

Creative Evolution (1911)

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Results of the inquiry—The vital impulse

Even in animals, [a cause of a psychological nature] will act only on points which are under the direct or indirect control of the will. And even where it does act, it is not clear how it could compass a change so profound as an increase of complexity: at most this would be conceivable if the acquired characters were regularly transmitted so as to be added together; but this transmission seems to be the exception rather than the rule. A hereditary change in a definite direction, which continues to accumulate and add to itself so as to build up a more and more complex machine, must certainly be related to some sort of effort, but to an effort of far greater depth than the individual effort, far more independent of circumstances, an effort common to most representatives of the same species, inherent in the germs they bear rather than in their substance alone, an effort thereby assured of being passed on to their descendants.

So we come back, by a somewhat roundabout way, to the idea we started from, that of an original impetus of life, passing from one generation of germs to the following generation of germs through the developed organisms which bridge the interval between the generations. This impetus, sustained right along the lines of evolution among which it gets divided, is the fundamental cause of variations, at least of those that are regularly passed on, that accumulate and create new species. In general, when species have begun to diverge from a common stock, they accentuate their divergence as they progress in their evolution. Yet in certain definite points, they may evolve identically; in fact, they must do so if the hypothesis of a common impetus be accepted. This is just what we shall have to show now in a more precise way, by the same example we have chosen, the formation of the eye in [88] molluscs and vertebrates. The idea of an "original impetus," moreover, will thus be made clearer.

Two points are equally striking in an organ like the eye: the complexity of its structure and the simplicity of its function. The eye is composed of distinct parts, such as the sclerotic, the cornea, the retina, the crystalline lens, etc. In each of these parts the detail is infinite. The retina alone comprises three layers of nervous elements—multipolar cells, bipolar cells, visual cells—each of which has its individuality and is undoubtedly a very complicated organism: so complicated, indeed, is the retinal membrane in its intimate structure, that no simple description can give an adequate idea of it. The mechanism of the eye is, in short, composed of an infinity of mechanisms all of extreme complexity. Yet vision is one simple fact. As soon as the eye opens, the visual act is effected. Just because the act is simple, the slightest negligence on the part of nature in the building of the infinitely complex machine would have made vision impossible. This contrast between the complexity of the organ and the unity of the function is what gives us pause.

A mechanistic theory is one which means to show us the gradual building-up of the machine under the influence of external circumstances intervening either directly by action on the tissues or indirectly by the selection of better-adapted ones. But, whatever form this theory may take, supposing it avails at all to explain the detail of the parts, it throws no light on their correlation.

Then comes the doctrine of finality, which says that the parts have been brought together on a preconceived plan with a view to a certain end. In this it likens the labor of nature to that of the workman, who also proceeds by the assemblage of parts with a view to the realization of an idea or the imitation of a model. Mechanism, [89] here, reproaches finalism with its anthropomorphic character, and rightly. But it fails

to see that itself proceeds according to this method—somewhat mutilated! True, it has got rid of the end pursued or the ideal model. But it also holds that nature has worked like a human being by bringing parts together, while a mere glance at the development of an embryo shows that life goes to work in a very different way. *Life does not proceed by the association and addition of elements, but by dissociation and division.*

We must get beyond both points of view, both mechanism and finalism being, at bottom, only standpoints to which the human mind has been led by considering the work of man. But in what direction can we go beyond them? We have said that in analyzing the structure of an organ, we can go on decomposing for ever, although the function of the whole is a simple thing. This contrast between the infinite complexity of the organ and the extreme simplicity of the function is what should open our eyes.

In general, when the same object appears in one aspect and in another as infinitely complex, the two aspects have by no means the same importance, or rather the same degree of reality. In such cases, the simplicity belongs to the object itself, and the infinite complexity to the views we take in turning around it, to the symbols by which our senses or intellect represent it to us' or, more generally, to elements *of a different order*, with which we try to imitate it artificially, but with which it remains incommensurable, being of a different nature. An artist of genius has painted a figure on his canvas. We can imitate his picture with many-colored squares of mosaic. And we shall reproduce the curves and shades of the model so much the better as our squares are smaller, more numerous and more varied in tone. But an infinity of elements infinitely small, [90] presenting an infinity of shades, would be necessary to obtain the exact equivalent of the figure that the artist has conceived as a simple thing, which he has wished to transport as a whole to the canvas, and which is the more complete the more it strikes us as the projection of an indivisible intuition. Now, suppose our eyes so made that they cannot help seeing in the work of the master a mosaic effect. Or suppose our intellect so made that it cannot explain the appearance of the figure on the canvas except as a work of mosaic. We should then be able to speak simply of a collection of little squares, and we should be under the mechanistic hypothesis. We might add that, beside the materiality of the collection, there must be a plan on which the artist worked; and then we should be expressing ourselves as finalists. But in neither case should we have got at the real process, for there are no squares brought together. It is the picture, i.e. the simple act, projected on the canvas, which, by the mere fact of entering into our perception, is decomposed before our eyes into thousands and thousands of little squares which present, as recomposed, a wonderful arrangement. So the eye, with its marvelous complexity of structure, may be only the simple act of vision, divided for us into a mosaic of cells, whose order seems marvelous to us because we have conceived the whole as an assemblage.

If I raise my hand from A to B, this movement appears to me under two aspects at once, Felt from within, it is a simple, indivisible act. Perceived from without, it is the course of a certain curve, AB. In this curve I can distinguish as many positions as I please and the line itself might be defined as a certain mutual coordination of these positions. But the positions, infinite in number, and the order in which they are connected, have sprung automatically from the indivisible act by which my hand [91] has gone from A to B. Mechanism, here, would consist in seeing only the positions. Finalism would take their order into account. But both mechanism and finalism would leave on one side the movement, which is reality itself. In one sense, the movement is more than the positions and than their order; for it is sufficient to make it in its indivisible simplicity to secure that the infinity of the successive positions as also their order be given at once—with something else which is neither order nor position but which is essential, the mobility. But, in another sense, the movement is less than the series of positions and their connecting order; for, to arrange points in a certain order, it is necessary first to conceive the order and then to realize it with points, there must be the work of assemblage and there must be intelligence, whereas the simple movement of the hand contains nothing of

either. It is not intelligent, in the human sense of the word, and it is not an assemblage, for it is not made up of elements. Just so with the relation of the eye to vision. There is in vision more than the component cells of the eye and their mutual coordination: in this sense, neither mechanism nor finalism go far enough. But, in another sense, mechanism and finalism both go too far, for they attribute to Nature the most formidable of the labors of Hercules in holding that she has exalted to the simple act of vision an infinity of infinitely complex elements, whereas Nature has had no more trouble in making an eye than I have in lifting my hand. Nature's simple act has divided itself automatically into an infinity of elements which are then found to be coordinated to one idea, just as the movement of my hand has dropped an infinity of points which are then found to satisfy one equation.

We find it very hard to see things in that light, because [92] we cannot help conceiving organization as manufacturing. But it is one thing to manufacture, and quite another to organize. Manufacturing is peculiar to man. It consists in assembling parts of matter which we have cut out in such manner that we can fit them together and obtain from them a common action. The parts are arranged, so to speak, around the action as an ideal centre. To manufacture, therefore, is to work from the periphery to the centre, or, as the philosophers say, from the many to the one. Organization, on the contrary, works from the centre to the periphery. It begins in a point that is almost a mathematical point, and spreads around this point by concentric waves which go on enlarging. The work of manufacturing is the more effective, the greater the quantity of matter dealt with. It proceeds by concentration and compression. The organizing act, on the contrary, has something explosive about it: it needs at the beginning the smallest possible place, a minimum of matter, as if the organizing forces only entered space reluctantly. The spermatozoon, which sets in motion the evolutionary process of the embryonic life, is one of the smallest cells of the organism ' ; and it is only a small part of the spermatozoon which really takes part in the operation.

But these are only superficial differences. Digging beneath them, we think, a deeper difference would be found.

A manufactured thing delineates exactly the form of the work of manufacturing it. I mean that the manufacturer finds in his product exactly what he has put into it. If he is going to make a machine, he cuts out its pieces one by one and then puts them together: the machine, when made, will show both the pieces and their assemblage. The whole of the result represents the whole of the work; and to each part of the work corresponds a part of the result.

[93] Now I recognize that positive science can and should proceed as if organization was like making a machine. Only so will it have any hold on organized bodies. For its object is not to show us the essence of things, but to furnish us with the best means of acting on them. Physics and chemistry are well advanced sciences, and living matter lends itself to our action only so far as we can treat it by the processes of our physics and chemistry. Organization can therefore only be studied scientifically if the organized body has first been likened to a machine. The cells will be the pieces of the machine, the organism their assemblage, and the elementary labors which have organized the parts will be regarded as the real elements of the labor which has organized the whole. This is the standpoint of science. Quite different, in our opinion, is that of philosophy.

For us, the whole of an organized machine may, strictly speaking, represent the whole of the organizing work (this is, however, only approximately true), yet the parts of the machine do not correspond to parts of the work, because *the materiality of this machine does not represent a sum of means employed, but a sum of obstacles avoided: it is a negation rather than a positive reality.* So, as we have shown in a former study, vision is a power which should attain *by right* an infinity of things inaccessible to our eyes. But such a vision would not be continued into action; *it might suit* a phantom, but not a living being. The vision of a living being is an effective vision,

limited to objects on which the being can act: it is a vision that is *canalized*, and the visual apparatus simply symbolizes the work of canalizing. Therefore the creation of the visual apparatus is no more explained by the assembling of its anatomic elements than the digging of a canal could be explained by the heaping-up of the earth which might have formed its banks. A mechanistic theory would maintain that the [94] earth had been brought cart-load by cart-load; finalism would add that it had not been dumped down at random, that the carters had followed a plan. But both theories would be mistaken, for the canal has been made in another way.

With greater precision, we may compare the process by which nature constructs an eye to the simple act by which we raise the hand. But we supposed at first that the hand met with no resistance. Let us now imagine that, instead of moving in air, the hand has to pass through iron filings which are compressed and offer resistance to it in proportion as it goes forward. At a certain moment the hand will have exhausted its effort, and, at this very moment, the filings will be massed and coordinated in a certain definite form, to wit, that of the hand that is stopped and of a part of the arm. Now, suppose that the hand and arm are invisible. Lookers-on will seek the reason of the arrangement in the filings themselves and in forces within the mass. Some will account for the position of each filing by the action exerted upon it by the neighboring filings: these are the mechanists. Others will prefer to think that a plan of the whole has presided over the detail of these elementary actions. they are the finalists. But the truth is that there has been merely one indivisible act, that of the hand passing through the filings: the inexhaustible detail of the movement of the grains, as well as the order of their final arrangement, expresses negatively, in a way, this undivided movement, being the unitary form of a resistance, and not a synthesis of positive elementary actions. For this reason, if the arrangement of the grains is termed an "effect " and the movement of the hand a "cause," it may indeed be said that the whole of the effect is explained by the whole of the cause, but to parts of the cause parts of the effect will in no wise correspond. In [95] other words, neither mechanism nor finalism will here be in place, and we must resort to an explanation of a different kind. Now, in the hypothesis we propose, the relation of vision to the visual apparatus would be very nearly that of the hand to the iron filings that follow, canalize and limit its motion.

The greater the effort of the hand, the farther it will go into the filings. But at whatever point it stops, instantaneously and automatically the filings coordinate and find their equilibrium. So with vision and its organ. According as the undivided act constituting vision advances more or less, the materiality of the organ is made of a more or less considerable number of mutually coordinated elements, but the order is necessarily complete and perfect. It could not be partial, because, once again, the real process which gives rise to it has no parts. That is what neither mechanism nor finalism takes into account, and it is what we also fail to consider when we wonder at the marvelous structure of an instrument such as the eye. At the bottom of our wondering is always this idea, that it would have been possible for a part only of this coordination to have been realized, that the complete realization is a kind of special favor. This favor the finalists consider as dispensed to them all at once, by the final cause; the mechanists claim to obtain it little by little, by the effect of natural selection; but both see something positive in this coordination, and consequently something fractionable in its cause,-something which admits of every possible degree of achievement. In reality, the cause, though more or less intense, cannot produce its effect except in one piece, and completely finished. According as it goes further and further in the direction of vision, it gives the simple pigmentary masses of a lower organism, or the rudimentary eye of [96] a *Serpula*, or the slightly differentiated eye of the *Alciope*, or the marvelously perfected eye of the bird; but all these organs, unequal as is their complexity, necessarily present an equal coordination. For this reason, no matter how distant two animal species may be from each

other, if the progress toward vision has gone equally far in both, there is the same visual organ in each case, for the form of the organ only expresses the degree in which the exercise of the function has been obtained.

But, in speaking of a progress toward vision, are we not coming back to the old notion of finality? It would be so, undoubtedly, if this progress required the conscious or unconscious idea of an end to be attained. But it is really effected in virtue of the original impetus of life; it is implied in this movement itself, and that is just why it is found in independent lines of evolution. If now we are asked why and how it is implied therein, we reply that life is, more than anything else, a tendency to act on inert matter. The direction of this action is not predetermined; hence the unforeseeable variety of forms which life, in evolving, sows along its path. But this action always presents, to some extent, the character of contingency; it implies at least a rudiment of choice. Now a choice involves the anticipatory idea of several possible actions. Possibilities of action must therefore be marked out for the living being before the action itself. Visual perception is nothing else:¹ the visible outlines of bodies are the design of our eventual action on them. Vision will be found therefore, in different degrees in the most diverse animals, and it will appear, in the same complexity of structure wherever it has reached the same degree of intensity.

We have dwelt on these resemblances of structure [97] in general, and on the example of the eye in particular, because we had to define our attitude toward mechanism on the one hand and finalism on the other. It remains for us to describe it more precisely in itself. This we shall now do by showing the divergent results of evolution not as presenting analogies, but as themselves mutually complementary.

The evolutionism of Spencer

The post-Kantian philosophy, severe as it may have been on the mechanistic theories, accepts from mechanism the idea of a science that is one and the same for all kinds of reality. And it is nearer to mechanism than it imagines; for though, in the consideration of matter, of life and of thought, it replaces the successive degrees of complexity, that mechanism supposed by degrees of the realization of an Idea or by degrees of the objectification of a Will, it still speaks of degrees, and these degrees are those of a scale which Being traverses in a single direction. In short, it makes out the same articulations in nature that mechanism does. Of mechanism it retains the whole design; it, merely gives it a different coloring. But it is the design itself, or at least one half of the design, that needs to be re-made.

If we are to do that, we must give up the method of *construction*, which was that of Kant's successors. We [363] must appeal to experience—an experience purified, or, in other words, released, where necessary, from the molds that our intellect has formed in the degree and proportion of the progress of our action on things. An experience of this kind is not a non-temporal experience. It only seeks, beyond the spatialized time in which we believe we see continual rearrangements between the parts, that concrete duration in which a radical recasting of the whole is always going on. It follows the real in all its sinuosities. It does not lead us, like the method of construction, to higher and higher generalities—piled-up stories of a magnificent building. But then it leaves no play between the explanations it suggests and the objects it has to explain. It is the detail of the real, and no longer only the whole in a lump, that it claims to illumine.

That the thought of the nineteenth century called for a philosophy of this kind, rescued from the arbitrary, capable of coming down to the detail of particular facts, is unquestionable. Unquestionably, also, it felt that this philosophy ought to establish itself in what we call concrete duration. The advent of the moral sciences, the progress of psychology, the growing importance of embryology among the biological sciences—

¹ See, on this subject, *Matière et mémoire*, chap. i.

all this was bound to suggest the idea of a reality which *endures* inwardly, which is duration itself. So, when a philosopher arose who announced a doctrine of evolution, in which the progress of matter toward perceptibility would be traced together with the advance of the mind toward rationality, in which the complication of correspondences between the external and the internal would be followed step by step, in which change would become the very substance of things—to him all eyes were turned. The powerful attraction that Spencerian evolutionism has exercised on contemporary [364] thought is due to that very cause. However far Spencer may seem to be from Kant, however ignorant, indeed, he may have been of Kantianism, he felt, nevertheless, at his first contact with the biological sciences, the direction in which philosophy could continue to advance without laying itself open to the Kantian criticism.

But he had no sooner started to follow the path than he turned off short. He had promised to retrace a genesis, and, lo! he was doing something entirely different. His doctrine bore indeed the name of evolutionism; it claimed to remount and redescend the course of the universal becoming; but, in fact, it dealt neither with becoming nor with evolution.

We need not enter here into a profound examination of this philosophy. Let us say merely that *the usual device of the Spencerian method consists in reconstructing evolution with fragments of the evolved*. If I paste a picture on a card and then cut up the card into bits, I can reproduce the picture by rightly grouping again the small pieces. And a child who working thus with the pieces of a puzzle-picture, and putting together unformed fragments of the picture finally obtains a pretty colored design, no doubt imagines that he has *produced* design and color. Yet the act of drawing and painting has nothing to do with that of putting together the fragments of a picture already drawn and already painted. So, by combining together the most simple results of evolution, you may imitate well or ill the most complex effects; but of neither the simple nor the complex will you have retraced the, genesis, and the. addition of evolved to evolved will bear no resemblance whatever to the movement of evolution.

Such, however, is Spencer's illusion. He takes reality in its present form; he breaks it to pieces, he scatters it in fragments which he throws to the winds; then he [365] "integrates" these fragments and "dissipates their movement." Having *imitated* the Whole by a work of mosaic, he imagines he has retraced the design of it, and made the genesis.

Is it matter that is in question? The diffused elements which he integrates into visible and tangible bodies have all the air of being the very particles of the simple bodies, which he first supposes disseminated throughout space. They are, at any rate, "material points," and consequently unvarying points, veritable little solids: as if solidity, being what is nearest and handiest to us, could be found at the very origin of materiality! The more physics progresses, the more it shows the impossibility of representing the properties of ether or of electricity—the probable base of all bodies—on the model of the properties of the matter which we perceive. But philosophy goes back further even than the ether, a mere schematic figure of the relations between phenomena apprehended by our senses. It knows indeed that what is visible and tangible in things represents our possible action on them. It is not by dividing the evolved that we shall reach the principle of that which evolves. It is not by recomposing the evolved with itself that we shall reproduce the evolution of which it is the term.

Is it the question of mind? By compounding the reflex with the reflex, Spencer thinks he generates instinct and rational volition one after the other. He fails to see that the specialized reflex, being a terminal point of evolution just as much as perfect will, cannot be supposed at the start. That the first of the two terms should have reached its final form before the other is probable enough; but both the one and the other are *deposits* of the evolution movement, and the evolution movement itself can no more be expressed as a

function solely of the first than solely [366] of the second. We must begin by mixing the reflex and the voluntary. We must then go in quest of the fluid reality which has been precipitated in this twofold form, and which probably shares in both without being either. At the lowest degree of the animal scale, in living beings that are but an undifferentiated protoplasmic mass, the reaction to stimulus does not yet call into play one definite mechanism, as in the reflex; it has not yet choice among several definite mechanisms, as in the voluntary act; it is, then, neither voluntary nor reflex, though it heralds both. We experience in ourselves something of this true original activity when we perform semi-voluntary and semi-automatic movements to escape a pressing danger. And yet this is but a very imperfect imitation of the primitive character, for we are concerned here with a mixture of two activities already formed, already localized in a brain and in a spinal cord, whereas the original activity was a simple thing, which became diversified through the very construction of mechanisms like those of the spinal cord and brain. But to all this Spencer shuts his eyes, because it is of the essence of his method to recombine the consolidated with the consolidated, instead of going back to the gradual process of consolidation, which is evolution itself.

Is it, finally, the question of the correspondence between mind and matter? Spencer is right in defining the intellect by this correspondence. He is right in regarding it as the end of an evolution. But when he comes to retrace this evolution, again he integrates the evolved with the evolved—failing to see that he is thus taking useless trouble, and that in positing the slightest fragment of the actually evolved he posits the whole—so that it is vain for him, then, to pretend to make the genesis of it.

For, according to him, the phenomena that succeed [367] each other in nature project into the human mind images which represent them. To the relations between phenomena, therefore, correspond symmetrically relations between the ideas. And the most general laws of nature, in which the relations between phenomena are condensed, are thus found to have engendered the directing principles of thought, into which the relations between ideas have been integrated. Nature, therefore, is reflected in mind. The intimate structure of our thought corresponds, piece by piece, to the very skeleton of things—I admit it willingly; but, in order that the human mind may be able to represent relations between phenomena, there must first be phenomena, that is to say, distinct facts, cut out in the continuity of becoming. And once we posit this particular mode of cutting up such as we perceive it to-day, we posit also the intellect such as it is to-day, for it is by relation to it, and to it alone, that reality is cut up in this manner. Is it probable that mammals and insects notice the same aspects of nature, trace in it the same divisions, articulate the whole in the same way? And yet the insect, so far as intelligent, has already something of our intellect. Each being cuts up the material world according to the lines that its action must follow: it is these lines of *possible action* that, by intercrossing, mark out the net of experience of which each mesh is a fact. No doubt, a town is composed exclusively of houses, and the streets of the town are only the intervals between the houses: so, we may say that nature contains only facts, and that, the facts once posited, the relations are simply the lines running between the facts. But, in a town, it is the gradual portioning of the ground into lots that has determined at once the place of the houses, their general shape, and the direction of the streets: to this portioning we must go back if we wish to understand the particular mode of subdivision that causes each house [368] to be where it is, each street to run as it does. Now, the cardinal error of Spencer is to take experience already allotted as given, whereas the true problem is to know how the allotment was worked. I agree that the laws of thought are only the integration of relations between facts. But, when I posit the facts with the shape they have for me to-day, I suppose my faculties of perception and intellection such as they are in me to-day; for it is they that portion the real into lots, they that cut the facts out in the whole of reality. Therefore, instead of saying that the relations between facts have generated the laws of thought, I can as well claim that it is the

form of thought that has determined the shape of the facts perceived, and consequently their relations among themselves: the two ways of expressing oneself are equivalent; they say at bottom the same thing. With the second, it is true, we give up speaking of evolution. But, with the first, we only speak of it, we do not think of it any the more. For a true evolutionism would propose to discover by what *modus vivendi*, gradually obtained, the intellect has adopted its plan of structure, and matter its mode of subdivision. This structure and this subdivision work into each other; they are mutually complementary; they must have progressed one with the other. And, whether we posit the present structure of mind or the present subdivision of matter, in either case we remain in the evolved: we are told nothing of what evolves, nothing of evolution.

And yet it is this evolution that we must discover. Already, in the field of physics itself, the scientists who are pushing the study of their science furthest incline to believe that we cannot reason about the parts as we reason about the whole; that the same principles are not applicable to the origin and to the end of a progress; that neither creation nor annihilation, for instance, is inadmissible [369] when we are concerned with the constituent corpuscles of the atom. Thereby they tend to place themselves in the concrete duration, in which alone there is true generation and not only a composition of parts. It is true that the creation and annihilation of which they speak concern the movement or the energy, and not the imponderable medium through which the energy and the movement are supposed to circulate. But what can remain of matter when you take away everything that determines it, that is to say, just energy and movement themselves? The philosopher must go further than the scientist. Making a clean sweep of everything that is only an imaginative symbol, he will see the material world melt back into a simple flux, a continuity of flowing, a becoming. And he will thus be prepared to discover real duration there where it is still more useful to find it, in the realm of life and of consciousness. For, so far as inert matter is concerned, we may neglect the flowing without committing a serious error: matter, we have said, is weighted with geometry; and matter, the reality which *descends*, endures only by its connection with that which *ascends*. But life and consciousness are this very ascension. When once we have grasped them in their essence by adopting their movement, we understand how the rest of reality is derived from them. Evolution appears and, within this evolution, the progressive determination of materiality and intellectuality by the gradual consolidation of the one and of the other. But, then, it is within the evolutionary movement that we place ourselves, in order to follow it to its present results, instead of recomposing these results, artificially with fragments of themselves. Such seems to us to be the true function of philosophy. So understood, philosophy is not only the turning of the mind homeward, the coincidence of human consciousness with the living principle whence [370] it emanates, a contact with the creative effort: it is the study of becoming in general, it is true evolutionism and consequently the true continuation of science—provided that we understand by this word a set of truths either experienced or demonstrated, and not a certain new scholasticism that has grown up during the latter half of the nineteenth century around the physics of Galileo, as the old scholasticism grew up around Aristotle.

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