DEVELOPMENTS IN CONVERSATION THEORY: ACTUAL AND POTENTIAL APPLICATIONS

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ABSTRACT

Conversation Theory and a dynamic protolanguage, Lp, are used to illustrate an argument in favour of reflective and relativistic theories in Cybernetics and Systems Studies.

KEYWORDS

Conversation; consciousness, cybernetics; systems, thought.

INTRODUCTION

This paper is either completely mistaken, or else it is a sensibly fundamental essay on the Cybernetics of life. About this dichotomy, I am in no position to judge fairly and dispassionately; but the essay is submitted as the well-intentioned rhetoric of probably my last scientific report, and I have faith in its content. The formalism, also the empirical support of the argument, are in press or to appear in a book and monographs.

This, however, is probably my last scientific report because it seems that, in the present "climate of opinion" or the prevailing "conventional wisdom" (at least, in much of the UK and the USA), the word "science" is misleading, when used in the context of non-trivial activity; the occupation of scientists is conceived as the diligent pursuit, by more or less tried and tested methods, of the support or denial of certain hypotheses, until such moment as they achieve theory-hood or not (and, if not, are minimally modified and submitted to grinding in the same mill).

All brief summaries are unfair, as surely this one is, but the view just parodied does have quite sturdy justification. The efficacity of a scientific research programme, (Lakatos' phrase) is undeniably enhanced by collaborative effort, based, in turn, upon a general and rather narrow agreement about what should be the aim of experimentation . However, this selfsame view of things is bound to minimise the part played by innovation in science, as it is often conceived; if you prefer it, to place innovation outside the conduct of science, so that scientists are not inventors, nor do they have the responsibility (call it "partiality", in a perjorative mood), that, for example, managers and designers are supposed to have.

Insofar as this view of science prevails, "Science" is not descriptive of the genuine, non trivial, conduct of Cybernetics or General System Theory (call them either name or any other name). These disciplines are vastly concerned with inn-

ovation, invention, creativity and the like; that is, such activities are part and parcel of our day-to-day occupation as "Cyberneticians" or "System Theorists". Further, this occupation does entail responsibility, and the theoretical framework which underpins it does, a-fortiori, encompass participation just as much as the numinous stance of an observer who defines, and minimally perturbs, a "system". Any root-theory must do so, since, amongst other things, it will speak of consciousness and kindred subjects, taboo to popular science.

Because of this, "science" is, perhaps, misleading as a descriptor to a substantial body of people, and I prefer nowadays to image our discipline, whatever its name, as a variety of applied epistemology, conjoined to the practice and philosophy of action, including the intellectual action of thought.

The argument is exemplified by Conversation Theory, one kind of Cybernetic or System-oriented-theory, because I know it well and am intimately involved as one originator. By the same token, a protolanguage, Lp, which turns out to be the epistemological bedrock of Conversation Theory, is used in an illustrative fashion. So, of necessity, the argument hinges upon Conversation Theory and Lp (hereafter abbreviated to CT and Lp) . But I do not believe that the argument is confined to one facet of Cybernetics and General Systemising; I conjecture that it applies to all theories and all practices of our common discipline.

CT grew up as a fairly rigorous discipline for dealing with inter- and intrapersonal interaction; for instance, in education, learning, management and innovation. Because of that, CT uses terms like "concept" which, for different applications, might be more elegantly replaced by "autonomous unit" or "cluster that sticks together". Apart from preferences in notation, anything said of CT might be said of other types of system; biological, economic, political, cultural, transportation, ecological or whatever. With respect to applications CT is potentially universal.

Conversation Theory (References 1 - 12)

Suppose there is a language, L, with many properties of a human natural language (ability to question, to command, to answer, obey, explain and present metaphors as well as descriptions). L, the conversational language, need not be spoken or confined to any particular modality; it might, for example, be a suitably rich behavioural language. There are, at this juncture, no good grounds for supposing that L does exist, but, if the supposition is temporarily granted, then the minimal observable events of conversation theory are L conversations comprising the execution of L expressions, commands, obediences, questions, explanations, demonstrations and the like, in a processing medium, M, which is commonly a human brain or a collection of human brains.

For generality (and, later, to justify the supposition of L) the processing medium, M is not confined to human or other brains. For example, several human brains augmented by computing and communication devices also counts as a medium and it is possible, without invoking any specific features of biology, to specify an adequate processing medium in terms of a sufficient number of distinguishable array processors, potentially asynchronous, in coupled and concurrent activity.

Stable Units; Stable Concepts, Participants, Conversations

The stable units of conversation theory are all organisationally closed systems (19,20) (in the biological domain autopoietic systems) which owe their autonomy to computing their own boundaries. In psychological jargon, one organisationally closed entity is a reproductive and possibly productive system; Bartlett used this notion in the context of stable beliefs and skills; Wertheimer in "productive and reproductive" conceptualisation and thought; according to the insightful interpretations

of Gaines, Shaw and Thomas, Kelly regarded "personal constructs", in particular, "core constructs", as systems of this type (13 - 18).

In CT the minimal (beware of that word) unit is a stable concept. It is a cluster of wholly or partly coherent L processes, undergoing execution in the processing medium M, and is organisationally closed insofar as the procedures (which, upon execution, give rise to the processes in M that make up a concept, Con T, say) are, themselves, reproducible from other concepts by operators, also of type Con. Further, that these operators of type Con, are amongst the products of the entire production system. This requirement is, incidentally, sufficient to admit the inferences "some organisationally closed systems of this sort are informationally open", and that "all of them have a potential informational open-ness; a degree of productivity, over and above reproductivity".

A prototype stable concept, Con T is shown in Fig.1 as constructed in the context of other concepts Con P and Con Q (or any number of them). The system is characterised as belonging to a participant A, B,... by the designating subscript Con_AT, Con_BT....

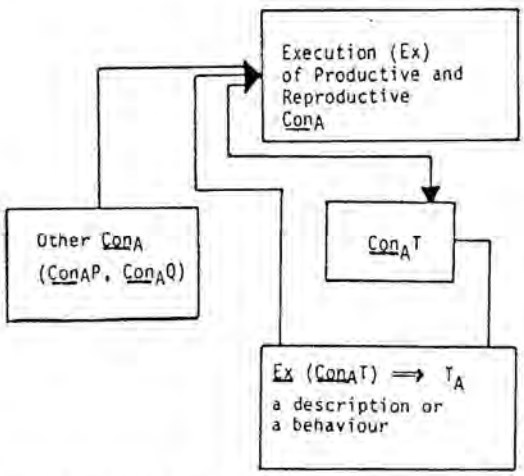


Fig. 1. A stable (productive and reproduced) concept (Con_AT) in participant A. The execution Ex (Con_AT) produces a description (or image) and possibly a behaviour such as driving or drawing circles. Productive and reproductive operations are also of the type "concept" but act upon Con_AT, T_A or other concepts (say Con_AP, where P_A is a plane surface and Con_AQ, where Q_A is a compass) to reconstruct Con_AT.

If Con T is, itself, executed iteratively and without limit, then it gives rise to a periodic behaviour or description "T"; similarly, the execution of Con_AT gives rise to "T_A". It is quite legitimate, in the latter case, to think of T_A as a behaviour, like driving or inscribing a rectangle on paper (if Con_AT is A's concept of driving or rectangularity); it is equally legitimate to think of T_A as A's imagination of driving, or A's intellectual image of rectangles. The fact is that Con T and T are necessarily coexistent; the existence of one implies the existence of the other; they are complementary: $\langle$Con T, T$\rangle$, comparable to the complementary pair $\langle$Eigenoperator, Eigenvalues$\rangle$, in a kinetic computing medium, M. The same comments apply to $\langle Con_AT, T_A\rangle$ or to $\langle Con_BT, T_B\rangle$, although $Con_AT \neq Con_BT$ and $T_A \neq T_B$ (at most, there could be isomorphism).

The participants A, B,... who engage in L conversations are not yet defined. It would be possible, and it is usual, to offer a partial definition by a sensible but predetermined carving-up of the computing medium into brains, as given. To obtain

a usefully general definition, CT has recourse to the idea that A, B,... N are organisationally closed systems in L, M, such that at least more-than-one process ordering is possible in each and such that they are both informationally open. The process (execution) ordering is, at most, partial and may be regarded as a focus of attention; the "more than one"clause specifies the coexistence in any A, B,... N of more than one focus of attention (although one may be dominant or salient). The informational open-ness asserts the possibility of A, B, conversation and its actuality for at least some of A, B,... N. So participants are partially coherent L processes of conceptualisation, belief etc. The boundaries of A, B,... are functionally specified as the boundaries of their closure. Surely this boundary distinction divides the processing medium into distinct universes which may be independent, but the boundary need not be inside one brain.

Paradigmatically, the L dialogue is "concept sharing" between A and B. The symmetric case, in which A shares some of B's stable concepts and is able to reproduce them and B shares some of A's stable concepts and is able to reproduce them, is shown in Fig. 2. It is an agreement between A and B over T or A's consciousness with B of T.

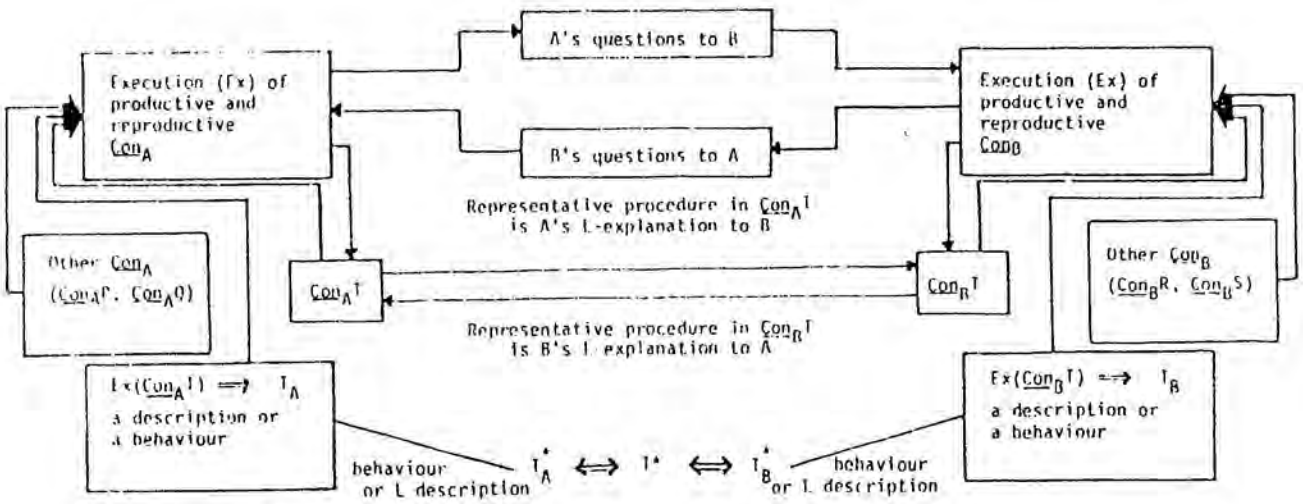


Fig. 2. An A, B, conversation in Language, L, as a result of which, if agreement is reached, some of A's procedures can be executed and reproduced as part of $\underline{Con}_B T$ and some of B's procedures can be executed and reproduced as part of $\underline{Con}_A T$. Symbol " $\Longleftrightarrow$ " is isomorphism. T_A^* is part, or all, of T_A, and T_B^* is part, or all of T_B

Finally, an A, B, conversation or any A, B,... N conversation is, itself, an organisationally closed and informationally open system; I used the term "P Individuated"system.

At the stage of development of CT from which it is convenient to start the main

discussion, it was customary to obtain static inscriptions of the shared component of A's and B's concepts as a kernel of nodes, standing for topics (ie. a contextually suitable name for the static inscription of a complementary pair, such as Con T, T). These inscriptions, together with relations between, form an entailment mesh and much of the experimental work over the last 18 years has involved rather complex computer regulated and mechanical interfaces at which concept sharing could be guaranteed to have these properties, called, in the literature, "agreement over an understanding". The important point, however, is not the mechanics but the recognition that agreements over an understanding are the "hard valued" observable conceptual events in CT.

Commentary and Points for Emphasis

Any brief summary of a fairly complicated subject matter, like CT, is liable to be misleading, and a number of comments, intended to avoid that danger, are laid out, in this section, before embarking upon the developments and discoveries noted in the title.

(a) The caution over "minimal" should be taken seriously. There is no general sense in which "minimality" (of a stable concept) implies "membership of" or "inclusion in" or "smaller than". It means "procedurally coherent with", stated as concisely as possible. For example, a stable concept may be smaller than a participant or larger (if it is a cultural concept about many participants). By the same token a conversation may be smaller or larger than the participants who are in debate.

(b) Concept sharing is, and is interpreted as, an information transfer; but only in the Petri and Holt sense of establishing (local) synchronicity between asynchronic systems or "local dependency between otherwise independent systems". Information transfer which does not cross the closure-induced boundary of a participant A, B, has the dimension of "A's awareness" or "B's awareness", as in private thought. Information transfer across the closure-induced boundary of A and B has the dimension of A's consciousness, with B of T (and vice versa). In either case, the content of the information transfer is the shared concept or the set of shared procedures. The quantity of the commodity "information" may often be measured, in special cases, by the usual selective and statistical indices.

(c) The participants may (in CT) be people, groups, cultures, systems of belief, (for instance, religious, political, or scientific institutions). On the other hand, one person may simultaneously maintain the perspectives of more than one participant which are unified by the "internal" conversation of thought: as when adopting different roles or weighing up the merits of different hypotheses.

(d) The value of an agreement between participants, A, B, who agree or disagree in a conversation is a coherence value. The word "coherence" is employed in its logical sense, an "intertwining of partially compatible hypotheses", but this usage is not at odds with, even though it is more general than, the physical meaning (for instance, coherent/incoherent, radiation or coherent/incoherent non-linear oscillators). Further, the sharp valued observables of a conversation (by an observer who looks on at A and B), are agreements (including agreements to disagree), and the commanding, questioning, requesting, obeying, answering, involved in the process.

(e) Factual truth (in contrast to coherence truth) is obtained if there are agreed tests of adequacy applicable for some or many universes or participants, pieces of processing medium, M carved-up by organisational closure, into M_A, M_B . Proof theory may be applied under subsistency only (ie. in some particular universes).

(f) The inscription of an agreement is a statement designating an analogy relation; that is, an often well specified similarity (morphism or functor) between distinct processes.

(g) Conceptually sharp valued observations assert the similarity (a cluster of shared procedures) of participants, A, B,... distinguished by an observer; written $Dist_{OB}(A, B)$. Using a metalanguage which is a restriction of his language, L, an observer can say "it is a fact that A and B agree over T", and other observers may agree, in this metalanguage, that "this is a fact".

(h) It is also true that A and B may appreciate analogies and that A and B can create analogies between universes, X, Y... they distinguish themselves, and between themselves, as participants.

The similarity of an agreement between participants, A and B, is the content of mutually coherent concepts. In order to reach agreement the participants must construct distinctions such as $Dist_A(X, Y)$, $Dist_B(X, Y)$ distinguishing portions M_X, M_Y of M or even like $Dist_A(A, B)$ and $Dist_B(A, B)$. As required already, organisationally closed systems compute their own boundary distinctions; $Dist_A$, $Dist_B$.

(i) All theories like CT (all theories?) are relativistic. For example, CT is specified relative to any one or several conversational languages, L, to knowables expressed in L and to the various metalanguages , in which observers talk about L conversations, agreements, or whatever.

(j) For participants, CT is relative to an entailment mesh (their conversational domain) and some other particpant(s).

(k) Unlike classical system theories, CT is also self-and-other referential, or reflective. CT is a participant theory; an observer may be a participant and vice-versa.

DISCOVERIES AND DEVELOPMENTS IN CT OR Lp

The entailment meshes, noted in the commentary, came into being as computer manipulable short-hand expressions of any stable concept externalised in an L conversation (for example, in Fig. 2, that A derives a concept of T from concepts of P and of Q; that B derives a concept of T from concepts of R and S). By closure the converse derivation would be possible, given a shift in perspective; so that, really, A finds that T, P, Q hang together coherently, without losing their distinction; B finds T, R, S hang together coherently, without losing their distinction.

At this point in the growth of CT, it became evident that entailment meshes are not just a manipulable short-hand but expressions in a crude but powerful language of coherence, distinction, independence and morphism; namely, the protolanguage, Lp. from which, L, may be derived as a restriction (not assumed) if and only if,an adequate processing medium, M, exists.

Lp Expressions

Collective Expressions of coherence (without loss of distinction amongst the coherency entities called "topics", any topic standing for a complementary pair like $<$ Con, T, T $>$) are of the kind shown in Fig. 3., as I or II. For example:

T = Manager, P = Factory, Q = Product; or T = Manager, R = Inventory, S = Finance

In which case "manager" makes sense in the context of a factory and a product; the sign, "manager", devoid of context does not do so, or, in the other case, "manager" makes sense in the context of an inventory and financial structure.

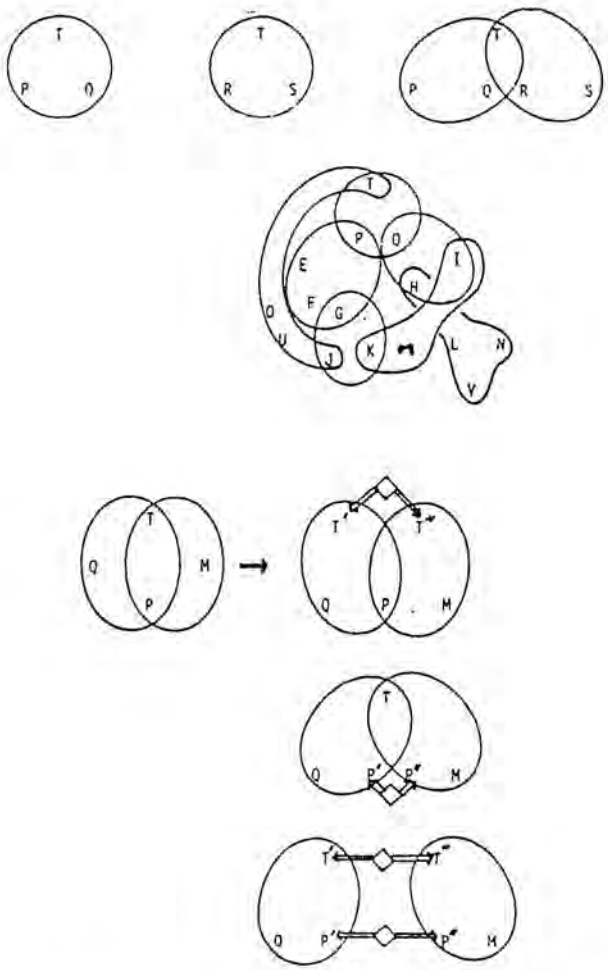
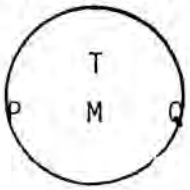


Fig. 3. Entailment meshes or conversational domains

There may be any number of coherent topics in a collective statement.

A distributive statement (and there is no limit upon the distribution scope) is shown as III in Fig. 3. It is interpreted as "Manager" which makes sense in either connection or both; alternatively, in the imperative form, to "manage" call for "a factory and a product" or call for "an inventory and finance" or "both".

A more complex structure, also an Lp expression and an entailment mesh is shown in IV of Fig. 3. Some possible inscriptions are incoherent when it is recalled that topics depict complementary pairs like ⟨Con T, T⟩(and, henceforward, letters T, P, Q, R, S... always stand for such complementary pairs). Incoherency occurs because asserted distinction is not sufficient to maintain the coherency which is also asserted . The simplest one to draw is V of Fig. 3. Here the matter could be remedied by an increased specificity, as for instance in



But the other solutions, Midoro's Rule of Genoa, invoke a bifurcation; Fig. 3 VI, that creates distinction $T \neq T' \neq T''$ and $P \neq P' \neq P''$. In fact, T' and T'' exist in distinct (and unless more is said independent) universes as do P' and P''. However, (unless more is said) T' is isomorphic to T'' and P' is isomorphic to P'' (more elegantly their coherence categories are related by faithful and adjoint functors). The independent universes created by the Rule of Genoa are labelled X and Y, and the disjoint entailment meshes of an origianl mesh, $\mathcal{R}$, are called $\mathcal{R}_X$ and $\mathcal{R}_Y$

The diamond shaped connections are not topics in $\mathcal{R}$ or $\mathcal{R}_X$ or $\mathcal{R}_Y$ but are known as pseudo-topics. They stand, at this stage, for independent, but in one-to-one correspondence.

As a special and interesting case, the conversation depicted in Fig. 2., can be indicated, if any concept is shared by the participants, as in Fig. 4., (the asterisk denoting possibly incomplete sharing). The initial conditions are shown as I for A and II for B and the terminal conditions (after agreement) as III, and IV, the residue; an impersonal, shared, concept which exists as a static inscription as V in Fig 4. It seems that the apparent disparity between the psychologist's "A's concept of T, B's concept of T" and the philosopher's "concept is the meaning of a phrase", are reconcilable if conversation takes place, for the latter is the inscribed residue

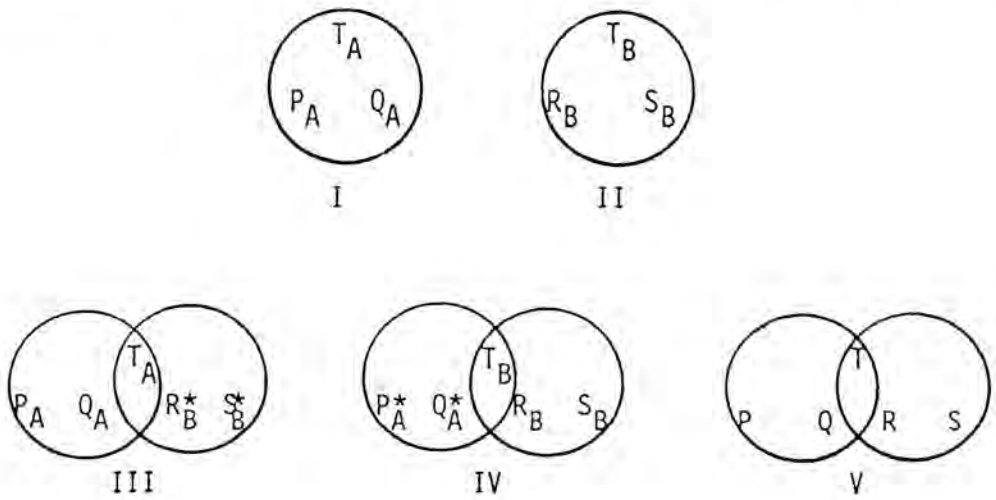


Fig.4. Lp Expressions of concept sharing

The unsatisfactory part of the reconciliation between a psychological and a philosophical view is that personalised concepts are dynamic entities. But philosophical concepts are static inscriptions denoting dynamic entities ⟨Con T, T⟩ or ⟨Con P, P⟩ It is, later, possible to enliven Lp and thus to give the philosophical and psychological notions a comparable type.

Lp Operations

"Adopting a Perspective" invokes an ordering (at most, partial) of actions, either intellectual acts like describing a learning strategy, or prescribing a plan of action or else behaviours.

Adopting (one or more) perspectives is captured by an Lp operation pruning which hierarchicalised the mesh, $\mathcal{R}$, under (one or more) topics . A further operation

Selprun (selective pruning) brings out the individual strategies or plans that usually make up a pruning and Supr (superimposition) recomposes Selpruns.

Some cases are sketched in Fig. 5., as follows: I pruning I of Fig. 3., under T; II under Q; III Pruning of IV or Fig. 3, under T and IV under R. V and VI of Fig. 5., shows the Selprun (1, T) and Selprun (2, T), of Fig. 3., IV, under T.

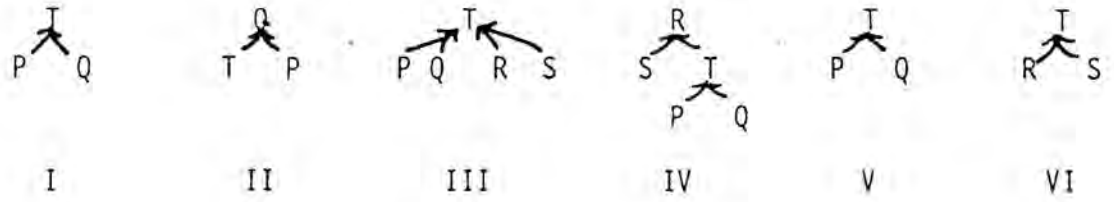


Fig. 5. Some Lp Operations

Further Lp operations represent the comparison and contrast of several perspectives and create topics in a mesh of higher order. One operation, Condensation or Cond, is, for mesh order n,

$$\underline{\text{Cond}}\ F^n, G^n \ldots \mathcal{R}^n = \underline{\text{Supr}}\ (\underline{\text{Prune}}\ (F^n, \mathcal{R}^n), \underline{\text{Prune}}\ (G^n, \mathcal{R}^n)\ldots) \equiv F^{n+1}, G^{n+1}, \text{in} \mathcal{R}^{n+1}.$$

Recognising that distinct topics forming a coherent collection in $\mathcal{R}^n$ are certainly (although trivially) analogous (similar and distinct with coherence as an additional similarity) it is clear that these higher order topics, in $\mathcal{R}^{n+1}$, stand for usually non trivial relations between perspectives or points of view with respect to topics in $\mathcal{R}^n$, and are thus degenerate analogies; similarities (endomorphisms) between topics in $\mathcal{R}^n$. that is, given F^n, it is possible to derive something of G^n; namely the superimposition of Prune ($\mathcal{R}^n$, F^n), and Prune ($\mathcal{R}^n$, G^n). By extending this principle it is possible to deal with topics in disjoint meshes, $\mathcal{R}^n_X$, $\mathcal{R}^n_Y$ distinguished by a Rule of Genoa bifurcation or otherwise, having universes, M_X, M_Y in the processing medium, M. Hence for a diamond (pseudo topic) $\mathcal{D}$, relating F^n in $\mathcal{R}^n_X$ and G^n in $\mathcal{R}^n_Y$, Consider a pruning operation from some other topic E, in $\mathcal{R}^n_X$; on reaching F^n the pseudo topic is interpreted naturally as an instruction to point at G^n, in $\mathcal{R}^n_Y$, (from X to Y) and to initiate an independent primary operation by M_Y under G^n in $\mathcal{R}^n_Y$; vice versa, for some topic H in $\mathcal{R}^n_Y$, the pruning operation passes from G^n through the pseudo topic $\mathcal{D}$, to initiate a pruning operation by M_X in $\mathcal{R}^n_X$ under F^n. In particular a condensation under pseudo topic $\mathcal{D}$ is a comparison of simultaneous perspectives pointing in direction $X \rightarrow Y$ at G^n, and in direction $Y \rightarrow X$ at F^n.

$$\underline{\text{Cond}}\ (\mathcal{D}, \mathcal{R}^n_X) \overset{\Delta}{=} \underline{\text{Supr}}\ (\underline{\text{Prune}}\ (F^n, \mathcal{R}^n, X \rightarrow Y), \underline{\text{Prune}}\ (G^n, \mathcal{R}^n, Y \rightarrow X)\ldots) \equiv$$
$$F^{n+1}, G^{n+1}, \mathcal{D}^{n+1} \text{ in } \mathcal{R}^{n+1}$$

In this case the comparison is trivial (as is the purely ostensive analogy between $\mathcal{R}^n_X$ and $\mathcal{R}^n_Y$). It is not if there is more than one pseudo topic relating topics in $\mathcal{R}^n_X$ and topics in $\mathcal{R}^n_Y$; say a pseudo topic $\mathcal{M}$ relating E in $\mathcal{R}^n_X$ to H in $\mathcal{R}^n_Y$; (as there must be, if the bifurcation is due to the Rule of Genoa). Here, the independent pruning operations initiated in M_X and M_Y from $\mathcal{D}$, initiate, through $\mathcal{M}$ and in the reverse directions, further independent pruning operations in M_Y and M_X. So that at least one derivation is placed in correspondence due to synchronisation of M_X and M_Y. This is a correspondence in the "universe" or independent part of the processing medium belonging to $\mathcal{R}^{n+1}$; say $M_{\mathcal{U}}$, the "universe of analogy" under a kinetic interpretation of L; that is L, M with $M = M_X, M_Y \ldots M_{\mathcal{U}}$.

Condensation may be repeated (although, except for convenience, it need not be) for $\mathcal{R}^{n+2}$ and so on.

The converse Lp operation, expansion, retrieves $\mathcal{R}^n = \mathcal{R}^n_X, \mathcal{R}^n_Y \ldots$ adjoined to an analogical universe $M\mathcal{U}$, which contains the topics in $\mathcal{R}^{n+1}$, created out of the original pseudo topics in $\mathcal{R}^n$; so that, even when there is one mesh $\mathcal{R}^n$ a fresh universe $M\mathcal{U}$ is created to accommodate the comparison of perspectives in $\mathcal{R}^n$. The mesh which structures $M\mathcal{U}$, say $\mathcal{R}\mathcal{U}$ is created with the coherence property which can always be (trivially) introduced. But in non trivial cases calls for information transfer. Notice that the entire cycle of analogy construction is a depersonalised prototype for creativity, abduction and invention.

Although there is no need, apart from convenience to examine repeated condensation it is interesting and illuminating to look briefly at repeated expansion. The following cases sufficiently illustrate the main issues:
(a) If a mesh $\mathcal{R}^n$ has never been condensed, then its indefinitely repeated expansion $\mathcal{R}^{n-r}$, is the processing medium M with the structure imposed by the Lp statements of $\mathcal{R}^n$.
(b) If $\mathcal{R}^n$ has been condensed, then $\mathcal{R}^{n-r}$ is $\langle M, M\mathcal{U}\rangle$.
(c) If there is a disjoint mesh $\mathcal{R}^n$, $\mathcal{R}^n_X$, $\mathcal{R}^n_Y$, $\mathcal{R}^n_{\mathcal{U}}$, then $\mathcal{R}^{n-r}$ is M_X, $M_Y \ldots M\mathcal{U}$ again with the structure imposed upon it by the Lp statements of $\mathcal{R}^n$. But,
(d) The mesh order, n, is arbitrary; n could have any value
(e) It is possible to capture M by canonical production systems that are organisationally closed but greater generality is obtained if these are converted to the process formalism of Petri Nets (stripped of paraphenalia, like "input nodes", or "output nodes" and with tokens marking the addicity of event relations). In order to do so Petri Net theory must be (and has been) extended to include:
(I) a bifurcation principle, to cut nets into independent or quasi independent parts as well as
(II) a generation principle for conditions and a replication principle for "transitions" or events .
I have represented the "canonical" forms of CT and Lp in this idiom but Midoro and Pangaro have radically improved the constructions used.

Commentary upon $\langle$Lp, M$\rangle$

(1) To preserve the original notion that events, rather than things, are significant it is sufficient to ordain that Condensation and Expansion occur repeatedly, over legal Lp inscriptions that are crude statements in Lp, M. Notice, however, that the topological dimension of the event relations is usually large, as Atkin points out event can seldom be represented as a 1-simplex, a line, circle, or the like. No conversational event, involving M_A, M_B (participant processors) or M_X, M_Y, is a relational 1-simplex.

(2) Under Condensation/Expansion the lowermost resolution picture of Fig.3VI becomes an analogy. The symmetric agreement of Fig.4 is also an analogy, thus justifying the commentary clauses b, d, e, g, h (one cannot give factuality to an analogy or a question command, answer or obedience) although it may be your fact that you observed one

(3) Whatever else, Lp and its pervasive processing medium, is a kinetic language, albeit modulated by users. So, for example, the residual concept in Fig. 4.IV. is and must be dynamic "has a life of its own", in "culture" or in media that are not well understood. The processing medium is integral with the language.

(4) Just as Fig. 4IV, is analogy under condensation/expansion through a participant A and participant B distinction, so commands and questions are directional condensations maybe restricted to only some of all the selective prunings. The same

comment applies to explanations (here, perhaps, in the reverse direction) to obediences and the like.

(5) Insofar as a conversational language L, is used as a vehicle of communication; insofar as intellectual activity and overt behaviour frequently occupy reserved bits of M, it is often fashioned as a beautiful sophistication of the crude protolanguage Lp, but is, because of its refinement, less general.

Stable Structures in Lp.

Although the M dynamic underpinning a coherent form reflects organisational closure it does not image the productive accretion of novel procedures sketched in Fig. 1. To do so requires an ongoing activity, mesh saturation, which (very roughly) increases the mesh connectivity of coherent forms (making them more distributive) and does so, as illustrated in Fig. 6, unless adding further derivation paths would contravene the Rule of Genoa.

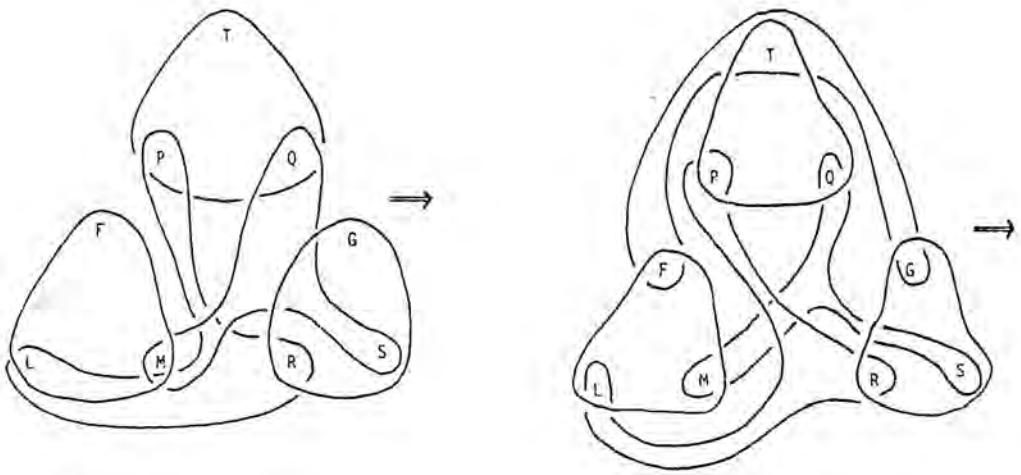


Fig. 6. Clark's Saturation.

Clark has shown that these maximally saturated (stable, ossified, rigid, aged) organisations belong to two infinite classes; Steiner Systems, (combinatorially well known but with no unique generator) and, as a further discovery, degenerate ring structures. The result applies to any system at all, social, psychological, economic, etc.

If supersaturation is allowed and the Rule of Genoa is thus contravened, the former structures bifurcate in an irregular way, the latter into precise replicas.

It is evident, under these circumstances, that either there must be conversation between structures that are independent apart from their linkage by means of analogies created through bifurcation; or all structures tend, over process, to one of the two infinite classes and the story is repeated with endless, but meaningless, variation.

Conservation Principle

Is it possible to avoid these generalised fates? One technique is as follows: "Apply the CT conservation principle to Lp, M " by, in some way, ensuring that "Supersaturation" proceeds up to a point where the information transfer between structures is the conserved commodity "over the evolving system and for each

locally coherent structure".

That is a formal and unperspicuous solution to the problem.

General Solution

I cannot ordain that conversations shall take place, although it is reasonable to encourage conditions which in many possible ways do conserve information transfer.

On the other hand, if there were no conversation, there would be no CT observables and no Lp expressions; more generally, nothing could be known.

Bråten and Glanville pointed out the interactionist character of reality some years ago; I took their different points but did not savour their significance; De Gelder made the point afresh last year, and now I do.

CONCLUSIONS AND RECALL

This paper is about applied epistemology - type interactionism; brand CT and Lp. My motivation for practising such a philosophy is born of an aesthetic/pragmatic norm rather than the respected -because-beautiful proof/elegance of mathematics, or an empiricist ethos.

In any case an applied epistemologist is scarcely counted as a "scientist" according to the nowadays popular connotation of "science" and this probably is my last scientific paper.

There are many research programmes in applied epistemology (where, incidentally, the semantic cannot, except artificially, be divided into pragmatics, semantics and grammar). One of them concerns the personalisation (in the broadest sense) of creative acts (again in the broadest sense). Another programme involves stable, saturated, structures. Do they, by virtue of their symmetries and latent symmetry-breaking properties gain the status of autonomous units of a full-blooded and lively kind? For example, this predication trick (ie. an ontology is induced by the epistemology), is used in particle physics and in classical chemistry or other disciplines where the epistemology is clearly manifest, and maybe the trick is applicable with more general scope.

But the gist of this paper is not only exploration in applied epistemology, or its development, or its commitment to an ontology. I have argued that CT and Lp are concerned in a participant (reflective) manner with real consciousness, real innovation, real learning, real decision and real life; it is better to call CT and Lp "applied epistemology", and mean it; rather than "science". This is not, I believe, an oddity of a trademark with which I am intimately bound up, but is applicable to any Cybernetics, to any System study whatsoever.

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