

The Body-Mind Relation

MICHAEL POLANYI

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When I point my finger at the wall and call out: "Look at this!" all eyes turn to the wall, away from my finger. You are clearly attending to my pointing finger, but only in order to look at something else; namely, at the point to which my finger is directing your attention. We have here two different ways of being aware of things. One way is to look at a thing. This is the way you look at the wall. But how is one to describe the way you see my finger pointing at the wall? You are not looking at my finger, but away from it. I should say that you do not see it as a mere object to be examined as such, but as an object having a function: the function of directing your attention away from itself and at something else. But this is not to say that my pointing finger was trying to make you disregard itself. Far from it. It wanted to be seen, but to be seen only in order to be followed and not in order to be examined.

I shall call my pointing finger a subsidiary thing or an instrumental thing that functions by pointing at an object which is at the focus of our attention. And I suggest that we have

here two different kinds of awareness. We are subsidiarily, aware of the pointing finger and focally aware of the object at which it points. We establish an integrated relationship between them by recognizing the direction in which the finger directs us and by following this direction.

This relationship is not symmetrical. The finger points at the wall, but the wall does not point at the finger. The relationship that we have established has an intrinsic direction: it is directive. Thus, the finger has a meaning that the wall lacks. It can raise a problem: If you come across a pointing finger by itself, in a wood, it makes you wonder what it may be pointing at. This shows that it is for us to establish the coherence of the pointing finger with that to which it points. It is for us to comprehend the coherent system connecting a subsidiary element with the focal point on which the subsidiary element bears. And note that we perform this comprehending without a word. No syllogism is set up; no evidence is cited. The performance is tacit, and since its result is valid, we may call it an act of tacit inference.

Another case of this kind will reinforce this analysis and develop it further. Think of a pair of stereoscopic photographs, viewed in the proper way, one eye looking at one, the other eye at the other. The objects shown in the two pictures appear in their joint image as distributed in depth, and tangible. This is what we see at the focus of our eyes; but it involves also the sight of the two component pictures: cover these up and we see nothing at all. But we do not see these two pictures in themselves. In a way, we look through them, or from them, at their joint image. So I shall class our awareness of them as subsidiary and observe that the way we look at them integrates their sights into the spacially deepened image to which they contribute. Thanks to our integration, the two flat pictures effectively function as clues to a spacial image.

We may say that this image is their joint meaning, and that this joint meaning lies in the focus of our attention. So far, the structure of this tacit integration is analogous to that of a finger pointing at an object. But something important is added here. The joint meaning of the subsidiaries is expressed

in a new sensory quality. Sights in depth have come about by integrating sights that were comparatively flat.

This change of appearance is, in fact, a regular accompaniment of tacit integration. A pointing finger also looks a little different from the finger fixed in the same position by arthritis. This kind of difference is more noticeable in the closely analogous case of a word denoting an object. The word, when functioning in this way, appears transparent by contrast to its opaque appearance when we listen to it as a sequence of sounds. I shall come back to this case later.

Professor Hadley Cantril of Princeton has shown that when we introduce two fairly disparate pictures into the stereoscope, we see fanciful integrations of them. Such images are illusory. But we may limit ourselves to the case that the two pictures viewed are proper photographs, and that, hence, their stereoscopic image is a reasonably correct evaluation of their joint meaning. We can then regard stereoscopic viewing as a feat of tacit inference; that is, as a tacit counterpart to a process of explicit inference.

But let me stop to warn here against a misconception. It is a mistake (and I often find it done) to identify subsidiary awareness with subconscious or pre-conscious awareness, or with the fringe of consciousness described by William James. The relation of subsidiaries to that on which they bear is a logical relation similar to that which a premise has to the inference drawn from it, with the great difference that the inferences arrived at here are tacit. Subsidiary awareness can be fully conscious, as that of a pointing finger or a pair of pictures viewed in the stereoscope, though in other cases our consciousness of subsidiaries may be on a very low level and may be altogether subliminal. Such is the case, for example, when sensory clues inside our eyes and inner ear are integrated to a percept. Such variations in their level of consciousness in no way affects the functions of subsidiary elements in contributing to an act of tacit knowing.

Jean Piaget has strikingly contrasted the act of acquiring knowledge by a sensory act like perception as compared with a process of explicit inference. He points out that explicit in-

ference is *reversible* in the sense that we can go back to its premises and go forward again to its conclusions as often as we like, while this is not true for the sensory act. And since perception is always combined with action, and action with sensation, Piaget contrasts all sensory-motor acts with explicit inferences and calls them *irreversible*.

Actually, all acts of tacit integration are irreversible, and this can be understood from the structure of tacit knowing. We find, indeed, that tacit knowing can have two kinds of irreversibility. One consists in the fact that we may not be able to identify all the clues which we have integrated in establishing their joint meaning. The other kind of irreversibility goes beyond this. It is due to the fact that when we shift the focus of our attention from the meaningful result of tacit integration, and focus on the subsidiaries, their integration is wiped out. The subsidiary particulars cease to have a bearing on their prospective target and are reduced to an aggregate of meaningless objects. The first kind of irreversibility can be called contingent, by contrast to the second, that is logically necessary.

The joint viewing of two stereoscopic photographs offers a simple example both of contingent and logical irreversibility. Think of the differences in the two pictures, by virtue of which their joint viewing offers the sight of spacial depth: these differences are very small and are scattered all over the pictures. It is almost impossible to identify them; they are virtually un-specifiable. This is the first kind of irreversibility. But even if we could overcome this and identify the clues of stereoscopic vision, it would not be the same as retracing the steps of a mathematical proof. To reconsider a mathematical deduction is to deepen our understanding of the idea which it embodies. We can see now in the premises the whole panorama of their implications. By contrast, if we take out the stereo pictures from the viewer and look at them separately, they cease to tell us anything of what they jointly mean; we see nothing of what they would jointly present to our eyes. To go back to the antecedents of our tacit inference has not deepened our grasp of its result, but rather has made us lose sight of it.

I have already mentioned in passing the most widely known

example of this disintegration of meaning, caused by the shifting of our focal attention to that which has this meaning. A spoken word loses its meaning if we repeat it a number of times while carefully attending to the movement of our lips and tongue and to the sound we are making. These actions are meaningful, so long as we attend to that on which they jointly bear; they lose their meaning when we shift our attention to the actions, themselves.

Admittedly, the disintegration of tacit knowledge by shifting our attention to its clues is not irreparable. The two stereo pictures can be viewed jointly once more; the word that has lost its meaning will regain it if we once more use it—once more subsidiarily be casting our mind forward to something we can say by it.

But it is important to note that this recovery never brings back the original meaning. It may improve on it. Motion studies, which tend to paralyze a skill, will improve it when followed by practice. The meticulous dismembering of a text which can kill appreciation of it, can also supply material for a much deeper understanding of it. In these cases, the detailing of particulars, which, by itself, would destroy meaning, serves as a guide to their subsequent integration, and thus establishes a more secure and more accurate meaning.

But the damage done by the specification of particulars may be irremediable. Meticulous detailing may obscure beyond recall a subject like history, literature, or philosophy. In his essay on the *Name and Nature of Poetry*, A. E. Housman has described the disastrous effect of spelling out in detail the allusions of Edgar Poe in his poem *The Haunted Palace*. My former colleague at Manchester, the distinguished French scholar Mansell Jones, has written that the humanities are discredited and rejected because of their unconscious abuse of erudition in the teaching of humane subjects. "Research [he wrote] is at once the flower and the virus of Arts."*

But it is not the unintentional damage done to our tacit knowledge, by reducing our capacity to reintegrate its sub-

* P. Mansell Jones, *Modern Humanities in the Technological Age with Reference to the Study of French*. Manchester University Press; 1957.

subsidiaries after having brought them to the light of focal consciousness, that is the main issue here; it is a deliberate refusal to rely on the tacit mode of integration. The modern mind refuses to accept the necessity for tacit assumptions and wants to keep the grounds of its beliefs clearly in focus, as one does in an explicit deduction. Our whole culture is pervaded by the resolve to avoid unspecifiable commitments and to get down ruthlessly to the hard facts of this world, and to keep our eyes firmly fixed on them.

The purpose of this paper is to show that the relation between body and mind has the same logical structure as the relation between clues and the image to which the clues are pointing. I suggest that the body is a subsidiary thing which bears on the mind that is its meaning. The problem of the body-mind relation is that no examination of a person's neural processes (however meticulously carried out) can make the neurophysiologist share the person's sensations and thoughts. I want to show that this deficiency is but an instance of the general fact that when we turn our attention on the subsidiaries which bear on their joint meaning, that meaning is wiped out. I have cited the obvious case that we lose the sight of a stereo image by looking at the two pictures separately; and I have mentioned also that a word, when used for designating something, appears transparent, and that it becomes opaque and meaningless when we attend to its physical details, such as the movements of our lips and tongue and the sound we are making. I would add now that we find something like this happening for any skilled performance. It loses its meaning and becomes paralyzed if we attend to its several motions in themselves. The famous tightrope walker, Blondin, says in his memoirs that he would instantly lose his balance if he thought directly of keeping it; he must force himself to think only of the way he would eventually descend from the rope. Similarly, we lose a pattern from sight if we look at it too closely. When flying by airplane first started, the traces of ancient sites were revealed in fields over which generations of country folk had walked without noticing them. And once landed, the pilot could no longer see them either.

Furthermore, we recognize animals and plants by their shapes, their structures, and functions. We know them as comprehensive entities by integrating their parts; and when we concentrate our attention on their several parts, and lose sight of the entity on which these bear, the parts lose their meaning.

In all these cases, we have two kinds of awareness meaningfully related in an act of tacit knowledge, and find that this knowledge is wiped out by directing our attention to the subsidiary particulars.

But we must yet take a further step in deepening our conception of tacit knowledge. We must realize that whenever we observe an external object, be it by sight or smell or touch, we know it by being subsidiarily aware of the impact the object makes on our body, as well as of the responses that our body makes to the object. All conscious transactions we have with the world involve our subsidiary use of our body.

We may indeed say that our body is the only collection of things which we know almost exclusively by relying on our awareness of them for attending to something else. Such is the exceptional position of our body in the universe; and this is what it means to live in our body.

Every deliberate act of consciousness, therefore, has not only an identifiable object as its focal point, but has also a set of subsidiary roots, inside our body. And this is where our body is related to our mind. As our sense organs—our nerves and brain, our muscles and memories—serve us to implement our conscious attention, our awareness of them enters subsidiarily into every meaningful entity which forms the focus of our attention.

And having thus identified the body-mind relation as a particular instance of the logical relation between the subsidiary and the focal, we can say conversely that all subsidiary elements function as our body does in bearing on conscious experiences. Anything bearing subsidiarily on the focus of our attention can be said then to function logically as part of our body.

Let us say that in such a relationship we attend from subsidiary particulars to their focus. Acts of consciousness are

then not only conscious of something, but are also from certain things, that include our body. Remembering that Brentano has taught that all conscious attention has *intentionality*, we recognize now that it also invariably has a *rootedness* which enters into its content.

Let me restate my theory of the body-mind problem in these terms. When we examine a human body engaged in conscious action, we meet no traces of consciousness in its organs; and this can now be understood in the sense that subsidiary elements, like the bodily organs engaged in conscious action, lose their functional meaning and appearance when we cease to look from them at the focus on which they bear, and look instead at them, as they are in themselves.

This kind of process can also take place in the opposite direction; it can work constructively as well as destructively. We can be looking at something and then, recognizing it to have a bearing on something else, we can pass from an at-awareness of it to a from-awareness of it. And again, we can go back on this, as I have just described, changing our from-awareness again into an at-awareness.

But this way of speaking is clumsy; we should have some simpler language for describing the way in which we establish tacit knowledge and the way in which we destroy it. For this, we shall assimilate all kinds of subsidiary awareness to the kind of awareness we normally have of our body when attending from it to an external event that impinges on it. We shall say then that when we become subsidiarily aware of something with a bearing on its meaning, we make it function as if it were part of our own body; in other words, we interiorize it and, in doing so, make ourselves *dwell in it* . The opposite action, of switching our attention to something of which we had hitherto been subsidiarily aware, can then be described as turning that thing into a mere external object, devoid of functional meaning; an action which can be said to *objectivize* the thing, or else to *externalize* it.

This formulation of tacit knowing is particularly suited for describing the way in which we know another person's mind. We know a chess player's mind by dwelling in the stratagems of his games, and know another man's pain by dwelling in his

face distorted by suffering. And we may conclude that the opposite process; namely, of insisting to look at the parts of an observed behavior, and thus regarding them as mere objects, must make us lose sight of the mind in control of a person's

behavior.

But what then should we think of the current school of psychology which claims that it replaces the study of mental processes by observing the several particulars of behavior as objects, and then establishes experimentally the laws of their occurrence? We may doubt that the identification of the particulars is feasible, as these will include many unspecifiable clues. But the feasibility of the program will not only be uncertain, but also logically impossible. To objectivize the parts of conscious behavior must make us lose sight of the mind and dissolve the very image of a coherent behavior.

Admittedly, behaviorist studies do not reach this logical consequence of their program. This is due to the fact that we cannot wholly shift our attention to the fragments of a conscious behavior. When we quote a subject's report on a mental experience instead of referring to this experience, it leaves our knowledge of that experience untouched; the report retains some meaning, by bearing on this experience. An experimenter may speak of an electric shock as an objective fact, but he administers it only because he knows and remembers its painful effect. Afterwards, he may observe changes in the conductivity of the subject's skin which, in themselves, would be meaningless, and register them because they actually signify to him the expectation of an electric shock by the subject.

Thus, a behaviorist analysis merely paraphrases mentalist descriptions in terms known to be symptoms of mental states, and the meaning consists in these mentalist connotations. The practice of such paraphrasing might be harmless and sometimes even convenient, but a preference for tangible terms of description will tend to be restrictive and misleading. The behaviorist analysis of learning, for example, has banned the physiognomies of surprise, puzzlement, and concentrated attention by which Kibler described the mental efforts of his chimpanzees. It avoids the complex, delicately graded situations which evoke these mental states. The study of learning

was thus cut down to its crudest form known as conditioning. And this oversimple paradigm of learning was then misdescribed by Pavlov when he identified *eating* with an *expectation to be fed*, because both of these induce the secretion of saliva. Wherever we define mental processes by objectivist circumlocutions, we are apt to stumble into such absurdities. The actual working of behaviorism therefore confirms my conclusion that strictly isolated pieces of behavior are meaningless fragments, not identifiable as parts of behavior. Behaviorist psychology depends on covertly alluding to the mental states which it sets out to eliminate.

Principles of Boundary Control

But is not the material substance of all higher entities governed throughout by the laws of inanimate matter? Does it not follow then that it must be possible to represent all their workings in terms of these laws? Yes, this would follow. If I claim that these higher entities are irreducible, I must show that they are governed in part by principles beyond the scope of physics and chemistry. I shall do so. I shall show first that a number of different principles can control a comprehensive entity at different levels. I have repeatedly presented this theory before in more particular terms; it will be developed here on general lines.

There exist principles that apply to a variety of circumstances. They can be laws of nature, like the laws of mechanics; or be principles of operation, like those of physiology, as for example those controlling muscular contraction and coordination; or they can be principles laid down for the use of artifacts, like the vocabulary of the English language or the rules of chess. Not all important principles have such wide scope; but I need not go into this, for it is enough to have established the fact that some principles of widely variable applicability do exist.

We can then go on to note that such a principle is necessarily compatible with any restriction we may choose to impose on the situations to which it is to apply; it leaves wide

open the conditions under which it can be made to operate. Thus, these conditions lie beyond the control of our principle, and may be said to form its boundaries, or more precisely its *boundary conditions*. The term "boundary conditions" (borrowed from physics) will be used here in this sense.

Next, we recognize that, in certain cases, the boundary conditions of a principle are, in fact, subject to control by other principles. These I will call higher principles. Thus, the boundary conditions of the laws of mechanics may be controlled by the operational principles which define a machine; the boundary conditions of muscular action may be controlled by a pattern of purposive behavior like that of going for a walk; the boundary conditions of a vocabulary are usually controlled by the rules of grammar; and the conditions left open by the rules of chess are controlled by the stratagems of the players. And so we find that machines, purposive actions, grammatical sentences, and games of chess are all entities subject to *dual control*.

Such is the stratified structure of comprehensive entities. They embody a combination of two principles: a higher and a lower. Smash up a machine, utter words at random, or make chess moves without a purpose, and the corresponding higher principles—that which constitutes the machine, that which makes words into sentences, and that which makes moves of chess into a game—will all vanish, and the comprehensive entity which they controlled will cease to exist.

But the lower principles—the boundary conditions of which the higher principles had control—remain in operation. The laws of mechanics, the vocabulary sanctioned by the dictionary, and the rules of chess will all continue to apply as before. Hence, no description of a comprehensive entity in the light of its lower principles can ever reveal the operation of its higher principles. *The higher principles which characterize a comprehensive entity cannot be defined in terms of the laws that apply to its parts in themselves.*

On the other hand, a machine does rely for its working on the laws of mechanics; a purposive motoric action, like going for a walk, relies on the operations of the muscular system which it directs; and so on. The operation of higher principles

rely, quite generally, on the action of the laws governing lower levels.

Yet, since the laws of the lower level will go on operating whether the higher principles continue to be in working order or not, the action of the lower laws may well disrupt the working of the higher principles and destroy the comprehensive entity controlled by them. Such is the mechanism of a two-leveled comprehensive entity.

It presents us with an ontological counterpart of the *logical disintegration* caused by switching our attention from the center of a comprehensive entity to its particulars. For to turn our attention from the actions of the higher principle, which defines the two-leveled entity, and direct it to the lower principle, controlling the isolated parts of the entity, is to lose sight of the higher principle and, indeed, of the whole entity controlled by it. The logical structure of tacit knowing is seen to cover the ontological structure of a combined pair of levels.

Application of These Principles to Mind and Body

We must ask now whether the functioning of living beings and of their consciousness is, in fact, stratified. Is it subject to the joint control of different principles working at consecutive levels?

We may answer that the laws of physics and chemistry do not ascribe consciousness to any process controlled by them; the presence of consciousness proves, therefore, that other principles than those of inanimate matter participate in the conscious operations of living things.

And there are two other fundamental principles of biology which are beyond the scope of physics and chemistry. The structure and functioning of an organism is determined, like that of a machine, by constructional and operational principles which control boundary conditions left open by physics and chemistry. We may call this a *structural principle*, lying beyond the realm of physics and chemistry. I have explained this a number of times elsewhere and will not argue it here again.

Other functions of the organism not covered by physics and chemistry are exemplified by the working of the morphogenic field. Its principles are expressed most clearly by C. H. Waddington's "epigenetic landscapes." These show that the development of the embryo is controlled by the gradient of potential shapes, in the way the motion of a heavy body is controlled by the gradient of potential energy. We may call this principle an *organizing field* or speak of it as an *organismic principle*.*

Most biologists would declare that both the principles of structure and of organizing fields will be reduced one day to the laws of physics and chemistry. But I am unable to discover the grounds (or even understand the meaning) of such assurances, and hence I will disregard them and recognize these two principles as they are actually used by biology.

Living beings consist, therefore, in a hierarchy of levels, each level having its own structural and organismic principles. On the mental level, explicit inferences may be taken to represent the operations of fixed mental structures, while in tacit knowing, we meet the integrating powers of the mind. In all our conscious thoughts, these two modes mutually rely on each other; and it is plausible to assume that explicit mental operations are based on fixed neural networks, while tacit integrations are grounded mainly in organizing fields. I shall assume that these two principles are interwoven in the body, as their counterparts are in thought.

The purpose of this paper has been to explain the relation between body and mind as an instance of the relation between the subsidiary and the focal in tacit knowledge. The fact that any subsidiary element loses its meaning when we 'focus our attention on it, was used to explain the fact that when examining the body in conscious action, we meet no traces of consciousness in its organs. We are now ready to complete this project.

We have seen that we can know another person's mind by dwelling in his physiognomy and behavior; we lose sight of his mind only when we focus our attention on these bodily work-

* Comp. e.g. C. H. Waddington, *The Strategy of Genes*. London, 1957; particularly the explanation of genetic assimilation on p. 167.

ings and thus convert them into mere objects. But a neurophysiologist, observing the events that take place in the eyes and brain of a seeing man, would invariably fail to see in these neural events what the man, himself, sees by them. We must ask why the neurologist cannot dwell in these bodily events, as he could in the subject's physiognomy or intelligent behavior, in which he witnesses his mind.

We may notice that this kind of indwelling, for which we appear to be equipped by nature, enables us to read only *tacit* thoughts of another mind: thoughts and feelings of the kind that we may suitably ascribe to organismic processes in the nervous system. We can get to know the *explicit* thoughts of a person (which probably correspond to anatomically fixed functions of the nervous system) only from the person's verbal utterances. The meaning of such utterances is artificial; though ultimately derived from demonstrations pointing at tacit experiences, such utterances have no direct appeal on the native mind. The facility for indwelling can be seen to vary also in the case that prehistoric sites, unperceived from the ground, are discerned from the air. I suggest that our incapacity for experiencing the neural processes of another person in the manner he experiences them himself may be aligned with these gradual variations of indwelling.

We arrive, thus, at the following outline. Our capacity of conducting and experiencing the conscious operations of our body, including that of our nervous system, lies in the fact that we, ourselves, fully dwell in them. No one but ourselves can dwell in our body directly and know fully all its conscious operations; but our consciousness can also be experienced by others to the extent to which they can dwell in the external workings of our mind from outside. They can do this fairly effectively for many tacit workings of our mind by dwelling in our physiognomy and behavior. Such powers of indwelling are fundamentally innate in us. By contrast, our explicit thoughts can be known to others only by dwelling in our pronouncements, the making and understanding of which is founded on artificial conventions.

Objectivization, whether of another person's gestures or of his utterances, cancels our dwelling in them, destroys their

meaning, and cuts off communication through them. The nervous system, as observed by the neurophysiologist, is always objectivized and can convey its meaning to the observer only indirectly, by pointing at a behavior or at reports that we understand by indwelling.

The logic of tacit knowing and the ontological principles of stratified entities were derived here independently of each other, and we found that our tacit logic enables us to understand stratified entities. Tacit logic shows us: (1) that the higher principle of a stratified entity can be apprehended only by our dwelling in the boundary conditions of a lower principle on which the higher principle operates and (2) that such indwelling is logically incompatible with fixing our attention on the laws governing the lower level. Applied to mind and body, as to two strata in which the higher principles of the mind rely for their operations on the lower principles of physiology, we arrive at three conclusions.

1. No observations of physiology can make us apprehend the operations of the mind.
2. At the same time, the operations of the mind will never be found to interfere with the principles of physiology, or with the even lower principles of physics and chemistry on which they rely.
3. But as the operations of the mind rely on the services of lower bodily principles, the mind can be disturbed by adverse changes in the body, or be offered new opportunities by favorable changes of its bodily basis.

But I must yet show how the mind actually controls the *I* body. For, from the point that we have reached so far, we cannot see how this is done. Let me recall how far we have gone in comparing our own relation to our own mind with the relation that another person has to our mind. We attend to what we have in mind from our awareness of our body; we do this by living in our body and by using it consciously. Others can see what we have in our mind only by watching our facial expression and our gestures; all their knowledge of our consciousness, however sophisticated it be, is derived, in the last resort,

from this way of watching us. To sum up then: Others know our mind superficially from their superficial awareness of our body, and we know our own mind more fully from a much more intimate awareness of this body. So far, nothing has been said then, about the fact that we can use our own body actively and no one else can.

This fact can indeed be accounted for only by substantially enlarging our conception of the body-mind relation. The main point to account for is that while another person may watch what I am doing and guess from it what I am after, it would be absurd for me to watch what I am doing in order to guess what I am after. I *first* know what I am after and *then* do something about it. We shall have to expand our conception of tacit knowing and give it a dynamic form to explain how this sequence of intention and action arises. It will be explained by introducing the power of the imagination.

This goes back to William James. He explained the way we deliberately move our body as the work of our imagination. We start imagining the action that we are about to perform/ and this forward thrust of our intention evokes the muscular contractions which will implement it.

I have said that to take a walk is to suitably control the boundary conditions of a normal physiological function. My project is at the focus of my attention, and this focal action relies on my subsidiary operation of the muscular contractions which implement it. I now have to supplement this mechanism by including the imaginative process by which we start setting our body in motion. I shall say that in a deliberate bodily action we thrust the focus of our attention ahead of the subsidiary muscular contractions which will bring the action about. Thus, we anticipate the action by the powers of our imagination, and this focal anticipation causes the subsidiary elements to emerge and implement what we imagined.

This is the way our mind takes control of the body and makes it serve our purpose; this is the dynamics of tacit knowing. This dynamism endows tacit knowing with creativity. It lends us the power of acquiring a skill, and, by the same token, enables us to invent a machine; indeed, to perform any possible creative action. I have shown elsewhere in some detail how the

mechanism by which the mind sets the body in motion can be made to cover the whole range of creative originality.

At this point, there comes into sight a defect in our conception of consecutive levels of control. The way I described such stratified structure does not allow for the fact that in the embryonic development and in the growth of animals we see higher levels emerging by continuous changes, and that the same happens in phylogenetic evolution. The theory of consecutive levels must be somehow supplemented by a conception of the continuous transition of a lower level to a higher level. But the moment we see this problem, we are also presented with its solution. The development of an infant into a grown person illustrates a transition between successive levels. It shows that such a transition may take place gradually by a steady intensification of a higher principle from initial rudimentary traces, up to the stage where it fully takes control over the lower level from which it has emerged.

But here arises a further problem of great importance on which I can touch only briefly. The image of consecutive levels, unaccountable by the principles governing the levels below them, offers us a sharp definition of creativity. It defines creativity as the emergence of a new, irreducible higher principle. We can equally define in these terms both the action of intellectual originality and the creative processes by which new principles emerge in nature, whether this happens in the maturing infant or in the process of evolution. What the imagination achieves in the mind, the process of growth performs spontaneously in the child, and evolution performs likewise in the rise of higher forms of life.

This brings us back to Samuel Butler and Henri Bergson who thought of the evolution of species as a creative process akin to the acts of genius and not accountable by the laws of inanimate matter. I think that I have lent firm substance to this belief by defining more closely the process of creativity and by showing that evolution, like the rise of life itself, cannot be accounted for by the laws of inanimate nature. I believe to have shown also, that the logical relation between successive stages of evolution is the same as the logical relation between two stages of thought before and after a major inven-

tion or discovery. We find that creativity has a similar structure in both cases.

Admittedly, the imagination is a motive force of invention, which has no counterpart in the process of organic evolution. But I could reduce this disparity by showing, as I have done elsewhere, that the imagination alone does not achieve inventions or discoveries, but merely evokes a spontaneous, integrative event which brings about the discovery. It appears that the effort of the imagination merely prepares the ground for a creative act which eventually takes place of its own accord. This is how Poincaré described discovery in mathematics many years ago, and it can be shown to happen mostly like this. Discovery or invention are, as it were, processes of spontaneous growth induced by the labors of the questing imagination. Originality is deliberate growth.

The way my conclusions bear on Teilhard de Chardin's book *Le phenomene Humain* is fairly clear. I agree with his vision of evolution as a continuous sequence of creative acts. I do not think that he has done much towards meeting the difficulties arising when we try to spell out this vision in terms of biological detail. I would think that a precise conception of creativity and the proof of its being equally present in human originality, individual ontogenesis, and phylogenetic evolution will remedy this deficiency up to a point. But I think that this involves an idea of the body-mind relation that is very different from the dualism accepted and elaborated by Teilhard de Chardin and all his predecessors. In my theory, the distinction between the inner and outer view of things applies to every kind of comprehensive entity. It applies in a series of stages: the outer view looks at a lower level of a comprehensive entity, while the inner view sees a higher level of it. More generally speaking, the difference lies between looking at and looking from some coherent subsidiary things.

The problem of the body-mind relation is thus resolved by being shown to represent but an instance of these two alternative ways of knowing the subsidiaries of a coherent entity.

The hierarchy of levels I am postulating cannot be represented in a Cartesian dualism. I believe that this hierarchy gives a truer picture of the phenomenon of man.