BOOK II

A GENERAL INTRODUCTION TO NON-ARISTOTELIAN SYSTEMS AND GENERAL SEMANTICS

Of all men, Aristotle is the one of whom his followers have worshipped his defects as well as his excellencies: which is what he himself never did to any man living or dead; indeed, he has been accused of the contrary fault. (354) AUGUSTUS DE MORGAN

There is one very important fact on which we must be in no doubt, and that is that for any given deductive theory there is not *any one* system of fundamental notions nor *any one* system of fundamental propositions; there are generally several equally possible, *i. e.* from which it is equally possible to deduce correctly all the theorems . . . . This fact is very important, because it shows that there are in themselves no *undefinable* notions nor *indemonstrable* propositions; they are only so relatively to a certain adopted order, and they cease (at any rate partly) to be such if another order is adopted. This destroys the traditional conception of *fundamental ideas* and *fundamental truths*, fundamental, that is to say, absolutely and essentially. (120)
LOUIS COUTURAT

In this direction finality is not sought, for it is apparently unattainable. All that we can say is, in the words of a leading analyst, "sufficient unto the day is the rigor thereof." (23)　　　　　　　　　　　　　　　　　　　　　　E.T. BELL

In mathematics it is new ways of looking at old things which seem to be the most prolific sources of far-reaching discoveries. (23)　　　　　　　E.T. BELL

The first will show us how to change the language suffices to reveal generalizations not before suspected. (417)　　　　　　H. POINCARÉ

In sum, *all the scientist creates in a fact is the language in which he enunciates it.* (417)　　　　　　　　　　　　　　　　　　　　H. POINCARÉ

This long discussion brings us to the final conclusion that the concrete facts of nature are events exhibiting a certain structure in their mutual relations and certain characters of their own. The aim of science is to express the relations between their characters in terms of the mutual structural relations between the events thus characterised. (573)

A.N. WHITEHEAD

We cease to seek resemblances; we devote ourselves above all to the differences, and among the differences are chosen first the most accentuated, not only because they are the most striking, but because they will be the most instructive. (417)
H. POINCARÉ

The materialistic theory has all the completeness of the thought of the middle ages, which had a complete answer to everything, be it in heaven or in hell or in nature. There is trimness about it, with its instantaneous

present, its vanished past, its non-existent future, and its inert matter. This trimness is very medieval and ill accords with brute fact. (573)

<div align="right">A.N. WHITEHEAD</div>

The existence of analogies between central features of various theories implies the existence of a general theory which underlies the particular theories and unifies them with respect to those central features.[*]

<div align="right">E.H. MOORE</div>

Neither the authority of man alone nor the authority of fact alone is sufficient. The universe, as known to us, is a joint phenomenon of the observer and the observed; and every process of discovery in natural science or in other branches of human knowledge will acquire its best excellence when it is in accordance with this fundamental principle. (82)

<div align="right">R. D. CARMICHAEL</div>

It is evident that if we adopt this point of view toward concepts, namely that the proper definition of a concept is not in terms of its properties but in terms of actual operations, we need run no danger of having to revise our attitude toward nature. (55)

<div align="right">P.W. BRIDGMAN</div>

To say the facts are incomprehensible is a rationalization of individual ignorance.
Ignorance, however, may be no fault. It becomes so only when the individual permits himself to rationalize it, *i. e.*, give it a disguise, which effectually blocks him in the utilization of his intelligence, which might otherwise solve the problem in hand. (241)   SMITH ELY JELLIFFE

The symbol *A* is not the counterpart of anything in familiar life. To the child the letter *A* would seem horribly abstract; so we give him a familiar conception along with it. "*A* was an Archer who shot at a frog." This tides over his immediate difficulty; but he cannot make serious progress with word-building so long as Archers, Butchers, Captains, dance round the letters. The letters are abstract, and sooner or later he has to realise it. In physics we have outgrown archer and apple-pie definitions of the fundamental symbols. To a request to explain what an electron really is supposed to be we can only answer, "It is part of the A B C of physics". (149)   A.S. EDDINGTON

No previous existing system of thought had properly formed a working hypothesis to explain why for this or that individual it was necessary to "go up three steps or else be constipated," "or to take pills in multiples of three," or other analogous symptoms which will occur to the reader and which are found in bewildering profusion in all pathological cases, be they hysterias, or compulsion neuroses, phobias, schizophrenias, or what not. (241)   SMITH ELY JELLIFFE

The Dormouse . . . went on: "—that begins with an M, such as mousetraps, and the moon, and memory, and muchness—you know you say things are 'much of a muchness'—did you ever see such a thing as a drawing of a muchness !"
"Really, now you ask me," said Alice, very much confused, "I don't think—"
"Then you shouldn't talk," said the Hatter.[**]   LEWIS CARROLL

4.1212 What *can* be shown *cannot* be said. (590)   L. WITTGENSTEIN

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[*] *Introduction to a Form of General Analysis.* Yale Univ. Press.
[**] *Alice in Wonderland.*

PART VII

ON THE MECHANISM OF TIME-BINDING

There should be no theoretical objection to the hypothesis of the formation of new physiological paths and new connections within the cerebral hemispheres. (394)

I. P. PAVLOV

It seems desirable in this place to clearly emphasize the fact that in the use of psychoanalysis we are dealing solely with a method for gaining data. One occasionally hears the statement that psychoanalysis is nonsense. A method, or a tool, is not nonsense. (241)   SMITH ELY JELLIFFE

It is by means of internal inhibition that the signalizing activity of the hemispheres is constantly corrected and perfected. (394)   I. P. PAVLOV

We are dealing here with types of associative reaction peculiar to the cortical system, correctly opposed to the unqualified affective reactivity of the thalamus and usefully analysed by Head. (411)   HENRI PIÉRON

This example and other observations suggest that a gradual development of internal inhibition in the cortex should be used for re-establishment of the balance of normal conditions in cases of an unbalanced nervous system. (394)I. P. PAVLOV

A self-satisfied rationalism is in effect a form of anti-rationalism. It means an arbitrary halt at a particular set of abstractions. (575)

A.N. WHITEHEAD

. . . the 'fallacy of misplaced concreteness' . . . consists in neglecting the degree of abstraction involved when an actual entity is considered merely so far as it exemplifies certain categories of thought. (578)

A.N. WHITEHEAD

In the Garden of Eden Adam saw the animals before he named them: in the traditional system, children named the animals before they saw them. (575)A.N. WHITEHEAD

The negative judgment is the peak of mentality. (578)   A.N. WHITEHEAD

CHAPTER XXIV

ON ABSTRACTING

> . . . to be an abstraction does not mean that an entity is nothing. It merely means that its existence is only one factor of a more concrete element of nature. (573)
>
> A. N. WHITEHEAD

Aristotle, in building his theories, had at his disposal, besides his personal gifts, a good education according to his day and the science current in 400-300 B.C. Even in those days, the Greek language was a very elaborate affair. Aristotle and his followers simply took this language for granted. The problems of the structure of language and its effect on *s.r* had not yet arisen. To them, the language they used was *the* (unique) language. When I use the expression '*the* language', I do not mean anything connected with the language, as *Greek*; I mean only the structure of it, which was much similar in the other national languages of this group. The language Aristotle inherited was of great antiquity, and originated in periods when knowledge was still more scanty. Being a keen observer, and scientifically and methodologically inclined, he took this language for granted and systematized the modes of speaking. This systematization was called 'logic'. The primitive structural metaphysics underlying this inherited language, and expressed in its structure, became also the 'philosophical' background of this system. The subject-predicate form, the 'is' of identity, and the elementalism of the *A*-system are perhaps the main semantic factors in need of revision, as they are found to be the foundation of the insufficiency of this system and represent the mechanism of semantic disturbances, making general adjustment and sanity impossible. These doctrines have come down to us, and through the mechanism of language the semantic disturbing factors are forced upon our children. A whole procedure of training in delusional values was thus started for future generations.

As the work of Aristotle was, at his date, the most advanced and 'scientific', quite naturally its influence was wide-spread. In those days, no one spoke of this influence as 'linguistic', involving *s.r.* Aristotle's work was, and still is, spoken of as 'philosophy', and we speak mostly of the influence of *A* 'philosophy' rather than of the *A* structure of language, and its semantic influence.

As we have already seen, when we make any proposition whatsoever we involve creeds, or metaphysics, which are embodied silently as structural assumptions and in our undefined terms. The use of terms not

definable in simpler terms at a given date is inherent and seemingly unavoidable.

When our primitive ancestors were building their language, quite naturally they started with the lowest orders of abstractions, which are the most immediately connected with the outside world. They established a language of 'sensations'. Like infants, they identified their feelings with the outside world and personified most of the outside events.

This primitive semantic tendency resulted in the building of a language in which the 'is' of identity was fundamental. If we saw an animal and called it 'dog' and saw another animal roughly resembling the first, we said, quite happily, 'it *is* a dog', forgetting or not knowing that the objective level is un-speakable and that we deal only with absolute individuals, each one different from the other. Thus the mechanism of identification or confusion of orders of abstractions, natural at a very primitive stage of human development, became systematized and structurally embodied in this most important tool of daily use called 'language'. Having to deal with many *objects*, they had to have names for objects. These names were 'substantives'. They built 'substantives', grammatically speaking, for other feelings which were not 'substantives', ('colour', 'heat', 'soul', .). Judging by the lower order abstractions, they built adjectives and made a completely anthropomorphised world-picture. Speaking about speaking, let us be perfectly aware from the beginning that, when we make the simplest statement of any sort, this statement already presupposes some kind of structural metaphysics. The early vague feelings and savage speculations about the structure of this world, based on primitive insufficient scientific data, was influencing the building of the language. Once the language was built, and, particularly, systematized, these primitive structural metaphysics and *s.r* had to be projected or reflected on the outside world—a procedure which became habitual and automatic.

Was such a language structurally reliable and safe ? If we investigate, we can easily become convinced that it was not. Let us take three pails of water; the first at the temperature of 10° centigrade, the second at 30° , and the third at 50°. Let us put the left hand in the first pail and the right in the third. If we presently withdraw the left hand from the first pail and put it in the second, we feel how nicely *warm* the water in the second pail is. But, if we withdraw the right hand from the third pail and put it in the second, we notice how *cold* the water is. The temperature of the water in the second pail was practically not different in the two cases, yet our feelings registered a marked difference. The difference in the 'feel' depended on the former conditions to which our

hands had been subjected. Thus, we see that a language of 'senses' is not a very reliable language, and that we cannot depend on it for general purposes of evaluation.

How about the term 'dog' ? The number of individuals with which any one is directly acquainted is, by necessity, limited, and usually is small. Let us imagine that someone had dealt only with good-natured 'dogs', and had never been bitten by any of them. Next he sees some animal; he says, 'This *is* a dog'; his associations (relations) do not suggest a bite; he approaches the animal and begins to play with him, and is bitten. Was the statement 'this *is* a dog' a safe statement ? Obviously not. He approached the animal with semantic expectations and *evaluation* of his verbal definition, but was bitten by the non-verbal, un-speakable objective level, which has different characteristics.

Judging by present standards, knowledge in the days of Aristotle was very meagre. It was comparatively easy 2300 years ago to summarize the few facts known, and so to build generalizations which would cover those few facts.

If we attempt to build a $\overline{A}$-system, 1933, can we escape the difficulties which beset Aristotle ? The answer is that some difficulties are avoidable, but that some are inherent in the structure of human knowledge, and so cannot be entirely evaded. We can, however, invent new methods by which the harmful semantic effect of these limitations can be successfully eliminated.

There is no escape from the fact that we must start with undefined terms which express silent, structural creeds or metaphysics. If we state our undefined terms explicitly, we, at least, make our metaphysics conscious and public, and so we facilitate criticism, co-operation, . The modern undefined scientific terms, such as 'order', for instance, underlie the exact sciences and our wider world-outlook. We must start with these undefined terms as well as the modern structural world-outlook as given by science, 1933. That settles the important semantic point of our structural metaphysics. It need hardly be emphasized that in a human class of life, where creeds are characterized by having dates, they *should* always be labelled with this date. For sanity, the creeds utilized in 1933 should be of the issue of 1933.

Now as to the *structure* of our language. What structure shall we give to our language ? Shall we keep the old structure, with all its primitive implications and corresponding *s.r,* or shall we deliberately build a language of new structure which will carry new modern implications and *s.r* ? There seems to be only one reasonable choice. For a $\overline{A}$-system, we must build a new language. We must abandon the 'is' of identity, to

say the least. We have already seen that we have an excellent substitute in an actional, behaviouristic, operational, functional language. This type of language involves modern asymmetrical implications of 'order', and eliminates the 'is' of identity, which always introduces false evaluation.

To these fundamental starting points, we must add the principle that our language should be of *non-el* structure. With these *minimum* semantic requirements, we are ready to proceed.

Let us take any object of ordinary experience, let us say the one we usually call a 'pencil', and let us briefly analyse our nervous relationship to it. We can see it, touch it, smell it, taste it. , and use it in different ways. Is any of the relationships just mentioned an 'all-embracing' one, or is our acquaintance through any of them only *partial ?* Obviously, each of these means provides an acquaintance with this object which is not only *partial,* but is also *specific* for the nerve centres which are engaged. Thus, when we look at the object, we do not get odor or taste stimuli, but only visual stimuli, .

If the object we call 'pencil' were lying on the surface of this paper and we were to look at it along the surface of the paper in a perpendicular direction to its length, it would generally be seen as an elongated object, pointed at one end. But, if we were to observe it along the plane of the paper at right angles to our former direction, it would be seen as a disk. This illustration is rough, but serves to show that the acquaintance derived through any specific means (e.g., vision) is also *partial* in another sense; it varies with the position. , of any specified observer, Smith, or a camera.

Furthermore, any given means provides, for *different* observers, different acquaintances. Thus, vision shows the pencil to one observer, Smith, as a pointed rod, and to another observer, Jones, as a disk. Feeling, through other receptors, is just as dependent upon many conditions; and different observers receive different impressions. This is well illustrated by the familiar tale of the five blind men and the elephant.

Because of differences in sensitivity in the receptors of Smiths and Browns (partial colour-blindness, astigmatism, far-sightedness. ,), any given means of acquaintance (e.g., vision) gives to different observers different reports of the one object. The acquaintance is thus personal and individual.

Again, the reports received through particular channels are influenced by the kind of reports that have already come through that channel. To one who has not seen trees frequently, a spruce and a balsam are not seen to be different. They are just 'evergreens'. With better educated seeing, this individual later differentiates, perhaps, four kinds of spruce.

Because of this factor of experience, the *response* of each individual to similar external stimuli is individual. We can only *agree* on colours, shapes, distances. , by ignoring the fact that the effect of the 'same' stimulus is different in different individuals. Besides that, we have no accurate means of comparing our impressions.

The 'time' factor enters, in that we cannot become acquainted with our pencil *on all sides at once.* Nor can we observe the outer form and the inner structure at the 'same time'. We may even neglect to examine the inner structure entirely. Even more important is the fact that all our means together give us only a *partial* and personal acquaintance with the 'pencil'. Continually we invent extra-neural means which reveal new characteristics and finer detail. Nor is this process ever completed. No one can ever acquire a 'complete' acquaintance with even so simple an object as a pencil. The chemistry, the physics, the uses of the varieties. , offer fields of acquaintance that can be extended indefinitely. Nature is inexhaustible; the events have infinite numbers of characteristics, and this accounts for the wealth and infinite numbers of possibilities in nature.

I used the word 'acquaintance' deliberately, because it seems vague, and, as yet, *el* gambling on words have not spoiled this term. I had to avoid the *el* terms 'senses' and 'mind' as much as possible in this analysis. If we recall the example of paper roses in the case of hay fever, we shall realize that the terms 'senses' and 'mind' are not reliable, particularly in humans. As a further instance, we have but to remember the experiment with newspaper headlines, also cited earlier.

We become better acquainted with the object by exploring it in manifold ways, and building for ourselves different pictures, all partial, and supplied by direct or indirect contact with different nerve centres. In these explorations, different nerve centres supply their *specific* responses to the different stimuli. Other higher nerve centres summarize them, eliminate weaker details, and so, gradually, our acquaintance becomes fuller while yet remaining *specific* and *partial*, and the semantic problems of *evaluation, meanings,* begin to be important.

If we try to select a term which would describe structurally the processes which are essential for our acquaintance with the object, we should select a term which implies 'non-allness' and the specificity of the response to the stimuli.

If we pass from such a primitive level to a level of 1933, and enquire what we actually know about an object and the structure of its material, we find that in 1933 we know positively that the internal structure of materials is very *different* from what we gather by our rough 'senses' on the macroscopic level. It appears of a dynamic character and

of an extremely fine structure, which neither light, nor the nerve centres affected by light, can register.

What we see is structurally only a specific *statistical mass-effect* of happenings on a much finer grained level. We *see* what we see because we *miss* all the finer details. For our purpose, it is usually enough to deal only with sight; this simplifies writing, and the comments made apply to all other 'senses', though perhaps in different degrees.

In 1933, in our human economy, we have to take into account at least three levels. The one is the sub-microscopic level of science, what science 'knows' *about* 'it'. The second is the gross macroscopic, daily experience level of rough objects. The third is the verbal level.

We must also evaluate an important semantic issue; namely, the relative importance of these three levels. We know already that to become acquainted with an object, we must not only explore it from all possible points of view and put it in contact with as many nerve centres as we can, as this is an essential condition of 'knowing', but we must also not forget that our nerve centres must summarize the different partial, abstracted, specific pictures. In the human class of life, we find a new factor, non-existent in any other form of life; namely, that we have a capacity to collect all known experiences of different individuals. Such a capacity increases enormously the number of observations a single individual can handle, and so our acquaintance with the world around, and in, us becomes much more refined and exact. This capacity, which I call the time-binding capacity, is only possible because, in distinction from the animals, we have evolved, or perfected, extra-neural means by which, without altering our nervous system, we can refine its operation and expand its scope. Our scientific instruments record what ordinarily we cannot see, hear, . Our neural verbal centres allow us to exchange and accumulate experiences, although no one could live through all of them; and they would be soon forgotten if we had no neural and extra-neural means to record them.

Again the organism works as-a-whole. All forms of human activities are interconnected. It is impossible to select a special characteristic and treat it in a delusional *el* 'isolation' as the most important. Science becomes an extra-neural extension of the *human* nervous system. We might expect the structure of the nervous system to throw some light on the structure of science; and, vice versa, the structure of science might elucidate the working of the human nervous system.

This fact is very important, semantically, and usually is not sufficiently emphasized or analysed enough. When we take these undeniable facts into account, we find the results already reached to be quite natural

and necessary, and we understand better why an individual cannot be considered entirely sane if he is wholly ignorant of *scientific method* and structure, and so retains primitive *s.r.*

For a theory of sanity, all three levels are important. Our 'senses' react as they do because they are united as-a-whole in one living structure, which has potentialities or capacities for language and science.

If we enquire what we *do* in science, we find that we 'observe' silently and then record our observations *verbally.* From a neurological point of view, we abstract whatever we and the instruments can; then we summarize; and, finally, we generalize, by which we mean the processes of abstracting carried further.

In our 'acquaintance' with daily objects, we do substantially a similar thing. We abstract whatever we can, and, according to the degree of intelligence and information we have, we summarize and generalize. From the psychophysiological point of view, the ignorant is neurologically deficient. But to 'know' or to 'believe' something which is false to facts is still more dangerous and akin to delusions, as psychiatry and daily experience teach us.[1] It is a neurological fallacy to treat science in 'isolation' and disregard its psychophysiological role.

In the building of our language, a similar neurological process becomes evident. If we were to see a series of different individuals, whom we might call Smith, Brown, Jones. , we could, by a process of abstracting the characteristics, segregate the individuals by sizes or colours. ; then, by concentration on one characteristic and disregarding the others, we could build classes or higher abstractions, such as 'whites', 'blacks', . Abstracting again, with rejection of the colour difference. , we would finally reach the term 'man'. This procedure is general.

Anthropological studies show clearly how the degree of 'culture' among primitive peoples can be measured by the orders of the abstractions they have produced. Primitive languages are characterized particularly by an enormous number of names for individual objects. Some savage races have names for a pine or an oak. , but have no 'tree', which is a higher abstraction from 'pines', 'oaks', . Some other tribes have the term 'tree', but do not have a still higher abstraction 'woods'. It does not need much emphasis to see that higher abstractions are extremely *expedient* devices. There is an enormous economy which facilitates mutual understanding in being able to be brief in a statement and yet cover wider subjects.

Let us consider a primitive statement 'I have seen $tree_1$', followed by a description of the individual characteristics 'I have seen $tree_2$', with minute individual description. , where $tree_1$, $tree_2$. , stand for names of

the individual trees. If an event of interest had happened in a place where there were a hundred trees, it would take a long while to observe fairly well the individual trees and still longer to give an approximate description of them. Such a method is non-expedient, *fundamentally endless*; the mechanism is cumbersome, involves many *irrelevant* characteristics; and it is impossible to express in a few words much that might be *important.* Progress must be slow; the general level of development of a given race or individual must be low. It should be noticed that the problem of *evaluation* enters, at once implying many most important psycho-logical and semantic processes. Similar remarks apply to the abstracting of infants, 'mentally' deficient grown-ups, and some 'mentally' ill.

Indeed, as the readers of my *Manhood of Humanity* already know, the 'human class of life' is chiefly differentiated from 'animals' by its rapid rate of progress through the rapid rate of accumulation of past experiences. This is possible only when expedient means of communication are established; that is, when higher and higher orders of abstractions are worked out.

All scientific 'laws', and other generalizations of higher order (even single words), are precisely such methods of expediency, and represent abstractions of very high order. They are uniquely important because they accelerate progress and help the further summarizing and abstracting of results achieved by others. Naturally, this process of abstracting has also unique practical consequences. When chemical 'elements' were 'permanent' and 'immutable', our physics and chemistry were much undeveloped. With the advent of higher abstractions, such as the monistic and general dynamic theories of all 'matter' and 'electricity', unitary field theories. , the creative freedom of science and the control over 'nature' have increased enormously and will increase still more.

Psychiatry also seems to give data indicating that 'mental' illnesses are connected either with arrested development or with regression to phylogenetically older and more primitive levels, all of which, of course, involves lower order abstractions. From the point of view of a theory of sanity, a sharp differentiation between 'man' and 'animal' becomes imperative. For with 'man', the lack of knowledge of this difference may lead to the copying of animals, which would involve semantic *regression* and ultimately become a 'mental' illness.

Although organisms have had acquaintance with objects for many hundreds or thousands of millions of years, the higher abstractions which characterize 'man' are only a few hundreds of thousands of years old. As a result, the nervous currents have a natural tendency to select

the older, more travelled, nervous paths. Education should counteract this tendency which, from a *human* point of view, represents regression or under-development.

By now we know how important it is for a $\overline{A}$-system to abandon the older implications and adopt an actional, behaviouristic, operational, or functional language. On the neurological level, what the nervous system *does* is abstracting, of which the summarization, integration. , are only special aspects. Hence, I select the term *abstracting* as fundamental.

The standard meaning of 'abstract', 'abstracting' implies 'selecting', 'picking out', 'separating', 'summarizing', 'deducting', 'removing', 'omitting', 'disengaging', 'taking away', 'stripping', and, as an adjective, not 'concrete'. We see that the term 'abstracting' implies structurally and semantically the activities characteristic of the nervous system, and so serves as an excellent *functional physiological* term.

There are other reasons for making the term 'abstracting' fundamental, which, from a *practical* point of view, are important. A bad habit cannot be easily eliminated except by forming a new semantic counter-reaction. All of us have some undesirable but thoroughly established *linguistic habits* and *s.r* which have become almost automatic, overloaded with unconscious 'emotional' evaluation. This is the reason why new 'non-systems' are, in the beginning, so extremely difficult to acquire. We have to break down the old structural habits before we can acquire the new *s.r.* The $\overline{E}$ geometries or the $\overline{N}$ systems are not any more difficult than the older systems were. Perhaps they are even simpler. The main semantic difficulty, for those accustomed to the old, consists in breaking the old structural linguistic habits, in becoming once more flexible and receptive in feelings, and in acquiring new *s.r.* Similar remarks apply in a more marked degree to a $\overline{A}$-system. The majority of us have very little to do *directly* with $\overline{E}$ or $\overline{N}$ systems (although indirectly we all have a good deal to do with them). But all of us live our immediate lives in a human world still desperately *A*. Hence a $\overline{A}$-system, no matter what benefits it may give, is much handicapped by the old semantic blockages.

In building such a system, this natural resistance or persistence of the old *s.r* must be taken into consideration and, if possible, counteracted. One of the most pernicious bad habits which we have acquired 'emotionally' from the old language is the feeling of 'allness', of 'concreteness', in connection with the 'is' of identity and elementalism. One of the main points in the present $\overline{A}$-system is first to remove entirely from our *s.r* this 'allness' and 'concreteness', both of which are structurally unjustified and lead to identification, absolutism, dogmatism, and

other semantic disturbances. Usually, the term 'abstract' is contrasted with 'concrete', which is connected with some vague feeling of 'allness'. By making the functional term *abstracting* fundamental, we establish a most efficient semantic counter-reaction to replace the older terms which had such vicious structural implications. Indeed, it is comparatively easy to accept the term 'abstractions of different orders', and any one who does so will see how much clarity and how much semantic balance he will automatically acquire.

From a *non-el* point of view, the term 'abstracting' is also very satisfactory. The structure of the nervous system is in ordered levels, and all levels go through the process of abstracting from the other levels.

The term implies a general activity, not only of the nervous system as-a-whole, but even of all living protoplasm, as already explained. The characteristic activities of the nervous system, such as summarizing, integrating. , are also included by implication.

If we wish to use our terms in the strictly *non-el* way, we must abandon the older division of 'physiological abstractions', which implies 'body', and of 'mental abstractions', which, in turn, implies 'mind', both taken in an *el* way. We can easily do that by postulating abstractions of different orders. We should notice that the above use of the term 'abstracting' differs from the old usage. The semantic difference is in uniting all the abstractions our nervous system performs under the one term, and in distinguishing between different abstractions by the order of them, which is functionally, as well as structurally, justified.

The term 'first order abstractions' or 'abstractions of lower order' does not distinguish between 'body' and 'mind'. *Practically,* it corresponds roughly to 'senses' or immediate feelings, except that by implication it *does not eliminate 'mind'.* Neither does the term 'abstractions of higher orders' eliminate 'body' or 'senses', although it corresponds roughly to 'mental' processes.

From the point of view of 'order', the term 'abstracting' has a great deal in its favor. We have seen what serious structural and semantic importance the term 'order' has, and how the activity of the nervous system has to be spoken of in terms of order. If we establish the term 'abstracting' as fundamental for its *general* semantic implications, we can easily make the meanings more definite and specific in each case by having 'abstractions of different orders'.

We have seen also that the terms we select should involve environment by implication: it is not difficult to see that the term 'abstracting' implies 'abstracting from something' and so involves the environment as an implication.

The term 'abstractions of different orders' is, in this work, as fundamental as the term 'time-binding' was in the author's earlier *Manhood of Humanity.* Hence, it is impossible to be comprehensive about it at this stage; more will be forthcoming as we proceed.

But we have already come to some important semantic results. We have selected our structural metaphysics, and decided that in 1933 we should accept the metaphysics of 1933, which is given *exclusively* by science. We have decided to abandon the false to facts 'is' of identity and to use, instead, the best available language; namely, an actional, behaviouristic, functional, operational language, based on 'order'. And, finally, we have found a term which is functionally satisfactory and has the correct structural and neural implications, and which represents a *non-el* term, and of which the meanings can be expanded and refined indefinitely by assigning to them different orders.

In passing on to the general scientific outlook, similar structural remarks upon a *non-el* point of view apply, and are semantically of importance. Because of the *non-el* character of the work of the writers on the Einstein and new quantum theories, much use is made of this material in the present work. There is a marked structural, methodological, *and semantic* parallelism between all modern *non-el* strivings, which are extremely effective psycho-logically. More material on this subject is given in Parts IX and X.

Now, returning to the analysis of the object which we called 'pencil', we observe that, in spite of all 'similarities', this object is unique, is different from anything else, and has a *unique* relationship to the rest of the world. Hence, we should give the object a *unique name.* Fortunately, we have already become acquainted with the way mathematicians manufacture an endless array of individual names without unduly expanding the vocabulary. If we call the given object 'pencil$_1$' we could call another similar object 'pencil$_2$', . In this way, we produce individual names, and so cover the *differences.* By keeping the main root word 'pencil', we keep the implications of daily life, and also of *similarities.* The habitual use of such a device is structurally and semantically of extreme importance. It has already been emphasized repeatedly that our abstracting from physical objects or situations proceeds by missing, neglecting, or forgetting, and that those disregarded characteristics usually produce errors in evaluation, resulting in the disasters of life. If we acquire this extensional mathematical habit of using special names for unique individuals, we become conscious, not only of the similarities, but also of the differences, which consciousness is one of the

mechanisms for helping the proper evaluation and so preventing or eliminating semantic disturbances.

So we now have before us a unique object which we call by a unique name 'pencil$_1$'. If we enquire what science 1933 has to say about this object, we find that this object represents structurally an extremely complex, dynamic process. For our purpose, which is *intuitive,* it is of little importance whether we accept the object as made up of atoms and the atom as made up of whirling electrons. , or whether we accept the newer quantum theory, as given in Part X, according to which the atom is formulated in terms of 'electrons' but the 'electron' is the region where some waves reinforce each other, instead of being a 'bit' of something. It is of no importance from our point of view whether the atoms are of a finite size or whether they extend indefinitely and are noticeable to us only in the regions of reinforcement of the waves. Naturally, this last hypothesis has a strong semantic appeal, since it would account, when worked out, for many other facts, such as 'fulness', in a *non-el* language; but probably it would necessitate a postulation of some sub-electronic structures.

What is important for our *s.r* is that we realize the fact that the gross macroscopic materials with which we are familiar are *not* simply what we see, feel. , but consist of dynamic processes of some extremely fine structure; and that we realize further that our 'senses' are not adapted to register these processes without the help of extra-neural means and higher order abstractions.

Let us recall, in this connection, the familiar example of a rotary fan, which is made up of separate radial blades, but which, when rotating with a certain velocity, gives the impression of a *solid disk.* In this case the 'disk' is not 'reality', but a nervous integration, or abstraction from the rotating blades. We not only see the 'disk' (*b*) where there is no disk, but, if the blades rotate fast enough, we could not throw sand through them, as the sand would be too slow to get through before being struck by one of the blades.
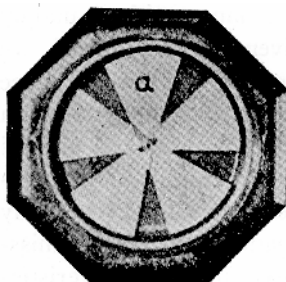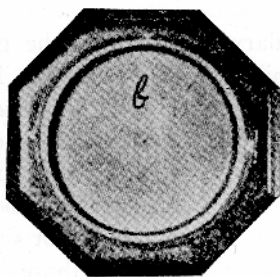

FIG. 1a   FIG. 1b

The 'disk' represents a *joint phenomenon* of the rotating blades (*a*) and of the abstracting power of our nervous system, which registers only the gross macroscopic aspects and slow velocities, but *not* the finer activities on subtler levels. We cannot blame 'the finite mind' for the failure to register the separate blades, because physical instruments may behave similarly. For instance, the illustrations (*a*) and (*b*) are photographs of a small fan which I use in lectures, and the photographic camera also missed the rotating blades and registered only a 'disk', in Fig. 1b.

Something roughly similar may be assumed for our purpose as going on in what we usually call 'materials'. These are composed of some dynamic, fine-grained processes, not unlike the 'rotating blades' of our example; and what we register is the 'disk', be it a table or a chair or ourselves.

For a similar reason, we may assume that we cannot put our finger through a table, as our finger is too thick and too slow, and that, for some materials, it takes X-rays to be agile enough to penetrate.

The above analogies are helpful for our purpose only, but are oversimplified and should not be taken as a scientific explanation.

This neural process seems to be very general, and in all our daily experiences the dynamic fine structures are lost to our rough 'senses'. We register 'disks', although investigation discovers not 'disks', but rotating 'blades'. Our gross macroscopic experience is only a nervous abstraction of some definite order.

As we need to speak about such problems, we must select the best language at our disposal. This ought to be *non-el* and, structurally, the closest to facts. Such a language has been built, and is to be found in the differential and four-dimensional language of space-time, and in the new quantum mechanics. In practice, it is simple to ascribe to every 'point of space' a date, but it takes some training to get this *s.r.* The language of space-time is *non-el*. To the new notion of a 'point' in 'space-time', such a 'point', always having a date associated with it and hence never identical with any other point, the name of 'point-event', or simply 'event', has been given.

How to pass from point-events to extended macroscopic events is a problem in mathematical 'logic'. Several quite satisfactory schemes have been given, into the details of which we do not need to enter here. As the *non-el* structure of the language of space-time appears different from the older *el* language of 'space' *and* 'time', quite obviously the old term 'matter', which belonged to the descriptive apparatus of 'space' *and* 'time', should be abandoned also, and the 'bits' of materials we dealt with

should be referred to by structurally new terms. In fact, we know that the old term 'matter' can be displaced by some other term connected with the 'curvature' of 'space-time'.

There is on record a striking example of what the structure of a form of representation means. In a paper printed in the Proceedings of the National Academy of Science, February, 1926, Professor G. Y. Rainich, the mathematician, tried to introduce 'mass' into space-time, the terms belonging to forms of representation of different structure. He succeeded, but at the price of splitting space-time into the original space *and* time. This is, as far as my knowledge goes, the first proof of how intimately a form of representation is inwardly and structurally interconnected. This fact is of extraordinary semantic importance for psycho-logicians and psychiatrists, who always study symbolism of some sort. It would be of great interest to have such problems worked out by them.

As abstracting in many orders seems to be a general process found in all forms of life, but particularly in humans, it is of importance to be clear on this subject and to select a language of proper structure. As we know already, we use *one* term, say 'apple', for at least *four* entirely different entities; namely, (1) the event, or scientific object, or the sub-microscopic physico-chemical processes, (2) the ordinary object manufactured from the event by our lower nervous centres, (3) the psycho-logical picture probably manufactured by the higher centres, and (4) the verbal definition of the term. If we use a language of adjectives and subject-predicate forms pertaining to 'sense' impressions, we are using a language which deals with entities *inside our skin* and characteristics entirely non-existent in the outside world. Thus the events outside our skin are neither cold nor warm, green nor red, sweet nor bitter. , but these characteristics are manufactured by our nervous system inside our skins, as responses only to different energy manifestations, physico-chemical processes, . When we use such terms, we are dealing with characteristics which are absent in the external world, and build up an anthropomorphic and delusional world non-similar in structure to the world around us. Not so if we use a language of order, relations, or structure, which can be applied to sub-microscopic events, to objective levels, to semantic levels, and which can also be expressed in words. In using such language, we deal with characteristics found or discovered on all levels which give us *structural* data uniquely important for knowledge. The ordering on semantic levels in the meantime abolishes identification. It is of extreme importance to realize that the relational. , attitude is optional and can be applied everywhere and always, once the above-

mentioned benefits are realized. Thus, any object can be considered as a set of relations of its parts. , any 'sense' perception may be considered as a response to a stimulus. , which again introduces relations, . As relations are found in the scientific sub-microscopic world, the objective world, and also in the psycho-logical and verbal worlds, it is beneficial to use such a language because it is *similar in structure* to the external world and our nervous system; and it is applicable to all levels. The use of such a language leads to the discovery of invariant relations usually called 'laws of nature', gives us structural data which make the only possible content of 'knowledge', and eliminates also anthropomorphic, primitive, and delusional speculations, identifications, and harmful *s.r.*