

Systems of Orientation

Richard Jung¹

Cornell University

Manfred Kochen (Ed.).
Some Problems in Information Science.
New York NY & London UK: The Scarecrow Press, 1965.
Ch. IIA, pp. 67-93.

This paper is a substantially revised and updated version of a research report which was undertaken, in part, at the IBM Th. J. Watson Research Center during the summer of 1963 with the support of contract AF19(628)-2752. The author was then affiliated with Rutgers University.

The present version incorporates results obtained in the fall of 1964 at Cornell University in the research context of the Program in Social Systems Analysis.

The original version of the first working paper in the theory of orientation was read 30.12.1962 at the annual meeting of the American Association for the Advancement of Science in Philadelphia PA under the title "Formal analysis of ideological components of behavior". R. JUNG (1962d).

¹ Kouřimská 24, CZ - 284 01 Kutná Hora, Czech Republic;
+420 327 512 197; Richard.Jung@post.Harvard.edu , <http://www.RichardJung.cz/> .

 67²

Systems of Orientation

Richard Jung

Cornell University ³

INTRODUCTION AND OVERVIEW

This paper describes an attempt to formulate a functional theory of orientation. It is the second working paper in a projected series. The first working paper⁴ reported that a phenomenological analysis and reconstruction of one phase of the postulated process of orientation yielded a conceptualization of twelve systems of discourse.

The present paper reports the results of a formal analysis of another phase of the process of orientation and its reconstruction as a set of systems of orientation. It is postulated that the systems of orientation are the generative mechanisms for the systems of discourse.

These results are presented in several Figures and Tables. The Figures locate the phases of the process relative to each other. The Tables display the structure of the systems of orientation, and they indicate which components of each system of discourse are generated by a given set of operators in the corresponding system of orientation. A systematic study of the Figures and Tables should convey efficiently and adequately the central thesis of the paper.

THE THEORETICAL CONTEXT

The theoretical context of the problem of orientation is firmly established by the major traditions of psychological and sociological theory. In most theories of behavior, it is regarded as axiomatic that the organism does not

² Original page number in:
MANFRED KOCHEN (ED.), *Some Problems in Information Science*, Ch. IIA, pp. 67-93.
New York NY & London UK: The Scarecrow Press, 1965

³ This paper is a substantially revised and updated version of a research report, which was undertaken, in part, at the IBM Th. J. Watson Research Center during the summer of 1963 with the support of contract AF19 (628)-2752. The author was then affiliated with Rutgers University. The present version incorporates results obtained in the fall of 1964 at Cornell University in the research context of the Program in Social Systems Analysis. The original version of the first working paper in the theory of orientation was read at the annual meeting of the American Association for the Advancement of Science, Philadelphia PA, December 30, 1962, under the title "Formal analysis of ideological components of behavior." Cf. R. JUNG (1962d).

⁴ R. JUNG (1962d).

respond to the total environment, but to  68 some selected subset of it. It is further assumed that every organism takes an active part in constructing its action-world; it not only selects from the ontological world, but also adds some elements and imposes some, if not all, relations.

In sociology, since Weber, a necessary step in the analysis of action is its 'meaningful interpretation' (*deutendes Verstehen*) in terms of, what Thomas called, the actor's 'definition of the situation.' This mode of sociological analysis has been codified and further developed by Parsons, and its basic concepts are now generally accepted.

Similarly, in psychology, part of the variation in responses of an organism to ontologically similar conditions is accounted for by postulated differences in the organism's response set. The active part of the actor in constructing his action-world is emphasized in the classical Freudian, Gestalt, Lewin's, Piaget's and New-Look-Cognitive theories. The learning theory of Tolman, the psychology of personal constructs of Kelly, Festinger's cognitive dissonance theory, Orne's methodological critique of psychological experiments in terms of the subject's construction of a meaningful experimental situation by his detection or invention of the demand characteristics of the experiment, and the work of Berlyne on epistemic behavior are among the more recent formulations which assign critical importance to the actor's construction of his action-world.

The problem of orientation is a familiar one in ethology since von Uexküll's construction of the concepts *Umwelt* and *Wirkwelt*. Similar examples from theories of economic and political behavior abound. On the whole, current theories of behavior attribute a significant portion of the variation in behavior unexplained by them to orientation as an undefined residual category.

It appears that this is not due to the admitted inadequacy of these theories, but that even fully adequate theories of motivation and decision will not be able to account for all the variation in action, and that a substantial portion of this residual variation is indeed attributable to differences in orientation. At the present, no  69 theory of orientation exists. The construction of such a theory appears to be a necessary and critical step in the further development of behavioral theory, as well as a prerequisite for the programming of mechanical systems for behavior of the human order of complexity.

The aim of the project is to formulate a theory of orientation, *i.e.*, to give a systematic general description and an explanation of the process by which any behaving system (organism, collectivity, or machine)⁵ constructs a definition of itself as an actor and of the world as its situation.

Among the major questions the theory should answer are:

- 1) What are the different possible types of orientation?

⁵ Since no generic term is available to characterize all behaving systems (organisms, machines, and collectivities formed of combinations of organisms and/or machines) the term 'organism' will be used hereafter as a generic term for all such systems.

- 2) What is the specific principle governing each type of orientation?
- 3) What is the principle governing the selection, or the relative preponderance, of the different types of orientation within the general process?
- 4) What is orientation, i.e., what is the common nature of all the different types of orientation?
- 5) What is the principle governing (*i.e.*, explaining) the general process of orientation?

The purpose of the following text and Tables is to distinguish, but not to judge, the varieties of orientations exemplified by tropisms and stratagems, scientific experiments and mystical revelations, artistic expressions and dogmatic interpretations of sacred texts, rigorous proofs of mathematical theorems and psychotic delusions and hallucinations.

FUNCTIONAL EXPLANATION AND THEORY OF ACTION

All the four modes of explanation⁶ that meet the requirements of scientific epistemology have been employed in attempts to construct theories of behavior, but the greatest theoretical advance has occurred in the application of the functional mode of explanation to behavioral phenomena. The functional mode has been precisely formulated and successfully applied in physics. Cybernetics, decision  70 and game theory, information theory, and other important system theories are functional theories. Although considerable confusion exists as to the exact format, functional formulations in biology, psychology, economics, and sociology possess sufficient degree of similarity to make the work of different authors highly cumulative. For this and other reasons, the functional mode of explanation has been chosen as the format for the present theoretical work.

Theories employing the functional mode of explanation are usually called Theories of Action. Since both the term 'functional explanation' and the term 'Theory of Action' evoke a variety of only partially overlapping associations, the meanings of these terms, as intended in this paper, are briefly indicated.

The functional mode explains the behavior of a system as Action, *i.e.*, as the distribution of a definite amount of energy (quantum of action) through time and space subject to definite constraints. The action of the system is described as its transition from state P to state Q (within a definite time interval $t_i - t_f$) along a particular trajectory (a locus of points in state-space, with time as a parameter). The fundamental question for the theory of action is which particular trajectory, among all the possible trajectories, actually describes the action of the system. The method is a search for variables that maintain extrema (constants, maxima, or minima) during the transition from P_i^t to Q_t^f . The aim of the theory of action is the specification of a set of extremum principles (and of intervening variables governed by them) that is suffi-

⁶ Scientific explanations can be classified into four relatively well-understood types. These are the deterministic, the functional, the genetic-comparative, and the probabilistic mode of explanation.

ciently powerful to select a unique trajectory compatible with any given set of general boundary conditions (ranges of values of independent variables).

The general theory of action is envisaged as emerging through the integration of three special theories: (1) an orientation theory, (2) a decision theory, and (3) a motivation theory. Each special theory would be concerned with a different (special) fundamental problem in the explanation of action, employ different dependent variables, and invoke a different special extremum principle to explain a different part of the total variation in action.⁷

71

In an initial 'kinetic' formulation of the general theory, the special theories would provide functional boundary conditions (ranges of admissible values of intervening variables) for each other. It is with a kinetic type of a general theory of action in mind that the special theory of orientation is being constructed. A 'feedback' formulation of the general theory is anticipated as the intermediate step toward a 'dynamic' general theory. A general theory, in any one of the three formulations, would also constitute a theory of development.⁸

A PRELIMINARY DEFINITION OF ORIENTATION

Although the idea of 'orientation' seems intuitively simple and obvious, (and is invoked in most theories of behavior), it is not easy to give a definition of orientation acceptable for technical purposes. As is often the case, the central concept of a theory can be defined only by the theory itself.

In the absence of a substantive technical definition, the term 'orientation' can be characterized by: (1) a summary of relevant usage, *i.e.*, a dictionary definition; (2) a listing of the phenomena the term is intended to subsume, *i.e.*, a denotative definition; and (3) a program for the use of the term in the theory, *i.e.*, a quasi-syntactic definition.

1) The relevant usage is summarized in an authoritative technical dictionary as follows:

orientation: n. 1. the discovery or knowledge of where one is and where one is going, either literally in space and time, or figuratively in relation to a confusing situation or a puzzling problem, or to people and personal relations. The orientation is cognitive when it consists chiefly in knowing the situation; positively or negatively cathective when it consists primarily in feelings; evaluative when comparisons are made and the relation of the situation to personal goals is brought out.

Partial syn. Insight 2. the discovery of what or who one is; = self-orientation. — Syn. autopsychic orientation (rare), self-insight. 3. turning toward a source of stimulation (cp. tropism) or in a prescribed direction, literally or figuratively. 4. a set toward a certain stimulus, or a predisposition toward certain behavior patterns. 5. the direction taken by something. 6. a very general point of view, not necessarily verbalized, which helps to determine acceptance

⁷ For a preliminary formulation of an approach to a special theory of motivation, cf. JUNG (1965a). A Working Paper outlining a compatible special theory of decision is being prepared for publication.

⁸ A general approach to the construction of a theory of development has been discussed in JUNG (1962b).

or rejection of scientific postulates, hypotheses, and  72 methodologies. 7. the process of helping a person to an orientation in any of the above senses: orientation program. — *v.* orient (not orientate). — *adj.* oriented (not orientated).⁹

2) As presently envisaged, the theory of orientation would be a special theory, in that it would seek to explain only a portion of the total variation in behavior as a function of the orientation of an organism.¹⁰ It would subsume most of the phenomena traditionally discussed as perception, cognition, and thinking as instances of epistemic orientation. It would also subsume many aspects of emotion (but not of motivation), and nearly all the prudential, moral, ethical, normative, and other forms of valuation (but not of decision) as instances of telic orientation. In principle, it should explain not only the orientation of known organisms and collectives, but also of specifiable alien and mechanical systems exhibiting behavior.

3) The description of the use of the term orientation in the theory can at this point be only programmatic. The remainder of the paper is, in one respect, an attempt to provide an adequate syntactic definition. The definition given below is quasi-syntactic, since it invokes two additional undefined terms, *i.e.*, ‘experience’ and ‘definition of action-world.’ While a vast literature exists in philosophy, psychology, and sociology on the meaning of those terms, technical definitions suitable in the present context have not been found.

Orientation is that operation on the manifold of experience by which it is transformed into a definition of an action-world.

The manifold of experience is the basic operand of orientation. It can be characterized as an amalgam of potential objects and undifferentiated properties. In the context of the theory of orientation, the manifold of experience is regarded as an indeterminate field of a system, *i.e.*, the objects, variables, and relations of the system are unspecified.

The definition of an action-world is the final transform (or product, or outcome) of orientation. It is a system made determinate by the specification of: (1) the dimensions of the world; (2) the structure of the world; (3) the boundaries of a focal region, *i.e.*, by  73 a definition of the actor; and (4) the available action-lines, *i.e.*, by a definition of the situation.

The above quasi-syntactic definition of the basic concepts ‘experience,’ ‘definition of an action-world,’ and ‘orientation’ provides the basic format for the analysis of the process of orientation. Of the three concepts, the first two have been characterized, however sparsely and informally. At this initial stage of analysis they act as the only defining terms for the as yet unanalyzed concept ‘orientation.’ This state of the theory is represented in [Figure 1](#).

THE DEFINITION OF AN ACTION-WORLD

⁹ Quoted from ENGLISH AND ENGLISH (1958): 363-364.

¹⁰ Since no generic term is available to characterize all behaving systems (organisms, machines, and collectivities formed of combinations of organisms and/or machines) the term ‘organism’ is used as a generic term for all such systems.

AND THE SYSTEMS OF DISCOURSE

How many different types of orientation are there? This problem was investigated by a phenomenological analysis of the most directly accessible phase of the process of orientation - its outcome, *i.e.*, the definition of an action-world. The results were reported in the first working paper¹¹ and are summarized and placed in context in this section.

As suggested in the preceding section, the definition of an action-world can be treated as a system, which is made determinate to the extent that its constituents are specified. We shall call the act of specification an *utterance* (regardless whether it is public or private, conscious or unconscious, explicit or implicit, manifest or inferred).

A minimal list of necessary utterances that would constitute the definition of an action-world can be obtained by combining the irreducible facets of the concept 'action-world' with the necessary components of the format 'system'. Such minimal list is given in Table 1.

The column headings of Table 1 give the minimal components of the format system, the row headings the irreducible facets of action-world. The table yields explicitly the basic constituents needed for the definition of an action-world. These were already mentioned, more informally, in the previous section. The entries constitute the basic formal terms and concepts that will be employed and elaborated in subsequent text and tables. Row T entries render equivalent relevant set-theoretic,  74 topological, sociological and psychological basic terms.¹²

In the presently relevant context, it is not necessary to distinguish between the kind of utterances needed to specify constituents 1a, 1b, and 2, respectively. These and further such distinctions are made in subsequent tables. Instead, we shall refine the classification of utterances along the vertical axis of Table 1. There, the set of all action-world defining utterances has been partitioned into two equivalence classes. Class E of all epistemic utterances, and class T of all telic utterances. Further phenomenological analysis of each class of utterances yields a partition of class E into six equivalence sub-classes, and a partition of class T into six equivalence sub-classes. Altogether, then, twelve equivalence classes of action-world defining utterances have been distinguished.

An utterance is an accepted statement. 'Accepted' is a value assigned to a statement by some operation of judgment or validation. The operand of validation is a parent set, containing all available statements. Since utterances differ from available statements only in having the value 'accepted', we can induce from the partition of utterances a corresponding partition of the

¹¹ R. JUNG (1962b).

¹² The terminological mélange in Tables 65b - 1 ff. results from a search for concepts compatible with a unified formulation. The basic terms in Table 65b - 1, row T, draw on relevant functional formulations of physics, of cybernetics, and of sociology. The most directly relevant sources are: YOURGRAU AND MANDELSTAM (1955): Chs. II & III; ASHBY (1964): 83-97, esp. 91-92 and PARSONS AND SHILS WITH OLDS (1954): esp. 53-68.

set of available statements. There are at least twelve classes of statements in the partition, each being a parent set of the corresponding class of utterances. Each of the twelve classes of statements is a system of statements, and has been labeled a system of discourse. The description of the phenomenological characteristics of the statements in the different systems of discourse was the topic of the previous working paper,¹³ and is summarized in the entries of Tables 5a - 8. The fundamental phenomenological similarities and differences between the twelve systems of discourse are accounted for by a set of three distinctions, which jointly yield a typology given in Table 2.

Table 2 displays the cross-partition of systems of discourse into four equivalence classes (each of which contains three systems of discourse), that is generated by the distinction between epistemic  75 and telic systems on the one hand, and between simple and combined systems on the other hand.

Telic systems differ from epistemic systems in as indicated in Table 1. Only in telic discourse a definition of an actor is given, and the meaning of all statements depends on (a) their relevance to that definition (situation or residual environment) and (b) their compatibility with that definition (eu- or dysfunctional).

Both simple and combined systems of discourse contain statements capable of specifying the variables, values, and relations of a world. Combined systems, however, contain two additional types of statements:

- 1) Correspondence statements (that combine the meaning of two or more terms from two different simple systems).
- 2) Transfer statements (that project the meaning of a statement from one simple system into another simple system).

Additional phenomenological criteria generate equivalence classes that are identified in Table 2 (and in subsequent tables) by the symbols 1, 2, 3, 2&1, 2&3, and 1&3. Each of these classes contains two systems, one epistemic and one telic. The phenomenological criteria of equivalence cannot be adequately summarized here, except by saying that statements in the two different systems of the same class are equivalent under a subjectifying transformation (epistemic to telic), or under its inverse, an objectifying transformation (telic to epistemic). The symbols identifying the combined systems indicate which two simple systems each combines.

Three results of the phenomenological analysis are relevant to what follows:

- 1) All the kinds of utterances that are necessary and sufficient for the definition of any action-world can be accounted for by a twelve-fold typology yielded by a cross-partition based on three sets of phenomenological distinctions.

¹³ R. JUNG (1962d).

2) A one-one correspondence under a common transformation has been established between the six telic systems of discourse and the previously much better understood six epistemic systems of discourse.

3)  76 The formulation of the process of orientation has been advanced from the state represented in Figure 1 to the state represented by Figure 2. Figure 2 indicates the following:

a) The final transform of experience, the definition of an action-world, has been fully analyzed. It consists of utterances, *i.e.*, accepted statements. The minimal requirements are indicated in Table 1. In subsequent tables the distinctions along both the horizontal and the vertical axis are refined to an extent regarded as sufficient to account for all the variants of world-defining utterances.

b) An intermediate transform of experience, the systems of discourse, has been postulated. It consists of available statements. It has been fully analyzed phenomenologically. The resultant typology of statements is presented in the entries of Tables 2 - 6c.

c) The previously unanalyzed operator, 'orientation,' has been partitioned into two classes of operators. Class 02, tentatively called the systems of validation, acts on the systems of discourse as its operand and assigns the value 'accepted' to some available statements, thus transforming them into utterances in the definition of an action-world. Class 01 operators presumably act on the initial operand 'experience' and transform it into systems of discourse.

THE SYSTEMS OF ORIENTATION

Given the results of the phenomenological analysis of the systems of discourse, their formal characteristics will be considered in this section.

The results reported below were obtained in the following order:

1) The formal characteristics of the systems of discourse were analyzed.

2) A set of formal characteristics common to all systems of discourse was abstracted.

a) Distinguishing formal characteristics of the various systems of discourse were identified up to a point of refinement that matched the articulation of the phenomenological typology.

3) Assuming that the systems of discourse are a transform of 'experience,' the first phase of the process of  77 orientation was reconstructed by postulating a set of systems of orientation as the Class 01 operator in Figure 2. The systems of orientation consist of two kind of operators:

a) Pandemic operators, which generate all the common formal properties of all systems of discourse.¹⁴

¹⁴ Pandemic operators appear sufficient to generate experience.

b) Endemic operators, which select the distinguishing formal characteristics of each of the twelve different systems of discourse.

For the sake of simplicity and brevity, the exposition of the results will be in the reverse order: First, we shall identify the various operators in the systems of orientation, and then indicate which formal and phenomenological characteristics of the various systems of discourse they generate.

Since all the twelve systems of discourse are alike in that they consist of statements, and since all statements are either (a) expressions of relationships between objects and properties, or (b) expressions of relationships between properties, it will be useful to keep in mind the following definitions:

Let an element be an object or a property. Let a statement be a relation on an ordered set of two elements.¹⁵ The set of all the first elements that satisfy a relation is the domain of the relation. The set of all the second elements that satisfy a relation is the range of the relation. The set of elements formed by the union of the domain and the range of a relation is the field of the relation. The set of all elements in a system is the field of the system. The set of all relations in a system is the structure of the system.

Table 3 lists all the generative and selective operators that appear necessary to transform experience into all the kinds of statements that, according to the previous formulation, are available in the twelve systems of discourse.

The pandemic operators generate *objects*, *properties*, and *relations*. Objects are generated by attaching an arbitrary label (tag) to any segment of experience by the denoting operator 1.1a (an index set). By repeating the same operation, objects may be arbitrarily subdivided or aggregated. This automatically segregates the  78 unlabeled remainder of experience as the background, or the environment, of the objects. There are a number of well-known philosophical problems in the pandemic analysis of the manifold concerning the nature of objects, the possibility of exhausting experience by indexing, and the possible special status of general and specific boundary constants (such as time and space). At this stage of the formulation these problems are bypassed and operators 1.1b, 1.2a and 1.2b are included for future consideration.

The second type of pandemic operators differentiate properties and collect them by the process of abstraction into four kinds of sets — *fields*, *variables*, *relations*, and *systems*. It is assumed that there is an indefinite number of potential properties and relations, and the problem of classification is avoided by disregarding the substantive characteristics of the properties and relations generated by type 2 operators.

The endemic operators select among the properties and relations generated by type 2 operators on the basis of formal characteristics.

Type 3 operators restrict the meaning of statements. Type 3.1 operators restrict the meaning of statements to, respectively, the *concrete*, the *abstract*,

¹⁵ The relations may be on n elements, but the discussion of binary relations is simpler.

or the *formal* aspects of properties. Type 3.2 operators distinguish between statements according to the *source* of their meaning. Jointly, the combinations of type 3 operators that are given in Table 4a are sufficient to generate the three classes of simple systems of discourse.

Type 4 operators extend the meaning of statements to encompass aspects of properties, and of domains and sources of relations, of *two simple systems* at a time. This is sufficient to generate the three classes of the combined systems of discourse, as shown in Table 4b.

Type 5 operators distinguish between the epistemic and the telic systems. For the sake of exposition we shall consider the construction of the telic system as if it involved a subjectifying transformation of an already constructed epistemic system. It  79 should be noted, however, that the formulation of the operators provides as well the inverse objectifying transformation (telic to epistemic). It also allows for the direct generation of both telic and epistemic systems from experience. No genetic implications should be read into the present manner of presentation.

In Table 1 the minimal constituents of an epistemic and a telic world were juxtaposed and the effect of the subjectifying operation can be read as the transformation of Row E into Row T. The minimal properties of an epistemic world constitute its dimensions, *i.e.*, the coordinates of an (epistemic) descriptive space. Operator 5.1 emphasizes one or several of the dimensions (or other variables) and thus selects a set of essential variables, *i.e.*, the coordinates of a telic hyperplane (evaluative frame of reference). Telic systems contain only relations (statements) whose range consists exclusively of telic properties (*i.e.*, values of essential variables, or points in the telic hyperplane, or telic values). The range of epistemic relations (statements), on the other hand, is not restricted beyond the restrictions by operators 3.1 on aspects of the field common to both epistemic and telic systems of the same type.

Operator 5.2 selects one or more values of an essential (range) variable as critical values. These polarize the essential variable by stating the bounds of a critical interval (containing eutelic values) and its complement (containing dystelic values). The intersection of the critical intervals on all the essential variables defines the focal region on the telic hyperplane. The focal region constitutes a definition of the actor.¹⁶

In the epistemic system, a point in description space represents the state of the organism. When projected on the evaluation hyperplane, does it, or does it not fall into the focal region, *i.e.*, within the definition of the actor? The possibility of this comparison is a prerequisite of a conceptualization of motivation and decision. It also provides the scheme within which one can propose as the principle of action the imperative of authenticity: ACT AS TO MINIMIZE THE DISCREPANCY BETWEEN YOUR STATE AS AN ORGANISM AND  80 YOUR DEFINITION AS AN ACTOR!

¹⁶ Each telic system produces different definitions of the actor. In a complete definition of an action-world, at least one definition of each type is incorporated. See pp. 80-81.

The epistemic systems of orientation generate statements about the conditions of action. The state of the organism at a given time and the structure of the epistemic world define jointly the environment of the organism and determine its admissible trajectories (in epistemic space-time). A functional projection by operator 5.1 of the above on the telic hyperplane defines the actor's situation. Eufunctional and dysfunctional action-lines can now be distinguished. In this fashion the telic systems generate statements that are rules of action. This is illustrated by a telic world-graph in [Figure 4](#).

The operators listed in [Table 3](#), when appropriately combined into twelve systems of orientation, can generate the formal and phenomenological characteristics of the twelve systems of discourse, as shown in [Tables 5a-6c](#). This advances the formulation of the process of orientation to a state shown in [Figure 3](#).

SYSTEMS OF VALIDATION

As shown in [Figure 3](#), the overall features of the process of orientation have now been formulated as follows: The initial operand, experience, is a (Jamesian) manifold conceptualized as amalgam of potential objects and undifferentiated properties and formalized as an indeterminate field of an unspecified system. The operators of the systems of orientation analyze experience into elements (objects and properties) and order the elements into collections (aggregates, sets, fields, variables, relations, and systems). The results of this transformation are available statements organized in twelve systems of discourse. Next, systems of validation operate on the systems of discourse and accept some of the available statements, thereby transforming them into utterances. A system of utterances constitutes the definition of an action-world. This yields the final transform of experience, a specified and relatively determinate system.

Each system of discourse contains statements, which, if accepted, yield a different kind of knowledge of the action-world. The phenomenological analysis distinguished twelve types of knowledge,  81 each made available by one system of discourse. The formal analysis of the systems of orientation explains how the different combinations of endemic operators generate the differences in the types of knowledge. This is shown in [Table 7](#), which gives the phenomenological characteristics of the twelve types of knowledge, and in [Tables 4a](#) and [4b](#), which indicate the formal constraints on the meaning of the different types of knowledge.

[Table 7](#) gives us a point of departure for the analysis of the last unanalyzed mechanism of the process of orientation, the systems of validation. Twelve different dimensions of validity are postulated, each associated with one of the systems of discourse. Each system of validation will then need to contain operations that are necessary and sufficient to determine the acceptability of a statement with reference to the relevant dimension of validity.

The four major classes of statements are again distinguished in terms of the criteria of their validity. Knowledge provided by simple systems claims a single sphere of validity, while knowledge provided by combined systems

claims a double sphere of validity. The validity of epistemic statements is *absolute*, *i.e.*, depends on the judgment that they are independent of any definition of an actor. The validity of telic statements is *relative* or contingent, *i.e.*, depends on the judgment that they are relevant to, and compatible or incompatible with, a specific definition of a given actor.

THE PRINCIPLE OF ORIENTATION

To advance beyond the conceptualization of orientation to a theory, an explanatory principle governing the process of orientation and determining the relative contribution of its phases and types must be postulated.

At the present time, some principle of management of uncertainty is being considered. While many problems remain to be solved,¹⁷ it appears plausible that it could be formulated as a minimal principle, *i.e.*, a principle of reduction of uncertainty. Accordingly, from all the available statements such definition of an action-world will be accepted, as has minimum possible uncertainty.

The principle of reduction of uncertainty leads to the postulation of gradients of uncertainty, associated with each system. The gradients of uncertainty of the telic systems are shown in Table 8.  82 In the dynamic formulation of the theory of orientation the gradients of uncertainty will be arranged into uncertainty levels, as follows:

Level 1: all aggregates of objects;

Level 2: all substantive properties and relations;

Level 3: all simple systems;

Level 4: combined systems 2&1 and 2&3;

Level 5: combined systems 1&3.

The higher the level, the steeper is the gradient of uncertainty; therefore the higher the level, the greater is the potential for uncertainty generation and reduction.

SOME POSSIBLE APPLICATIONS

Concurrently with the formulation of the theory of orientation, attempts are being made to test it. Five possible tests of the adequacy of the formulation are now being explored:

- 1) Its internal consistency, by an attempted axiomatization.
- 2) Its theoretical compatibility
 - a) with the attempted formulation of a general theory of action, and

¹⁷ Among the problems that must be solved are:

- 1) Are there two types of uncertainty, semantic and syntactic, corresponding to the signification meaning of property, object relations and the structural meaning of property, property relations?
- 2) What is the source of uncertainty? If it is to be attributed to experience, then experience itself must be reformulated as the product of the pandemic operators.

- b) with the attempted reformulations of motivation and decision theories as special theories of action.
- 3) Its philosophical consequences for the hitherto normative doctrines of epistemology and ethics. Would it be possible to outline a behavioral epistemology and teleology that would not be normative?
- 4) Its empirical power, in three areas of substantive interest to the author and his collaborators:
 - a) One is in the social psychology of individual development.
 - b) Another is in the area of psychopathology, where an attempt is made to use the theory to explain the major functional psychoses as 'disorders of orientation'.
 - c) The last area is the study of ideology, especially its role in the rise  83 and development of the various types of collective behavior.
- 5) Its algorithmic adequacy as a guide to the programming of higher epistemic and telic processes on computers. This is a test by 'simulation', in that a demonstration of the ability of the theory to generate artificial intelligence and artificial conscience in automata could be regarded as enhancing its plausibility.

NOTES ¹⁸ [REFERENCES ¹⁹]

ASHBY, W. R. (1964).

The set theory of mechanism and homeostasis.

In BERTALANFFY, L., AND RAPOPORT, A. (EDS.), *General Systems*, Vol. IX. Bedford MA: Society for General Systems Research.

ENGLISH, H. B. AND ENGLISH, AVA C. (1958).

A Comprehensive Dictionary of Psychological and Psychoanalytic Terms.

New York NY: Longman, Green.

JUNG, R. (1962b).

Analysis of Psychosocial Development: A Study of Adult, Educated Women.

Unpublished Ph.D. dissertation. Cambridge MA: Harvard University.

JUNG, R. (1962d).

Formal analysis of ideological components of behavior.

Paper read at the annual meeting of the American Association for the Advancement of Science, Philadelphia PA, December 30.

JUNG, R. (1965a).

Self-control in sociological perspective: Introduction to Part II.

In KLAUSNER, S. Z. (ED.), *The Quest for Self-Control: Classical Philosophies and Scientific Research.* New York NY: The Free Press, pp. 121-125.

PARSONS, T., SHILS, E. A., WITH OLDS, J. (1954).

Values, motives, and systems of action.

In PARSONS, T. AND SHILS, E. A. (EDS.), *Toward a General Theory of Action.* Cambridge MA: Harvard University Press.

YOURGRAU, H. AND MANDELSTAM, S. (1955).

Variational Principles in Dynamics and Quantum Theory.

London UK: Pitman.

¹⁸ [Notes that appeared on pages 83 and 84 in the original have been here reprinted as footnotes to the text.]

¹⁹ [References that appeared on pages 83 and 84 of the original have been reprinted here.]

85

FIGURES AND TABLES

Fig. 1. The Process of Orientation: Primitive Formulation.

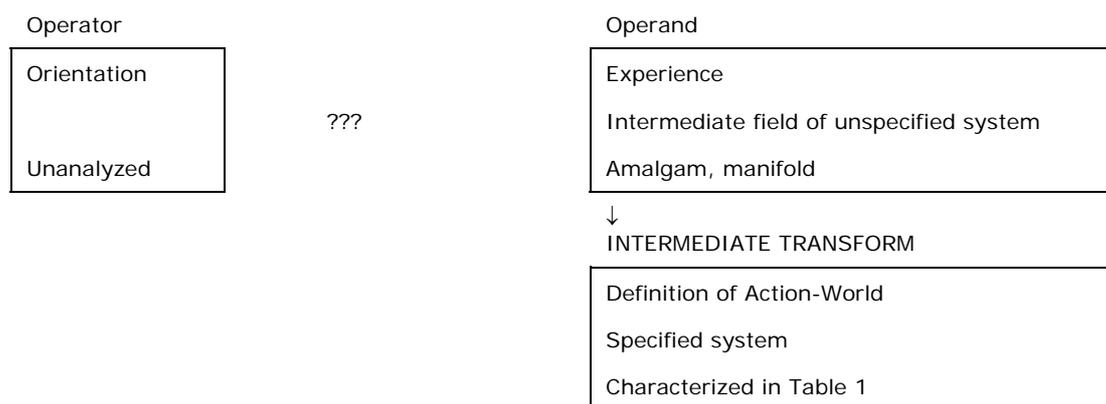


Fig. 2. The Process of Orientation: Phenomenological Results.

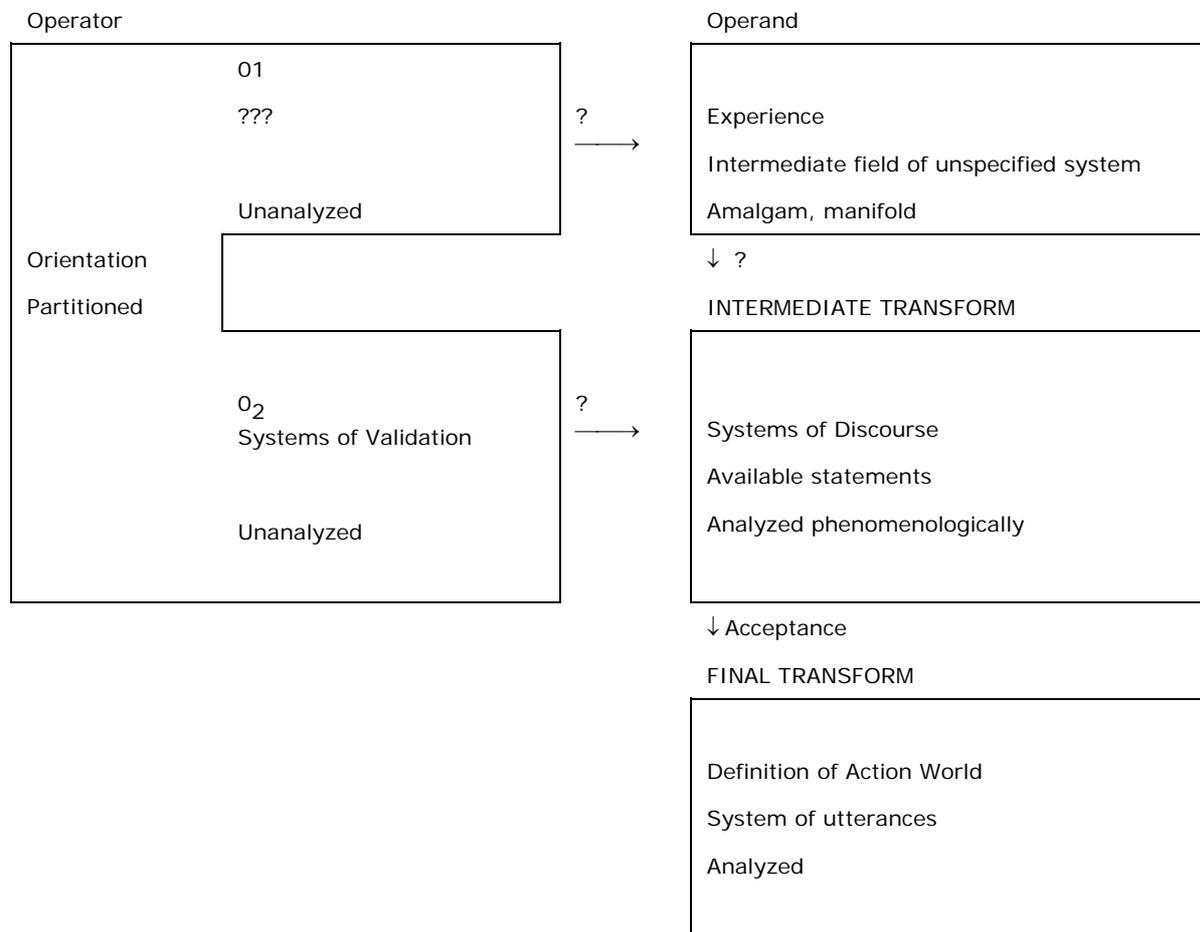


Fig. 3. The Process of Orientation: Formal Results.

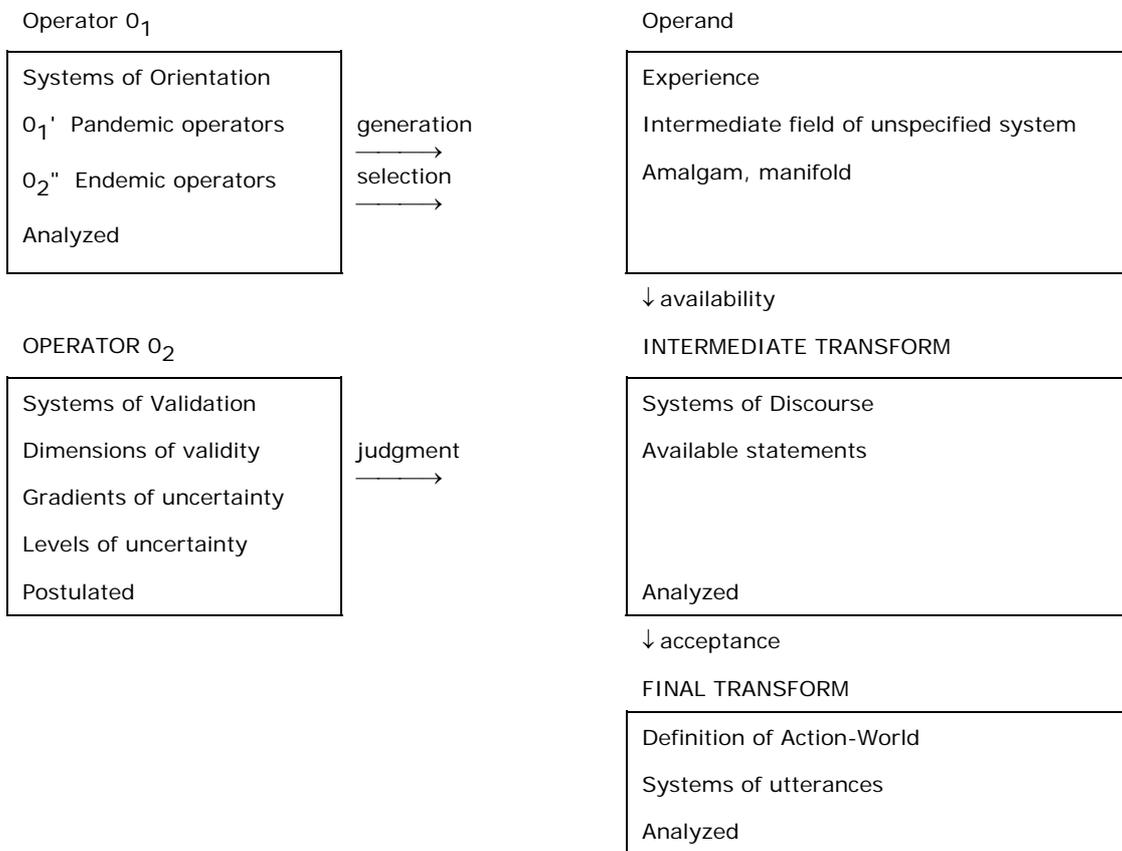
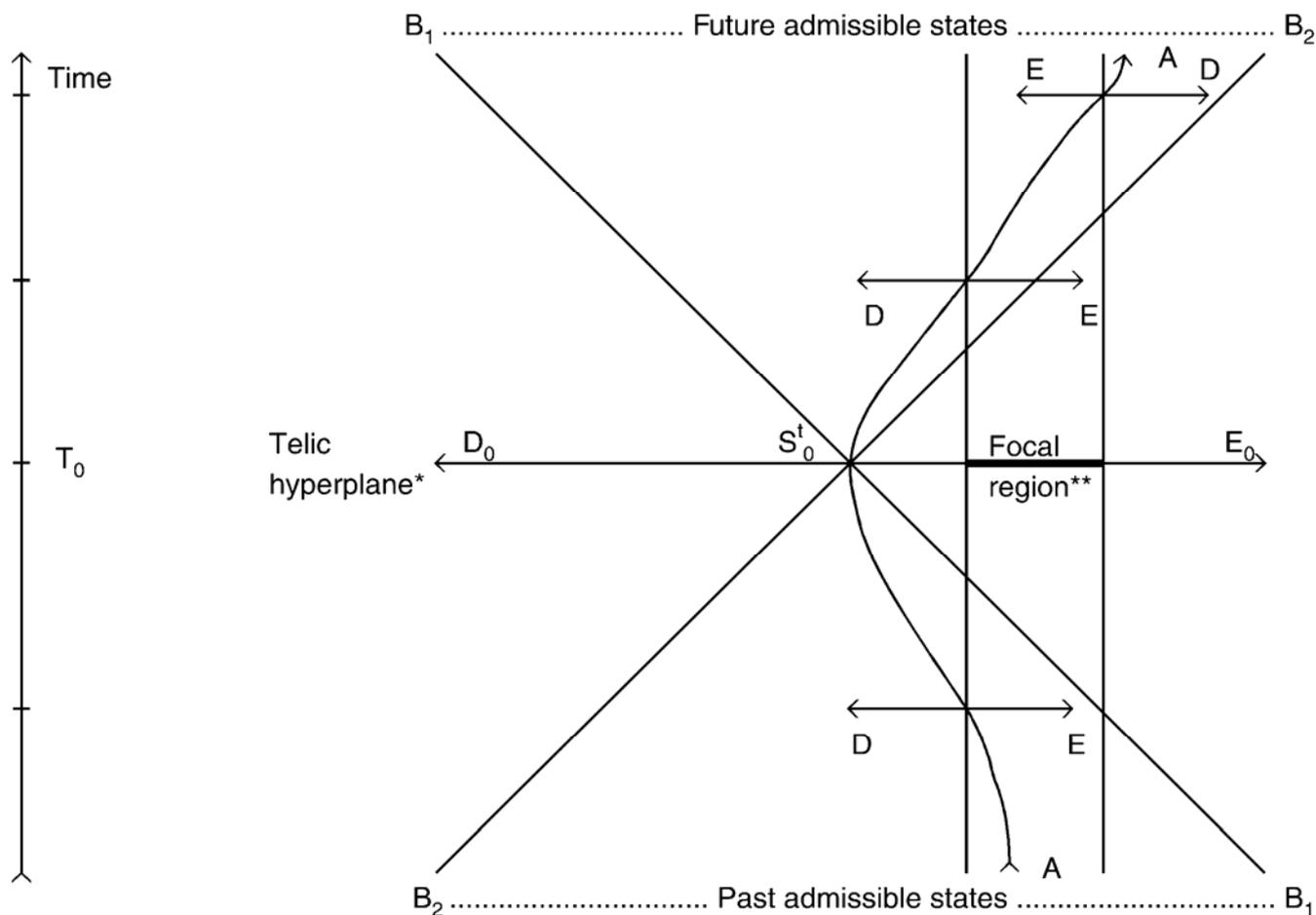


Fig. 4. A Telic World-Graph (the situation of an organism in state s_0).²⁰



²⁰ T_0 Now.
 S'_0 State of the organism at T_0 in a functional projection on the telic hyperplane, *i.e.*, the present telic value of the state of the organism.
 A An admissible action-line.
 $B_{1,2}$ Projections of epistemic boundaries on admissible states, given a structure of the epistemic world and a state of the organism S_0 .
 D Dysfunctional direction of action at a given point in space-time.
 E Eufunctional direction of action at a given point in space-time.
 * N-dimensional hyperplane represented by one coordinate.
 ** Projection of the n-dimensional focal region.
 † The counter-intuitive simplifying assumption is made, that the definition of actor (focal region) does not change over time.

Tab. 1. The Definition of an Action-World:
Minimal Constituents.

System		(1a) Variables	(1b) Their Value	(2) Relations on Variables
Action	(E) Epistemic World	Dimensions Epistemic space	State Epistemic event	Structure Epistemic trajectories
World	(T) Telic World	Essential variables Telic hyperplane <i>Evaluative frame of reference</i>	Critical intervals Focal region <i>Definition of actor</i>	Functional projections Action lines <i>Definition of situation</i>

Tab. 2. The Twelve Systems of Discourse:
Phenomenological Typology.

Type of System		Epistemic	Telic
Simple	1	Accounting	Aesthetic
	2	Conceptual	Moral
	3	Explanatory	Religious
Combined	2 & 1	Methodological	Pragmatic
	2 & 3	Theoretical	Ethical
	1 & 3	Representational	Expressive



Tab. 3. Transforms of Experience
under Generative and Selective Operators.

OPERATORS		TRANSFORMS			
O₁'	Pandemic operators				
1.	Object generators	Objects, aggregates of objects (strings, lists)			
1.	Denoting operators	Inventory			
		Value	Aggregate	Type	Universal interval
1.1a	Index (tag, label)	Individual	Sample	Class	Population
1.1b	General boundary (complement)	Condition	Context	Situation	Environment
1.	Specific boundary operators	Chronography and chorography			
1.2a	Time	Date	Period	Stage	Epoch
1.2b	Space	Location	Area	Region	Universe
2.	Set abstractors	Substantive characteristics			
2.1	Common property	Variables (υ)			
2.2	Common order	Relations (\Re)			
2.3	2.1 & 2.2	Fields, spaces, systems			
O₁''	Endemic operators	Formal characteristics			
3.	Meaning restrictors				
3.1	Aspect restrictors				
3.1a	Concrete	Concrete			
3.1b	Abstract values, fields & variables	Abstract properties			
3.1c	Formal	Formal			
3.2	Domain quantifiers				
3.2a	Existential quantifier	Particular statements (\exists)			
3.2b	Universal quantifier	Universal statement (\forall)			
3.3	Source restrictors				
3.3a	Endosystemic (syntactic) implication	Analytic statements (A)			
3.3b	Any other source	Synthetic statements (S)			
4.	Meaning extenders				
4.1	Correspondence rules	Correspondence statements			
4.2	Transfer procedures	Transfer statements			
5.	Subjectifying operators				
5.1	Emphasizing operator	Essential variables, telic hyperplane, telic values; functional vs. non-functional relations (statements)			
5.2	Polarizing operator	Critical values and intervals, focal region, eutelic vs. dystelic values; eufunctional vs. dystelic relations (statements)			

Tab. 4a. Simple Systems of Orientation.²¹

System number	Variables, values and fields	Description or evaluation space relations	System relations
1	Concrete	(A \exists) Analytic & Existential	(S \exists) Synthetic & Existential
2	Abstract	(A \exists) Analytic & Existential	(S \forall) Synthetic & Universal
3	Formal	(A \exists) Analytic & Existential	(A \forall) Analytic & Universal

Tab. 4b. Combined Systems of Orientation.

System number	Variables, values and fields	Description or evaluation space relations	System relations
2 & 1	Abstract & Concrete	(A \exists) ₂ \equiv (A \exists) ₁	(S \forall) ₂ \Leftrightarrow (S \exists) ₁
2 & 3	Abstract & Formal	(A \exists) ₂ \equiv (A \exists) ₃	(S \forall) ₂ \Leftrightarrow (A \forall) ₃
1 & 3	Concrete & Formal	(A \exists) ₁ \equiv (A \exists) ₃	(S \exists) ₁ \Leftrightarrow (A \forall) ₃

²¹ \equiv means rendered equivalent by a correspondence rule;
 \Leftrightarrow means mutually derivable by an appropriate transfer procedure.

Tab. 5a. Epistemic Systems of Discourse: Simple Systems.

System	Name of system	Variables	Values of variables	Relations
1	Accounting	Observers	States of observers	Patterns
2	Conceptual	Class concepts	Element concepts	Propositions
3	Explanatory	Variable symbols	Value symbols	Functions

Tab. 5b. Epistemic Systems of Discourse:
Combination Statements.²²

System (X & Y)	Name of system	Correspondence rule		Transfer procedure	
		$(v \in X) \leftarrow (v \in Y)$	$(v \in X) \Rightarrow (v \in Y)$	$(\mathfrak{R} \in X) \leftarrow (\mathfrak{R} \in Y)$	$(\mathfrak{R} \in X) \Rightarrow (\mathfrak{R} \in Y)$
2 & 1	Methodological	Interpretation as indicator	Operational definition	Inductive generalization	Test of hypothesis
2 & 3	Theoretical	Interpretation	Lexical definition	Deductive inference	Explanation
1 & 3	Representational	Representation	Symbolization	Production	Simulation

Tab. 5c. Epistemic Systems of Discourse: Combined Systems.²³

System	Name of system	Variables	Values of variables	Relations
2 & 1	Methodological	$(v_1 \in 2) = (v_1 \in 1)$	Facts	Hypotheses
2 & 3	Theoretical	$(v_1 \in 2) = (v_1 \in 3)$	Constructs	Laws
1 & 3	Representational	$(v_1 \in 1) = (v_1 \in 3)$	Artifacts	Models

²² X, Y = respective simple systems;
 v = variables and implicitly their values;
 \mathfrak{R} = relations; arrow indicates the direction of mapping.

²³ No generic concepts are available in current terminology for the three types of statements of correspondence between variables in two different systems.



Tab. 6a. Telic Systems of Discourse: Simple Systems.

System	Name of system	Subjectifying operation	Critical values	Focal region (df. of Actor)	Functional relations
1	Aesthetic	Separation	Thresholds	Body-Self	Emotions
2	Moral	Commitment	Standards	Role	Rules of conduct
3	Religious	Individuation	Values	Condition	Rules of importance

Tab. 6b. Telic Systems of Discourse: Combination Statements.²⁴

System	Name of system	Correspondence rule		Transfer procedure	
		$(v \in X) \leftarrow (v \in Y)$	$(v \in X) \Rightarrow (v \in Y)$	$(\mathfrak{R} \in X) \leftarrow (\mathfrak{R} \in Y)$	$(\mathfrak{R} \in X) \Rightarrow (\mathfrak{R} \in Y)$
2 & 1	Pragmatic	Interpretation as sanction	Cathexis	Prudential generalization	Pragmatic experiment
2 & 3	Ethical	Interpretation as duty (Responsibility)	Identification (Loyalty)	Categorical command	Categorical judgment
1 & 3	Expressive	Representation	Symbolization	Incarnation	Sublimation

Tab. 6c. Telic Systems of Discourse: Combined Systems.

System	Name of system	Subjectifying operator	Critical values	Focal region (df. of Actor)	Functional relations
2 & 1	Pragmatic	Engagement	Constraints	Regulator	Prudential rules
2 & 3	Ethical	Calling (Appointment)	Norms	Office	Categorical rules
1 & 3	Expressive	Posture	Stigmata	Status	Rituals

²⁴ X, Y = respective simple systems;

v = variables and their values, implicitly also telic ranges, critical values and focal regions;

\mathfrak{R} = relations; arrow indicates the direction of mapping.

 92

Tab. 7. Dimensions of Validity.

Sphere of validity		Absolute (with respect to what is):	Contingent (relative to the actor's):
SYSTEM		Epistemic	Telic
Single	1	Actual	Existence
	2	Possible	Identity
	3	Necessary	Destiny
Double	2 & 1	Real	Task
	2 & 3	Ideal	Mission
	1 & 3	Permissible	Image

 93
Tab. 8. Telic Systems: Gradients of Uncertainty. ²⁵

System no.	Name of system	UNCERTAINTY			
				Polarized	
		MAX	MIN	MIN (+)	MIN (-)
1	Aesthetic	Irritation	Emotional clarity	Pleasure (Well-being)	Pain (Misery)
2	Moral	Functional insignificance	Functional significance	Eufunctional significance	Dysfunctional significance
3	Religious	Absurdity	Meaning	Comprehension	Mystery
2 & 1	Pragmatic	Impotence	Competence	Mastery	Endurance
2 & 3	Ethical	Anomie	Normative determination	Prescription	Proscription
1 & 3	Expressive	Isolation (Loneliness)	Integration	Solidarity	Antagonism

²⁵ Polarization of the uncertainty gradient is one of the results of the partitioning operation: f. Table 3, (5.2). I am indebted to Professor Burkart Holzner for a suggestion that lead to the retention of an original insight concerning a polarity of "integration" and to its generalization to all six systems.