THE PSYCHOLOGICAL REVIEW

A WORKING HYPOTHESIS FOR INNER PSYCHOPHYSICS¹

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I. PSYCHOPHYSICAL PARALLELISM

Notwithstanding my conviction that a modified psychophysical parallelism is the least objectionable of the current concepts by which we can express the correlation of noetically mutually irreducible systems of experience, I believe that it has been and is an unfortunate working hypothesis for psychological investigation.

In the history of inner psychophysics, psychophysical parallelism has been notably sterile. In a period of relatively rapid development of psychological and physiological experience and theory, one seeks in vain for a single advance in inner psychophysics that can be accredited legitimately to the principle of psychophysical parallelism. On the contrary, in four respects at least it is a distinct handicap.

1. Aside from its metaphysics, with which psychology is only indirectly concerned, the principle of psychophysical parallelism is inhibiting rather than stimulating.

If at the outset of psychophysical investigation we postulate a thoroughgoing parallelism between the phenomena of introspection and nervous physiology, we thereby abstract at the beginning from important questions of fact. Psychology as empirical science may not shift its scientific responsibilities by a noetical construction. The correlation of nervous processes and consciousness is phenomenal not

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noumenal. It is a problem of experience before it can properly become a problem of theoretical implication.

Now as a matter of actual experience it is conspicuous that the two series are not parallel throughout.

The phenomena of consciousness cease to exist in the only form in which they are given to us directly, while some of the processes of nervous metabolism may be demonstrated to continue. Furthermore, there seems to be little doubt that consciousness as it is given to us directly is more intimately and directly connected with the activity of the superior cerebro-spinal ganglion than with any of the others. But if consciousness, in the only form in which we can know it directly, is correlated with specific nervous processes in specific parts of the nervous system, it is part of the business of inner psychophysics to discover the peculiar characteristics of the neural processes which appear to be necessary conditions of that consciousness which we know.

This is a plain straight-forward scientific problem. Towards its solution much remains to be done. But it is obvious that the advance will not be stimulated by the belief in a thoroughgoing parallelism.

Perhaps each segment of the spinal cord, or even each neuron or physical atom, may possess a consciousness of its own. The supposition is entirely thinkable. It is, moreover, apparently incapable of disproof. But a suppositious cord consciousness is at present utterly inaccessible to us. It is not our consciousness. It is not even comprehensible in terms of our consciousness. The hypothesis of a special kind of inaccessible consciousness to correlate with every kind of neural process is utterly indefensible as empirical science. While it may be justifiable on philosophic grounds, as a psychological hypothesis it merely confuses the issue. It would be legitimate only if we could show that the various neural processes actually possess those characteristics which in the cerebrum are correlated with consciousness as we know it.

Psychic units and psychic elements never have been, and never can be correlated with physiological units and ele-

mentary physiological processes. A psychic element always appears as the resultant of a physiological manifold. A color or tone which for consciousness is not further analyzable is physiologically still highly complex. Beginning in the sense organ and ending in the cortex there are at least three links in the chain of neural happenings. In the case of color the number of links is probably higher. But in none of the links is the process a simple one. It is impossible to start the process in a single receptive element without interaction with some of the other receptive elements of the receptive organ. In the last link it spreads to a more or less general cortical disturbance with complex interplay of excitations and inhibitions.

It may be that some simple conscious process parallels the migration of each separate ion in nervous tissue. But such conscious processes are utterly inaccessible to us. We can form no conjecture from our inner experience as to what they might be like. They belong to that large but discredited class of hypotheses, that spring, not from the facts, but from the imagination. Their main function is to support an antecedent hypothesis. They are utterly unprovable and irrefutable. They have no proper place in a science of phenomena. On the contrary it is clearly a part of the business of psychology as science to ask, what is the peculiar complication of the physiological manifold whose correlate is actual sensation.

2. Both in the *Elemente* and in the *In Sachen der Psychophysik*, Fechner promulgated the now widely accepted doctrine that the 'threshold' of outer psychophysics has a counterpart in inner psychophysics. It seems to be generally agreed that even the peculiar nervous correlate of normal consciousness may be stimulated sub-liminally. Fechner held that the sub-threshold waves have a definite configuration which represents their mutual interdependence and determines their advent into consciousness. The same view finds various expression in current psychological theory.

Through its various practical and theoretical bearings on normal and abnormal mental life, the problem of the sub-

conscious excitations has become vital. Psychology cannot ignore it. But by the same token it must deal with the facts, not with mere speculations about them. I for one must refuse to believe on any merely analogical grounds that the accessible phenomena of consciousness are related to the unconscious as quantitative variations of the same functional facts. There seems to me to be a clear organic difference. It is utterly incomprehensible to me that consciousness is any mere 'emphasis' on the unconscious. Certainly there is no conclusive evidence for the supposition in the argument by analogy from external stimulation. No one really holds, as far as I am aware, that consciousness as such is directly correlated with a quantitative change in the stimulation of a sense organ. The nervous effect of supra-threshold stimulation is probably qualitatively different from that of sub-threshold stimulation. There is abundant analogical evidence in the response of living tissue to various chemical, electrical, and mechanical stimuli, that quantitative changes in the stimuli produce qualitative changes in the reactions, even to a 'reversal' of their 'sense.' There is direct physiological evidence to the point in the regular close relationship of relative fatigue, inhibition, and the refractory period, with normal reaction, 'Treppe' and 'Scheinbare Bahnung.' There is direct psychophysical evidence in the qualitative changes of sensation and feeling through quantitative changes in stimulation.

But even if the incomprehensible could be granted as demonstrated fact, psychophysical parallelism would still need limitation and modification before it would fit the phenomena of inner psychophysics. Our consciousness is obviously not correlated with the sub-threshold intensity of action of the nervous system, but only with a nervous activity of definite, *i. e.*, of supra-threshold intensity. We must face the phenomenal problems: What really happens when the threshold is reached? Why do supra-threshold intensities alone have conscious correlates in the only form in which we can know them directly? These questions, however, are matters for scientific analysis, not for speculation. And the analysis must be free from speculative prejudice.

3. Further evidence for the inadequacy of parallelism as a working hypothesis for inner psychophysics is the fact that it breaks down when we really use it, and leads to absurdity. We are utterly unable to reason successfully either from known nervous facts to consciousness, or from consciousness to its nervous correlates. Phenomenal parallelism as a working hypothesis for inner psychophysics assumes too much. It is equally embarrassed by the question where in the scale of organic existence a consciousness comparable to our own begins, as well as by the question concerning the specific conditions of the only consciousness which we can know directly.

Wherever psychology has ventured to express itself in supposedly parallel physiological concepts it has made a lamentable failure. At the present time at least we cannot use the terms quantity, force, work, fatigue, inhibition, excitation or facilitation with any proper physiological connotation in psychology. For example, we know nothing at all what a fatigue of consciousness might mean. While a consciousness of fatigue is a very different matter from physiological fatigue. Conversely animal physiology is just now seriously trying to rid itself of anthropomorphism in its concepts and in its terminology.

In short the hypothesis of psychophysical parallelism is not only sterile as a working hypothesis but it must be tinkered before it will fit the facts. It cannot be trusted anywhere, and is consequently altogether unfitted for the functions of a working hypothesis.

4. Finally, parallelism in inner psychophysics is really at heart a confession of scientific impotence. DuBois Reymond's 'Ignorabimus' may be the final word. But it was never a satisfactory starting point for developing science. It may be that 'astronomical knowledge' of neural processes will forever fail to discover consciousness. Meantime, however, it is pertinent and legitimate to ask what characteristics of the nervous processes are essential to our normal consciousness as it is immediately given to us in introspection.

The task of every science is to describe the sum total

of the conditions of the various phenomena that it investigates. Psychology has no especial privilege if it would be a science, even though the task reaches beyond our present strength.

Some of the conditions of the various phenomena of consciousness seem to be given in introspection. In no case are they completely given. Consciousness is always something more than the sum of the factors that we can introspectively analyze out of it. Wundt's principle of creative synthesis¹ must be admitted even in a descriptive psychology.² It is true of the simplest combinations of sensations. It is still more conspicuously true of meaning and personality.

The conditions of consciousness itself can never be accessible to direct introspection, since as conditions of consciousness they must also be conditions of introspection. Obviously direct analysis can reach only so far as introspection reaches. If in spite of the paralyzing dogma that consciousness is unanalyzable and undefinable, we persist in asking the scientific question concerning the conditions of consciousness that makes introspection possible, we must use some other technique.

Similarly, analysis of the neural process will doubtless never reach beyond itself. Certainly physiological analysis by itself will never reach the psychical, since our human consciousness is correlated not with elemental metabolic processes but with a specific organic complication of metabolic processes in a specific organ.

From both the physiological and the psychological standpoints the problem of consciousness appears as a synthetic one. We must ultimately discover what the organic complications involved in consciousness actually are. It will do us little good to catalogue the elements of which it is composed.

It is the business of a profitable working hypothesis to point out a direction of investigation that looks promising. Under the present circumstances it seems to me that the first step may well be to make some reasonable estimate of the

¹ *Phil. Stud.*, X., 1-124.

² Ebbinghaus, *Zeit. f. P. u. P. der S.*, IX., 161-205.

kind of organic integration that would approximate consciousness as we know it.

II. THE PRINCIPLE OF APPERCEPTIVE INTEGRATION

While it is probable that the integrative principle of consciousness can never be separated out of consciousness by introspective analysis, since in all consciousness it is presupposed not as a factor but as consciousness itself; nevertheless, if we are to discover any clue to the integrative principle it must be from consciousness. We may reasonably expect that it will be reflected in the fundamental organizations within consciousness that are accessible to us.

If we should ask what has generally appealed to scientific psychologists as the most essential characteristics of consciousness, memory and association would probably be the favorites by a large margin. Without either, consciousness as we know it could not exist. Modifications of either by accident or disease effect grave changes in the soul life, not in its stuff merely but in its organic character.

In what seems to most psychologists an extreme and untenable position, Loeb holds that associative memory is consciousness. The psychological offence in Loeb's formulation consists in an apparent *petitio principii*. Psychology knows no association except the association that may occur between facts that are already conscious. Similarly in memory, what is remembered must have previously been a conscious fact. But it gives no real clue to the nature of consciousness to say that consciousness is the revival and association of conscious facts. We are bound to ask the further question: What constituted consciousness in the original of the associated and remembered fact?

I suppose that Loeb's answer to the difficulty would be to insist that both memory and association are wide embracing biological concepts. That memory is a function of all organic matter and that association is equally a characteristic of all living tissue. But in this sense, *i. e.*, the only sense in which Loeb's principle ceases to be a *petitio principii*, it ceases to be strictly true. If association and memory are general

biological principles, we must demand the peculiar characteristics of the associative memory that constitutes our consciousness. These characteristics it seems to me are given in the type of associative reproduction which for want of a better name we call apperception.

In using the word apperception we must make it clear that we are not using it in the restricted sense of Wundtian theory but rather in the more general sense indicated in Erdmann's apparently little known but eminently sound description of the facts.¹ By apperception then we mean that complex reproductive process that occurs in every perception of developed consciousness, in which the present stimulus immediately arouses and fuses with the residua of similar past stimulation, and mediately arouses and is interwoven with the residua of past experiences which are associated with it.

But in order to use even Erdmann's formula as the schema for all conscious integration we must abstract from the specific function in whose service the apperceptive process is here exploited, and from those characteristics of the apperceptive process which relate only to direct sense perception. Our generalized principle might be restated as follows: Apperceptive integration is a general name for a complex reproductive process which occurs in every moment of developed consciousness, in which the present nervous excitation in so far as it comes to consciousness at all, arouses immediately the residua of previous similar excitations and fuses with them; while it also arouses mediately the residua of previous excitations originally connected with it.

The question of the validity of our working hypothesis is a triple one: Could such an integrative principle give us the organization of consciousness as we know it? Does it correspond with the psychological facts at our command? Does it correspond with our physiological data?

III. HYPOTHETICAL QUESTIONS IN SYNTHETIC PSYCHOLOGY

If we postulate a living tissue of such character: (1) that n changes in its environment (nS) tend to excite n

¹ *Vierteljahrsschrift für wiss. Phil.*, Bd. X., pp. 307 and 391.

characteristically different reactive modifications in the life history of its elements and their organic interrelations, (nR); (2) that every new S tends to reproduce every previous R in definite sequences, though in various degrees of completeness; (3) so that every new R becomes a part of a relatively slowly changing system of reactive modifications, with which it thus becomes organically integrated and to which it adds its peculiarity: should we not with such a reproductive organization of its reactive modifications grant to our tissue a kind of consciousness, in which the qualities of the original nR are logical accidents, depending on the number of discrete reactive modifications of which the elements of our hypothetical tissue are capable, within the limits of their organic interrelations?

If we further postulate a circular excito-reactive process by which the directly excited factors of the system tend to reinforce the S which aroused them, and to emphasize the corresponding R , together with other R s immediately connected with it; while it tends to inhibit less directly connected processes, within the limits of relative fatigue; would we not therewith grant our tissue a kind of selective attention?

If we further postulate a relatively slowly changing group of emphasized R s which are regularly reproduced with every new R must we not therewith grant our tissue a kind of personality?

IV. THE PSYCHOLOGICAL PROBLEM

As is indicated by their form, our questions make no pretence of giving an elaborated psychological theory. They aim to focalize the problem of the organic structure of consciousness, and to suggest a synthetic solution of the problem.

The fundamental principle which underlies the questions, *i. e.*, that consciousness may be known as a kind of organization, is by no means new. Psychology at the very beginning of its modern period undertook responsibility for analyzing the complex forms of organization which are directly observable within consciousness. It has made substantial additions to positive knowledge, not only in the fields of perception

memory and association, but also in the more complex fields, of language and secondary identification, meaning and co-ordinated response, and the thought processes themselves. The limits of progress seem to be determined only by the precision of our problems and the development of adequate technique.

Our thesis however goes further. Not only are there discoverable forms of organization within consciousness which characterize the systematic groupings of experience into units, temporal and spatial, practical and scientific, logical ethical, and religious, etc., but we hold that consciousness itself is not essentially different from the observable phenomena of consciousness. It is conspicuous that we can never catch consciousness except in organized form. Single conscious elements never have been discovered, and never will be. They are scientific abstractions. Moreover there is abundant and excellent psychological precedent from Kant to the present, for believing that consciousness itself may be cognized as a kind of organization.

The lamented James put the matter in his striking way: "Consciousness connotes a kind of external relation, and does not denote a special stuff or way of thinking." "The peculiarity of our experiences, that they not only are but are known, which their conscious quality is invoked to explain, is better explained by their relation to one another."

The thesis is not lacking direct scientific evidence. The splendid experimental analyses of hysteria and the subconscious, of divided consciousness and multiple personality clearly indicate that any actual unity of consciousness is neither intrinsic nor necessary, but functional. Consciousness never appears as a homogeneous quantum of some specific stuff. It always involves the unification of discrete, more or less highly differentiated factors. Divided consciousness and dual personality have the common characteristic of a disturbance of the unifying process.

Similar phenomena are familiar enough in normal mental life. Adequate stimuli of many kinds are constantly affecting the sensorium. The fact that the vast majority fail to come

to consciousness is not due to any inherent characteristics of the stimuli themselves. The same stimuli under slightly different subjective conditions may give rise to conspicuous features of our experience. In the former case available material failed to be taken up into the momentary organization of cleared consciousness. Sometimes subsequent moments appropriate it. It may affect subsequent moments without ever clearing independently. There is evidence that it may leave revivable residua. Apparently much is lost forever, and never becomes a part of our organized experience. These differences of relationship between consciousness and its material are especially conspicuous in connection with the organic sensations.

Experimental evidence is conclusive that the arousal of nervous residua is no guarantee of corresponding consciousness. Specific residua may be actively stimulated and function in the process of association without clearing up in consciousness. If the actively stimulated residua at one time fail to be included in consciousness and at another time succeed, the difference must lie in something outside the residua themselves. We can figure it in terms of our theory as a variation in the completeness of the interneural processes. The stuff of consciousness was present in both cases. What was lacking in the former instance seems to be the completeness of the organization. The unconsciously aroused residua fail of being taken up into the particular moment of organization and unification in which our present consciousness consists.

Our personal consciousness is clearly a functional unity. If possible material fails to be included, in normal life it will be inhibited; in abnormal conditions it may organize in an independent system.

Unfortunately, in its attempts to differentiate the specific character of conscious organization, psychology has been far from unanimous. A considerable variety of stimulating hypotheses is found in contemporary discussions. This is no place for a criticism of these various theories, even if I had the capacity or the interest to do it impartially. Our

present business is exposition. Critical discussion can follow, if any excuse for it arises.

An important characteristic of the principle of apperceptive integration is that it makes no claim to be a principle of explanation. The particular physiological conditions of organization are left indeterminate. But if consciousness itself, as well as its various aspects can be regarded as a kind of organization, the special problems of inner psychophysics as well as its main problem are rendered more concrete and definite.

The second claim to attention is that our principle is drawn directly from fundamental mental processes which are directly or indirectly accessible to introspection.

Perception itself, and consequently introspection, shows the process in completest form in the processes of apperception and assimilation. Various aspects of the process are conspicuous in the familiar abstractions of conscious memory and association, in habit, in the conscious controls, and in conduct.

In memory and association the application of our principle is obvious.

Habit and conduct have always offered peculiar difficulties to the application of psychophysical formulæ. The degradation of consciousness in the facilitation of habit was always an offence to the motor theories of consciousness. If we once admit, however, that consciousness is a particular kind of organization of organic reactive modifications, then it is evident that a simplification of the organization, whether by the development of direct arcs within the cerebrum, or in the lower ganglia, will lose the peculiar characteristics of the conscious organization. Secondary automatic acts will participate in consciousness in the same way that the simplest reflexes, like the knee jerk and the protective wink participate. Situation and response will be perceived as phases of a single process.

In so-called voluntary activity, on the other hand, with its conscious suppressions and reinforcements, the resulting activity may, and in its highest form will, represent the

resultant of the completest practicable interplay of the individual's past, present, and future experiences. Each relatively steady control adds to the complexity of the regularly reproduced reactive modifications which make up the personality.

Conversely in organisms whose nervous systems contain only relatively simple reflex mechanisms, there is neither ground nor excuse for assuming the complex reproductive processes of consciousness. The application of our principle to the problems of animal consciousness is at least a clear cut issue.

Loeb and others make the criterion of consciousness the educability of an organism. Against this all the force of Becker's arguments against Driesch apply without the possibility of Driesch's answer. Moreover, it is confronted by empirical contradiction. Many of our human reflexes show development and change by repetition without conscious participation.

Miss Washburn suggests that the simplest consciousness consists in a series of flashes. If amoebas have minds that act in a series of flashes, where these minds may be and what they are when they are not flashing are as unexplained and inexplicable as the nature of the flash itself. On the basis of our organic principle we are bound to ask whether the amoeba is of such organic complexity that a reactive modification can reproduce past reactive modifications in any definite series however primitive. I believe that the available evidence is against it.

In a single cell all internal reactive modification is at the same time external. But the actual reactions of amoeba, though they show adaptation give no evidence of habitual series of differentiated reactions resulting from each new stimulation. Such systems would be a menace to its welfare, or to the welfare of any creature in which external reaction and internal reaction were identical. Only in a differentiated tissue, whose reactive modifications do not find immediate expression in action, would the reproduction of previous modifications in habitual systems be tolerable. Such a dif-

ferentiated tissue seems to be observable only in the nervous ganglia.

A cell consciousness comparable to our consciousness seems improbable. Aside from the difficulty that we can discover no suitable mechanism, the very simplicity of the life history of the single cell leaves no room for complex differentiated experiences. Even if by some hocus pocus a single cell could be artificially endowed with differentiated experiences revivable in definite chains, it would be an utterly useless burden. In the monotonous reactions of its simple life it must soon decay from disuse.

V. THE PHYSIOLOGICAL PROBLEM

From the standpoint of biology and physiology, I believe that the conception of consciousness under the schema of a specific kind of organization is just as conspicuously an outgrowth of the data. With the epoch-making developments in biological science which began in the middle of the last century, the motives for such a conception were very strong. The early biological theories, however, suffered from the general preëxperimental confusion between psychological fact and psychological hypothesis. Moreover, they often confused the issue with mechanical or materialistic interpretations.

With the discovery of the electrical currents of action in nerve and muscle, theories of nervous organization followed the analogy of the telegraph. The cerebrum corresponded to the central exchange or switch-board. Energy was supposed to enter the system in sense stimulation. Various combined and modified it found exit as a motor impulse. Consciousness was a product of the switching process.

Traces of this conception are still found in popular thought and even in psychological text-books. But the present scientific view of the action of the nervous system is fundamentally different. Each of the millions of neurons whose various clusters make the anatomical units of the nervous system, seems to be a rather independent little body, and leads a relatively independent life. It has its own supply of energy; regulates to a considerable degree its own nutrition and

growth; reacts in its own peculiar way to the chemical and nervous stimuli to which it happens to be sensitive; and finally, it may die without necessarily involving the destruction of its neighbors. In general each neuron seems to be particularly sensitive to some particular kind of stimulus. But its action in every case seems to be relatively independent of the kind of stimulus that excites it. That appears to be determined primarily by its own specific form of energizing. Each neuron may stimulate an indefinite number of other neurons; and each may in turn be variously stimulated. The end of the chain may be gland, muscle, or nervous tissue. Whatever the final outcome, each step in the process, including the last, is determined by the character of the participant links. The result, as measured at different points of the process, may bear widely different ratios to the energy of the original stimulation. It may become negative in direct inhibition. It may reach enormous proportions by association.

Take, for example, the familiar phenomenon of the knee jerk. Considerable pressure against the tendon produces no reaction. The same energy in the form of a quick tap may develop a vigorous reaction. It is possible to adjust the stimulus so that it develops more than twenty-five times its energy in the reaction. But if the same blows are given in a series of about ten per second, the reactions entirely disappear in a relative refractory phase.¹

Similarly, ether vibrations of barely threshold intensity, corresponding to the light reflected from a thin column of smoke in a darkened theater, may produce extensive neural excitations. It may lead to the maximum activity of the largest muscles in the body. Nervous activity is no longer regarded as the central reflection and final motor emergence of the afferent energy derived from sense stimulation. Each link in the chain is a magazine of potential energy, which reacts to adequate stimulation in its own way. Every sensory-motor reaction may thus be traced through the nervous system as a chain of stimulations and adjustments.

Somewhere in that process our consciousness arises.

¹Dodge, *Zeitschrift für allgemeine Physiologie*, Bd. XII., pp. 53-55.

There is evidence that its locus is not in the peripheral sense organ. Though there have been recent attempts to connect it with the basal ganglia, the weight of evidence forces us to regard it as correlated with cerebral activities.

The Cartesian theory of a single point of contact between soul and body is clearly inadequate. It was long ago abandoned as a tenable hypothesis in physiology. But its effects are still felt. True there is no single place discoverable where consciousness as such is located. No circumscribed or focal lesion necessarily destroys consciousness as a whole. But it is not uncommonly held by psychologists and physiologists alike that certain kinds of consciousness are located in discrete cortical areas. Certainly there is no warrant for such an assumption in our present knowledge of the localization of function. It is indeed true that each of the several sensory projection fields has peculiar functions with relation to the rest which no other field can vicariously affect. But we cannot say that a certain kind of consciousness is here or there. If a given field is destroyed consciousness will lose some of its possible variations, but consciousness will remain. It will be a distorted, crippled consciousness, with more or less conspicuous differences from the normal. The brightness and the song will be gone. But a very human consciousness without either vision or audition is a conspicuous reality. The assumption, on the other hand, that the visual projection area contains the correlate of a visual consciousness, which might persist if these areas could be isolated, is without a shred of evidence. The anatomical provision for the intricate organization of each part with all the rest is certainly not meaningless. Its obvious lesson is confirmed by some of the most assured products of psychological analysis, which indicate the complexity of the physiological conditions of even the simplest concrete facts of consciousness.

If some of the present tendencies in physiology appear to emphasize the processes within the cell units, the physiology of the cerebrum never more clearly faced the problem of the importance of the systematic interrelations of the neurons. This is especially conspicuous in the substitution of the con-

cept of a point of maximum vulnerability for the old concept of localization, in the speech disorders. The assumption that consciousness is somehow connected with the individual cells is certainly not based on any clear notion of how the intra-neuron processes are related to consciousness. I conjecture it is rather because it is recognized that the cerebrum is an integrating organ and it is uncritically assumed that the elements must have the same characteristics as the integrated whole.

VI. THE STUFF OF CONSCIOUSNESS

The question as to the nature of the unorganized stuff of consciousness is not really a part of our present discussion. But it is bound to be asked and ultimately it is vital. Is there a peculiar soul stuff, or not? For myself I must confess that the problem is tremendously interesting, but it seems to me that this is an added motive to guard against methodological error.

Whatever the answer, as far as science is concerned, it must be in the form of a hypothesis. There will be a characteristic difference between this hypothesis and the hypothesis of our questions. The latter appeared to be not a principle of explanation, but a working hypothesis. The motive for the former is not practical as far as I can see but purely speculative. The question must be asked. It will be answered. The speculative demands of human reason must be satisfied or the completest organization of consciousness will be lacking. But the question and its answer are not directly pertinent to the main question at issue.

On the other hand, our fundamental hypothesis does effect a certain control of possible answers. It is obvious that on this basis, the stuff of consciousness cannot be sensations, feelings, memory images or any of the other direct products of introspective analysis. As far as these facts are not pure abstractions, they obviously serve as building material for the complex organizations within consciousness. They cannot be the unintegrated stuff of consciousness because they are already conscious.

It is widely held that certain moral needs demand that

the stuff of consciousness be a peculiar sort of soul stuff. The demand arises in the effort to escape the determinism of a materialistic universe. These needs certainly deserve a hearing. But it never seemed to me that the hypothesis of a special soul stuff helped matters much when we are forever forced to deal with that stuff and its combinations under the category of causality. Neither does it seem to me that the stuff of our material world-construct can be held responsible for its organization. It cannot supply the principles of its organization without being more than stuff.

One is justly suspicious of cycle and epicycle of hypotheses. There are good methodological grounds for making explanatory hypotheses as simple as possible. In the present case these grounds constitute a motive for the hypothesis that the stuff of our spatial construct, on the one hand, and of our consciousness, on the other, have no necessary and intrinsic differences. The stuff of conscious integration must be capable of that kind of organization. But I can see no intrinsic reason why the same stuff should not be capable of organization in the other series too. I can discover no other necessary peculiarity for the stuff of consciousness than the fact that it is so organized. There is no negation given or implied. As far as I can see the stuff of consciousness might enter into all sorts of different systems, as any given atom in the body is also in systematic relations with the inanimate.

In one very fundamental sense metaphysical parallelism was not affected by our critique of parallelism as a working hypothesis for inner psychophysics. It seems to me that we might well hold that the stuff of the universe shows parallel attributes. That it is at once a soul stuff and a matter stuff. But I can understand this in no other way than one might say that an atom of carbon is either organic or inorganic. As atom it is neither. In the course of history it may be both. But this sort of parallelism makes no pretense to knowledge of the one form of organization from knowledge of the other form. On this basis it would be absurd to hold that the organization of the primitive stuff in consciousness

was paralleled by the organization of some more of the primitive stuff in brain tissue. The concept would be ludicrous and I believe it is ludicrous.

To sum up: My main contention is that the stuff of consciousness is a logical accident. Whatever it were, the right kind of integration would constitute a kind of consciousness. I can see no reason why any stuff in the universe may not enter into a similar kind of organization, if the proper conditions are given.