbing circumstances that he sees acting upon the organism. Such meaning, however, lies exclusively in the descriptive domain of the observed organism as an autopoietic system.

Statement 2.   The nervous system is a closed network of lateral, parallel, sequential and recursively interacting neurons.

Comment: The closed organization of the nervous system is apparent in its changes of state. In fact, operationally the nervous system is a closed network of interacting neurons such that a change in the state of relative activity of a group of neurons always leads to a change in the state of relative activity of other groups of neurons, either directly through synaptic action, or indirectly through the participation of some physical or chemical intervening element. Therefore, the organization of the nervous system as a finite neuronal network is defined by relations of closeness in the neuronal interactions generated in the network. Sensory and effector neurons, as they would be described by an observer who sees an organism in an environment, are not an exception to this because all

sensory activity in an organism leads to activity in its effector surfaces, and all effector activity in turn leads to changes in its sensory surfaces. That at this point an observer should see environmental elements intervening between the effector and the sensory surfaces of the organism is irrelevant because the nervous system is defined as a network of neuronal interactions by the interactions of its component neurons regardless of any intervening elements. Therefore, as long as the neuronal network closes onto itself, its phenomenology is the phenomenology of a closed system in which neuronal activity always leads to neuronal activity. This is so even though the ambient can perturb the nervous system and change its states by coupling to it as an independent agent at any neuronal receptor surface. The changes that the nervous system can undergo without disintegration (loss of defining relations) as a result of these or of any other perturbations are fully specified by its connectivity, and the perturbing agent only constitutes a historical determinant for the occurrence of these changes. As a closed neuronal network the nervous system has no input or output, and there is no intrinsic feature in its organization that would allow it to discriminate, through the dynamics of its changes of state, between possible internal or external causes for these changes of state. This has two fundamental consequences:

i) The phenomenology of the changes of state of the nervous system is exclusively the phenomenology of the changes of state of a closed neuronal network. This means that for the nervous system as a neuronal network there is no inside or outside.

ii) The distinction between internal and external causes in the origin of the changes of state of the nervous system can only be make by an observer who sees the organism (or the nervous system) as a unity and defines its inside and outside by specifying its boundaries.

It follows that it is only with respect to the domain of interactions of the organism as a unity that the changes of state of the nervous system may have an internal or an external origin, and, hence, that the history of causes for the changes of state of the nervous system lies in a phenomenological domain different from the changes of state themselves. To the extent that no distinction can be made through the activity of the nervous system between its internally and its externally generated states, no distinction is possible through the activity of the nervous system between perception and

hallucination. Such a distinction can only be made by an observer who sees the organism and its environment, because it is he who establishes a relation between a change of state of the nervous system and the environmental circumstances in which this change of state takes place. Hallucinations pertain to the domain of observation, not to the domain of experiences. There are two additional considerations to be made:

i) Whatever the circumstances under which there is a change in the neuronal relative activity in the nervous system of an observed organism, all that the observed nervous system can do is to generate new states of neuronal relative activity that will recursively generate new states of neuronal relative activity and so on.

ii) The nervous system in its operation as a closed neuronal network does not act upon the environment. In fact, the environment does not exist for the operation of the nervous system, it exists only for an observer, and it is only for him and in his domain of description that any action upon the environment can take place. It follows that it is only for an observer that the different states of the nervous system can be construed as representations of the environment of the organism, and that representations play no role in the operation of the nervous system as a neuronal network. However, although representations pertain to the domain of observations only, they reflect in this domain a coupling of the closed phenomenology of the nervous system with the independent (open or closed) phenomenology of the ambient.

Statement 3. The nervous system is coupled to the organism that it integrates in a manner such that its plastic connectivity is continuously being determined through its participation in the autopoiesis of the organism. Therefore, the connectivity of the nervous system is coupled to the history of interactions of the organism to which it is coupled.

Comment: The coupling of the nervous system and the organism takes place in three ways, all of which result in the subordination of its connectivity to the ontogeny of the organism:

i) The organism, including the nervous system, provides the physical and biochemical environment for the autopoiesis of the neurons (as well as for all other cells), and, hence, is a source of physical and biochemical perturbations that may alter (even through the control of genetic expression) the properties of the neurons and,

thus, lead to ii) or iii).

ii) There are states of the organism (physical and biochemical) that change the state of activity of the nervous system by acting upon the receptor surfaces of some of its component neurons, and, thus lead to iii).

iii) There are states of the nervous system that change the states of the organism (physical and biochemical) and, thus, lead recursively to i) and to ii).

Due to its coupling with the organism, the nervous system necessarily participates in the generation of the relations that constitute the organism as an autopoietic unity. Also, due to this coupling, the organization of the nervous system is necessarily continuously determined and realized through the generation of neuronal relations internally defined with respect to the nervous system itself. As a consequence, the nervous system necessarily operates as a homeostatic system that maintains invariant the relations that define its participation in the autopoiesis of the organism, and does so by generating neuronal relations that are historically determined along the ontogeny of the organism through its participation in this ontogeny. This has the following implications.

i) The changes that the nervous system undergoes as a homeostatic system while compensating for deformations, which it suffers as a result of the interactions of the organism (itself a homeostatic system), cannot be localized to any single point in the nervous system, but must be distributed through it in a non-random manner, because any localized change is, in itself, a source of additional deformations that must be compensated for by further changes. This process is potentially endless. As a result, the operation of the nervous system as a component of the organism is a process of continuous generation of significant neuronal relations, and all the transformations that it may undergo as a closed neuronal network are subordinated to this. If, as a result of a perturbation, the nervous system fails in the generation of the neuronal relations significant for its participation in the autopoiesis of the organism, the organism disintegrates.

ii) Although the organism and the nervous system are closed a-temporal systems, the fact that the organization of the nervous system is determined through its participation in the ontogeny of the organism makes this organization a function of the circumstances that determine this ontogeny, that is, of the history of interaction

of the organism as well as of its genetic determination. Therefore, the domain of the possible states that the nervous system can adopt as an atemporal system is at any moment a function of this history of interaction, and without representing it implies it. The result is the coupling of two constitutively different phenomenologies, the phenomenology of the nervous system (and organism) as a closed homeostatic system, and the phenomenology of the ambient (including the organism and the nervous system) as an open non-homeostatic system that are thus woven together in a manner such that the domain of possible states of the nervous system continuously becomes commensurate with the domain of possible states of the ambient. Furthermore, since all the states of the nervous system are internal states, and the nervous system cannot make a distinction in its processes of transformation between its internally and externally generated changes, the nervous system is bound to couple its history of transformations as much to the history of its internally determined changes as to the history of its externally determined changes of state. Thus, the transformations that the nervous system undergoes during its operation are a constitutive part of its ambient.

iii) The historical coupling of the nervous system to the transformations of its ambient, however, is apparent only in the domain of observation, not in the domain of operation of the nervous system, which remains a closed homeostatic system in which all states are equivalent to the extent that they all lead to the generation of the relations that define its participation in the autopoiesis of the organism. The observer can see that a given change in the organization of the nervous system arises as a result of a given interaction of the organism, and he can consider this change as a representation of the circumstances of the interaction. This representation, however, as phenomenon, exists only in the domain of observation, and has a validity that applies only to the domain generated by the observer as he maps the environment onto the behaviour of the organism by treating it as an allopoietic system. The change referred to in the organization of the nervous system constitutes a change in the domain of its possible states under conditions in which the representation of the causing circumstances do not enter as component.

iv) Through this coupling, the ontogeny of the nervous system is a function of the operation of the nervous system, and, since the properties of the neurons (as determined by their internal organization

of the organism) are a function of the ontogeny of the organism, the nervous system participates in the specification of its component neurons. Furthermore, since the properties of the neurons determine the connectivity of the nervous system, this participates through them in the specification of its own connectivity. Therefore, through this coupling the connectivity of the nervous system is a function of the ontogeny of the organism. Finally, since the closed phenomenology of the organism's autopoiesis is coupled to the phenomenology of the ambient through its compensation for perturbations, the ontogeny of the organism is a function of the organism's history of interaction, and, therefore, the connectivity of the nervous system is a function of this history. It follows that the connectivity of the nervous system changes along the ontogeny of the organism, coupled to the changes in the way in which the autopoiesis of the organism is realized.

v) Since history as a phenomenon is accessible to the observer only in the domain of descriptions, it is only in this domain that history participates in the generation of the observer's behaviour. This, in fact, takes place. Descriptions as linguistic behaviour constitute a source of deformations of the nervous system, and, hence, part of its ambient. Accordingly, the phenomenology of transformation of the nervous system discussed above also applies to the interactions of the organism in the domain of descriptions, and the structure of the nervous system is also a function of the history of interaction of the organism in this domain. The implications are obvious. All elements of the domain of descriptions, even though they do not represent states of the nervous system, constitute causal components in the domain of behaviour of the organism; such is the case, for example, with notions like beauty, freedom and dignity. They arise, as dimensions in the domain of behaviour of the organism through distinctions in this domain, from the coupling of the phenomenology of the nervous system and the domain of interactions of the organism, and have, therefore, behavioural value.

iv) As an evolutionary consequence of the constitutive coupling of the nervous system and the organism, the genetically determined architecture of the nervous systems of different species is different. Yet due to this same coupling, the actual connectivity of the nervous system that is realized in each individual of a species, within its genetically determined range of possibilities, is specified along its ontogeny through its history of interaction.

D. Subject dependent knowledge and the unity and diversity of man.

Conclusion 1. Men as members of a single species partake of the same pattern of genetically determined organization, both in their general mode of autopoiesis and in the architecture of their nervous systems. This structural unity constitutes the basis for any cultural unity.

Comment: The genetic unity of man determines the domain within which are realized the individual variations in the human mode of autopoiesis and in the human mode of connectivity of the nervous system. Which particular autopoiesis and which particular connectivity of the nervous system are actually realized in each man depends, however, on the particular circumstances of each ontogeny. Therefore, if the individual histories of different men resemble each other, their autopoiesis and neuronal connectivities will undergo transformations that are commensurate with their similar modes of life. They will have similar modes of conduct under similar perturbations: their cognitive domains will be similar. A culture, then, is by necessity a historical system of relations that constitutes a domain of specification of the cognitive domains of its members by determining their possible histories of interactions.

Conclusion 2. Cultural differences do not represent different modes of treating the same objective reality, but legitimately different cognitive domains. Culturally different men live in different cognitive realities that are recursively specified through their living in them.

Comment: To the extent that cognition is a subject dependent process, an individual can only exist in the cognitive reality specified by his particular mode of autopoiesis and neuronal connectivity. It is, therefore, a mistake to talk of any cultural limitation in the cognitive access to an objective reality. This simply does not exist. Also, there is no objective notion by which any culture can be deemed more adequate than another. Values are necessarily relative to the culture in which they arise, and cultures are necessarily relative to their own histories. Furthermore, all cultures are necessarily successful in the predictive domain that they define, and to accuse any one culture of failure from the perspective of another culture is an error. Cultural differences, then, are legitimate and must be respected, because they represent completely valid cognitive domains, not because they are human expressions.

Conclusion 3. The problem of the cultural unity of man is not a problem of learning a single valid cognitive approach to an objective reality, but is the problem of generating a common subject dependent behavioural domain that defines a common subject dependent reality.

Comment: If there is no possibility of objective knowledge, this should not be taken as a guide to our conduct. If human cognitive diversity is the result of different ontogenies, the problem of human unity is the problem of generating an experiential domain which will lead to similar ontogenies. Societies, by constituting the ambient in which a man lives, restrict and determine his domain of possible experiences; conversely, men constitute societies and specify their nature through their conduct. Thus, men, through the society that they integrate constitute a cultural system as a homeostatic system that maintains the unity of the cognitive domains of its members by specifying both their concrete and their conceptual experiences. Therefore, the problem of the cultural unity of man is the creation of the conditions that define a collection of human beings as a cultural unity. This can be attained in a noncoercive manner only by defining a fundamental aim valid for all men through their biological unity such that its pursuit leads to experiences that make these men desire its aim.

E. Cognitive strategies.

In coming to the end of this series of considerations, the statement of our problems seems very similar to what it would have been at the beginning. Our understanding of it, however, is, I hope, different. In fact, since we cannot talk about an objective reality, we must recognize that all reality is subject dependent, and if we do that, three things should be apparent:

1. Science is not a domain of objective knowledge, but a domain of subject dependent knowledge defined by a methodology that specifies the properties of the knower. In other words, the validity of scientific knowledge rests on its methodology, which specifies the cultural unity of the observers, not in its being a reflection of an objective reality, which it is not. The implications are clear:

i) For epistemological reasons that arise in the culturally unified cognitive domain of our scientific thought, we need a substratum for existence, yet we cannot make any objective statement about this substratum because such a statement would arise in our

subject dependent cognitive domain.

ii) The question of solipsism arises only as a pseudo-problem, or does not arise at all, because the necessary condition for our possibility of talking about it is our having a language that is a consensual system of interactions in a subject dependent cognitive domain, and this condition constitutes the negation of solipsism.

2. The problem of the cultural unity of man is not a problem of knowledge but a problem in the use of knowledge, therefore an ethical problem. Objective knowledge does not exist, consequently there is no basis for human cultural unity other than our desire to have such for reasons having to do with us as men. The reasons are clear. In our subject dependent cognitive domain there are grounds for viewing all men as equivalent; we recognize each other experientially (sexual recognition) as members of the same species. This is unavoidably knowledge because it is bound to our definition as men. As a result there are some of us who want this biological unity to be cultural as well as in reference to the conditions of existence. There are others whose wants are otherwise, and want the cultural diversity to represent a biological discontinuity. In either case we make an ethical choice; which way we choose, however, depends on our personal history of experiences, and, therefore, on our individual cognitive domain.

3. A decision is a choice between several alternative actions that is determined by relations proper to a domain different (a meta-domain) from the domain in which the alternative actions take place, and from the perspective of which the several possible actions are not equivalent. Therefore, from the perspective of the domain in which the actions take place the choice of one of them is an expression of preference, an arbitrary action in that domain, i.e., an action with a meta-determination. Yet, reason is compelling. Given a set of premises as a starting point the outcome of an argument is determined; no alternative arises and no decision is ever made along it. If no mistake is committed the result of the argument can be rejected by an observer only because he does not like it, or because he does not accept the starting premises, and in either case the rejection has a meta-determination.

Ethical decisions are expressions of preference in the face of alternative actions that affect the lives of other human beings, and as such they are not determined by the knowledge of the consequences of the preferred action, but by the desire that the consequences of that action take place. Yet, for every human being, his subject dependent domain of knowledge constitutes his only basis for ethical decisions, because it determines the domain of alternatives over which he projects the world that he wants to validate with his actions. Therefore, although knowledge does not and cannot determine an ethic, ethics as a domain of preference determines the use of knowledge. Thus, we cannot escape the conclusion that the possibility of cultural unity in man rests exclusively on the possibility that all men may have the same ethic, and, hence on the possibility of creating for all men a common domain of experiences that should give rise in them to similar ethical preferences. The attainment of cultural (ethical) unity in man, then, is not a problem for science as we usually understand it, but is a problem in the art of living.

Many times in the course of human history men have tried to attain ethical unity through religious and political doctrines. These, however, are systems designed to reduce the individual variability of the human beings as social members by specifying their domains of experiences and by forcing them through well defined hierarchical relations that end with the subordination of men to men; to acquire the structures that determine in them the desired modes of conduct (ethics). This has led to the world of oppression, exploitation and self-delusion in which we presently live. The question remains, however, of whether it is possible to obtain in man an ethical unity that denies human oppression. Which experiences should we choose for ourselves as well as for other human beings so that, as a result of them, we all want, consciously and unconsciously, to generate with our conduct a society in which no man is systematically restricted by or subordinated to other men, and to generate such a society by means that do not negate this desired end, however complex and changing this society may be?

The answer is not easy. Due to the nature of our cognitive domain, we can always enlarge or restrict this domain through our experiences, and one of the things we westerners can always do is to conceptually step out of our social system and look at it. This is in itself an experience that may change a man's ethic and transform him into a revolutionary, that is, into a man whose ethic is different from that implied by his social system, and who negates such a social system by validating a different one with his conduct. Ethical change leads to revolution. It is for this reason that coercive societies, through economic, religious, political and military coercion, deny their members the possibility of being observers

of their own social system, and, hence, of changing it towards a more desirable one.
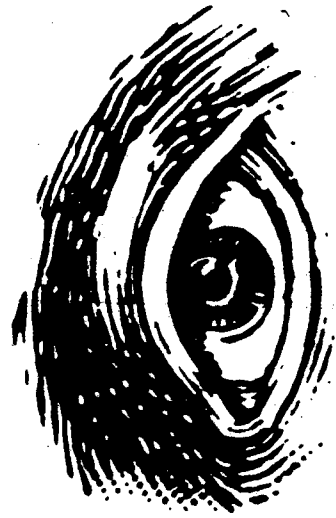
DESIRES

The spontaneous ontogenic course of a biological unity is always towards the stabilization of the relations that define it as a unity, that is, towards the stabilization of the hierarchical relations that hold between its components. This implies either an ontogenic stabilization of the properties of the components, or the ontogenic development of processes that make the components dispensable when their properties have changed, or both. The first case is undesirable because it implies the negation of man as an observer (totalitarian societies), that is, a negation of man as a social component who can step out of the system that he integrates and judge it ethically. The second case is undesirable because it negates our experiential feeling of being the centers of all cognitive processes (mercantile society), and makes our individual lives miserably alienated. Both are undesirable because conjointly they deny man. To believe that the spontaneous course of transformation of a society as a biological unity may lead to a non-oppressive system that does not negate the individual is, biologically, a delusion. Such a social system can only be obtained as an artifice of human creativity, and this by considering all individuals significant, through making the social system that they constitute in their coupling a non-hierarchical allopoietic system, designed to make their lives humanly desirable. Is this possible? My answer is yes, it can be done, but only by agreeing to continuously seek to generate a finite non-hierarchical society in a finite ecologically stable earth, by steps which do not deny the desired end. In other words, I think that such a society can be obtained by agreeing to continuously seek to generate:

i) a society that continuously negates and destroys any political, economical or cultural institution for the subordination of man to man in any possible form;

ii) a society that seeks to change its institutions following the changing material, aesthetic and spiritual ways in which the biological needs and cultural desires of all human beings are satisfied, because social institutions are instruments to be used by men to satisfy their needs and desires, and not entities to be maintained by them;

iii) a society that continuously seeks to become non-hierarchical, because its members accept the possibility of error and recognize that anything that leads to an increased difference between the present human hierarchical relations and the desired non-hierarchical ones is a mistake;

iv) a society whose members understand that they live on a finite earth, and that their biological existence is coupled to the ecological stability of this finite earth;

v) a society whose members understand that the natural course of all plastic biological systems is towards the stabilization of the hierarchical relations that determine their unity, and that non-hierarchical society is an artificial biological system produced by man that can never be obtained as a stable system, but which must be continuously produced as an always regenerated approximation to that state. Furthermore, I think that such a society can only be obtained if the following operational conditions are fulfilled:

1) Population stability, which is a necessary condition for an absolute accumulation of material well-being, uniformly distributed among all human beings, and for the possibility of agreeing on a common purpose that is not the individual accumulation of wealth and power, which by generating hierarchical relations intrinsically negates the possibility of a non-hierarchical society.

2) A population size which is the minimal population that allows for an interesting and diversified life for everyone on an ecologically stable earth, and for a realtime access of every member of the society to the information, knowledge, and possibility of decision that its operation as a system continuously generated through the ethical decisions of its members requires.

If we indeed desire to generate such a non-hierarchical society, we must start from our present day societies and modify them in a manner that does not negate the desired end, even if we do not know which form it will adopt in terms of its changing institutions, for a non-hierarchical society cannot be obtained by processes that increase hierarchical relations. A system can only be destroyed by denying the relations that constitute it, and, conversely, a system can be generated only by implementing the relations that do constitute it. There is no other possibility. Therefore, for man to generate a new society he must generate new interpersonal relations, and to do so he must change his cognitive domain. Accordingly, only if men want to live in a non-hierarchical society in which everybody has real-time access to an interesting and satisfactory life will they create it, otherwise they will not. However, it is not the

Two Remarks:

1) The terms "structure" and "organization" are synonyms to the extent that both make reference to relations existing between components in a system. Yet, there are some connotational differences between the two terms, which are linked to their different ethnological origin, and which are worthwhile emphasizing because they allude to two different aspects of the constitution of a system. "Structure" comes from the Latin word struere, a verb that means to build. Thus, in agreement with this origin, the work "structure" refers both to that which is built and to the way in which its particular components are put together while making it a whole. In other words, the term "structure" emphasizes the relations between the parts which as well as the identity of the parts which constitute a whole. As a consequence, two systems have the same structure if they have equivalent relations between equivalent components. Accordingly, the structural analysis in a given phenomenological domain (culture, for example), attempts at the discovery of universals both in the components and in the relations between the components in different phenomena of the domain. The word organization has a different ethnological origin; it comes from the Greek word ὄργανον (organon), which means instrument, and makes reference to the function or role that a component has in the constitution of a whole. Accordingly, the word "organization", as distinct from the word "structure", emphasizes the relations that define a system as a unity (and thus determine its properties), with no reference to the nature of the components, which can be any at all, as long as they satisfy these relations. Therefore, two systems have the same organization if the relations that define them as unities are the same, regardless of how these relations are obtained, and, accordingly, two systems that have the same organization may have different structures. Also, since two systems are equivalent only if they have the same organization, it follows that if the organization of a system changes the identity of the system changes and it becomes a different one, a new unity with different properties. Conversely, if the organization of a system stays invariant while its structure changes, the system remains the same and its identity stays unchanged. Strictly, then, the identity of a system is determined by its organization and remains unchanged as long as this

historical circumstance in which we now live, nor the laws of nature (for economic laws are an arbitrary human creation), nor lack of sociological imagination that limits us in the effort of creating a non-hierarchical utopia, it is our reluctance to abandon our culturally learned and deeply cherished joy of forcing other human beings to accept our pretended superiority. This is why unending discussions about the means to obtain a given end betray the lack of commitment to obtain that end. An end always specifies means to obtain it that do not negate it, but no agreement about ends is possible between members of different social systems if they do not change their ethic so as to coincide in a meta-level of identity. Social change can only arise from ethical change, therefore, a social revolution is first of all a cultural revolution.

remains unchanged, regardless of whether the system is static or dynamic and regardless of whether the structure of the system changes or not. In the context of this distinction between the two terms "structure" and "organization", it is easy to see that there are two kinds of dynamic (mechanistic) systems: those whose organization remains invariant as long as the product they produce remains the same, the allopoietic systems; and those that are the product of their own operation and whose organization remains invariant as they produce themselves, the autopoietic systems. It is also apparent that the organization of a system defines it as a unity for any space, while its structure constitutes it as a concrete entity in the space of its components. Thus, living systems are autopoietic systems in the physical space (see Cognitive Strategies), and, as such, the turn-over of matter that they undergo continuously, and the change in structure that takes place in them as a result of development and learning occur without loss of identity in the phys- ical space. It is interesting to note, however, that although we make these connotational distinctions in the use of the terms "struc- ture" and "organization", we are usually unaware of them and thus do not realize that the organization of a system is by necessity an invariant, and we talk about changes of organization without re- alizing that such changes imply a change of system. This is be- cause as observers we operationally identify a system in the physi- cal space by perceptual distinctions that arise from our interactions with its components, and not from our recognition of its organiza- tion, and, accordingly, consider the system the same while its com- ponents remain invariant, regardless of whether its organization changes or not. This confusion of structure with organization, how- ever, is not a severe operational problem when dealing with living systems as unities because these, as autonomous systems, assert their identity through their autopoietic organization in the physi- cal space and force us to recognize it as long as they are alive, even if they are mutilated. Yet, this confusion has obscured the understanding that a whole is a unity whose particular properties are generated by the way it is constituted and not by the properties of its components.

2) Although the nervous system is organized as a closed neuronal network, we can describe it as if it were an open system when we observe the organism in its interactions with the environment. For the following reasons this contradiction is only an apparent one:

i) Every closed system can be made to appear open without al- tering its organization, and, therefore, without interfering with its operation, by a structural change that consists in cutting it at some point and replacing the direct connection between the two artificially generated ends by an intervening device that allows the continued operation of the system and the observation of the two artificial ends as if they were intrinsically disconnected. When this is done, although the organization of the system is not changed, the system appears open to the observer. This is what in fact happens when we observe the nervous system of an organism, and we concern ourselves only with the cut ends, because we stand in the environment that intervenes between the organisms effector and sensory surfaces without altering the relations that define the ner- vous system as a closed network. The changes of state that the ner- vous system undergoes as a neuronal network always arise as changes in the relations of activity of its constituting neurons, and al- ways give origin to new relations of neuronal activity, whatever the environmental circumstances that allow for the closure of the sys- tem at the level of its effector and sensory surfaces. The fact that the changes of state of the nervous system are adequate to the environmental circumstances in which they take place (contribute to the continued autopoiesis of the organism) results from the coupling of the structure of the nervous system to the interactions of the organism, and has nothing to do with its closed or open organization as a neuronal network. If this were not the case, il- lusions, as modes of behavior that the observer considers inade- quate for the environmental circumstances in which he sees them to take place, would not be possible. The changes of state of the nervous system are determined by its structure, and not by the fea- tures of the environment that only constitute historical determinants for the sequence of the occurrence of those changes and, through that, for the structural specification of the nervous system. Therefore, the purposefulness that the observer sees in the operation of the nervous system, and that seems to justify his treating it as an open system that gathers information from the environment, is an artifice arising from his position as an observer who sees the ef- fector and sensory surfaces of the organism independently, and treats them as intrinsically disconnected, by neglecting the con- stitutive role of the environment as an intervening agent that connects them. Accordingly, descriptive terms such as "purpose"

It is in this sense only that the nervous system, defined as a system both by its closedness and by its participation in the autopoiesis of the organism that it integrates, participates in the solution of the problems that the organism has to solve. For this to take place, however, it is not necessary that there should be a representation of the environment in the nervous system as an operant factor in the determination of behaviour. In fact, since the solution to a problem need have validity only for the organism that faces it, and not for the observer, a given change of state of the perturbed organism is a solution to a problem only if it allows the organism to maintain its identity. Since the changes of state of the organism (the nervous system included) are determined by its structure, and not by the environment, a representation, which is a relation established by the observer, cannot enter as a factor in the determination of the behaviour of the organism. However, if the observer treats the nervous system as an open system (open network) designed to operate upon an environment, he must view its structure as a representation of the environment in order to explain the adaptive behaviour of the organism, and not as a homeostatic system that maintains constant certain relations of neuronal activity that have become specified by the historical coupling of its structure to the autopoiesis of the organism. With such an approach the observer cannot do otherwise because he handles the nervous system in terms of design, and, hence, as isomorphic to his description of his own operation. Yet, to do this is as gross an error as to claim that a representation of a road is a causal factor in the operation of a running automobile. Therefore, notions of representation and of coding of information have validity only for describing the interactions of the observer with the observed organism when he considers the nervous system as an open system, and not for the characterization of its organization as a neuronal network. In other words, the observer, who sees the organism in its interactions with the environment, can treat the changes that the organism undergoes as representations of the circumstances of its interactions, and describe it in these terms, but by doing this he describes a system different from the one that the organism with its nervous system is.
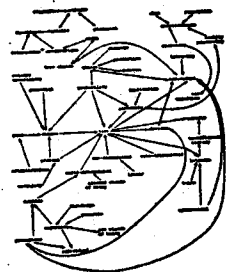
or "function" are inadequate for describing the organization and operation of the nervous system as a neuronal network, even though the structure of the nervous system is coupled to its successful operation. That the notion of the closed nervous system should apply to the nervous system of the observer himself does not create a contradiction. The descriptions that the observer makes are made in the domain of consensual observable behavior (linguistic domain), developed through a history of successful orienting interactions between two or more organisms (human beings in our case), and thus, are subject to the same artifice of observation. Furthermore, the general case is that any pair of dynamic (mechanistic) systems with invariant organization but with plastic structure coupled to the history of their successive states can develop, through their mutual interactions, a domain of coupled consensual conduct as a linguistic domain in which they can converse.

ii) A problem is a question. A question is a perturbation that the questioned system must compensate for by generating a conduct that satisfies certain criteria specified in the same domain as the perturbation. Therefore, to solve a problem is to answer a question in the same domain in which it is asked. An allopoietic system solves a problem posed by an observer when it changes its states in a manner that satisfies the criteria imposed by the observer through the formulation of his question. For autopoietic systems the problem solving situation is different only to the extent that in them all phenomena are phenomena of autopoiesis, and any question put to them is necessarily a question in that domain. This is so notwithstanding the fact that the observer can treat an autopoietic system as an allopoietic one, and thus define additional domains in which he can specify questions and their solution. These latter domains, however, exist only in parallel with the autopoietic domain of the questioned system, and only for the coupled system that this forms with the observer. Strictly, then, an autopoietic system solves a problem as a system if the changes that it undergoes as a result of the interactions that constitute the problem allow it to continue to operate as an autopoietic system; that is, without loss of identity. As a consequence, and by constitution, autopoietic systems always have solutions for the interactions (problems) that do not destroy them: they cannot but undergo homeostatic changes that compensate for the perturbations generated by the interactions, for otherwise they disintegrate and the problems prove unsolvable.

DESIRE

DESIRE must be distinguished from the simulation of desireful behavior. Just as the picture of a fruit cannot save a man dying of thirst, just so little reality-relevance has calling such simulations a demonstration of the existency of desire within the simulation. The only desire here would be that of the simulation to convince others that he was selling more than some emperor's new (and nonexistent) clothes. Thomas, the philosophical brother of the seventeenth century poet Henry Vaughan, wrote of some contemporary professors that "the mystery of their profession lies only in their terms," his trenchant irony showing what a genuine glossary should be: a classification of the substance behind special terms and not simply further obscurantism. Just as a surgeon's scalpel may be used to heal or murder, so words may be used to clarify other words substantively or merely to obfuscate and obscure them all the more. The use in either case depends on the DESIRE that is dominant in the one who wields the tool or the word. So desire is at the heart of many things.

Desiring arises at first only after some percept has been encountered that suggests the renewed possibility of a remembered or imagined experience that was pleasurable to the INDIVIDUAL in whom the desire arises by being thus evoked. Desire is thus FUTURE-addressed. DESIRE has its negative polarity of aversion: the desire to avoid any repetition of a remembered or imagined experience that was painful. In either case, the desire may be overridden by some priority still higher in the value--or desire--system (for values ultimately are desires); but only a desire of higher priority (of attraction or aversion) can override a given desire. Desire in either polarity and on any hierarchical level is thus directed toward the FUTURE and implies a power of choice. [C.M.]
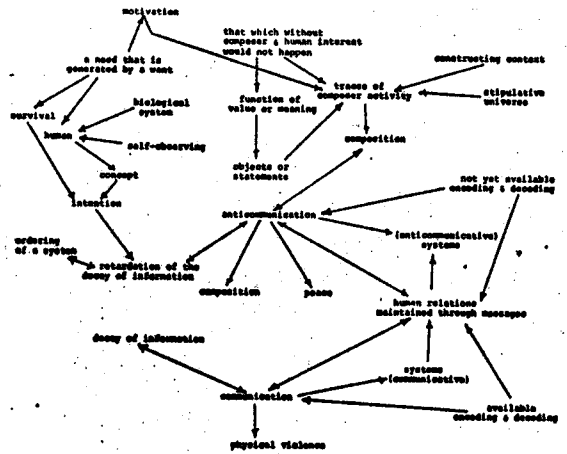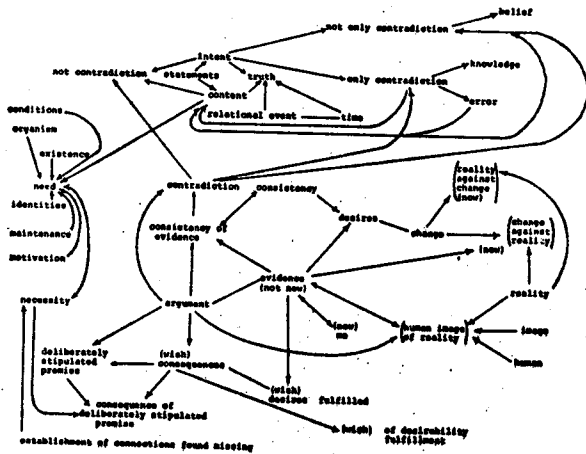
DESIRE

I use the word "desire" whenever I wish to speak of a delib-ately stipulated premise to whose consequences I wish to attribute the status of 'necessity' explicitly in order to question the va-lidity of all the 'evidence' which fails to support the attribution.

Deliberately stipulated premise: because its reasonability, that is its being a consequence itself, is to be considered irrele-vant.

Attribute: because I do not know whether I am or am not, speaking of 'need'; and because I do know that I am speaking of urgency.

To question the validity of non-supporting 'evidence': be-cause the same configuration of reality which allows us to correctly state the impossibility of the fulfilment of a "desire", may pre-vent us from recognizing our 'need' for a different configuration of reality.

I use the word "desire" whenever I wish to speak of change which I suspect of being needed.

OPTIMIZING EACH SUBSYSTEM INDEPEN-DENTLY WILL NOT IN GENERAL LEAD TO A SYSTEM OPTIMUM, OR MORE STRONGLY, IMPROVEMENT OF A PARTICULAR SUBSYSTEM MAY ACTUALLY WORSEN THE OVERALL SYSTEM

Herbert Brün:

Drawing Distinctions Links Contradictions

I shall tell what I think while remembering Arnold Schoenberg, rather than tell what he thought while predicting us. Where he was right, we should be deeply ashamed, and where he was in error, I, at least, shall not gloat. I can hear and understand the music he desired to compose, and while writing the following pages I thought, not only, but in particular, of his Trio.

Drawing

Arnold Schoenberg, just as Karl Kraus and Charles Ives, knew and expressed how passionately dedicated he was to the society which, as he understood it, he could not stand, and which, as it understood him, could not stand him. His life and letters and prose and poetry and theory and composition demonstrate how he tried to distinguish himself in and from this society. Both. To draw both distinctions at once was his theme and subject matter, even though this meant courting blatant contradiction while dealing, apparently, with mere conflicts.

Distinctions

Not many people know how passionately dedicated they are to the society which they cannot stand. Unaware of their living in contradiction they live in conflict.
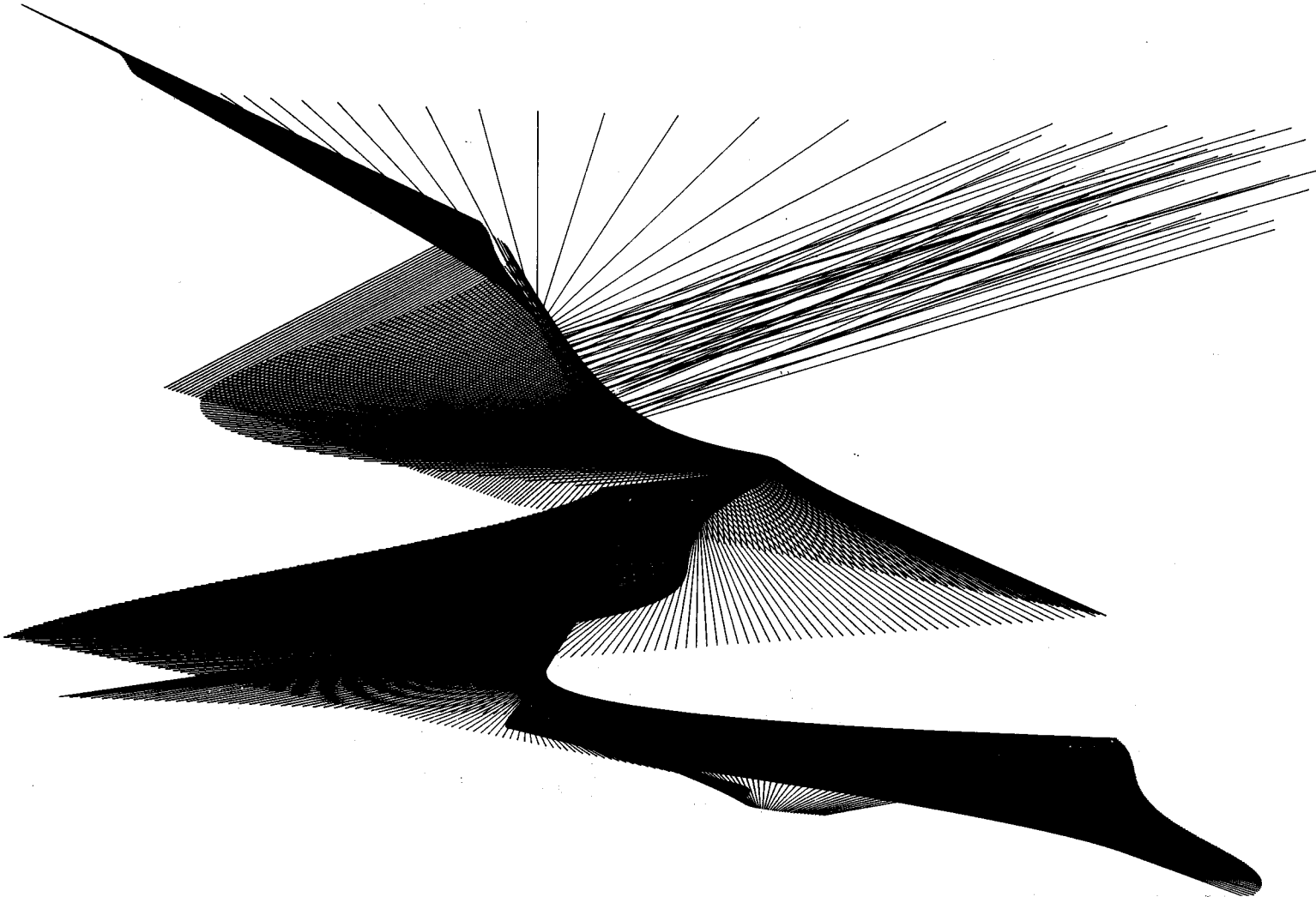
Not many people know how passionately dedicated they are to the society which cannot stand them. Unaware of their living in conflict they live in contradiction.

Nobody can stand not being stood.

Nobody wishes to admit that.

Everybody, therefore, searching for an admissable degree of relative comfort resorts to proper English and falsifies the issue, thus:
It is difficult to understand why one is not understood.

This proper English falsification underlies the prose and poetry written about Arnold Schoenberg by those of his friends and followers who, once his apologetic avowers, today, equally apologetically, disavow him. It is an underlie, because it is not at all difficult to understand why one is not understood, and that one is not stood because one is understood, and that one cannot stand that which one understands precisely because one does.

Anticommunication is the attempt at protecting a message of contemporary relevance and significance from the unconditional surrender to the addressed receiver.

Every desire can be transformed into a statement which wants to become "true".

Whenever the maintenance of a system is rated more important than the maintenance of its elements, then the system will solve the problems which assail it and perpetuate the problems which maintain it.

Perpetuated problems generate the desire for a change of system. The opposition to change calls these problems unsolvable in order to reject the fulfilment of desires.

The Composer's Music solves the problems which maintain it, and perpetuates the problems that assail it.

To learn how to compose is to learn how to construct systems wherein deliberately stipulated premises, statements of desires, become "true".

Given a thesis or statement which intends to condemn present day reality and facts.

Could you argue for this thesis without using present day reality and facts?

If used as an argument, present day reality and facts will condemn any thesis which condemns them.

Furthermore, an argument which supports a thesis will in turn appear supported by the thesis.

Thus it may happen that you support that which you intend to condemn.

How could you, without using present day reality and facts as an argument, argue for this thesis without becoming a composer?

In the system which perpetuates it, an unsolvable problem is just that.

Not many people know that a discovered contradiction needs to be protected against apologetic explanations reducing it to mere conflict.

Even fewer people know that conflicts can be resolved within the system in which they are said to be conflicts, and that contradictions cannot.

To turn contradictions into conflicts is the concern of the reformer who criticizes the flaws in a desired system.

To turn conflicts into contradictions is the concern of the revolutionary who criticizes the flawlessness of an undesired system.

Links

Anticommunication is an attempt, not a refusal.

The object is its name when called upon to manifest nothing but its mere existence.

Monologues are lonely dialogues.
Response prevents monologues.

The Listener is called upon to manifest more than his mere existence.
The Composer is called upon to manifest more than his mere existence.
Nor is music in performance an object.

Anyone can call that, to which he refuses to respond, a monologue.
Anyone can respond to that which he refuses to call a monologue.

Nobody can call upon anything to manifest nothing but his mere existence.
Anyone can call upon anything to manifest nothing but its mere existence.

Just name it and call it its name.

It is just a matter of disposition.

So disposed, and disposed of, it will leave you alone.
Alone? You do not want to be left alone?

That, then, is a matter of composition.

Our subject is our name when called upon to manifest anything but our mere existence.

Communication uses the order and the law that is meant
to be found by the receiver as his own; anticommunication
creates the order and the law that the receiver is to
find for the first time.

Anticommunication offers more or less decorative garbage
to the receiver who wants to understand, but it explodes
or condenses into intended messages to the receiver who
wants to understand.

The music you hear is, among other things, also the music
composed by the composer. While you hear what you want to
hear, you also hear what the composer wants you to hear,
provided your listening neither starts too late nor stops
too early. Otherwise you will hear what is, at least according
to the composition, the wrong piece. If it matters to a
composer that you listen to the right piece he will side with
his composition and not permit his listeners to think that it
does not matter.

The living organism needs food. When we want to eat,
this want follows the instruction of a need. Nobody,
however, needs to be either a composer or a listener
unless he wants to. Here the want generates the need
and the need for music follows the instruction of a
want. Want is the meaningful relation between needs
and music. In the one case want is a consequence, in
the other the cause. To disregard and to belittle want
in either case is to gloat over the needy, is to pride
oneself on needing nothing.

Spontaneity, at its very best, generates intuitive responses
to instructions received. Even the most brilliant improvisation
only embellishes obediance to what is wanted from, not by, the
musician.

The composer, on the other hand, articulates what he wants.
Not the mere fact that he wants something, but that he
articulates it as an instruction, gives music its function in
society and, sometimes, renders music immune to the insiduous
flatteries of commercial absorption.

Nobody will be free from want by just hiding it.

The composer brings about that which without him cannot happen.

The present brings about that which can happen without
the composer.

The future leaves no traces.

The past is traces left.

The present is traced in passing and left.

The environment is traces left in passing and left.

The environment is past present.

It can happen without the composer.

The environment happens within but without the composer.

The composer happens within but without the environment.

The composer brings about that which cannot happen without him.

He composes the future so that his composition leave the traces
of the future which the future won't leave.

The future cannot happen.

Left to the future it would never happen, not with and
not without the composer.

Therefore the composer brings about that which with and without
him cannot happen.

Music for instants and, for instance, poetry.

If the organization of a system in disorder is attempted with the aim to know all about the system and to render this information communicable, then it may be considered a "scientific" project. Here the system does not only offer the means, but also the contents of communication. It speaks for and about itself.

With a slyly embarrassed, but utterly unapologetic wink of complicity in the general direction of the sciences:

Uncertainty and ambivalence in a communication system betray, more than anything else, the presence of its only justification of existence, namely the presence of information. To lose this is the goal of the system under the inhuman and ruthless dictates of nature. Man can but retard this process or gleefully promote it.

The gleeful promoter is the conservative who reads reality by the flickering light emanating from putrid communication systems that have grown sadly safe and certain, hiding nothing, not the slightest bit of information, and who hopes to bask delightedly and soon among the lifeless residuals of todays unanswered questions.

It is the retarder, on the other hand, who regrets that life abandons passing things and configurations, who eagerly learns and studies nature's laws so that he may protect all and himself against these laws as long as possible, so that information may live a little longer before the communicative pit swallows it, before the digestive system of learned understanding will mutilate meaning for the production of meanings.

All adjectives and adverbs may be removed.

Not removable is the distinction between the conservative who conspires with nature, and the composer who resists its seduction to decay.

Communication appeals to the individual owners of personal properties like taste, repertory, language, a past, privileges, beliefs, etc., and problems. Anticommunication is the problem inviting the attack of all who are intelligently tired with the unconditional surrender of long since conditioned messages to ultimately adjusted receivers.

Music wants listeners whether listeners want music or not;

if listeners want music, listeners will react to and interact with whatever listeners think listeners have heard;

if listeners do not want music, listeners cease being listeners and will react to and interact with whatever listeners neither think nor hear.

As soon as the reader has conveyed to each word in this statement the meaning which will allow the statement to appear as a 'true' statement, he has understood the content of the statement.

The reader who, without thus understanding it, rejects the statement as being 'false', fails, in fact, to reject the written statement. He rejects only the reader's reading.

The reader who understands the content of the statement by discovering the conditions under which it becomes 'true' and, then, rejects the statement as being 'false', fails to reject only the written statement. He also rejects the discovered conditions.

The listener never accepts or rejects the music. The listener sometimes accepts only, and sometimes rejects only, what he thinks he has heard and, if he knows and understands what he has heard, also the composition by which and in which the music has been and, now, is being generated.

Where listeners consume music, both disappear. Where both appear, the listener is consumed by the music. Ready to further either and both, appearances and disappearances, almost all music almost always has been experimental. So have almost all listeners.

If the organization of a system in disorder is attempted
with the aim of mobilizing the means for the communication

of thoughts which transcend the definition of the system,

then it may be considered a "creative" project. Here the

system offers the means but not the contents of communi-

cation. It speaks for but not about itself.

Whenever I am wanted, I am defined.
Whenever a connection I want wants establishing, I am wanted.
Thence: rather "whither the statement?" than "whence?".

Not one of these statements is thought to be true.

If these statements were thought to be true, the consequences

of such thinking would be desirable.

Thus these statements need to be thought of as becoming true.

A program.

Contradictions

The composer wishes to bring about that which without him and with-
out human intent would not happen. In particular, he wishes to con-
struct systems, contexts, stipulated universes, wherein selected ob-
jects and statements manifest not only more than their mere existence
but have a function or value or sense or meaning which without his
constructions they would not have.

Occasionally a composer brings about that which without him and with-
out human intent could not have happened.

It was certainly not Schoenberg's wish to bring about that, which
without "those who applauded his wish" and without "their intentions"
would not happen. As soon as the applause had subsided, as soon as
the difference between his intentions and "theirs" became clear,
"their" voices rose protesting that not one of them would have com-
mitted Schoenberg's error by fulfilling Schoenberg's wish and his
intentions as Schoenberg had done. This obvious truism has been used
ever since as if it were some kind of contemporary criticism, but
has never yet been recognized for the supreme expression of respect
that it is, by confirming that indeed Schoenberg had brought about
that which without him, and with them, and without his intentions,
and with theirs, could not have happened.

Many successful works of art reflect present day reality and facts.
Affirmative output of our society. They are successful in that they
allow us to see our society, as it is embellished and affirmed by
the artists and composers whom it favors.

Some successful works of art reflect the problems which maintain
the system wherein they are conflicts. Indignantly contrite output
of our society. They are successful in that they allow us to see
our society, as it is heavily armed against change, under a thin
coat of free thought accorded the artists and composers whom it
favors.

A few successful works of art reflect the problems which assail
the system wherein they are contradictions. Affront as input to
our society. They are successful in that they allow us to see our
society as if it were also another, different, society and, rather
than its future, that of the artists and composers who favor it.

Even fewer successful works of art reflect the desire for, and the
rejection of, our society as tomorrow's reality and facts. Utopia
as input to our society. They are successful in that they allow us
to see our society as it prevents itself from becoming what it
wants to be, to see another society which helps itself to what it
wants to be, and its future rather than that of the artists and
composers who favor it.

No description of a work of art necessarily heeds all of the com-
poser's intentions. Most of the composer's intentions, however, may
be quite irrelevant for any description of his composition.

No composer necessarily plans to have his composition fit any par-
ticular combination of descriptions. Every composer does, however,
have a share in the responsibility for that combination of descrip-
tions which fits his composition.

Thus, Arnold Schoenberg is responsible for what he did and said and
claimed in his own name, as well as for was done, said, claimed in
his name by others. This does not, however, allow us to confuse him
with others. If the claims that were made in his name are now being
withdrawn by those who either initially had, or even had not, made
them, then I wish to redraw the distinction between the statement,
musical or otherwise, made by a composer, and all statements about
this statement by his audience. And if the others remind me of the
evidence which shows that the accurate meaning of every statement
is powerless against its once enthusiastic, now disavowing, and in
many cases inaccurate, interpretations, then I shall change the
evidence rather than live in that mental universe in which the
others, according to their evidence, are right.

I cannot and will not remember Arnold Schoenberg in anyone's name
but mine.

Herbert Brün

COMMUNICATION

Condition of meta-analysis.

Inference of energy as radiation.

Description of absence of mass or stable field formation.

Field concept underutilized as such.

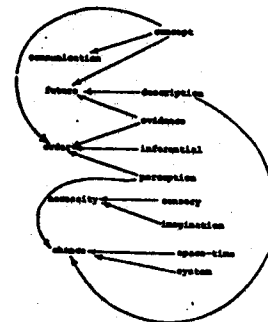Instinctual safety gesture.

Idiosyncratic sign sequence.

Meta-physical relay description.
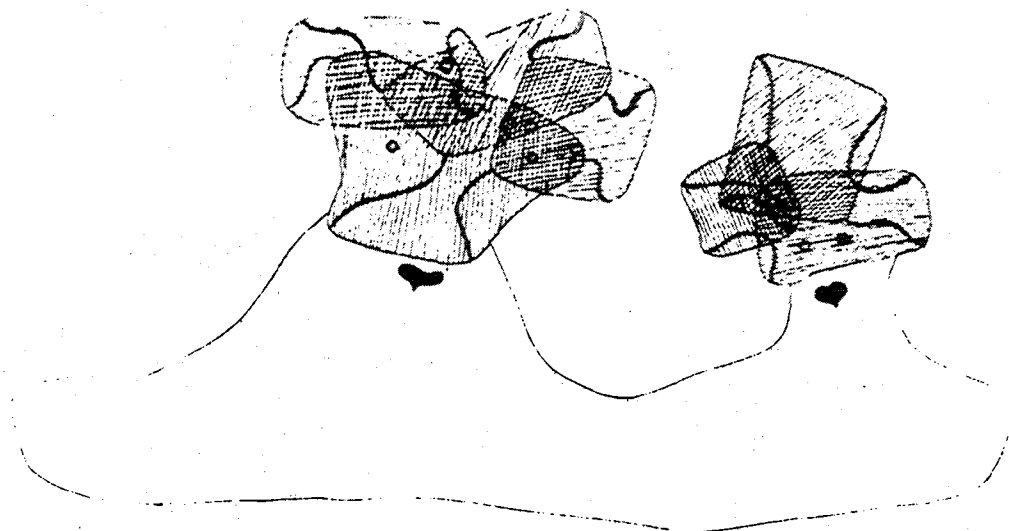
Stabilized standing wave description.

Consensual artifact.

Dysfunctional indicator of passive (i.e. non-existing) cognition.

Pattern excitation kinesthetically experienced.
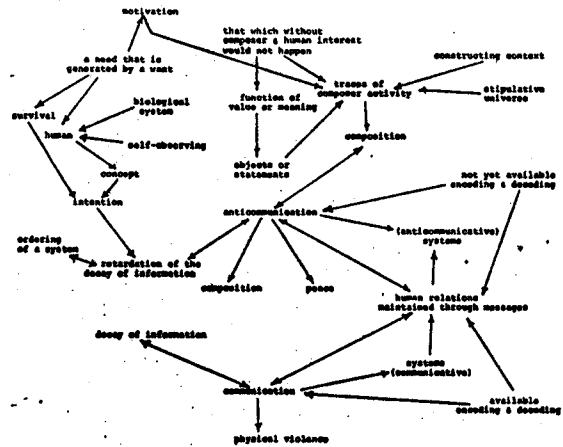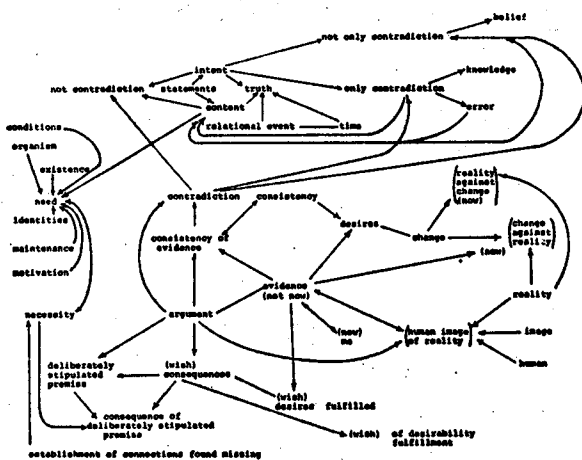
[E.S.]

COMMUNICATION

I use the word "communication" whenever I wish to speak of a human relation between persons and things which emerges and is maintained through messages required and permitted by already available encoding and decoding systems or mechanisms.

I use the word "anticommunication" whenever I wish to speak of a human relation between persons and things which emerges and is maintained through messages requiring and permitting not yet available encoding and decoding systems or mechanisms.

"Communication" feeds on, and speeds, the decay of information in systems on which depends the significance of human relations.

"Anticommunication" not only retards this decay, but even creates systems whose significance depends on human relations. Insistence on "communication" ultimately leads to social and physical violence.
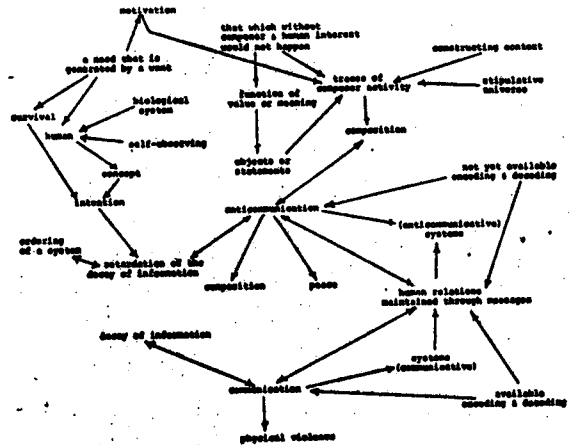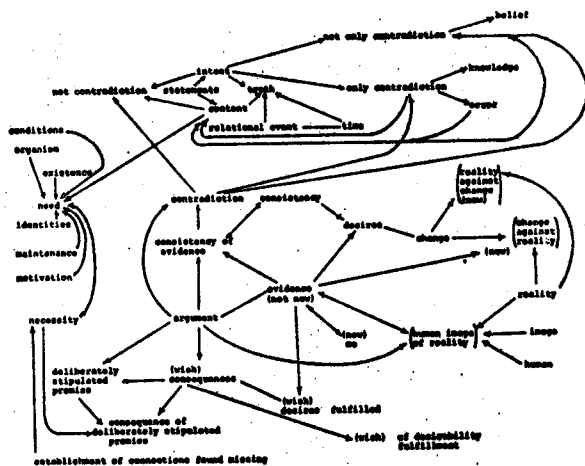
"Anticommunication" ultimately leads to the insistence on composition and peace.   [H.B.]
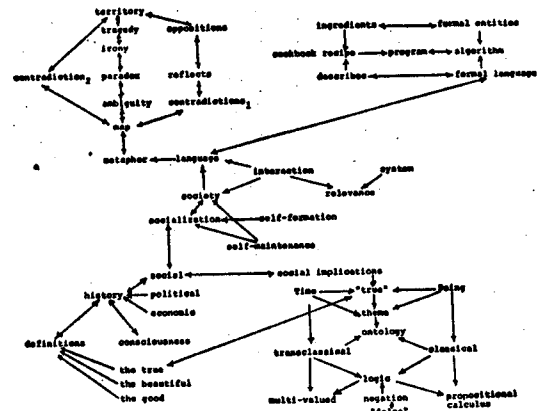
COMPOSITION

I use the word "composition" whenever I wish to speak of the composer's activity and the traces left by it. The composer's activity is motivated by a wish of bringing about that which without him and human interest would not happen. In particular, the composer's activity consists in constructing contexts, systems, stipulated universes, wherein objects and statements, selected by the composer, not only manifest more than their mere existence, but have a function or value or sense or meaning which without his construction they would not have. Occasionally the composer's activity brings about that which without him and without human interest could not have happened, leaving traces which nothing else could have left.

The wish which motivates the composer's activity is motivated by an exclusively human property, which thus exhaustively and sufficiently defines the term "human": a 'need' which is generated by a want. Among all biological systems only the human biological system contains that self-observing dimension whence comes, beyond the system's 'need', the system's want to survive. Thence the want, beyond the 'need', of survival and thus the exclusively human concept of an intent that would or will retard decay; in particular the decay of information, the ordering of a system, any system, stipulated, discovered, or dreamed of. [H.B.]

ONTOLOGY

Ontology has been called "the study of what is" (Quine). For the understanding of the term "ontology" it is important to point out that the above definition is itself an ontological statement, for it posits the existence of something that "is" that is the object of study. Ontologies divide into two major classes: classical and trans-classical (Günther). The classical ontology has one theme: Being (the "what is" of the above definition). This is what is meant by the expression "true". What is "true" "is". Or so they say. Such a statement has social implications, as is most easily seen in Hegel's well-known statement (in the Philosophy of Right) that "whatever is actual is real, and whatever is real is actual". ---Trans-classical ontologies are ontologies that in addition to the theme "Being" consider other themes, the principle one of which is "Time". Trans-classical ontologies are not an alternative to the classical one but rather an extension of it. An ontology that has negations of its themes as well as the themes themselves is a logic. So for example, in the classical ontology "not-Being" ("false") as well as "Being" ("true"). The classical ontological logic becomes calculable when the rules excluding contradiction and third terms are made explicit. Trans-classical ontological logics, having more than one theme, must have more than one negation. This leads to the so-called multi-valued logics. Research on the structure of multi-valued logics is currently of great interest among cyberneticians, in particular in the East European countries. In the Western bloc, the most advanced work in this field has been done by Professor Gotthard Günther. The development of multi-valued (trans-classical ontological) logics has not yet reached a stage at which calculation, comparable to that given by the classical logic via the propositional calculus and its derivatives, is feasible with the scope and flexibility of the classical logics. However, it is undoubtably the case that formal description of second-order cybernetic systems will require the development of the multi-valued logic calculus to just such a stage. [R.H.H.]

THE HISTORICAL CATEGORY OF THE NEW

Gotthard Günther
University of Illinois

The figure of Hegel appearing to us in his work stands in an ambiguous light. On the one hand Hegel was a loving and reverent keeper of the old; on the other hand no philosopher before had driven philosophical thought so far into new dimensions of reflection, so that the connection to the old often seems endangered, if not wholly lost. The threefold meaning of the Hegelian concept "Aufheben" (to "cancel") describes the dialectic of the situation. The old is "aufgehoben" in the new in so far as it is destroyed by and forgotten in the new. But in a deeper sense the old is maintained in the new and in the new has itself become new, it is elevated and transfigured in the rays of reflection.

In this dialectical opposition to the old the category of the new is revealed to us in three different forms, each according to the ontological place in which it appears to us. At the beginning of the history of the absolute the new is but an unfulfilled promise, the mere possibility of the something to come, for which one hopes. In the progress of world history the new is the revolutionary and dangerous that breaks apart old forms and restraints, and, finally, with an eschatological backward glance at history —complete at any moment in the here and now— the new reveals itself as the fulfillment and reconciliation of the dialectical oppositions in which the old has perished and, as Hegel says, returned to its ground.

The language that we have spoken in these introductory sentences is —as is Hegel's own text more often than not— metaphoric, romanticizing, and little suited to scientific analysis. For that reason we want to ask whether it is possible to submit the Hegelian concept of the new to a structural-theoretic analysis in which that which so far was to be understood only hermeneutically can be derived from exact analytic concepts. But before we proceed with this task we must establish what Hegel himself had to say on this theme. In volume IX of the first edition we find in the introduction to the Lectures on the Philosophy of History on page 67 the following passage: "The changes in nature, however infinitely manifold they are, describe but a circle that repeats itself ever and again; in nature there is nothing new under the sun, and to that extent the manifold play of her forms has a certain boredom to it. Only in the changes that come forth

on the ground of spirit does anything new appear." So in a fundamental and principled sense, it seems that for Hegel there is newness only in history, for in the same introduction he expressly distinguishes a natural and a spirited universe (p.35). The latter is for him world history.

According to Hegel, developments and changes in nature follow "an internally unchanging principle" and occur in an "immediate, unhindered manner free of oppositions". He then continues emphatically: "But with spirit it is otherwise ... spirit has itself to overcome as the true inimical hindrance to itself; development, which in nature is a tranquil process, is for spirit a hard, unending struggle against itself" (p.68). This distinction is so important for Hegel that in the next section he once again refers to the fact that the development of the historical epochs is not the same as the "harmless process free of struggle" (p.69) that, in his opinion, characterizes the evolution of natural life. Hegel then summarizes his historico-philosophical thoughts with the conclusive statement: "World history represents ... the sequence of stages of development of the principle whose content is the consciousness of freedom" (p.70).

In accordance with the lectures on the philosophy of history, the distinction between nature and spirit is that in nature all development takes place on the ground of an "internally unchanging principle" that allows no genuine, i.e., principled oppositions to arise; but that history implies a staged development of a principle. So the category of the new, as an eminently historical one, stands in an essential relation to the change of a general principle.

So that no misunderstanding might arise about this, Hegel also cites a false concept of the new. He mentions the legend of the Phoenix as symbol "of natural life that eternally prepares its own funeral pyre and then consumes itself, so that out of its ashes the new, youthful, fresh life may eternally arise" (p.90). After Hegel rejects this image as inappropriate, he continues by way of contrast: "Spirit, consuming the shroud of its own existence, does not merely wander into another shroud, not does it merely arise youthful and renewed from the ashes of its form, rather it arises from them elevated, transfigured, a purer spirit" (p.90ff.). There is nothing of elevation and transfiguration in the monotony of the eternally selfsame return of the Phoenix. Its resurrection is a mere natural event. It is the self-repetition of an unchanging principle that even through death is not transformed into anything higher. So, according to Hegel, such a death is an irrelevant destruction of the particular severed from the general. About this death, in the Phenomenology of Spirit, we read that it "has no inner range and content" (p.44

If now we finally turn to the question of whether —and to what extent— the Hegelian category of the new can be made precise structurally-theoretically, then it occurs to us that the eight (more if needs be) fundamental concepts mentioned by us that Hegel connects with the category of the now can be arranged into two groups, as in the following table:

secular	mythologizing
change (circular)	nature
principle	spirit
opposition	death
stage	resurrection

As can be seen, the terms on the left side of the table have an essentially structural-formal character. Those on the right side designate unsecularized mythologems. So every concept on the right side corresponds to a certain structural property on the left side —although no one could earnestly assert that our idea of "nature" is exhausted by our saying "circular change" instead.

On the other hand the relation of the left and right sides brings us to the following consideration: if the terms on the left side signify at least the beginning of a formalization and secularization of the mythologems, then it should be possible to continue such a process of formalization until all mythologems on the right side —and others that we could bring into our table— are unmasked as either elementary or complex structural properties of reality.

There can scarcely be any doubt that such a secularization process of an older mythology is at work in the Hegelian philosophy. And it can scarcely be contested that the category of the new is struck by that process, although for us today the word bears, if any at all, only weak metaphysical or mythological associations. But we do not want to forget that Hegel's thesis that nothing new happens in nature is a quotation from Ecclesiastes, and the term is often used elsewhere in the Bible in a fundamental sense. Just recall the beginning of the 21st chapter of the Revelation of St. John, where it reads: "And I saw a new heaven and a new earth: for the first heaven and the first earth passed away, and there was no more sea." Hegel's association of the term "new" with "principle" and "stage" for example contains to be sure the start of such a secularization, but then nothing more than a start.

We now want to drive this start one step further, and so we ask ourselves what it can mean when Hegel asserts that the subordinate changes —producing nothing really new— that nature is capable of rest on an oppositionlessness. Now it is wholly self-evident that in every change certain distinctions and therefore relative oppositions are involved. So Hegel must distinguish two types of oppositions. And in fact he does that, as is well known. Functionally he characterizes these types of oppositions by distinguishing partial and total negation.

But now to the first, classical negation with its partial and total variants Hegel adds yet his famous "second negation". For the purpose of clarifying the reciprocal relation of these two negations, we went to introduce a new pair of concepts that we designate with the terms "contexture" and "discontexturality". We will first illustrate what a contexture is with a few simple examples. If we speak of Being-in-General, then we mean by that a total systemic context that is closed in itself and is marked off from what Hegel calls pure Nothing. All the theoretical means that serve one within such a contextual context fail when one would go beyond the limits of that contexture by means of them. In application to the discontexturality of Being and Nothing that is quite trivial. Every logical sequence or every arithmetical counting process that serves us in the domain of Being comes to end when we attempt to overstep the boundary between Being and Nothing. In Nothing one can neither draw conclusions nor count things.

This is the most elementary case of discontexturality. If it were the only one that our universe is subject to, then the Hegelian logic would be superfluous, and it would be forever impossible for us to go beyond the classical tradition of thought and philosophy. But in fact our reality is woven through further discontexturalities that separate infinitely many contextures from one another. So, for example, the essence of all bona fide objects forms a contexture, and the subjective space of consciousness of an experiencing subject who perceives these objects forms another. A further example of discontexturality is the radical separation of an I from the so-called psychical sphere of a Thou. As much as we might try, we could never experience the conscious acts of another I as our own, because psychical experiences that are bound to different I-centers belong to different contextures and so, relative to one another, are discontextural.

Now we assert that the classical first negation, of Aristotelian provenance, has an intra-contextural function. It negates within a contexture and nowhere else. In opposition to that, Hegel's second negation has no intra-contextural function at all. It is trans-contextural. It negates the totality of a contexture and by this negation posits another contexture in its place.

Within any given conterture reigns that internally unchanging structural principle of which Hegel speaks. But the transition from one conterture to the next means a change in the structural principle. It belongs to the definition of a conterture that its structural character can in no way be changed by intra-contextural operations. But a conterture can not be changed by Hegel's second negation either, for indeed the latter has only the task of positing a new conterture in place of the old one.

Since the second negation never negates content determinations, rather only the structural context of given contents, it changes the logical principle. The opposition of which Hegel speaks in connection with the category of the new, and which he contrasts with the oppositionlessness of the so-called natural changes, is the universal opposition of contextural principles and system-contexts that reciprocally exclude one another. Compared with this, intra-contextural differences with a constant structural principle contract into a relative oppositionlessness. The new in history, which according to Hegel arises from the "unwilling labor" of spirit at its opposite, is therefore not the product of self-conflicting content determinations within a given conterture. Rather it results from the opposition of two contextures. This conclusion is unavoidable! Since spirit is itself a conterture, it can only have itself as oppositional conterture, not as a solitary contextural content.

With the simple result that the Hegelian category of the new, which is bound to the dissolution of one world historical epoch by another, is identical to the idea of a contextural change within history, we could be satisfied and conclude our observations, if it were not for the fact that Hegel indicates that world history represents a sequence of stages in the development of a principle, to the extent that a higher principle absorbs a lower one. How to be sure, we have identified the idea of a principle with the structural-theoretic conception of a closed conterture. But what we have said about contextures so far still gives us no right to assert that the transition from one conterture to the next is a progress from lower to higher or a regress from higher to lower. On the contrary, the examples of contextures that we so far have cited, for example the discontexturality of I and Thou subjectivity, expressly exclude such a possibility. The discontextural relation between the previously cited conterture is symmetrical and not hierarchical. In order to establish that Hegel is correct when he speaks of a sequence of stages of a principle that always changes anew, we must introduce another concept, namely that of asymmetrical discontexturality.

What is to be understood by that can best be explained if we recall precisely what is to be understood by symmetrical discontexturality. For purposes of illustration, we want to cite a further example of elementary discontexturality. Next to the opposition of reflectionless Being and pure undetermined Nothing with which Hegel opens his Logic, perhaps the most fundamental expression of elementary discontexturality is time. Structurally-theoretically considered, time is nothing but a discontextural relation between past and future. To be sure, we can make statements about the past, and with certain reservations we can make statements about the future, but we are in no way capable of making theoretical assertions about the future, because in the process of making the statement itself the present becomes the past. All possible statements must be arrangeable within a conterture. But the present means nothing else but a transition from one conterture to another. The discovery that past and future are discontextural dimensions of time can be traced back to Aristotle. In the IXth chapter of PERI HERMENEIAS namely, he indicates that the axiom of the excluded middle is valid for both the past and the future, but that it can be applied only to the past. The validity of the tertium non datur for both the past and the future shows that these two contextures form a symmetrical exchange relation. They can be seen as images of one another. On the grounds of classical logic, the course of time is only chronological and reflectionless, i.e., it is reversible. The discontexturality of the two dimensions of time: past and future, is expressed in that the reciprocal validity of the excluded middle is always applicable to one side only. The side to which we apply it is the very one that we call the past.

So we can consider chronological time as a "temporal" sequence of two contextures, but since this sequence is reversible there is nothing about it that indicates a sequence of stages and a progress from lower to higher.

On the other hand, however, we connect with the transition from old to new the conception of irreversibility. The new is only new because it comes after the old. So what we need is an irreversible discontextural relation. When we speak of Being and Nothing, or of I-subjectivity and Thou-subjectivity, or of past and future in the chronological sense, then we are speaking of unordered pairs of contextures. In order to make a sequence of stages out of them, which the Hegelian concept of directed Becoming implies, we must find a scheme according to which all possible contextures can be ordered. The solution to this problem is already at hand in the Logic of Hegel. As is well known, the greater Logic of Hegel begins with the undialectical opposition of Being and Nothing, which dialectically considered however is an equivalence. Being-in-General designates —as we have

already indicated— an unbroken ontological context. Nowhere does Being-in-General have breaks. But exactly the same thing must be asserted of Nothing. So just as Being has no breaks, so pure Nothing is nowhere broken by shards of Being. At the beginning of the greater Logic Hegel expressly indicates that both dimensions are wholly indistinguishable structurally. And yet they are discontextural, for Being is indeed Being and not Nothing. This state of affairs has long been known in mathematical logic, where it appears as the isomorphism of two-valuedness and the semantic symmetry of affirmation and negation. This isomorphism is posed as follows:

a) every statement is ordered with its negation
b) the basic relation "negation" is itself ordered
c) the basic relation "conjunction" is ordered with the basic relation "disjunction".

A surprising fact results from that: when we make use of the classical two-valued logic in our statements about the world, then we are in a position to form two sets of statements that linguistically are extremely different but that say exactly the same thing ontologically. In his lecture to the second Hegel Congress, held at Humboldt University in 1931, the mathematician Reinhold Baer referred to this isomorphism with the remark: "To be sure, every statement is distinct from its negation, but there is essentially no difference between positive and negative statements, even less so between a statement and its negation." Although Reinhold Baer's assertion is incontestable, our logical instinct insists that an essential ontological distinction does exist between a statement and its negation. And this instinct is correct. If in fact we place the essence of all affirmative statements that arise from the classical logic on the side of Hegel's reflectionless Being, and the isomorphic essence of all the negations of these statements on the side of the equally reflectionless Nothing, then our isomorphism demonstrates the total discontexturality of Being and Nothing. Hegel has a well known term for this discontexturality: Immediacy.

We want now in the light of the Hegelian category of the new to consider the concept of the isomorphism of two contextures that despite their isomorphic character are separated discontexturally. To be sure, every conceivable counting, thought, and objectification-capable process of reality is included in a given structural contexture. But if a second contexture is isomorphic to the first in the sense described by Baer, then these processes can be repeated, mirror-like, in the second contexture. But that means that all alleged statements about Nothing, in which one makes use of negative statements —as for example in the

negative theology of Dionysius Areopagita— are in reality nothing but masked statements about affirmative reflectionless Being. And if Being and Nothing are but simple mirror images of one another, then in the one we can find nothing that is not also to be found in the other. It follows —to return to our thematic category of the new— that after all we have learned from Being, Nothing cannot offer us anything new.

At that it becomes clear that the Hegelian category of the new must be bound to the structural principle of anisomorphism. When Hegel asserts that there is nothing new in nature, then he means by that that the category of the new as he understands it can find no application in sytems of symmetry. At that the mytho-logem "nature" in the Hegelian philosophy is fully secularized; and in anticipation of our further expositions, we can say that a first step towards secularization of the term "spirit" has been taken.   We can say of the latter that it is a mani-festation of an asymmetrical relation of contextures.

In so far as our classical tradition of thought rests on a two-valued, undia-lectical logic, it is the doctrine of all symmetry structures in the world. But a symmetrical world is a totally ahistorical world in which nothing genuinely new can appear in the sense defined by Hegel. Inversely, "history" is but the common language expression for the asymmetry of reality.

But in fact there is more to the relation between reflectionless Being and pure Nothing than Reinhold Baer has seen. This relation contains —from the standpoint of the dialectician— an asymmetry that we now want to investigate. We find it in the Hegelian distinction between Mediacy and Immediacy. On the one hand Being and Nothing confront one another as Immediacies, and to that extent their mutual relationship corresponds to Baer's description. But they are also, as Hegel remark; at the beginning of the greater Logic, mediated in the category of Becoming. But terms like "mediation" and "becoming" are fundamentally too only mythologems pro-duced by the common language, so long as one is not in a position to refer them back to structural properties of reality.

In order to satisfy this task we make reference to the fact that the Hegelian term "mediation" can have an exact sense only then when the term "being" (or, in-versely, "nothing") belongs to two different relations. That is in fact the case. On the one hand Being stands in a symmetrical exchange relation with Nothing, and we have said enough about that already. But Being also stands —and this is the more subtle connection— in a relation to the symmetrical exchange relation that occurs between it and Nothing. In order to bring this state of affairs into the

"sequence of stages". At the same time, it can be demonstrated that in transcontextural contexts of higher order —in consequence of the greater complexity of the whole system— logical properties appear that are not at all in evidence in the isolated elementary contextures. To that extent, the ontological conditions for the appearance of the new exist in the staged self-expanding transcontextural synthesis.

The transition from one contextural stage to another is provided by Hegel's second negation. For the classical first negation it is characteristic that an enrichment of contextural structure never results from its application. Inversely, it is characteristic of Hegel's second negation that every new application raises the complexity of the whole system. But that also means that this negation requires a new functional definition. So Hegel's famous term "second negation" is fundamentally a collective concept for a hierarchy of transclassical negations of continuously increasing scope. At this point, an investigation of the Hegelian logic merges with the philosophical theory of transclassical, multi-valued logics, which in the end are nothing but successive stages in the formalization of dialectics. Classical affirmation and negation alone produce neither formally nor informally a dialectical relation. They are, to use a simple image, caught in the cages of their separate contextures. The line of demarcation between the contextures obstructs any dialectical interplay —or even opposition.

To conclude these observations, we want to return once more to the category of the new in the Hegelian philosophy of history. We recall that in the quotations cited by us Hegel associates the category of the new with the appearance of a fresh historical epoch ... an epoch that expresses a general principle previously not present. On the other hand, it is self-evident that a new epoch brings new contents also. So the opposition between two historical epochs rests on a double negation: first, a reciprocal negation of contents —that is the Aristotelian negative moment—, and, second, a reciprocal negation of contextural principles. That is Hegel's second negation.

A dialectical structure arises when to mere content relations the specific structural conditions of a contexture are added that exclude other contextural relations. But since reciprocally opposing contextures can be assembled transcontexturally, structural conditions arise that can no longer be handled undialectically.

Since on the other hand there can be no doubt that the contexture concept can be defined exactly, and that the same can be said of the principle of transcontext-

most simple formulation, we can say: for the classical, undialectical relation theory resting on two-valued logic a relation is nothing more than the relation between the two members of the relationship. But a dialectical theory of relations must additionally establish that every member of a relationship, its connection to the other member aside, has yet another relation to the exchange relation that exists between it and the other member of the relation. It is clear that this relation between relational member and relation must be distinguished at once from the relation between the two relational members, as in the former the relational members are no longer exchangeable.

As long as Being and Nothing confronted one another as Immediacies, they were exchangeable at will; and by their exchange nothing in the least could be changed concerning their reciprocal relation. So Being and Nothing represent no ordered pair. But if we now form a new and unique relation where Being (or Nothing) stands on the one side and the exchange relation of Being and Nothing stands on the other, then in this latter relation the two relational members do represent an ordered pair. Since they no longer can be mapped onto one another, the relation possesses a sense of direction. That is what is meant by the Hegelian term "becoming", a Becoming in which Being and Nothing are mediated at the beginning of the greater logic.

We now want to translate these considerations into the language of our theory of contexturalities. We observed that Being is one contexture and that Nothing is another. Further we introduced the concept of transcontexturality. At that we are in a position to define two fundamental relations in the frame of the theory of contexturalities: first, the exchange relation between two mutually exclusive elementary contextures, and, second, the relation between contexture and transcontexturality, which in consequence of its asymmetry gives us the possibility of distinguishing "left" from "right" logically and therefore "before" and "after" ontologically.

Since we can only establish transcontexturality there where we have a relation between at least two contextures, the problem of the second, asymmetrical relation reduces to the simple question: what is the relationship of a single contexture to structures of higher complexity that can be constructed out of at least two or more contextures?

Now it can be shown that systems with a gradually increasing number of elementary contextures form a unique structure that is a good match for the Hegelian term

urality, so it turns out that even the theory of dialectics is accessible to a process of progressive formalization. We say "progressive", for the totality of dialectical processes, which reaches from absolute generality on down to the last isolated particularity, will remain in toto unformulizable. Said mathematically: the formalization conditions for dialectics must be recursive.

This recursiveness of the dialectical structures cannot be transcended, because they rest on a fundamental ontological presupposition concerning the relation of reflection and time —a presupposition that even enters into the Hegelian image of history. It has often been remarked that the Greeks, who developed the foundations of our classical image of the world, attempted to sketch a theoretical image of the cosmos that was timeless. This cosmos was subject to the law of the eternal return of the Same, because it lacked the historical dimensions of the singular and the irrepeatable. For this classical conception reality is one single closed context-ure in which at best there are discontinuities of a factual-content character. All breaks of contextual contexts are in this world image only apparent and temporary. They rest, as Kant later said, on a transcendental illusion. For the classical logic all oppositions, however wild and irreconcilable they may behave in this world, come together in the end in the divine Coincidentia Oppositorum of Nicholas of Cusa.

It is most characteristic that Hegel never mentions or systematically exploits the coincidentia oppositorum, unless then we consider the dialectical unity of Being and Nothing as coincidentia oppositorum. But this unity is for Hegel not the end of the sacred history of the world but rather a wholly secular elementary beginning. So we gain from the Hegelian philosophy of history an ontological image of the real previously not present. Seen from the standpoint of the Hegelian philosophy, the world is not a closed contexture that embraces all contents and reduces all to a common denominator. Rather it is a system of infinitely self-expanding contextures of constantly increasing richness. In the old classical image of the world, which to be sure possessed not a richness of contents but a total simplicity of contexture, there could be nothing genuinely and really new. Hence the yearning of men for a celestial paradise, or their fear of a Hell, beyond the limits of life. Paradise and Hell were the sole contrast to the eternal return of the old in earthly existence. The idea of a heavenly or hellish Jenseits is in fact an expression for discontexture —but all the same only a mythological expression. And world history viewed as sacred history, as the classical tradition does, is nothing more than a preparation for that new that lies beyond this earthly

life. But if sacred history only prepares for the new, then nothing new can appear within it, for then it would lose its character of preparation.

The fundamental difference between the Hegelian conception of history and that of the classical tradition is that he secularizes the discontexture that in the Platonic doctrine of the ideas —and elsewhere— severs Diesseits from Jenseits, and brings this discontexture into history itself. The vehicle for that is for him the category of the new. History is for him the medium in which the totally new arises. But the totally new cannot appear within a given contexture. And since Hegel —rightly or wrongly— interprets nature as a closed contexture, according to his conception it cannot bring forth anything genuinely new intracontexturally. The trivial transition from one content to another produces at most such inferior "novelties" as the changing fashions in clothing. But philosophy is not interested in that. The genuinely new that can withstand the glance of philosophy demands a change not only in content but also of contexture. But for that,not only the first but also the second negation is involved. With other words: the historical category of the new in Hegel's philosophy of history is the result of a dialectical process.

Translated by Richard Herbert Howe.

PUBLICATIONS

Gotthard Gunther

A. Books

1. Grundzüge einer neuen Theorie des Denkens in Hegels Logik, F. Meiner, Leipzig, 224 pp. (1933).

2. Christliche Metaphysik und das Schicksal des modernen Bewusstseins, Hirzel, Leipzig, 108 pp. (1937).

3. Das Bewusstsein der Maschinen, Agis Verlag, Baden-Baden, 106 pp. (1957).

4. Die Idee und ihre philosophischen Voraussetzungen, Vol. I of Idee und Grundris einer Nicht-Aristotelischen Logik, F. Meiner, Hamburg, 389 pp. (1959). [BCL Publication #8]

5. Logistischer Grundriss und Intro-Semantik, Vol. II of Idee und Grundris einer Nicht-Aristotelischen Logik, F. Meiner, Hamburg. (In preparation).

6. Die Entdeckung Amerikas, Rauch Verlag, Dusseldorf, 24 pp. (1952).

7. Das Bewusstsein der Maschinen, Second, revised, and enlarged edition, Agis Verlag, Baden-Baden, 213 pp. (1964). [BCL Publication #102]

B. Articles

8. "Bemerkungen zum Problem einer Strukturdifferenz der orientalischen und abendlandischen Psyche", Ztschrt. f. Missionskunde u. Religionswissenschaft, 41, 100-124 (1926).

9. "Individualität und Religionsgeschichte", Ztschrt. f. Missionskunde u. Religionswissenschaft, 42, 337-356, and 43, 232-247 (1927).

10. "Philosophie als Lebensnotwendigkeit", Tatwelt, XII (4) 216-220 (1936).

11. "Die philosophische Einheit der Wissenschaften", Tatwelt, XIII (2) 79-92 (1937).

12. "Schlussbemerkungen zur philosophischen Tagung im Euckenhaus, Jena, 1937", Tatwelt, XIII (3) 149 (1937).

13. "Wahrheit, Wirklichkeit und Zeit, die transzendentalen Bedingungen einer Metaphysik der Geschichte", Travaux du Congres International de philosophie Parix, VIII, 105-113 (1937).

14. "Logistik und Transzendentallogik", Tatwelt, XVI (1940).

15. "Die zweite Maschine", Weltraumbücher, 4, 219-242 (1952).

16. "Die philosophische Idee einer Nicht-Aristotelischen Logik", Travaux du XI Congres International de Philosophie, Bruxelles, V, 44-52 (1953).

17. "Aristotelian and Non-Aristotelian Logic", Startling Stories, 32 (1) 102-108 (1954).

18. "Achilles and the Tortoise", Astounding Science Fiction, Part I: 53 (5) 76-128; Part II: 53 (6) 85-146; Part III: 54 (1) 80-147 (1954).

19. "Seele und Maschine", Augenblick, 3 (1) 1-16 (1955).

20. "Metaphysik, Logik und die Theorie der Reflexion", Arch. f. Philos., 7, 1-44 (1957).

21. "Ideen zu einer Metaphysik des Todes", Arch. f. Philos., 7, 335-347 (1957).

22. "Die aristotelische Logik des Seins und die nicht-aristotelische Logik der Reflexion", Ztschrft f. philos. Forsch., 12, 360-407 (1958). [BCL Publication #3]

23. "Die gebrochene Rationalität", Augenblick, 3 (3) 1-26 (1958). [BCL Publication #4]

24. "Analog-Prinzip, Digitalmaschine und Mehrwetigkeit", Grundlagenstudie , 1 (2) 41-50 (1960). [BCL Publication #24]

25. "Schöpfung, Reflexion und Geschichte", Merkur, XIV (7) 628-650 (1960). [BCL Publication #25]

26. "Ein Vorbericht über die generalisierte Stellenwerttheorie der mehrwertigen Logik", Grundlagenstudien, 1 (4) 99-104 (1960). [BCL Publication #26]

27. "The Tradition of Logic and the Concept of Trans-Classic Rationality", Allgemeen Nederlands Tijdschrift voor Wijsbegeerte en Psychologie, 54 (4) 194-200 (1962). [BCL Publication #70]

28. "Logische Voraussetzungen und philosophische Sprache in den Socialwissenschaften", Soziale Welt, 12 (4) 289-304 (1962). [BCL Publication #69]

29. "Archilles and the Tortoise", Astounding Science Fiction, Part I: 53 (5) 76-128; Part II: 53 (6) 85-146; Part III: 54 (1) 80-147 (1954).

30. "Cybernetic Ontology and Transjunctional Operations" in Self-Organizing Systems, M.C. Yovits et al. (eds.), Spartan Books, Washington, D.C., 313-392 (1962). [BCL Publication #68]

31. "Hegel: Dialectic Theory and Symbolic Logic", ARTORGA, 58, 1-7 (1963). [BCL Publication #91]

32. "Zweiwertigkeit, logische Paradoxie und selbstreferierende Reflexion", Zeitschr. f. philos. Forsch., 17 (3) 419-437 (1964). [BCL Publication #105]

33. "Information, Communication and Many-Valued Logic" in Memorias del XIII Congreso Internacional de Filosofia Mexico 1963, Universidad National Autonoma de Mexico, 5 (1) 143-157 (1964). [BCL Publication #104]

34. "Das Problem einer Formalisierung der transzendental-dialektischen Logik", Hegel-Studien, 1, 65-122 (1964). [BCL Publication #103]

35. Günther, G., H.S. Na and H. Von Foerster: On Structural Analysis of Many-Valued Logic, T.R. (7)-1: 131 pp. (1964) [BCL Publication #116]

36. "Das Problem einer transklassischen Logik", Sprache im Technischen Zeitalter, 16, 1287-1308 (1965). [BCL Publication #116]

37. Cybernetics and the Transition from Classic to Trans-Classic Logic, BCL Report 3.0, Biological Computer Laboratory, Department of Electrical Engineering, University of Illinois, Urbana, 9 pp. (1965).

38. Günther, G.: Formal Logic, Totality and the Super-additive Principle, Epistemology 3.3: 23 pp. (1969).

39. With H. Von Foerster, "The Logical Structure of Evolution and Emanation" in Interdisciplinary Perspectives of Time, R. Fischer (ed.), New York Academy of Sciences, New York, 874-891 (1967). [BCL Publication #139]

40. "Über Anschauung und Abstraktion" in Dialog des Abendlandes, E. Heimendahl (ed.), Paul List Verlag, München, 199-207 (1966). [BCL Publication #130]

41. Günther, G.: Das Bewusstsein der Maschinen, 2nd Revised and enlarged edition, Agis Verlag: Baden-Baden, 107 pp. (1967).

42. "Time, Timeless Logic and Self-Referential Systems" in Interdisciplinary Perspectives of Time, R. Fischer (ed.), New York Academy of Sciences, New York, 396-406 (1967). [BCL Publication #138]

43. Logik, Zeit, Emanation und Evolution, Westdeutscher Verlag, Köln und Opladen, 96 pp. (1967). [BCL Publication #137]

44. "Bewusstsein als Informationsraffer", Grundlgst. Kyb. und Geisteswiss., 10 (1) 1-6 (1969). [BCL Publication #169]

45. "Das Rätsel des Seins", Civitas, 24, 521-530 (1969). [BCL Publication #170]

46. "Kritische Bemerkungen zur gegenwärtigen Wissenschaftstheorie", Die Soziale Welt, XIX, 3/4, 328-341 (1969). [BCL Publication #180]

47. "Structurelle Minimalbedingungen für eine Theorie des objec-tion Geistes als Einheit der Geschichte", Trans. of the Third International Hegel Congress, Lille, France, 159-205 (1968). [BCL Publication #181]

48. "Many-Valued Designations and a Hierarchy of First Order Ontologies" in Proc. of the 14th International Congress of Philosophy, III, L. Gabriel (ed.), Herder; Vienna, 37-44 (1969). [BCL Publication #182]

49. "Natural Numbers in Trans-Classic Systems", Journal of Cybernetics, Part I: 1 (2) 23-33; Part II: 1 (3) 50-62 (1971). [BCL Publication #216]

50. "Die historische Kategorie des Neuen", in Hegeljahrbuch, A. Hain & W.B. Verlag; Meisenheim, 34-61 (1970). [BCL Publication #199; "The Historical Category of the New", English translation by R. Howe, Biological Computer Laboratory, University of Illinois; Urbana, 13 pp. (1973); BCL Publication #199a.]

51. The Historical Category of the New, English translation by R. Howe, Biological Computer Laboratory, University of Illinois; Urbana, 13 pp. (1973); BCL Report 3.5.

52. "Die Theorie der 'mehrwertigen' Logik", Philosophische Perspektiven, 3, 110-131 (1971). [BCL Publication #200]

53. "Cognition and Volition", in Cybernetics Techniques in Brain Research and the Educational Process, 1971 Fall Fall Conference of the American Society for Cybernetics; Washington, D. C., 119-135 (1971).
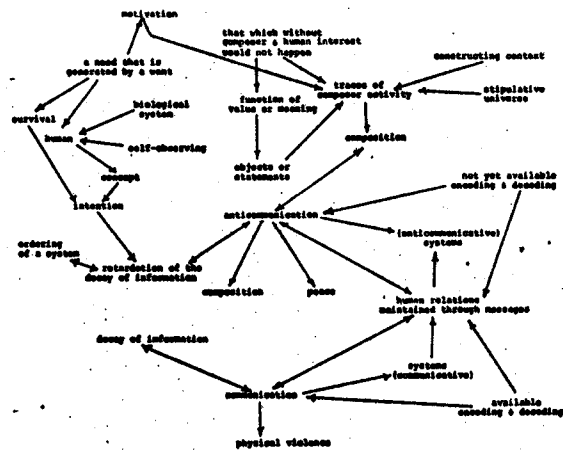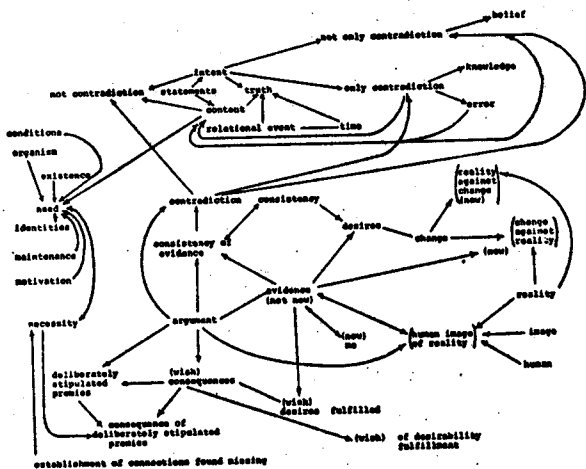
Scott Mutter

TRUTH

I use the word "truth" whenever I wish to speak of the time during which the intent and content of a person's statement can not and will not be accidentally in conflict or accidentally in contradiction with the intent and content of any other statement which this person would make in response to any situation, question or statement presented.

The time: because I refer to the passing presence of a relational event rather than to the value of timeless forms in formalized logics.

Not: because, were I to write 'only' instead, I should use the words "knowledge and error" instead of the word "truth"; and were I to write 'not only' instead, I should use the word "belief" instead of "truth" and instead of the words "knowledge and error". [H.B.]

TRUTH

In attempting a sketch of a definition of Truth, I shall first distinguish the Idea that is Truth from the concept of truthfulness. Truthfulness is a concept whose extension is the set of all statements about what we call "empirical reality" that stand in some degree of correspondence to that reality. The degree of this their correspondence is the measure of their truthfulness, which--considered with respect for time and chance--may also be called their probability or even plausibility. The intension of the concept of truthfulness is the set of procedures that compute for empirical reality a model whose predicates are of sufficient generality as to maximize the truthfulness or probability or plausibility of statements made with the assistance of that model with regard for that empirical reality. Thus there are truths but there is no "the truth"; nevertheless, there is Truth.

The reconstructed-logic of the logic-in-use of society in its process of self-maintenance has been, in its definition, historically bound to the constraints imposed upon it first by Parmenides: ἔστιν ἢ οὐκ ἔστιν --or, as they gained fame through the influence of Aristotle: "not both" and "nothing else". In this reconstructed-logic, there is one theme: Being (whose designator is usually called "true") and one negation: Not-Being (which is usually called "false"). No empirically real object that is to be described or modeled with this logic may both "be" and "not-be" at the same time; i.e., no statement in this logic about an empirically real object may be both "true" and "false" at once. And, further, no mode of "being" other than Being and Not-Being is allowed, for this logic has no designator for a theme for such a mode. --Owing to the structure of inference within this logic, failure to observe those rules: "not both" and "nothing else" leads to the possibility of proving that each and every statement within this logic is both "true" and "false", thus rendering this reconstructed-logic as logic-in-use   useless.

The constraints just discussed impose consistency upon this logic as the condition of its usefulness. Any single inconsistency within this logic would reduce the whole of this logic to a

shambles of useless inconsistencies. Nevertheless, this logic is indeed useless--even in its most consistent formulation--with regard to themes other than the theme of Being, such as the theme Time. For Time, considered as "the Now", is, under the aspect of this logic, contradictory in itself.

It was the attempt of Hegel to construct a multi-thematic, multi-negational logic that would incorporate just such themes as Time, Change, History into its structure as the "classical" logic had had to exclude because of their inherent contradictoriness. Hegel's Logic is a sketch of a system of contradictions. It is opposed to the "classical" logic, which is a system without contradictions. Yet considering both the "classical" and the Hegelian logics as systems, this opposition--system without contradictions vs. system of contradictions--reproduces, at this "higher" level of systemic totality, the very "not both" and "nothing else" that Hegel had sought to escape. For we cannot even now imagine a positive definition of a logical system that is neither contradictory nor non-contradictory, neither consistent nor inconsistent. Neither of these logical systems can be judged to be "true" or "false" vis-à-vis the other, nor do either of them produce a "something else" that escapes this dilemma. It is from just this dilemma that the Idea of Truth arises.

The Idea, not the concept of truth. A concept has both intension and extension--truth: neither. Truth is an Idea. An Idea is of language. The following paragraphs shall attempt to sketch an outline of the relationship "of" language and Truth:

1) Persons, in just those interactions that are necessary-- and no matter how many the mediations--for their self-maintence as autopoietic systems, generate--socially--language.

2) As concept, every word in language entails--and no matter how many the mediations--every other word in language. The image of this totality of conceptual connectivity, of this "conceptual entailment structure" defines each word in language as an Idea.

3) As Idea, each word in language is the Other of its conceptual entailment structure.

4) Considering the totality of all words in language under their aspect as Ideas, and considering this totality as an entailment structure <u>of</u> conceptual entailment structure <u>possibilities</u>, the Other of this <u>ideational</u> entailment structure is Truth.

5) It--that "Truth"--is false. It is false because always changing because persons, in just those interactions that are necessary--and no matter how many the mediations--for their self-maintenance as autopoietic systems,have generated not only a language but also and at the same time and through the same process a society whose structures are contradictory.
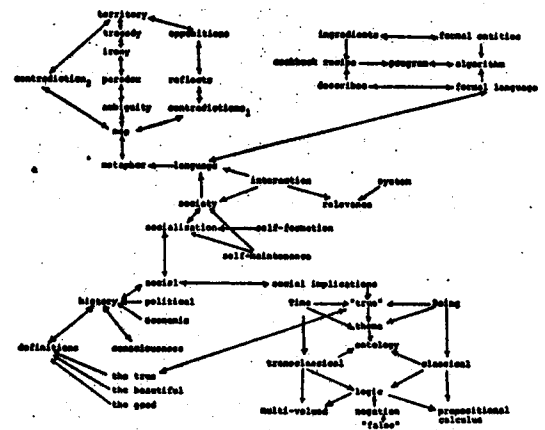
6) The dynamic of that contradictoriness and the contradictoriness of that dynamic vis-à-vis the self-maintenance of the individual persons constituting a society generate as Ideas values: ethical values.

7) Ethical values in their dynamic vis-à-vis the self-maintenance of the individuals constituting a society--and thus themselves--and generating its--and thus, sadly, their--language, generate the Other of the falsity of the "Truth" that the ideational connectivity of the language generates.

8) This Other be it--if anything--that be Truth. --Be it the historical dynamic of the oppositions and conflicts and contradictions and paradoxes and ambiguities and ironies of historically generated ethical falsities, so may Truth be likened to the hyperbola that it is: the hyperbola of human liberation, whose asymptote be never definable and always attainable.

Be Truth our definition and stipulation of the possibility of the possibility of human liberation, be it in this sense--and in this sense alone--the second-order cybernetics Idea <u>par excellence</u>.

[R.H.H.]

A IS BETTER OFF WHEN B IS BETTER OFF.