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Biological Relativity: 1. Psychic Regression and Biology

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# THE JOURNAL OF PHILOSOPHY

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## BIOLOGICAL RELATIVITY

### 1. PSYCHIC REGRESSION AND BIOLOGY

OF the various concepts employed by psychoanalysis, the concept of regression is one of the most useful. A psychic regression may be defined as a return to an earlier state of behavior, accompanied by the disappearance of later acquired forms of behavior. In the course of such psychic atavism there appear forms of behavior which have hitherto been inhibited by the individual, these forms representing the earlier responses characteristic of the level of conduct dominated to a large extent by instinct.

In some cases it is clear that this loss of the more recently acquired and less firmly established responses is correlated with a very definite degeneration of nervous tissue. Hughlings Jackson<sup>1</sup> regarded progressive mental dissolution as being due to the loss of control of the superior nervous centers over inferior centers. He argued that the mental symptoms (illusions, hallucinations, extravagant conduct, etc.) associated with the dissolution of nervous tissue are the manifestations of the activities of structures of lower (more primitive) levels of evolution.

More recently, and in another field, it has been established that in visual perception response to *brightness* represents the most primitive level, *pattern* or *form* perception the second level, and response to *color* the most recently acquired function. Dr. K. S. Lashley<sup>2</sup> states that pattern perception (he might have added color) is localized in the cortex and discrimination of brightness may be wholly a function of the thalamus and midbrain. In cases of progressive degeneration these functions disappear in the reverse order of development. In this connection it is interesting to recall that, within the field of color response, Mrs. Ladd-Franklin regarded partial and total color blindness as different stages of atavistic visual perception.

A further illustration of biological levels of synthesis is as follows. On the basis of experiments on the regeneration of nerves

<sup>1</sup> *The Evolution and Dissolution of the Nervous System*, 1884.

<sup>2</sup> "Mass Action in Cerebral Function," *Science*, 1931, Vol. 73, p. 248.

Sir Henry Head and his colleagues have distinguished two kinds of mechanisms on the afferent side of the nervous system. These are (1) the *protopathic* stage, characterized by the absence of any exactness of discrimination or localization, and by the presence of pronounced feeling tone; and (2) the *epicritic* stage, which marks the return to normal spatial perception of exact discrimination and localization. It is probable that these two types of sensibility represent distinct stages in the evolution of cutaneous perception. According to Head<sup>3</sup> and Holmes, the relation between protopathic and epicritic sensibility is analogous to the relation between the cerebral cortex and the optic thalamus. In the opinion of C. S. Myers<sup>4</sup> the protopathic system is responsible for the outbursts of volitional energy described by "act." This system is readily fatigued. The epicritic system yields the moderate and continuous activity which is illustrated by the "set" of unstriped (involuntary) muscles.

The psychological implications of this inhibition by the cortex of the tendency towards affective over-response by the thalamus have been drawn by W. H. R. Rivers in his book, *Instinct and the Unconscious*. He believes that these two systems are not only distinct anatomically, but separate in date of acquisition. This example of the repression of the mass reflexes of the lower level by higher centers is a common occurrence. In some cases, Rivers states, it seems that we are not dealing with the suppression of individual experience, but with the suppression in the race of experience belonging to an earlier phase of evolution. This suggests that racial suppression is repeated in every individual as part of the recapitulation of racial history.

In cases of purely functional disorders there may be no discoverable degeneration of nervous tissue to parallel the psychic regression. From the fact that in some cases a permanent cure can be produced through proper treatment it would appear that psychic regression need not be accompanied by somatic degeneration. But even in such cases physiological concepts may be applicable. Ribot emphasized the fact that regression represents an economy of effort in reacting to a situation which is too difficult for the individual to cope with otherwise. In this respect regression may be considered as a "shirking" reaction. From the point of view of many psychoanalysts religion, with its emphasis upon the Fatherhood of God and the infantilism of man ("Lest ye become as little children") is a regression. "Split" personalities, involving the dominance of a more juvenile self, also represent an easier way of reacting.<sup>5</sup> Freud

<sup>3</sup> *Brain*, 1911-12, Vol. 34, p. 112.

<sup>4</sup> "Conceptions of Fatigue and Adaptation," *Psych. Rev.*, 1925, Vol. 33, 1-17.

<sup>5</sup> On this point see H. H. Goddard's "A Case of Dual Personality," *J. Ab. & Soc. Psy.*, 1926, Vol. 21, 170-190.

carries this tendency towards refuge in childhood reactions much further. He believes that this tendency towards a reinstatement of an earlier condition has its first manifestation in the instinct of life to return to the lifeless matter out of which it originated. Thus Freud is led to the self-refuting hypothesis that "the goal of life is death."<sup>6</sup>

It has been suggested that this concept of regression throws light on problems in different fields. In the field of science and philosophy the concepts of psychoanalysis have been applied by C. J. Jung in his book, *Psychological Types*, and by Alexander Herzberg in his treatise, *The Psychology of Philosophers*. In the field of logic the writer<sup>7</sup> has suggested a possible application of the notion of psychic recapitulation.

Objections to this type of theory are, of course, not wanting. In the first place it must be noted that from the point of view of logic it is quite a jump from the admission that certain phenomena in adults are more or less *analogous* to the behavior of an infant or the activities of primitive man to the assertion that they are *identical* with such behavior. This difficulty will be considered in a following section. A further objection to this mode of explanation is made by E. S. Ames, who states<sup>8</sup> that the theory of recapitulation—that the child retraces the steps of racial development—is not altogether reliable, and must be modified by the recognition of "short cuts" and the influence of the immediate social environment.

A final and more serious objection arises out of the following circumstance. It is clear to the well informed that the doctrine that in his individual mental development the human being passes through the steps of previous phylogenetic evolution resembles the biological doctrine of the inheritance of acquired characteristics. The theory of "psychic recapitulation" and the "culture epoch" theory correspond rather strikingly to Haeckel's famous biogenetic law, according to which ontogeny recapitulates phylogeny. To be sure, many who accept this generalization as being approximately correct have not been advocates of the Lamarckian doctrine. Nevertheless, some present-day psychoanalysts who regard the unconscious of the individual as the epitome of the phyletic heritage specifically ally themselves with the Lamarckian doctrine of the inheritance of acquired traits (experiences). This then throws the doctrine open to all the criticisms levelled against Lamarck's theory of the effects of use and disuse. Before considering the seriousness of this difficulty, let us see how the Lamarckian theory has functioned in those systems which have attempted to trace a fundamental connection between heredity and biological memory.

<sup>6</sup> *Beyond the Pleasure Principle*, p. 47.

<sup>7</sup> O. L. Reiser, *Humanistic Logic*, p. 105.

<sup>8</sup> In his book, *The Psychology of Religious Experience*.

## 2. HEREDITY AND BIOLOGICAL MEMORY

The similarity between memory and heredity has appealed to a number of thinkers. So far as the writer is aware, Samuel Butler's work on *Unconscious Memory* (1880) was the first in which an attempt was made to demonstrate a connection between these two conservative factors. Ewald Hering's work *On Memory as a General Function of Organized Matter* (Eng. trans., Chicago, 1895), where he developed the notion of memory as a general property of organic tissue, was one of the most original attempts at a working out of a systematic conception of the relation between memory and heredity.

Hering states: "Through frequent repetition, one particular kind of function becomes, as it were, the second nature of a single cerebral cell, i.e., the cell acquires this special ability or energy. In this way the individual energies of the cerebral cells and fibers are developed by education on the basis of inherited dispositions. Also the additional energy, which the cells acquire during life, is transmitted by inheritance to the new-formed cells which are generated by partition. These new cells can in turn develop, evolve, or modify the inherited energy" (p. 44). Writing before the appearance of Mendelism, Hering supposed that the living germ-substance for each animal species had its specific properties or energy. Thus the "specific energies" theory, first formulated by Johannes Müller, is linked with the theory of the inheritance of acquired characteristics.

The next important development of this theory was presented by Richard Semon in his book, *Die Mneme* (Leipzig, 1904). Semon's conception of phyletic memory, as exhibited in instincts, habits, and "pattern reactions," is based on the idea that etchings on protoplasm by external stimuli leave certain reaction tendencies called engrams (*engrammes*). These are built up by the repetition of stimuli and passed on through evolution. Memory is a complex synthesis of engrams.

The work of Eugenio Rignano, *Sur la transmissibilité des caractères acquis* (Paris, 1906), constituted a further stage in the development of the doctrine. Rignano's view is interesting because he tries to be more specific in providing a mechanism which will bring together the facts of heredity and memory.

Rignano's hypothesis (best stated in his more recent book on *Biological Memory*) assumes the existence of "specific nervous accumulators." The fundamental idea is that every functional stimulus is transformed into a specific vital energy, and deposits in the nucleus of the cell a specific substance which is capable of discharging in an inverse direction as soon as the dynamic equilibrium of the organism is restored. These specific nuclear substances, different for each cell, are accumulated also in the nuclei of the germinal sub-

stance, constituting what Rignano calls the central zone of development. In other words, each functional adaptation changes slightly the dynamic equilibrium of the organism, and this change in the system of distribution of the nervous currents leads to the deposit in the central zone of development of a new specific substance. In the development of the next individual this new specific element enters into activity and reproduces the nervous current which formed it, as soon as the organism reaches the same conditions of dynamic equilibrium as those which obtained when the stimulus acted on the parent. Development can thus be regarded as consisting of a number of stages, at each of which new specific elements enter automatically into play and lead the embryo from that stage to the next.

While this view, in its general outlines, has appealed to some investigators (G. W. Crile and E. W. MacBride, for example), most biologists are unable to accept its tenets. Professor C. M. Child, for instance, has pointed out to the writer that Rignano's conception assumes the truth of the dubious doctrine of the specific energies of the nervous system. But aside from theoretical difficulties, there is the question of the empirical evidence in favor of the Lamarckian hypothesis upon which the view of Rignano, no less than the similar views of Hering and Semon, rests. The problem of adjusting the theory of psychic recapitulation to one's attitude on the Lamarckian hypothesis is one we left undecided, but now we must return to this question.

The conclusion which seems to come out of the foregoing discussion is this: If one believes in the doctrine of the transmission of acquired traits (including habits, which are *experiences* repeated until they acquire engrammatic character), it is natural to believe in the explanation of psychic regression as an instance of mental recapitulation, an atavistic reversion to more primitive levels of biological memory. But now the real problem arises. If one is convinced of the fact of psychic recapitulation, does this carry with it as a necessary logical consequence the acceptance of the doctrine of the inheritance of acquired characteristics? It seems to me that the answer to this question is no. A critic with an eye open to all possibilities might point out that here we are not faced with a true disjunction. It is not a case of accept Lamarck and psychic atavism goes with it; reject Lamarck and psychic recapitulation is rejected with it. It may be pointed out that there are other possibilities. The hypothesis of parallel induction,<sup>9</sup> for example, admits of the possibility of the appearance in subsequent generations of structural modifications which *apparently* are a result of the functioning (experience) of an organism, but which *in fact* are a result of changes

<sup>9</sup> For a discussion of this notion see Seba Eldridge's *The Organization of Life*, *passim*.

which occurred simultaneously in the somatic and germ cells, without there being any causal interaction between the bodily activities and the genetic units. This is merely mentioned as a possibility; other alternatives are perhaps conceivable. At any rate the ideas developed by Head and Rivers do not appear to rest on the Lamarckian hypothesis for their validity.

It is, of course, appropriate to point out that even if it should be proved that there is a necessary connection between psychic recapitulation and the transmission of acquired characteristics, this does not absolutely invalidate the explanation of psychic regression. The common objection to Lamarck's theory, that no mechanism has been discovered (or is even conceivable, it is sometimes stated) whereby individual experiences and the accompanying somatic modifications can influence the germ plasm, and thus become transmitted as hereditary effects, is in fact no objection. William McDougall is entirely correct in stating that even though we can not visualize how a process takes place, this does not render the fact of such an interaction impossible. The inability to conceive *how* a thing happens is no reason to deny *that* it happens. As a matter of fact, J. S. Cunningham in his book on *Hormones and Heredity* has suggested that these very potent "chemical messengers" may be the formative stimuli and bearers of racial memories, thus supplying a possible mechanism for the interaction. D. L. Watson<sup>10</sup> has also made some suggestions to take care of this difficulty.

These considerations might serve to make us sufficiently open-minded about the Lamarckian hypothesis, so that we could consider the theory of mental regression and recapitulation on its own merits. But there is another approach to this matter, and since this promises to throw light on some other dark corners of science, we pursue this path for what it is worth.

### 3. STRUCTURE AND FUNCTION

By way of approach let us first point out that the theory of psychic recapitulation is arrived at as a result of *reasoning by analogy*. Scott Buchanan<sup>11</sup> and the writer<sup>12</sup> have independently pointed out that reasoning by analogy may be put in the form of a proportion, as follows:

$$\frac{A}{B} = \frac{C}{D} \quad \text{or} \quad \frac{\text{Old problem}}{\text{New problem}} = \frac{\text{Old solution}}{\text{New solution}}$$

This is usually the form that reason follows in arriving at new hypotheses, which serve as tentative solutions to problems. This pat-

<sup>10</sup> "Biological Organization," *Quart. Rev. Biol.*, 1931, Vol. 6, p. 161.

<sup>11</sup> *Poetry and Mathematics*.

<sup>12</sup> *Humanistic Logic*.

tern is the conventional guide because solving problems, adapting ourselves to a novel environment, is a matter of *transposing* an adequate response to some old situation to the new stimulus pattern. As the writer has shown,<sup>13</sup> the theory of intelligence presented by gestalt psychology rests upon reasoning by analogy, for when you transpose an old gestalt into a new situation you are transposing a *set of relations*. Such a gestalt as a musical phrase consists in the relations between the notes of the musical melody of which it is composed, and the transposed melody possesses a similarity of structure paralleling the old melody.

This notion of *relation structure* is coming to be recognized as a concept fertile in its applications. Bertrand Russell<sup>14</sup> points to its epistemological significance in the following lines:

We naturally interpret the world pictorially; that is to say, we imagine that what goes on is more or less like what we see. But in fact this likeness can only extend to certain formal logical properties expressing structure, so that all we can know is certain general characteristics of its changes. Perhaps an illustration may make the matter clear. Between a piece of orchestral music as played, and the same piece of music as printed in the score, there is a certain resemblance, which may be described as a resemblance in structure. The resemblance is of such a sort that, when you know the rules, you can infer the music from the score or the score from the music.

L. T. Troland<sup>15</sup> sees in this principle a possible clue to the problem of the relation of brain and consciousness. After stating three general principles governing the relation between the brain and consciousness, Troland sums the matter up as follows:

All of these principles can be combined into the general statement that consciousness and the brain mechanism which underlies it have a similar logical *formula*. As an example of the meaning of this statement we may consider the case of a motion picture and a novel, both of which portray the same story. . . . A piece of music as played by a pianist and the score which he has before him are radically different things, and yet they have a corresponding structure.

The way in which this similarity of "structure" enables us to relate mind and body is not our immediate concern. Here we need only point out that the notion of "insight" as a case of analogical reasoning (transposition of sets of relations) finds support in the view of L. L. Whyte,<sup>16</sup> who states that "intuition is the recognition of the similarity of relation-structure in two situations, and reasoning the tracing of the consequences of this similarity." A similar view has been presented by S. K. Langer.<sup>17</sup>

<sup>13</sup> "The Logic of Gestalt Psychology," *Psych. Rev.*, 1931, Vol. 38, 359-368.

<sup>14</sup> *The A B C of Relativity*, 1925, p. 227.

<sup>15</sup> *The Mystery of Mind*, 1926, p. 203.

<sup>16</sup> Cf. his *Critique of Physics*, 1931, p. 163.

<sup>17</sup> In her book, *The Practice of Philosophy*, 1930, pages 87, 101, 166.

It thus appears that creative thinking follows a simple formula, a pattern which comes naturally out of the principles of gestalt psychology, and, through the concept of similarity of relation-structure, elucidates the relations between phenomenal and physical patterns. Developing this view, the writer<sup>18</sup> has proposed that the principles of gestalt psychology may be fitted into the pattern of the Hegelian dialectic as reinterpreted in terms of the contemporary theory of emergent evolution.

As Hegel recognized, thought is a result of a movement between opposites. The subject of thought (the *A*) must neglect the negative (the *not-A*), though over a period of time what was previously neglected may itself become the object of thought. In terms of gestalt psychology, the concepts which form the structural units of thought are like the *figures* which stand out against their *grounds* because the energy enclosed by the figure is greater (more concentrated) than that of the hinterland. The first thesis, the *A*, is the figure; the antithesis, the *not-A*, is the ground; and the synthesis is an emergent gestalt. There is thus an intellectual integration of the terms of the analysis whereby the mind progressively reorganizes itself in time. As a result of the interaction between an organism and its environment, and between the different (relatively isolated) systems (*gestalten*) within the organism, a new set of relations appear, which can not be explained in terms of either pole of the duality taken by itself. From this point of view mind might be regarded as the process whereby the incomplete strives towards completion. In a sense the organism's responses to its own reactions is the mind, and it is this which makes possible creative thought. Or in other terms, mind is the temporal process whereby the organism tries to harmonize the part-processes with each other, resolving conflicts, and thus reconciling the opposition of the thesis (the *figure*) and the antithesis (the *ground*) in a new synthesis (*gestalt*). This is our version of what G. P. Conger calls the "implicit duality of thinking." In thinking, as in biological evolution and individual development, analysis (differentiation) and synthesis (integration) are complementary and mutually implicative processes. Thus we introduce the concept of *transcendence* which, as R. M. Ogden has pointed out, is really necessary to the system of gestalt psychology.

And now we consider the implications of this for the problem of the structuralization of function, the problem of biological memory. Since reasoning by analogy, or the transposition of *gestalten* (relation-structures), is the method of gaining hypotheses, the hypothesis gained in this case must exhibit a pattern similar to our

<sup>18</sup> Cf. "Physics and the Laws of Thought," *Psyche*, April, 1931.

formula. This is indeed the case, for the doctrine of psychic recapitulation may be summarized as follows:

$$\frac{\text{Individual mental evolution}}{\text{Racial mental evolution}} = \frac{\text{Individual biological development}}{\text{Phyletic evolution}}.$$

Now if it is true, as we maintain, that reasoning is the cerebral counterpart of the general biological differentiation of part patterns within larger wholes (as G. E. Coghill's work suggests), while evolution, on the other hand, is the phylogenetic counterpart of the self-transcendence evident in thinking as it moves on to new integrations of response, then it necessarily follows that mental evolution recapitulates racial evolution (except for short-cuts) because body (mutations excluded) consists of conventionalized behavior (structuralized energy-patterns). In brief, structural gestalten are simply crystallized functional gestalten.

This idea has been approximated by various different investigators. Lloyd Morgan's statement, in his volume on *Emergent Evolution* (p. 29), that "life stands to matter in the same relation as mind stands to life," is only another way of putting S. Alexander's thesis that time is the mind of space. That is:

$$\frac{\text{Life}}{\text{Matter}} = \frac{\text{Mind}}{\text{Life}} \quad (\text{Lloyd Morgan}),$$

$$\frac{\text{Time}}{\text{Space}} = \frac{\text{Mind}}{\text{Body}} \quad (\text{Alexander}).$$

If we ask, What is the fundamental phenomenon of nature of which all other levels are analogies? the answer, I think, will be given in terms of a dualism of *structure* and *function*. That is:

$$\frac{\text{Time}}{\text{Space}} = \frac{\text{Energy}}{\text{Matter}} = \frac{\text{Life}}{\text{Protoplasm}} = \frac{\text{Consciousness}}{\text{Cortex}} = \frac{\text{Function}}{\text{Structure}}.$$

If one thinks of mind as a manifestation of the behavioral aspect of the body, and if one accepts the statement of J. H. Jeans<sup>19</sup> that in multi-dimensional geometry time plays the rôle of the next highest dimension, then it is possible to restate the ratio thus:

$$\frac{\text{Mind}}{\text{Body}} = \frac{n + 1\text{-dimensional space}}{n\text{-dimensional space}}.$$

In a sense we have thus explained psychic recapitulation, but in another sense we are exactly where we were when we started out—except that we now see that we will never get anywhere else. This, however, does not prevent us from making further progress in connection with the subject of biological relativity.

<sup>19</sup> *The Mysterious Universe*, p. 129.

## 4. BIOLOGICAL RELATIVITY

Poets have frequently compared life to a candle. The analogy is really an identity, for life is literally a process of combustion, and oxidation is the flame of life. The thesis of the chemist, that when one substance is oxidized another is reduced, applies equally well to organic processes as to inorganic reactions. Oxidation and reduction are complementary processes, occurring in conjunction. Since the organism is able to facilitate these oxido-reductions between different substances, it is perfectly correct to regard life as an oxidation-reduction rhythm.

Many thinkers have pointed out the rhythmic character of the life processes. One of the finest expressions of this rhythmic character has been given by A. N. Whitehead,<sup>20</sup> who, however, does not speculate about the physiological underpinning of the rhythm which is life. But the fact that it is this interplay of oxidation and reduction which accounts for so many synthetic reactions of protoplasm—such as the formation of fats from the sugars, which is ultimately a matter of oxidation-reduction—certainly lends support to the idea that the rhythms of life are oxido-reductant rhythms.<sup>21</sup> The power of living matter to carry on such oxidative and reductive transactions is dependent upon the presence of bio-catalysts. Among such catalysts are the enzymes, water—which has the ability to facilitate organic reactions—and perhaps also radiations (light).

It is now generally recognized that the oxidation-reduction reactions of protoplasm are at bottom electrical responses, involving the transfer of electrical charges.<sup>22</sup> Starting from the conception that all processes of oxidation involve the transfer of negative particles from one element to another, the one which receives the negative charge being reduced and the element losing it being thus rendered more positive and being said to be oxidized, we arrive at the conclusion that every bioelectric process involves a minute action current, as the charge is passed from the oxidizing to the oxidized body.

<sup>20</sup> *The Principles of Natural Knowledge*, Ch. 18.

<sup>21</sup> In his book, *Protoplasmic and Nervous Action*, R. S. Lillie states (p. 403) that "growth, repair and recovery from stimulation are the result or expression of chemical reactions, of the same general kind, apparently oxidative syntheses, which occur predominantly at the polar region." This view is entirely in accordance with the theory of C. M. Child that regions of higher metabolic rate control those of lesser rate. Thus, in his book on *The Origin and Evolution of the Nervous System*, Professor Child concedes (p. 84) that if oxidation and synthesis are associated, the physiological gradients are determined by regions of higher metabolic rate.

<sup>22</sup> Cf. A. P. Mathews, *Physiological Chemistry*, p. 258.

This idea has been developed in a systematic form by E. J. Lund,<sup>23</sup> who believes that the electric polarity of the cell is quantitatively correlated with the respiratory exchange of the cell and that electric currents accompany cell oxidation. Thus bioelectric currents are held to provide the basis for cell correlations. Lund has advanced the idea that bioelectric currents produced by the cells are the result of the oxidation-reduction potentials. He holds that stimulation changes the electric potential and therefore the electric polarity of the cell, because it temporarily accelerates the reaction reductant  $\rightarrow$  oxidant, thereby changing the *ratio* of oxidant to reductant. By an adaptation of the familiar Nernst formula for the oxidation-reduction potential the following equation

$$E = E_0 - \frac{RT}{nF} \log \frac{[\text{ox}]}{[\text{red}]}$$

is developed to cover the various phenomena studied.

And now we return to the notion of biological relativity by first calling attention to our thesis<sup>24</sup> that gestalt psychology would gain much by developing more systematically the physiological implications of the theory of psychological relativity. It was previously pointed out that in the case of a melody, which can be *transposed*, the gestalt consists in the *relation* between the "notes" (in general the elements of any phenomenal pattern). The gestalt, therefore, is not invariably localized in any specified set of neural elements. As S. H. Bartley informs me, while psychologists still talk of one set of neurones doing one thing and another set doing something else, the actual results indicate that the same cortical tissue may be both active and passive at the same time. That is to say, cerebral action currents are such only by virtue of a difference of potential at two points at a given time. Whether such a bioelectric current will appear depends upon where one electrode on the cortex is with respect to the other. This relativity of action currents must be a manifestation of the biochemical relativity of the oxidation-reduction rhythms (redoxpotentials).

In the human being the oxidative reactions go on most rapidly in the brain, which is the vehicle of consciousness. The extreme sensitivity of cerebral activity and of consciousness to oxygen deprivation points to the exceptionally high metabolic rate of nervous activity. Why, then, we ask, should we not consider the facts of psychological relativity, so obvious in the case of sensory percep-

<sup>23</sup> "Relations between Continuous Bioelectric Currents and Cell Respiration, V," *J. Exp. Zool.*, 1928, Vol. 51, 327-337.

<sup>24</sup> Cf. "Physical Relativity and Psychical Relativity," *Psych. Rev.*, 1930, Vol. 37, 257-263; "Contributions of the New Physics to Philosophy and Psychology," *Psyche*, 1930, Vol. 11, 65-87.

tion (e.g., simultaneous color-contrast, in the case of vision) as a phase of the relativity of cerebral action currents to the total state, which is the brain as a whole, including past experience? In Lund's view the reaction velocity reductant  $\rightarrow$  oxidant is a result of a *ratio* (proportion) of the electric potential, which makes it a relative matter. The notion that oxidation-reduction is an instance of what W. H. Manwaring<sup>25</sup> terms "biochemical relativity" is intimated by F. Knoop<sup>26</sup> when he states that probably every organic substance in the body has *in relation to every other* a certain redox-potential, which will vary according to conditions, for example, of the hydrogen ion concentration, temperature, oxygen concentration, the catalysts present, etc. Thus we have a biochemical relativity paralleling the psychological relativity which Professor Köhler has emphasized in his book, *Gestalt Psychology*. The way in which this bioelectric relativity might explain the "attraction" of two "similar" mental processes for each other has been suggested by the writer in a paper already referred to.

These ideas appear to be consistent with our espousal of certain of the concepts of psychoanalysis. No one has attempted a synthesis of psychoanalysis and gestalt psychology. When and if such a synthesis is achieved, it seems to me that it will come by way of the notion of biological relativity. Here are a few suggestions looking towards such a unification.

The relativity of the processes which underlie the psychoanalytic study is illustrated by such notions as "repressions." Whether the pressure exerted by the psychic censor to repress an experience or tendency is sufficient to keep it below the "surface" of the stream of consciousness depends upon the *relative strength of the impulse in relation to the force of resistance or inhibitory power*. Here we are again dealing with a dynamic situation. Pavlov's work on conditioned reflexes has shown that it is the cerebral cortex, with its powers of inhibition, which compels the coöperation between otherwise independent nerve centers. In the human animal the visual areas have come to dominate the conscious realm to a much larger extent than in lower animals, where the brain is more of a smell organ. But this fact does not justify the customary statement that in human beings the sense of smell has *degenerated* in favor of the distance receptors. Smell has been *repressed*; but when the cortical pressure is removed there may be a reversion to the more primitive level. Anyone who has studied epileptics psychoanalytically gets an

<sup>25</sup> *Science*, 1930, Vol. 72, p. 25.

<sup>26</sup> "The Mutual Influence of Organic Compounds in the Animal Body," *Science*, 1930, 23-25.

excellent idea of how unrepressed smell comes into its ancient own in volcanic anal erotic sadistic activities.<sup>27</sup>

The notion that psychic relativity arises out of the relation of part-processes to the whole has been proposed by Theodor Lipps<sup>28</sup> as an explanation of Weber's law. The present view holds that in addition to the "local" bioelectric currents there is some all-inclusive field associated with the body. This supposition is in harmony with Darcy W. Thompson's<sup>29</sup> suggestion that a comprehensive field of force running through an organism somehow shapes it, independently of the individual cells which enter like froth into its fabric. This all-encompassing field the writer has variously called a "superior coordinating force," a "macroscopic rhythm," etc.<sup>30</sup> The mode of interaction between local processes and the mind is conceived to be through the electromagnetic field.<sup>31</sup> In chemical reactions light frequently acts as a catalytic agent; the action of radiation is especially favorable to processes involving oxidation and reduction. It may be objected that the fields of force which necessarily must accompany the electromotive forces present in cerebral reactions can not be very strong, but we must not forget that such fields might be strong enough to initiate processes which then proceed on their own free (potential) energy.

If the supposition is correct that this comprehensive field is analogous to a new dimension, it follows that the only way to study the mind directly is to *experience* it. How this reality, an additional temporal dimension, acts as a morphogenetic force to assist in controlling phyletic and ontogenetic evolution is a question that can not be handled now.

## 5. RELATIVITY IN LOGIC

In a review of the writer's book on *Humanistic Logic* F. C. S. Schiller<sup>32</sup> criticizes the writer for alleged self-contradiction in the treatment of the *laws of thought*. Since the present essay deals with

<sup>27</sup> This fact has been pointed out to me by Dr. Smith Ely Jelliffe. I may say that the present paper shows the influence of Dr. Jelliffe's suggestions, and that it is in part an attempt to meet certain objections that Dr. Jelliffe has made to a paper by the writer on "The Biological Origins of Religion," to appear in a forthcoming issue of the *Psychoanalytic Review*.

<sup>28</sup> See his paper "The Law of Psychic Relativity and Weber's Law," in his *Psychological Studies*, Baltimore, 1926.

A further instance of psychological relativity is given by Harry Helson in his paper, "The Tau Effect—An Example of Psychological Relativity," *Science*, 1930, Vol. 71, 536-537. The quantitative study appears in *J. Exp. Psy.*, 1931, Vol. 4, 202-217.

<sup>29</sup> *On Growth and Form*, p. 200.

<sup>30</sup> Professor G. P. Conger's criticism of my view in his book, *A World of Epitomizations* (p. 16), is based on a misinterpretation.

<sup>31</sup> For a further statement see *The Alchemy of Light and Color*.

<sup>32</sup> In the *Personalist*, April, 1931.

the applications of logic to nature, a few comments on this matter are appropriate.

The logical position in harmony with the present view is that the "laws" of thought can and can not be violated by human thought. With Dr. N. Rashevsky<sup>33</sup> we agree that the *law of identity*, that only one meaning can be ascribed to any term at any moment, arises from the fact that normally alternative neuro-muscular sets can not be innervated simultaneously. If I think of *A*, I can not think of *not-A* at that same time. What is the "figure" can not be the "ground" simultaneously. At a later time one can ascribe different properties to *A* (any term). Thus words may become ambiguous, and in an evolutionary world there appears to be a violation of the law of identity. To facilitate social discourse and understanding human groups have accepted it as a regulative ideal that the same word should be used in the same sense by each individual for as long a time as possible, after which redefinition is legitimate.

The trouble with Professor Schiller<sup>34</sup> is that he fails to see that logic must learn to render unto Caesar (empirical science, which defines its terms by *inspection*) the things that are Caesar's, and unto God (the platonic realm of mathematico-logical universals, which are defined by *postulation*) the things that are God's. Our own attempt to apply a Hegelian view does not, for me, mean a denial of the law of excluded middle (Hegel to the contrary notwithstanding), for the entities and operations of logic have no empirical content and therefore do not evolve. In this connection it may be pointed out that if the "logocentric" predicament<sup>35</sup> as understood by H. M. Sheffer means that the logic we use in reasoning about logic can only be of one type, then this view is open to criticism. It seems to me that it might be possible for man to reason according to the principle that a term does not mean what it means. Theoretically the main difficulty with this would be that words then acquire an infinite number of meanings. The practical difficulty of carrying on human social life under such a circumstance constitutes a sufficient justification for our adhering to the "old" logic. Rejecting the laws of thought (in the only sense in which they can be rejected) would make it impossible for logicians to converse, and only an insane man can afford that luxury. It may be added that an insane man is by definition one who indulges in this privilege. It is interesting to note that Dr. Rashevsky informs me that in his own dreams he sometimes is himself as well as some

<sup>33</sup> "Possible Brain Mechanisms and their Physical Models," *J. Gen. Psych.*, July, 1931.

<sup>34</sup> As instanced by his treatment of the laws of thought in his book, *Logic for Use, passim*.

<sup>35</sup> For a statement of this see R. M. Eaton's *General Logic*, p. 385.

one else simultaneously. All I can say is that I do not have this type of experience, and that anyone who does is crazy—so long as he dreams!

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### ON THE MEANING OF A PROPOSITION

IN an article entitled "The Sacrifice of Barbara" (*The Personalist*, Oct., 1931) Mr. F. C. S. Schiller carries on his "mission" of fighting Formal Logic in connection with the two recent summaries of modern logic by Mr. Eaton and Miss Stebbing. But this time one can not help noticing behind the shield of sarcasms a change in the tone of Mr. Schiller's criticism: he is evidently much impressed by these two books. He admits that both Miss Stebbing and Mr. Eaton "have written good books," which present "a more perfectly formal form of Formal Logic," though he should rather brand them as deceitful sophistications, since he maintains that they are based on the same unjustified foundation as Aristotelean logic. Does it mean that Mr. Schiller is ready to make concessions or even is close to "conversion"? I would not be surprised if it comes to that, because it is easily seen from his article that only misunderstandings on his part estrange him from modern logic. The purpose of this note is to straighten the matter in the hope of facilitating Mr. Schiller's conversion. I shall consider, however, only the main point of his criticism.

Mr. Schiller observes correctly that modern logic is based on the concept of proposition, but he tries to undermine this basis by pointing out that the meaning of a proposition is different in different uses and contexts, and consequently propositions are ambiguous and unreliable for building up the foundation of logic. Thus to say that a proposition is true is ambiguous, because "it may be true in one sense and use, and false in others."

The answer to this criticism is that the meaning of a proposition is not a distinct entity from the proposition itself. The meaning of a proposition is the proposition. Hence the same proposition can not have different meanings in different contexts and uses, though, of course, many different propositions may be associated with the same verbal expression (sentence) on different occasions. The supposition that a proposition could change its meaning betrays a most astounding anthropomorphism: a proposition being inanimate is not subject to growth or willful modifications. I am sure Mr. Schiller really does not believe that propositions can change by themselves. He probably means that people change their minds and often, with-