Relationship between Elements of Knowledge (1972)
(overview at: http://www.laetusinpraesens.org/docs70s/elemknow.php)

Appendix E: Language and knowledge considerations

Concept of semantic fields: Appendix E1

Use of several languages and translation problems: Appendix E2

A discipline's model as a "language": Appendix E3

Knowledge, information, and documentation: Appendix E4

Knowledge dynamics: Appendix E5

TIME SERIES / SÉRIES CHRONOLOGIQUES

C. PRELIMINARY TREATMENT OF DATA	C. TRAITEMENT PRÉLIMINAIRE DES DONNÉES
(1) Before studying the various movements of time-series [1] it is essential to insure the comparability of the observations included by making necessary adjustments for, *inter alia*:	(1) Avant d'étudier les différents mouvements de séries chronologiques [1] il est essentiel de s'assurer de la comparabilité des observations effectuées, en procédant aux ajustements nécessaires pour tenir compte, entre autres, des :
(a) **variations in the interval of time** [2] /caused by fluctuations, resulting partly from the incidence of holidays, in the numbers of **calendar days** [3] or **working days** [4] per month, per quarter, etc./;	(a) **variations de** $\begin{Bmatrix} \text{l'intervalle de temps [2]} \\ \text{la période des observations [2]} \end{Bmatrix}$ /dues à des fluctuations qui résultent en partie de l'incidence des jours de fête sur le nombre de jours civils [3] ou de jours ouvrables [4] par mois, trimestre etc./ ;
(b) **population changes** [5] /to eliminate their influence time-series [5] are often calculated on a **per capita** basis [6]/;	(b) **variations de la population** [5] /pour éliminer leur influence, les séries chronologiques [5] sont souvent calculées par tête [6]/ ;
(c) **price changes** [7] /to eliminate their influence value data forming time-series [8] are divided /deflated/ by the price $\begin{Bmatrix} \text{indexes [8]} \\ \text{indices [8]} \end{Bmatrix}$ for the corresponding periods and thus **quantum indexes** [9] are established/.	(c) **variations des prix** [7] /pour éliminer leur influence, les données de valeur constituant des séries chronologiques [8] sont divisées par les indices de prix [8] pour les périodes correspondantes, et les indices de $\begin{Bmatrix} \text{quantités [9]} \\ \text{volume [9]} \\ \text{production [9]} \end{Bmatrix}$ sont ainsi établis/.
D. ANALYSIS OF THE (SECULAR) TREND	**D. L'ANALYSE DE LA TENDANCE (GÉNÉRALE)**
(1) The first step to be taken in the analysis of time-series [1] is to plot them on ordinary $\begin{Bmatrix} \text{plotting [2a]} \\ \text{arithmetic [2b]} \end{Bmatrix}$ paper or semilogarithmic [3] or logarithmic [4] plotting paper [s. Ch. IV, A.2., (2) and (3)]. The secular trend [5] may be $\begin{Bmatrix} \text{fitted} \\ \text{drawn} \end{Bmatrix}$ on such a chart—freehand or with a transparent ruler—as a curve or as a straight line thus enabling us to study it as well as the deviations from it due to cyclical [6], seasonal [7] or random factors [8] [s. B., (1), above]. This method of trend-fitting [9] contains, however, a certain subjective element and is very approximate. If we want to make forecasts [10] based on the	(1) La première étape de l'analyse de séries chronologiques [1] consiste en leur représentation graphique sur du papier $\begin{Bmatrix} \text{quadrillé [2a]} \\ \text{millimétré [2b]} \end{Bmatrix}$ ordinaire ou du papier quadrillé semi-logarithmique [3] ou (doublement) logarithmique [4] [v. Ch. IV, A.2., (2) et (3)]. La tendance générale [5] peut être ajustée sur un tel graphique à main levée ou à l'aide d'une règle transparente suivant une courbe ou une droite, ce qui permet de l'étudier en même temps que les écarts par rapport à elle, dus aux facteurs cycliques [6], saisonniers [7] ou accidentels [8] [v. B., (1), ci-dessus]. Cette méthode d'ajustement de la tendance [9] contient, pourtant, un élément subjectif et est très approxi-

* So-called 'calendar variations'; cf. A., (2), above.

* Cf. A., (2), ci-dessus.

The concept of semantic fields (*)

The semantic field theory (*) was first put forward by Jost Tries and is based on the conception of fields as closely-knit sections of the vocabulary, in which a particular sphere is divided up, classified and organized in such a way that each element helps to delimit its neighbors and is delimited by them. Their contours fit into each other like pieces of different shapes in a mosaic. In each field, the raw material of experience is analysed and elaborated in a unique way, differing from one language to another and ofter from one period to another in the history of the same idiom. In this way, the structure of semantic fields embodies a specific philosophy and a scale of values.

The field theory has been strongly criticised from various quarters and some of the claims put forward by its champions are no doubt extravagant and unconvincing. The neatness with which words delimit each other and build up a kind of mosaic, without any gaps or overlaps, has been greatly exaggerated. This is true only of specialized and rigidly-defined systems; in ordinary language, vagueness, synonymy, ambiguity and similar factors will produce a much less tidy picture... Quite apart from overlaps between the various conceptual spheres, it is clear that many of these have no systematic organization of any kind.

These limitations must not, however, be allowed to obscure the outstanding importance of the field theory.

Ullmann cites: its introduction of a truly structural method into a branch of linguistics, the possibility of formulating problems which would otherwise pass unobserved; and a method of approach to the problem of the influence of language on thinking.

A semantic field does not merely reflect the ideas, values and outlook of contemporary society, but it crystallizes and perpetuates them: it hands down to the oncoming generation a ready-made analysis of experience through which the world will be viewed until the analysis becomes so palpably inadequate and out-of-date that the whole field has to be recast.

At this point, the field theory links up with another recent development in linguistics, the so-called Sapis-Whorf hypothe-

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(*) This Appendix consists of extracts from: S. Ullman. Semantics; an introduction to the science of meaning. Oxford, Blackwell, p. 243-253.

(**) For recent work see: L. Weinberger, Von Weltbild der deutscher Spache. (Dusseldorf, 1953-54, 2nd edition). F. Hiorth. "On the relation between field research and lexicography." Studia Linguistica, 10 (1956), pp. 57-66.

thesis on the influence of language upon thought. (see Appendix
E2) Modern philosophers, "linguistic analysts" and others, are
deeply concerned about the possibility that some philosophical
problems are pseudo-problems generated by the structure of our
languages. Benjamin Lee Whorf approached the question in a
novel and fruitful way: by comparing our own European languages
--"Standard Average European", as he called them -- with the
totally different structure of American Indian idioms. His
researches convinced him that each language contains a "hidden
metaphysics",that it embodies a unique way of viewing the world
and imposes this outlook on its speakers. "The linguistic sys-
tem of each language," he argued," is not merely a reproducing
system for voicing ideas, but rather is itself the shaper of
ideas, the program and guide for the individual's mental acti-
vity, for his analysis of impressions, for his systhesis of his
mental stock-in-trade. We dissect nature along lines laid
down by our native languages."

During the last few years, a new concept of semantic fields
has been evolved by the French linguist Georges Matoré:
c'est en partant de l'étude du vocabulaire que nous essaierons
d'expliquer une société. Aussi pourrons-nous definir la lexi-
cologie comme une discipline sociologique utilisant le materiel
linguistique que sont les mots." His teaching and example
have also stimulated a number of enquiries into specialized
vocabularies, ranging from feudalism to railways and from
fashion to medicine. These investigations have found a focal
point in the recently-established centre of lexicological
studies at Besançon, where large-scale research projects are
being organized with the aid of modern mechanical devices. (*)

(*) The centre, headed by B. Quemada, publishes a series en-
     titled,"Cahiers de Lexicologie,"and a "Bulletin d'Infor-
     mation du Laboratoire d'Analyse Lexicologique".

Use of several languages and translation problems.

A. Absence of a lingua franca.

It would be optimistic to expect wide acceptance of the
system if it was based on one language only. The UNISIST
Study notes (pp. 72-73) that:

(i) English now accounts for about 40% of the world
     literature, regularly yielding (as are French and
     German) to the rising group of "Eastern" languages
     e.g. Slavic, Chinese and Japanese.

(ii) No one can predict what the situation will be twenty
      or fifty years ahead, nor does anyone possess reliable
      data on the present use of foreign language materials
      in the scientific community (but see Appendix E2,section C).

(iii) The position of English as a lingua franca of science
       is contested by some governments either to consolidate
       a new country via a national language or in the belief
       that language can be artificially maintained as a
       vehicle of a culture.

(iv) The chances of securing international acceptance of
      English as the standard language of science are, in
      present circumstances, very poor.

B. Language preferences.

Apart from these aspects, there is the extremely serious
problem that social scientists in one language group tend
to either ignore foreign language material or find it "less
relevant" to their particular concerns. This is particularly
significant across the English, French, German divide. Con-
cepts given in foreign languages may be difficult to compre-
hend if one is less than completely at home with the lan-
guage in question. An unconscious hostility to concepts
expressed in foreign languages may even build up (see section C).

C. Language group incompatabilities.

There is also the possibility that a concept may first be
expressed or may only be expressible, in a given foreign
language. It would be an advantage to be able to file it
as such and worry about the translation afterwards. The
author who has done much to emphasize the difficult-to-
comprehend contrasts between meanings in the standard Indo-
European languages and those in other language groups is
Benjamin Lee Whorf. These contrasts are well-illustrated
in the following extract from one of his papers (*):

"The growth of the Indo-European language-culture
complex dates from ancient times. Much of its meta-
phorical reference to the nonspatial by the spatial

(*) B.L. Whorf. Language, Thought, and Reality. New York, Wiley,
    1958, 278 p. ("The relation of habitual thought and behaviour
    to language")

was already fixed in the ancient tongues, and more
especially in Latin. It is indeed a marked trait of
Latin. If we compare, say Hebrew, we find that, while
Hebrew has some allusion to not-space as space, Latin
has more. Latin terms for nonspatials, like educo,
religio, principia, comprehendo, are usually metaphor-
ized physical references: lead out, tying back, etc.
This is not true of all languages -- it is quite un-
true of Hopi. The fact that in Latin the direction of
development happened to be from spatial to nonspatial
(partly because of secondary stimulation to abstract
thinking when the intellectually crude Romans encoun-
tered Greek culture) and that later tongues were strongly
stimulated to mimic Latin, seems a likely reason for a
belief, which still lingers on among linguists, that
this is the natural direction of semantic change in all
languages, and for the persistent notion in Western
learned circles (in strong contrast to Eastern ones)
that objective experience is prior to subjective.
Philosophies make a strong case for the reverse, and
certainly the direction of development is sometimes the
reverse. Thus the Hopi word for "heart" can be shown
to be a late formation within Hopi from a root meaning
think or remember. Or consider what has happened to
the word "radio" in such a sentence as "he bought a
new radio" as compared to its prior meaning "science
of wireless telephony."

"To sum up the matter, concepts of "time" and "matter"
are not given in substantially the same form by exper-
ience to all men but depend upon the nature of the
language or languages through the use of which they have
been developed. They do not depend so much upon any
one system (e.g. tense, or nouns) within the grammar as
upon the ways of analyzing and reporting experience
which have become fixed in the language as integrated
"fashions of speaking" and which cut across the typical
grammatical classifications, so that such a "fashion"
may include lexical, morphological, syntactic, and other-
wise systemically diverse means coordinated in a certain
framework of consistency. Our own "time" differs
markedly from Hopi "duration". It is conceived as like
a space of strictly limited dimensions, or sometimes as
like a motion upon such a space, and employed as an
intellectual tool accordingly. Hopi "duration" seems
to be inconceivable in terms of space or motion, being
the mode in which life differs from form, and conscious-
ness in toto from   the spatial elements of conscious-
ness. Certain ideas born of our own time-concept, such
as that of absolute simultaneity, would be either very
difficult to express or impossible and devoid of mean-
ing under the Hopi conception, and would be replaced by
operational concepts. Our "matter" is the physical
subtype of "substance" or "stuff" which is conceived as
the formless extensional item that must be joined with
form before there can be real existence. In Hopi there

seems to be nothing corresponding to it; there are no
formless extensional items; existence may or may not
have form, but what it also has, with or without form,
is intensity and duration, these being nonextensional
and at bottom the same."

The differences are not restricted to high level abstrac-
tions such as "time" and "matter" but may permeate the whole
perspective. The famous hypothesis associated with the
work of von Humboldt, Sapir and formalized by Whorf suggests:

"that the commonly held belief that the cognitive
processes of all human beings possess a common
logical structure which operated prior to and inde-
pendently of communication through language, is er-
roneous. It is Whorf's view that the linguistic
patterns themselves determine what the individual
perceives in this world and how he thinks about it.
Since these patterns vary widely, the modes of think-
ing and perceiving in groups utilizing different
linguistic systems will result in basically different
world views." (1)

"We are thus introduced to a new principle of relativity
which holds that all observers are not led by the same
physical evidence to the same picture of the universe,
unless their linguistic backgrounds are similar... We
cut up and organize the spread and flow of events as
we do largely because, through our mother tongue, we
are parties of an agreement to do so, not because nature
itself is segmented in exactly that way for all to see" (2)

Each language becomes a classification and organization of
experience in its own right. As such each may be signifi-
cantly different from the other and may structure the forms
and categories by which the individual not only communicates
but also analyzes nature, perceives or neglects particular
phenomena or relationships, and constructs his model of the
world (3).

A striking example of the possible differences is given by
Marshall Walker in discussing the social factors which affect
scientific models:

"The language of the Wintu Indians of California
seems to indicate a way of thinking quite different
from our own. Imagine the surface of a table with a

1 F. Fearing. "An examination of the conceptions of Benjamin Whorf
in the light of theories of perception and cognition". In H.
Hoijer (Ed.) Language in Culture. American Anthropologist, 56,
(1954), Memoir 79, 47.

2 B.L. Whorf. Collected Papers on Metalinguistics. Washington,
Foreign Service Institute, Department of State, 1952.

3 See Wharf, op.cit.

book lying on it. The remainder of the surface is
bare. In English one describes the situation by say-
ing, "The book is on the table." In Wintu one says,
"The table bumps". The English phrase has already
committed the speaker to an entire analytical philo-
sophy of the situation: (1) there are two objects; (2)
there is a polarity such that one object is above the
other; (3) there is an implication that the book is
supported by the table. None of this analysis is pre-
sent in the Wintu sentence, which is purely topological....
The scientist who wishes to be as objective as possible
in his study of the external world will try to free
himself from the possible constraints of his own lan-
guage." (1)

Such languages may not have parts of speech or separate
subject and predicate. In Indian Languages such as Nootke
and Hopi events as a whole are signified. Instead of
"a light flashed" or "it flashed", Hopi uses a single term,
"flash" to signify that a happening has occurred. There is
thus no distinction between tenses, for the Hopi has no
general notion or intuition of time as a smooth flowing con-
tinuum in which everything in the universe proceeds at an
equal rate, out of a future, through a present, into a past.
The focus is rather on the totality accessible to the senses
at a given moment with no distinction between present, past,
or even the future or physically distant where the latter
are accessible or represented in memory. Navaho is different
again with little development of tenses by an emphasis on
types of activity or aspects of action. The first concern
of Indo-European languages can be defined as time; of Hopi,
the validity a statement has (in terms of fact, memory, ex-
pectation, or custom); and of Navaho , the type of activity.(2)

Von Bertalanffy suggests that the Whorfian hypothesis may
be extended. He argues that the categories of knowledge
depend on biological and cultural factors. In particular,
he argues that Aristotelean logic actually covers only the
extremely small field of subject-predicate relations. The
all-or-none concepts of traditional logic fall short of con-
tinuity concepts basic for mathematical analysis. He is with
Whorf in hoping that other languages may permit basically
different kinds of "science" which would represent other
aspects of reality as well or even better than does the cur-
rent scientific world picture.

The suggestion has been made, for example, that a language
like Hopi might be better suited to verbalizing the concepts
of modern physics than English. But some of the non-Indo-

1
Marshall Walker. The Nature of Scientific Thought. Prentice-
Hall, 1963, p.103

2
These points are based on Ludwig von Bertalenffy's account of the
Whorfian hypothesis in: "The relativity of categories" in:
General Systems Theory, New York, Braziller, 1968.

European languages may also have important and hitherto
unknown concepts concerning the functioning of social pro-
cesses -- an area in which continuity is even more vital
to understanding than is the natural sciences.

Some languages may in fact constitute rich sources of con-
cepts which could prove useful to the understanding of or-
ganized social complexity. Little work seems to have been
done on this possibility -- most of the examples refer to
contrasts of interest to the natural science perspective.
In fact the field of comparative linguistics seems to be
made up of "one shot" studies with very little comparison.
Where comparisons are made it is at the formal rather than
the conceptual level (1), so that with the exception of a
few startling examples which augur for a fascinating variety
of thinking styles, little information is available. It
may be that few linguists are competent to write on the
concepts of more than one or two non-Indo-European languages,
so that no wide-ranging study or classification is possible,
and no "handbook" is available. The absence of such a
study only helps to conceal the many differences from the
Indo-European perspective-- the existence of such differences
is certainly not widely recognized (2).

The whole argument raises the possibility that the computer
record design envisaged (see Appendix A6) would not be suf-
ficiently general and flexible to be able to "contain" the
concepts of some other language groups. The either-or dis-
tinction between "entities" and "relationships" may only
amount to a magnificent exercise in handling Aristotelian
"substance" and "attribute" as represented in Indo-European
nouns and predicate adjectives. Is the concept of distinct,

1
One reason is that a major school of linguistics denies the need
to consider "semantics" and "concepts", claiming that all under-
standing relevant to the discipline can be gained from analysis
of syntax. A second reason may be, as Sapir has argued, that
many linguists consider such languages "primitive" and therefore
unlikely to constitute a source of concepts unknown to the Indo-
European culture.

2
Marshall Walker (The Nature of Scientific Thought) notes (p.103-4):
"The student of science also has a vital need for comparative lin-
guistics in order to acquire experience in the isolation of concepts
from their language matrix. The usual language departments of a
university are not much help for this type of study....There is
need for a course for undergraduates (not language majors) which
is designed to illustrate the expression of concepts by different
language families. Pending the arrival of such courses the stu-
dent of science will have to do it himself as best he can."

persisting "entities" common to all languages and can
all concepts of "relationships" be adequately represented
by graph-theoretic type areas?

David Bohm, a theoretical physicist interested in Piaget's
and Gibson's work on the problems of perception, gives de-
tailed arguments against permanence of "entities" and con-
cludes (1):

> "it is clear that both in common experience and in
> scientific investigations, the objects, entities,
> substances, etc., that we actually experience, perceive,
> or observe have always (thus far) shown themselves to
> be only relatively invariant in their properties, this
> relative invariance having often been mistaken for
> absolute permanence" (p.14)

> "It is evident then that by considering entities and
> structures as relatively invariant, with an as-yet-
> unknown domain of invariance, we avoid making unneces-
> sary and unprovable assumptions concerning their abso-
> lute invariance. Such a procedure has enormous advan-
> tages in research, because one of the main sources of
> difficulty in the development of new concepts -- not
> only in physics but also in the whole of science --
> has been the tendency to hold onto old concepts beyond
> their domain of validity." (p.121-2)

Colin Cherry, a telecommunications engineer interested in
the psychology of communication with developing countries,
considers that relationships may not be meaningfully repre-
sented by graph-theoretic links and that other forms of
representation might be preferable.

One response is in the work on linguistic universals. It
is suggested that terms exist in all languages to designate
objects which meet a condition of spatio-temporal contiguity.
And, in general, that all languages are cut to the same pat-
tern without there necessarily being any point by point cor-
respondence between particular languages (2). It is recog-
nized that work in this area is only at the early stages (3).
A close look at the logical assumptions built into the com-
puter record design seems to be necessary.

It would seem important to avoid losing the richness of al-
ternative perspectives by confining this project to one or
two languages in one language group -- particularly as the
concepts inventoried are supposed to be in some way relevant
to the cultures using such languages. That this is signi-
ficant is indicated by the fact that --% of the world's
population currently uses non-Indo-European languages (4).
This includes the Chinese, who are unlikely to remain a

1 David Bohm. The Special Theory of Relativity. N.Y., Benjamin, 1965.

2 Noam Chomsky. Aspects of the Theory of Syntax. Cambridge, MIT,
  p. 29-30.

3 See:J.H.Greenberg (ed.)Universals of Language.Cambridge,MIT, 1963.
4

minor influence on world society. The argument that many
learn an Indo-European "second" language is weak in that
being present in classes at which such a second language
is taught or used is no evidence that the language and its
perspective "take" in the individual -- as most school
leavers know. Even if they do take, it is questionable
whether it is satisfactory to ignore the individual's
problems of translating between the two conceptual systems.(1)

D. Problems of translation.

It may astonish many people to know that contemporary lin-
guistics has concluded that translation between languages
is theoretically impossible. Chomsky notes (p.202):

> "In fact, although there is much reason to believe
> that languages are to a significant extent cast in
> the same mold, there is little reason to suppose that
> reasonable procedures (not involving extralinguistic
> information) of translation are in general possible"

Georges Mounin, who notes the same conclusion, has summar-
ized the theoretical difficulties prior to considering why,
how, and within what limits the practical operation of trans-
lations is relatively possible (1).

Some of the difficulties he notes argue against any attempt
to force this project into a unilingual mode.

> --certain languages have highly developed terminologies
>   in areas where there are few Indo-European equivalents
>   (e.g. the Pyalluo Indians and "salmon"; the Eskimos
>   and "snow" (30 terms), some African languages and
>   "palm trees", the Argentine gauchos and "horse colour-
>   ing" (200)). There is little value in attempting a
>   definitive translation when no exact equivalent exists.

> --the situation becomes more complex when dealing with
>   socio-cultural terms, e.g. how can "brother" and sister
>   be translated into Maya when that language only has
>   terms for "younger brother" or "older brother" (2)
>   Much closer to the concerns of this project is the
>   simple problem of translating "people's capitalism"
>   into French (3).

1 Georges Mounin. Les problèmes théoretiques de la traduction.
  Paris, Gallimard, 1963.

2 A special issue of the ETC (Institute of General Semantics),15,2,
  March 1958 is entirely devoted to interpretation and intercultu-
  ral communication. It gives many examples of this sort of problem.

3. Georges Mounin, op.cit. p.67-68.

-- another excellent example, noted by Colin Cherry (XVV) is that whilst there is no difficulty in translating the colour "red" into and from Russian,the association in the two languages are very different. In English: blood red, red in tooth and claw, red with anger, red light district, etc. In Russian the translation of "red" is synonymous with "beautiful" and has associations equivalent to the English "golden" -- hence "Red Square" and the "Red Army" should be meaningfully translated as the "Golden Square" and the "Golden Army". How much has international tension been aggravated and reinforced by this simple error? Similarly, In Chinese,"red"is primarily associated with "joy", "prosperity", "luck", and "happiness" (*). Thus greeting cards, invitations, decorations, etc., are usually in red. (To what extent have the positive associations of the colour in the two cultures influences the marked success of socialism there, compared to that in Anglo-Saxon culture, where it has more negative association?)

E. Use of foreign language material by social scientists

A recent study of 1000 social science research information users in Great Britain has just been completed (**). It shows that 18% of the sample read English only, 75% read French, and 27% read German. Of those who said they were able to read a foreign language, only one-third regularly scan literature in that language. There is even a reluctance to follow up articles in another language.

It was also noted that 22% make no use of abstracts or indexes, 35% never use bibliographies, 22% do not use library catalogues, and 48% do not consult the librarian.

F. Administrative delays

If the attempt is made to translate every theoretical formulation into English, before filing, there will be a hold-up similar to that associated with the modelling activity. There is also bound to be disagreement as to the adequacy of translations. It may be preferable therefore to conceive of a Translation Phase in parallel with the filing, modelling, and term allocation phases, and to give priorities to the translation of given terms according to need.

(*) I am grateful to Mr. Thai Wo Tsan for this information.

(**) Maurice Line (Ed). Information Requirements of Researchers in the Social Sciences. Bath University, 1971, 2 vols.

A discipline's model as a "language"

For each entity or class of entities within a discipline we can attempt to indicate which other entities, relationships, attributes may be associated with it (i.e., in a political science parlance, what entities or classes of entities can the attribute "democratic" possibly be meaningfully applied to?). In a given discipline the number of such permissable relationships should be quite limited for a given concept -- and even if the number is large it can be reduced by redefining the entities in question as a class or classes.

This approach permits us to define the possible meaningful subunits of propositions which may be generated from the discipline vocabulary. In effect extremely stringent "grammatical" rules are thus set up for the creation of valid elements of sentences in the discipline jargon.

By this approach, extra conditions on sentence formulation are imposed, based on the knowledge obtained by use of the disciplines. In natural language such conditions cannot be imposed because many meaningless sentences in natural language are grammatically correct. Because of the richness and redundencies, size of vocabulary and indifference to truth values in natural language, any natural language project would lead to very large numbers of permissable relations which would be of little use, besides being impracticable. (Basically, in natural language, any adjective may be used to qualify any entity in the class of "nouns"; any adverb may be used with any entity in the class of "verbs", etc. -- and it is difficult to introduce restrictions at a more detailed level.)

Once the sub-propositional units have been determined (perhaps as "concept pairs") these in effect amount to new compound concepts (e.g. "voting procedure"). These may either be registered as new concepts or left as permissable "generateable" concepts (merely indicating the relationship between the component units, rather than showing the component units as components of a new compound unit). The choice would depend on the frequency of usage of the composed unit.

The procedure may then be repeated for the compound units, where this is considered useful, in order to build up the more complex permissable units commonly encountered. Clearly at a certain point in a particular domain:

-- it becomes difficult to determine whether higher level concepts are permissable because there meaningfulness is as yet untested, i.e. they are "new

-- it is decreasingly useful to create new units because of the quantity

In certain cases, however, the build-up can continue to the level of defining permissable propositions,i.e., a propositional inventory is built up from the units. Other sub-units are

held in such a form that many probable propositions may be
generated automatically for inspection and possible coding as
requiring investigation, meaningless, false, etc. This proce-
dure introduces further rules restricting the manner in which
the units may be combined. Modification and additions may of
course be made as new insights and data are obtained.

Once the concepts of a discipline are held in this structured
form, some interesting investigations of levels of analysis
and degree of equivalence may be made. Where a set of propo-
sitions exists employing a given entity (e.g. "nation") which
is itself made up of sub-units (e.g."provinces"), or is itself
a sub-unit of a larger entity (e.g.,"continental region") (*).
"new" propositions may be systematically generated for the
higher or lower level by treating the terms as equivalent. These
propositions may then be inspected as before, to eliminate the
obviously meaningless and inapplicable at the new level. The
remaining propositions may be added to the inventory if required.

A similar approach may be adopted between disciplines. In some
cases new insights may be suggested by treating key entities
in different disciplines as equivalent and substituting the
entity from the second discipline into the propositions of the
first containing the proposed counterpart. (e.g.,"individual"
in psychology may be substituted for "nation" in political
science or vice versa; "cell"from biology for "organization"
in organization theory(**)). In the case of a given set of
propositions containing a limited number of concepts, equiva-
lents for many of the concepts may be selected from the second
discipline, so that only the formal structure of the first
discipline proposition is retained. This amounts to a general
system investigation of propositional invariance or isomorphy
across discipline boundaries -- without the need to define any
questionable "meta language" in which the isomorphy is estab-
lished (***).

> "In fact, similar concepts, models and laws have often
> appeared in widely different fields, independently and
> based upon totally different facts. There are many in-
> stances where identical principles were discovered sev-
> eral times because the workers in one field were unaware
> that the theoretical structure required was already well

(*) On "levels of analysis" with respect to international studies,
see Henry Teune,"Conceptual dimensions of linking international
and comparative research" (Paper presented to the International
Conference on the Relationship of Comparative and International
Studies, Bellagio, 1971)

(**) See M.Haire. Biological models and empirical histories of the
growth of organizations,in:M.Haire (ed),Modern Organization
Theory. New York, Wiley, 1959, pp.272-306.

(***) Some very interesting math for the detection of such isomorphy
is given in:P.Jaffard et.G. Poitou, "Introduction aux catégories
et aux problémes universels." Paris, Ediscience, 1971.

developed in some other field." (*, p.33-34)

."Thus, there exist models, principles, and laws that apply
to generalized systems or their subclasses, irrespective
of their particular kind, the nature of their component
elements, and the relations or "forces" between them ...
we can ask for principles applying to systems in general,
irrespective of whether they are of physical, biological
or sociological nature.... To take a simple example, an
exponential law of growth applies to certain bacterial
cells, to populations of bacteria, of animals or humans,
and to the progress of scientific research measured by
the number of publications in genetics or science in gen-
eral. The entities in question, such as bacteria, animals
men, books, etc., are completely different, and so are the
causal mechanisms involved. Nevertheless, the mathematical
law is the same." (*, p. 32-33)

Clearly, investigation of propositions generated by this tech-
nique would facilitate the elimination of meaningless and false
propositions, and the identification of isomorphisms as dis-
tinct from superficial analogies.(**)

(*) L. von Bertalanffy. General System Theory. New York,
Braziller, 1968.

(**) L. von Bertalanffy, op.cit., p.84-5.