

Introduction: Henri Bergson's *Creative Evolution*

Michael Vaughan

Henri Bergson was the philosopher who, in an intellectual career stretching from the 1880s to the 1930s, provided a rigorous account of the real efficacy of time (which he called *duration*). This allowed him to conceive of creativity as the source of both psychological freedom and of life as an open system. Bergson identifies in the history of Western thought the demotion of time to the status of a measurement, a demotion that renders the effects of its real activity in consciousness and in life inexplicable (even non-existent). According to Bergson it is impossible, without an adequate conception of time, to properly pose questions of free will or evolution, and in books such as *Time and free Will* (1889), *Matter and Memory* (1896) and *Creative Evolution* (1907) he reinterprets a vast range of empirical research in such a way as to take into account the role of time in psychological and biological processes. In the late nineteenth century, the sciences of consciousness and of life were dominated by a commitment to materialism and mechanism that meant they struggled to conceptualize growth, change and creativity, or even held such phenomena to be unreal. Bergson's commitment to the reality of time as a source of creative change enabled him to clarify many problems in psychology and biology that appeared contradictory from existing scientific and philosophical perspectives, and to provide a rigorous account of a creative evolution, the creative mind, and the nature of their relation. Hence, those sciences that attempted to explain consciousness in purely physiological terms and those that attempted to explain life in purely physical and chemical terms are subject to extensive critiques in Bergson's works.

In 1907, Bergson was a forty-seven year old professor at the Collège de France, where he held the chair in Modern Philosophy. He had a background in mathematics, for which he had won prizes as a student, and in his first two books, *Time and Free Will* and *Matter and Memory*, he had based his arguments on a close analysis of the latest research in psychology and neurology. *Creative Evolution* was his third book, and was the result of several years of painstaking research, reading books

and research papers on comparative homology, cytology, embryology and palaeontology, in English, German and French. However, a survey of both Bergson's published essays and the posthumously collected documents in *Mélanges* (1959) from the eleven years following *Matter and Memory* reveals little to suggest that a major encounter with the biological sciences was underway. Even the essay "L'idée de néant" [The Idea of Nothing], published in the November 1906 issue of *Revue Philosophique* and reproduced at the beginning of the fourth chapter of *Creative Evolution*, did not represent the real focus of the book; it challenged the metaphysical sense of a supposed "nothing" that is said to precede existence, rather than dealing with any directly biological issue.¹

However, it would be wrong to suggest that *Creative Evolution* appeared out of nowhere. First, Bergson included a number of sessions on different conceptions of life in the lecture course on metaphysics that he held at the college of Clermont-Ferrand in 1887-1888. Summaries of these lectures were published in France in 1992, and a selection of those sections dealing with the life sciences appear in this issue of *SubStance*, in their first English translation. These lectures indicate that before the publication of *Time and Free Will*, Bergson was at least aware of the issues that would become central in *Creative Evolution*: the difference between organic and inorganic matter, the coordination of parts in organisms, the nature of life and the relation between life and consciousness. More significantly though, there is the unity and continuity that Bergson's philosophical approach establishes between his previous works in psychology and his new work in biology. In this introduction, we will examine how Bergson's philosophy, particularly in its response to the sciences, allows him to address the problem of evolution.

Bergson and Biology

Although it is the work of a philosopher, and makes a major new contribution to the theory of knowledge, *Creative Evolution* also remains a book about biology. Bergson's philosophy is empirical, his arguments are based on research, and if we try to understand his conclusions outside of the scientific context within which they were developed, they become distorted. We need to attend to the context of *Creative Evolution* in Bergson's oeuvre in order to grasp the guiding principles of his encounter with evolution, but we also need to attend to the context of evolution theories around the turn of the last century in order to see how those principles both guide and respond to the evidence of the biological sciences. The latter task is slightly more complicated, because the mechanistic biology

that Bergson forcefully opposes in *Creative Evolution* (he places himself closer to teleology and to vitalism, though with important qualifications) not only still dominates biology today, but is far better established than it was in 1907, particularly in view of its technological applications. Thus Bergson's critique of neo-Darwinism finds renewed relevance, but also a more powerful opponent, in modern genetics.

What was the scientific context of *Creative Evolution*, then? When thinking of the evolutionary biology of the late nineteenth and early twentieth centuries, it is Darwinism that immediately springs to mind, but certain revisionist histories have recently documented how "the early phase of Darwinism represented support for the general idea of evolution, not for the theory of natural selection" (Bowler 1983: *x*). Indeed, already in *Evolution: The Modern Synthesis* (1942) Julian Huxley had claimed that the arrival of Mendelian genetics saw Darwinism emerge from a crisis in which many biologists had turned their backs on natural selection. Bergson was by no means alone in challenging this Darwinian mechanism. Besides natural selection, a number of evolution theories—Lamarckism, orthogenesis, mutation theory and theistic evolution—were all taken seriously around 1900. Bergson's creative evolution contains elements of all these, and can by no means be simply categorised under "vitalism." Among these elements are the following: (1) Like Darwin, Bergson accepts natural selection as an explanation of extinction but not of evolutionary change; (2) Like Lamarck, he characterizes evolution by a certain effort of the same kind as consciousness, but this is the creative effort of life itself, broader than the individual efforts that lead to use-inheritance in Lamarckism; (3) Like Eimer, he describes life as following certain definite directions, but the directions of orthogenesis are given in advance, while for Bergson these directions create themselves in an unpredictable way; and (4) Like de Vries, he accepts that evolution proceeds through sudden mutations, although for Bergson these are creative changes, and not conceived mechanistically.

Bergson does not only engage with evolutionary debates at a theoretical level, however, but through a close consideration of laboratory practice. Indeed, the two are closely linked, especially in an era when biological research was becoming more and more specialized. As Peter Bowler has observed, "this fragmentation of interests allowed a polarisation of theoretical opinions, with each group favouring the theory that seemed best able to solve its own most pressing problems" (13-14). On the one hand, then, as a philosopher Bergson is able to avoid this natural bias of the specialized researcher and to take a broad view of a

range of biological evidence for evolution. On the other hand, he does of course have a commitment to the reality of time as a non-mechanistic source of creative change, and this inevitably gives him a preference for those research practices that seem to point in the direction of a creative rather than a mechanistic evolution: “embryologists and naturalists believe far less readily than physiologists in the physico-chemical character of vital actions” (CE, 23).

Hence Bergson’s treatment of biology is guided by his commitment to the priority of creative change, and this predisposes him to favor certain directions in scientific research over others. His principle of creative change is developed in response to the observation that life creates through *dissociation*, (as in cell division, in speciation, or in the division of labor in the higher organisms). This quality was not emphasized in Bergson’s work on psychology, but he would have come across it again and again in his readings in biology. We could say, then, that while the concept of *duration* as creative change to some extent governs Bergson’s approach to biology, the concept of *élan vital* as a movement of differentiation is to some extent a response to biology.

The “Creative Evolution” Project

Let us briefly consider just what Bergson hoped to achieve through *Creative Evolution*, how he himself conceived the book, and in broader terms, how he conceived the task of philosophy in relation to a science like biology. From his introduction:

A philosophy of this kind will not be made in a day. Unlike the philosophical systems properly so called, each of which was the work of an individual man of genius and sprang up as a whole, to be taken or left, it will only be built up by the collective and progressive effort of many thinkers, of many observers also, completing, correcting and improving one another. (CE, xxxviii; compare to *ibid.*, 123-124, to ME, 4 and to CM, 44)

Bergson rejects “the exaggerated confidence of philosophy in the powers of the individual mind” (CE, 123) and adopts instead a communal, research-based approach to philosophy more akin to that of science. *Creative Evolution* is not intended to establish universal “truths” that would underpin the empirical work of biology, and even though Bergson often refers to his philosophy as “metaphysics,” it is clear that in the context of the creative evolution project this metaphysics has quite a different meaning (and a different relation to science) from the kind of abstract speculation that would claim to discover a reality beyond the reach of science. One of Bergson’s problems with traditional metaphysics

is that it achieves a completeness of explanation at the price of its "truth."² Indeed, Bergson was acutely aware (in the era of positivism, we may note) that any such "truths" are constructed from a historically contingent perspective, and his metaphysics is better understood as a pragmatic metaphysics that, through an awareness of its own contingency, is able to mitigate the realism of the sciences.

In "Truth and Reality" (1911), the preface that Bergson wrote for the French translation of William James's *Pragmatism*, this theme is developed in a way that can usefully illuminate for us the pragmatic nature of *Creative Evolution* as a research project. To steal Bergson's analogy, the nature of evolution is not waiting to be discovered as America was waiting for Christopher Columbus. Bergson identifies in science and in philosophy "a natural tendency to have truth look backward" (CM, 215), a tendency to believe that truth corresponds to an already existing reality, as if the mechanism of evolution had been hidden from view and was, at the right time, for the right person, uncovered. On the contrary, for Bergson, as for James, truth looks ahead: "while for other doctrines a new truth is a discovery, for pragmatism it is an invention... we invent the truth to utilise reality, as we create mechanical devices to utilise the forces of nature" (CM, 215). The analogy with machinery that Bergson uses here is not a casual one. Within Bergson's oeuvre, *Creative Evolution* is the first instance of what would become a central theme in his later work: the detrimental influence of the demands of technology on scientific research, and hence on the overall state of human knowledge.

However, that truths are created by us does not mean that they are *solely* created by us. Alongside their contingency upon human invention, truths have their roots in "currents" (CM, 217) that are not created by us, in what Bergson elsewhere calls "articulations of the real" (in the essay "Life and Consciousness" of 1911: ME, 4). Scientific research, then, in principle if not always in fact, is a creation and not a discovery of facts. Whether it offers us knowledge of things or rather simply develops ways of acting on them is to be answered with reference to the degree to which research follows real articulations:

I believe we must establish between the truths of feeling and the scientific truths the same kind of difference as there is, for example, between the sail-boat and the steamer: both are human inventions; but the first makes only slight use of artificial means – it takes the direction of the wind and makes the natural force it utilises perceptible to the eye; on the contrary, in the second the artificial mechanism holds the most important place; it covers the force it puts into play and assigns to it a direction which we ourselves have chosen. (CM, 217-218)

While science moves full steam ahead with the invention of new ways of acting on materials, philosophy can remind it that invention is not explanation, certainly not discovery, and that it in fact actively constitutes its object of study in a certain way (there are strong parallels between Bergson's pragmatic conception of truth and Heidegger's conception of truth as unconcealment). Indeed, the incisions science makes can actually obscure the real articulations of evolution. In relation to science, then, philosophy, for Bergson, is not a mere commentary on or interpretation of facts; it is the reintegration of facts in real processes. Hence, Bergson conceives of a methodological partnership between science and philosophy in which the two can correct and advance each other: adherence to the facts keeps philosophy from abstract speculation; awareness that facts are to a certain extent inventions keeps science from dogmatic realism. In this relationship, science and philosophy together can steer a pragmatic and creative course between the extremes of idealism and materialism.

Time and Scientific Research

Bergson's emphasis on the genesis of scientific facts rather than on the facts themselves provides a link to his work on psychology, where he focuses on the way in which we can escape the habits that come to overdetermine each new experience in terms of the old. Let us see how his critique of science and his psychology come together in the context of his philosophy of time. Speaking as a former mathematician himself, Bergson describes his first and most fundamental philosophical insight as the realization that time eludes mathematical treatment—a realization he recounts in the 1922 essay "The Retrograde Movement of the True Growth of Truth":

I was very much struck to see how real time, which plays the leading part in any philosophy of evolution, eludes mathematical treatment. Its essence being to flow, not one of its parts is still there when another part comes along. Superposition of one part on another with measurement in view is therefore impossible, unimaginable, inconceivable. (CM, 12)

It is telling that for Bergson, mathematics does not only pertain to measurement (although numerical knowledge is of course the paradigm of mathematical knowledge), but also to the way in which knowledge is apprehended in experience—in this case through a superposition of one part on another. In his 1935-36 lecture course "Basic Questions of Metaphysics," Martin Heidegger provides an analysis of the etymological origins of mathematics (*mathesis*), emphasizing that the term has broader connotations than strictly numerical measurement and calculation. In

terms that complement Bergson's, Heidegger shows how mathematics pertains to our experience of things generally, being a mode of knowledge in which we apprehend about things only what we are already predisposed to know them to be in advance. It is the essence of the mathematical view of things to filter out of every new experience those aspects that are irreducible to the already known. In Bergson's metaphysics this means to filter out the real creative action of time and know it only through a schematic superposition of parts.

In *Matter and Memory* Bergson describes how motor mechanisms are set up to respond immediately to generic types of stimulus. It is not only mathematicians who measure time, reducing it to a calculable form that does not reflect real creative efficacy. This reduction is played out in everyday life when a new event is experienced minimally, overdetermined by a habitual reaction. For Bergson the natural bent of the human intellect is to parcel out the reality that flows into segments that may be weighed and measured. Only in this way can we take a firm grasp of the moving reality, in order to find in it a fulcrum for our activity and satisfy the vital needs of the organism. We are by nature mathematicians, because we are by nature industrious, and the sciences, insofar as they proceed mathematically, merely continue the natural direction of the intellect, bringing it to a state of extreme precision.

In *Creative Evolution* Bergson explains the fundamental inability of our intellect to comprehend the real nature of evolution with reference to the intellect's place in evolution. The intellect is "created by life, in definite circumstances, to act on definite things" and Bergson is sensitive to the contradictions of attempting to use it to "embrace life, of which it is only an emanation or an aspect" (CE, xxxv). However, the major difficulty lies in the specific nature of intellect as "an appendage of the faculty of acting" which as such is designed "to think matter" (*ibid.*). This means that the intellect "is incapable of presenting the true nature of life" (*ibid.*). To think matter means to regard reality as divisible into parts, among which the function of the intellect is to establish relations: "it makes us consider every actual form of things, even the form of natural things, as artificial and provisional; it makes our thought efface from the object perceived, even though organised and living, the lines that outwardly mark its inward structure" (*ibid.*, 101). Natural form is effaced by the intellectual function of regarding all matter as arbitrarily divisible.³

The critique of the biological sciences, then, is a complex issue, for it is the way in which evolution is constituted as an object of study for certain researchers (primarily mechanistically minded ones) that is really

in question. In this sense, Bergson's "superior empiricism" resists a scientific realism regarding the actual object of study, affirming instead the virtuality of the object – the fact that it is always *actualized* in relation to the researcher, who can treat it more or less mathematically. As Bergson would later say (in his 1922 essay, "The Stating of Problems") if we are to avoid conceptually reducing living organisms to their physico-chemical material, we must continually appeal from the *esprit géométrique* to the *esprit de finesse*.

Bergson's Opposition to Mechanism

It is this scientific realism regarding the facts of biology that lies at the heart of Bergson's critique of mechanism. In such a view, time is useless, unreal—a mere measurement: "the essence of mechanical explanation is to regard the future and the past as calculable functions of the present, and thus to claim that *all is given*" (CE, 24). Hence, when mechanism treats parts artificially isolated from the real process of evolution, it does not treat real parts at all, but partial views of reality. What this leads to, for Bergson, is a futile effort to reconstruct evolution from fragments of the evolved. In this, mechanism betrays its intellectual origins:

Mechanism... 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.* (CE, 58)

Bergson uses the example of the evolution of the eye to address his critique of mechanism to Darwinism. As Bergson reads Darwin, the eye is held to be the result of an accumulation of insensible variations. How could this be the case? If the elements of the eye are not in themselves of any use how would they survive natural selection in order to wait for the other elements to evolve? And if the variations are random, how does an eye of similar structure develop in lines as different as vertebrates and mollusks? For Bergson, these questions are insoluble because they are badly posed in terms of "parts" of the eye, which we can divide in retrospect but which were not produced by a process of association.

We have seen how Bergson locates the essence of this mechanistic view in a specific type of intellectual experience. In the history of systems of thought that takes up much of chapter four of *Creative Evolution*, Bergson also accounts for the specific form this mechanistic view took in biology. The fact that biology is a young science was of great importance for Bergson (he would make the same point about psychology), for it had to develop the methods and principles of the investigation of life within a

scientific context whose presuppositions had been formed during the long history of the mathematical and later physical sciences.

It is important to note that Bergson is not opposed to mechanism in itself, which in its treatment of unorganized matter is unproblematic. The error of mechanism lies in the idea that one and the same science holds good for all kinds of reality. This Bergson calls "radical mechanism," and his opposition to it is that it "implies a metaphysic in which the totality of the real is postulated complete in eternity, and in which the apparent duration of things expresses only the infirmity of a mind that cannot know everything at once" (CE, 25). It is not the mechanistic viewpoint but its extension beyond matter to life that Bergson criticizes, because it is only when mechanism believes that it can treat organized as well as unorganized matter that it falls into error. It is precisely because intellect has evolved as an appendage of action and not as a faculty of representation that it can be illusory insofar as its view of life is concerned, but can still work insofar as its treatment of matter is concerned. Mechanism grasps reality, but only as material for organization. Material that is also living, and so organized internally, escapes it. Mechanism becomes "less and less objective, more and more symbolical, to the extent that it goes from the physical to the vital" (CE, 229). What, then, is the difference between life and matter? What is the cause of the inner organization of organisms that mechanism cannot grasp, if it is not material? In short, where does *Creative Evolution* fit into a history of vitalism in biology?

Élan Vital and Vitalism

Running through all of Bergson's work is a critique of materialism—whether it is psychology's reduction of the mind to brain activity, or biology's reduction of life to its physical and chemical components. However, also running through his work is the refusal to accept any metaphysical explanations that would appeal to an immaterial cause of life or consciousness. That is to say, Bergson is not a spiritualist, nor is he a vitalist, in any traditional sense (although he has been called both). Bergson's concept of *élan vital* is, then, significantly different from the vitalism that we find in the history of biology. Indeed, vitalism in one form or another has been around as long as the distinction between the inorganic and the organic: its essence is the irreducibility of the latter to the former. As Ernst Mayr has said:

It would be ahistorical to ridicule vitalists. When one reads the writings of one of the leading vitalists like Dreisch one is forced to agree with him that many of the basic problems of biology simply

cannot be solved by a philosophy as that of Descartes, in which the organism is simply considered as a machine... The logic of the vitalists was impeccable, but all their efforts to find a scientific answer to all the so-called vitalistic phenomena were failures. (*The Walter Arndt Lecture: The Autonomy of Biology*, 2002)

Certainly, Bergson's critique of mechanism is compatible with this critical side of vitalism, insofar as both hold that organic processes are not explicable in exclusively physicochemical terms, nor are they exclusively determined by the action of physicochemical forces. There is, for Bergson and for vitalism, a fundamental irreducibility of life to matter. However, Bergson does not go so far as traditional vitalism in the affirmation of a vital principle distinct from physicochemical forces. In order to grasp this difference, between the metaphysical principles of traditional vitalism on the one hand and those of Bergson's *élan vital* on the other, it is necessary, as Bergson says in *Creative Evolution* and in *The Two Sources of Morality and Religion*, to grasp the *empirical* nature of his concept. What is the empirical aspect of this *élan vital* concept, then, and how can it allow us to distinguish Bergson's metaphysics from that of vitalism? Again, we seem closer to epistemology than to metaphysics.

As we have said, it is not Bergson's concern to verify or refute the results of positive science, but to investigate how those results are constituted for a given research practice. Now, this is exactly what traditional vitalism does not do. It accepts the physical and chemical facts of life as received from the hand of the mechanist, while claiming that there are also other kinds of facts that do not admit of mechanistic treatment, of which the mechanist is therefore unaware, and without which the mechanistic explanation of life is incomplete. Now, Bergson does not designate a type of immaterial force in addition to material forces. *Élan vital*, on the contrary, designates the vitality of matter itself, its organization, its growth, its indeterminacy, unpredictability and creativity, and this is inaccessible to mechanism in principle, not merely in fact.

We can distinguish Bergson's *élan vital* from other "vital principles" in the following way: for vitalism there is a life force that is irreducible to known material forces, forming a metaphysical dualism. For Bergson, on the other hand, there is a thinking of life (as creative evolution, the *action* of the universe) that cannot take place in the same terms as a thinking of matter (as mechanistic, determined and isolable). *Élan vital*, then, does not simply signify a force different in kind to material forces. It signifies a force different in kind to *matter conceived mechanistically or deterministically*, and this "force" is nothing more than that very same

matter conceived intuitively: as active, as creative, as itself vital – the very qualities that a mechanistic materialism effaces when it isolates superposable parts and treats as quantifiable and repeatable what is really continuous qualitative change. *Élan vital* as the organization of matter neither implies nor requires the action of an immaterial agent; it requires the conception of matter *as* agency.

Morality and Religion

Creative Evolution stood as a foundational work for Bergson's subsequent philosophy, particularly in his turn to questions of religion, morality and society in *The Two Sources of Morality and Religion*. In *Creative Evolution* Bergson describes two sources of evolution: first "the resistance life meets from inert matter" and second "the explosive force—due to an unstable balance of tendencies—which life bears within itself" (CE, 64). Like Bergson's other dualisms, life and inert matter are "ideal limits." They are literally ideas, necessary to think a reality that is always a mixture of the two—that is, therefore, *living* matter. In *Creative Evolution* the partnership between life and matter is worked out in terms of a logic of organization. In this term "organization" there is a tension between two meanings. The word should be taken as a verb (the act of organizing) and as a noun (a certain arrangement of things). The active side is attributed to life, while the conservative side is attributed to matter.⁴ This logic of organization gives us a volatile image of reality, one whose "laws" Bergson describes in terms of dichotomy and frenzy at the end of *The Two Sources of Morality and Religion*.

The two types of organization that Bergson focuses on in *Creative Evolution*, the social and the individual, provide the context for his whole analysis of morality and religion. Describing how evolution proceeds by dissociation, Bergson sees in the evolution of animal life the gradual dissociation of two main lines. One is organized primarily at the social level, and reaches its highest point in the social insects—ants, bees, wasps, termites. The other is organized primarily at the individual level and reaches its highest point in humans. There is another tension within the term "organisation" between activity and passivity. A being both organizes (its environment) and is organized (biologically). The interplay between activity and passivity is a key theme of Bergson's philosophy of life: freedom within necessity, the organized being's ability to organize, the re-emergence of creative change through the structures that it creates. The difference between the social insects and humans, then, is not only that organization takes place primarily at a different level, more

importantly it reveals that at the social level organization is primarily done to organisms (they are organized), while at the individual level it is primarily done through them (they organize). Bergson often comments on the automatism and unconsciousness of the individual ant, riveted to its task by its structure, and compares the polymorphous insect society to a single organism with differentiated functions. In humans, on the other hand, while there is still a real social organization, which gives a certain necessity to social life, there is a latitude given to the individual to organize through a free will that the ant lacks. Hence society is necessary, but the form it takes is contingent upon the history of free individual actions.

This freedom within necessity of the individual in society is the context within which Bergson's account of morality and religion is developed. There is a delicate balance required if life is to progress through matter, if the individual is to progress through society. Too much creativity, too much freedom, and the identity of the organization within its environment is threatened; it may unravel. Too much necessity, too much structure, and an organization may close upon itself and practically cease to grow and change (Bergson points to numerous dead ends of evolution, not through extinction, but through a loss of the impetus to change, and to dead ends of culture, where the creative potential of humans is bound up in overbearing customs, traditions or laws). Hence "obligation" and "fabulation," the aspects of morality and religion that tend towards stasis, function to preserve social unity by repressing individuality. This is necessary, for Bergson, because of certain dangers that attend the evolution of the intellect as the dominant form of human consciousness:

[The intellect] enables the individual to invent, and society to progress. But if society is to progress it must first of all be able to maintain itself. Invention means initiative, and an appeal to individual initiative straightaway involves the risk of endangering social discipline. (TS, 121)

Hence, while in principle intellect works for the good of society, in fact "intelligence would counsel egoism first" (*ibid.*, 122). With their emphasis on discipline, prohibition and responsibility, Bergson describes both (closed) morality and (static) religion as having their common origin in custom. If this controlling function is necessary to prevent society unravelling, however, a creative function is also necessary if it is to progress.

The theme of life's re-emergence is first worked out in *Creative Evolution*, where it is the human capacity for free creative activity that

reveals the significance of evolution, both in the sense that it is life's highest achievement, and in that it indicates the creativity of life itself. In his account of dynamic religion in *The Two Sources of Morality and Religion*, Bergson regards mystical experience, in particular Christian love, as significant. It is important to note though that dynamic religion is not transcendent to static religion. The mystic operates as the dynamism of religion, and religion, thus energized, is in turn the dynamism of human culture. While the mystic has essentially the same experience of reality through intuition as does the philosopher, the material structure of religion is so much more extensive than that of philosophy that the mystic's effect on society will be greater. For Bergson, it is essential as a corrective to the effect of science on society, which, through industrial technology, has given us a power of action that outstrips our knowledge of reality. As Bergson says, we do not have a soul that is equal to the vast body, the vast power of action that technology has given us. This brings us back to biology, and its contemporary status in light of genetic technology.

Creative Evolution Today: Biology, Ecology, Complexity

While the biology of the last century has by no means taken an exclusively mechanistic or deterministic view of life (both ecology and complexity theories of biology repeat many of the central components of Bergson's view in a new scientific context), histories of biology have nevertheless tended to be histories of the development of a mechanistic science, in which alternative views such as Bergson's are often effaced. For this very reason, we must not limit our treatment of *Creative Evolution* to its reinstatement in a revisionist history of biology—one that allocates to Bergson's text a place of merely historical interest alongside other late nineteenth-century alternatives to neo-Darwinism. Nor, however, should we claim to reinstate *Creative Evolution* as a canonical text for other directions (such as ecology and complexity theory) that philosophy and biology have taken in the century that separates us from its publication. While it is true that people like Brian Goodwin are aware of Bergson's work and appreciative of the strong parallels his thought has with complexity theory, *Creative Evolution* is not a key text in the development of these directions, and there would be little point in celebrating it for merely "foreshadowing" them. More relevant (and closer to the spirit of Bergson's philosophy) is the appropriation of *Creative Evolution* for contemporary problems in biology, and it is in this sense that it remains an essential resource. Biologist Steven Rose has recently stated the need

for resources exactly like this. In the preface to *Lifelines* he describes how his project to establish a perspective on biology that transcends genetic reductionism made it necessary to “draw upon those powerful alternative traditions in biology which have refused to be swept along by the ultra-Darwinist tide into accepting that living processes can be reduced to mere assemblages of molecules driven by the selfish urges of the genes to make copies of themselves” (Rose, *xii*). For Rose, Bergson (along with Georges Cuvier, Étienne Geoffroy Saint-Hilaire and Hans Dreisch) is part of “an alternative, almost underground non-reductionist tradition in biology [whose] voices were and still are drowned out by an almost universal reductionist consensus which insists that, whatever the theoretical critique, reductionism works” (*ibid.*, 78-79).

The relation between time and genetics raises an obvious question: if time is fundamental, then why is genetics the dominant paradigm? Why does genetic research get more funding and academic attention than research into temporal rhythms of life? This brings us back to the detrimental influence of technological requirements on scientific research. Bergson reminds us again and again that research is not undertaken in the spirit of understanding, but in the spirit of control. The understanding is not free to speculate just for the sheer joy of knowledge. It is at the service of life, and life demands we take a utilitarian disposition towards the world. The gene is what our intellect and our technology can get a grip on. Time slips through our fingers. The gene can be cut out of its temporal rhythm without doing it too much damage, and stitched back in somewhere else, with occasionally useful results. It is easy to think of the gene as the only reality.

However, it is not enough to apply Bergson’s theory that scientific facts are static viewpoints on a dynamic reality to genetics; this must be demonstrated by a careful interpretation of the latest research. In this respect, the work of biologist Brian Goodwin can act as a rigorous demonstration of the relevance of Bergson’s critique of neo-Darwinism to modern genetics. In *The Evolution of Complexity*, Goodwin describes how scientific realism survived the shift from the Darwinism Bergson criticized to modern genetics:

Organisms have been replaced by genes and their products as the basic elements of biological reality... There is no lack of highly persuasive books whose objective is to demonstrate why organisms are not what they seem to be—integrated entities with lives and natures of their own—but complex molecular machines controlled by the genes carried within them... It is the absence of any theory of organisms as distinctive entities in their own right, with a characteristic type of dynamic order and organisation, that has

resulted in their disappearance from the basic conceptual structure of modern biology. (ix-x)

If we are to avoid genetic determinism, and answer the questions that it cannot, we need a theory that accounts for the dynamic organization of an organism in a way that re-integrates it in its real environment. Bergson answered the same need in response to neo-Darwinism. For Goodwin, it is complexity theory that is able to address "the problem of emergent order in evolution, the origins of novel structures in organisms" (xi). For Bergson, life is constituted as a relative stability within a reality of volatile tendencies; for Goodwin "a particularly striking property of these complex systems is that even chaotic behaviour at one level of activity, molecules or cells or organisms, can give rise to distinctive order at the next level, morphology and behaviour" (xi). Evolution is not here the realization of a genetic program, but a dynamic process of emergent order that Goodwin calls morphogenesis, "in which genes play a significant but limited role" (xiii). It is a theory that, like Bergson's, includes the facts of scientific realism in a broader appreciation of the generative process that is their true context. As Goodwin says:

Once this is included in an extended view of the living process, the focus shifts from inheritance and natural selection to creative emergence as the central quality of the evolutionary process... Inheritance and natural selection continue to play significant roles in this expanded biology, but they become parts of a more comprehensive dynamical theory of life which is focussed on the dynamics of emergent processes. (xiii)

Goodwin develops an ethical implication of a creative or dynamic evolution that remains merely implicit in Bergson's work. In his essay "From Control to Participation via a Science of Qualities," Goodwin has argued that emergent systems have qualities such as health, that are in no sense "secondary" to the quantities usually observed by science. They are properties that pertain to the whole system, and cannot be explained in terms of the properties or interaction of its parts. The understanding of the qualitative nature of organisms brings with it, for Goodwin, a responsibility not to violate those natures. In this sense, genetics is not wrong, but inappropriate. In realizing the subtlety of natural processes, we should surely learn to be subtle in our engagements with them. To maintain an exploitative relation to life (Goodwin uses the example of genetic alteration of animals for food, a practice that is detrimental to the health of both the animals and the consumers) is to make ourselves sick and alienated from our ecological roots. In Bergson's terms, such behavior is unphilosophical, as it is utilitarian and operates in ignorance of real

articulations (as Goodwin would say, it is control rather than participation,) but Bergson does not go so far as to say that it is unethical. In Goodwin, we find an ethical theory based on appropriate participation, indicating to us the direction in which a Bergsonian ethics could be developed.

The Bergson scholar and environmentalist Pete Gunter has developed Bergson's evolutionary theory in exactly this direction. For Gunter, Bergson "locates man squarely *in* nature and stresses man's kinship to all living creatures" (168). Certainly, there is an implicit ecology at the very center of Bergson's biology. Bergson insisted that the divergent lines of evolution are mutually complementary. Rather than analogy, there is a real sympathy between them. Bergson's model of evolution as the differentiation of a common impetus clearly emphasizes the importance of studying the evolution of ecosystems as well as individual species. The concept of divergent tendencies within a single evolutionary process means that all evolution, in principle, is symbiotic. This places ecology at the very heart of biology, essentially so. In this context, Gunter develops Bergson's epistemological point regarding scientific practice, suggesting that intuition presupposes environmentalism. For Bergson, intellectual analysis misconstrues a reality that intuition can recapture. Intuition is depicted by Bergson as knowledge from the inside rather than the outside. Having an intuition of something is, then, being something as opposed to being towards something. How are we to understand this? Of course, it cannot mean that to do entomology properly, for example, we have to be insects. Recalling that for Bergson, the apprehension of real processes as discrete parts is a misrepresentation, intuition of living things requires the experience, from the inside, of life itself *before its differentiation into discrete things*. This does not mean that we experience life as undifferentiated, for it is not. It means that we experience it as differentiation, that we apprehend its real articulations, and grasp, at the same time, the nature of the participation of all creatures in their co-evolution. Again, the implication for scientific practice is that in order to grasp the reality of life and evolution, a shift in perspective is necessary, from control to participation. However, Gunter also reminds us of an important fact: while intuition can take us beyond the conceptual prejudice that we have, it cannot take us beyond the perceptual prejudice that we are, and upon which the former is based. For Bergson, the utilitarian intellect dominates human action, and the shift towards participation that is taking place in the contemporary sciences, through the work of people like Gunter and Goodwin, requires the same effort—

one of going against the natural direction of the intellect to control and predict—that Bergson always stressed was necessary to intuition.

Creative Evolution is only now receiving the attention it deserves. More than any other work in the philosophy of science, this text is predominantly understood *in light of what came after it*. This is not to say merely that we interpret it in retrospect, but that the philosophical community has had a century to acclimatize itself to the scientific worldview that Bergson recognized at its inception. *Creative Evolution* stands as a lesson in how philosophy can accompany—rather than follow—science, and how both disciplines gain from this partnership. Today, more than ever, the guidance that a philosophy of life can offer to science could be of the utmost importance. Complexity theories of biology and evolution can only operate through the recognition of life (the real efficacy of the temporal in organisms); ecological theories can only operate through the recognition of sympathy between organisms. Both these approaches were developed by Bergson at a time when biological science on the whole could only operate by treating organisms as raw material. Let us say, then, not only that science has caught up with Bergson, but that the most challenging and important sciences—those that indicate to us the future directions of human enterprise, away from control and towards participation, away from exploitation and towards sustainability—are only now catching up with Bergson, and are only now embarking on the path that he pointed out a century ago in *Creative Evolution*, a path that he had seen indicated in the evolutionary biology of the late nineteenth century.

University of Warwick

Abbreviations Used

CM	<i>The Creative Mind</i>
CE	<i>Creative Evolution</i>
ME	<i>Mind-Energy</i>
MM	<i>Matter and Memory</i>
TS	<i>The Two Sources of Morality and Religion</i>

Works Cited

- Bergson, Henri. *Creative Evolution* [*L'évolution créatrice*, 1907]. Trans. A. Mitchell, ed. K. Ansell Pearson, M. Kolkman, and M. Vaughan. Basingstoke: Palgrave Macmillan, 2007 [CE].
- . *The Creative Mind: an Introduction to Metaphysics*. [*La Pensée et le mouvant*, 1934]. New York: Citadel Press, 1946 [CM].
- . *Matter and Memory*. [*Matière et mémoire*, 1896]. London: Zone Books, 1988 [MM].

- —. *Mind-Energy*. [*L'Energie spirituelle*, 1919]. London: Palgrave Macmillan, 2007 [ME].
- —. *The Two Sources of Morality and Religion*. Notre Dame, Indiana: University of Notre Dame Press, 1977 [TS].
- Bowler, Peter. *The Eclipse of Darwinism*. Baltimore, Maryland: John Hopkins University Press, 1983.
- Goodwin, Brian. *How the Leopard Changed its Spots: The Evolution of Complexity*. London: Phoenix, 1994.
- Gunter, P.A.Y. "Bergson and the War against Nature" in John Mullarkey (ed.), *The New Bergson*. Manchester: Manchester University Press, 1999.
- Heidegger, Martin. *What is a Thing?* [*Die Frage nach dem Ding*, 1935-36] Trans. W.B. Barton, Jr., and Vera Deutsche. Chicago: Henry Regnery Co., 1967.
- Mayr, Ernst. *The Walter Arndt Lecture: The Autonomy of Biology, 2002*. (http://www.biologie.uni-hamburg.de/b-online/e01_2/autonomy.htm)
- Rose, Steven. *Lifelines: Life Beyond the Gene*. Oxford: Oxford University Press, 1997.
- Waldrop, Mitchell. *Complexity: The Emerging Science at the Edge of Order and Chaos*. Harmondsworth: Penguin, 1992.

Notes

1. Nor can one find any clues to the direction of his future research in his teaching at the Collège de France during this period. True, his lecture course of 1903-04 is listed as "l'Evolution des théories de la mémoire" in the archives of the Collège de France, but it is also listed as "l'Histoire des théories de la mémoire" in the course summary published in the *Revue de Philosophie*, and this suggests that even this close to the publication of *Creative Evolution*, Bergson used the word "evolution" metaphorically in place of the word "history" (as was the vogue at the time), rather than in any substantial sense. The same can no doubt be said for the lecture course of 1904-05 "l'Evolution du problème de la liberté." Indeed, the very topics of *liberté* and *mémoire* suggest that in his teaching, Bergson looked back to his previous work, rather than forward to *Creative Evolution*.
2. In the 1922 essay "The Stating of Problems," Bergson gives the example of Plato's treatment of the question of the immortality of the soul. Based on his definition of the soul as one and simple, Plato is able to conclude that it cannot be dissolved and therefore must be immortal. As Bergson points out, though, this conclusion only holds good if we accept the definition: it is hypothetical. (See CM, 46)
3. We will see later how Bergson's connection of the intellect with practical action contains the germ of an ethics that is being developed in certain areas of contemporary science. Bergson goes so far as to characterize the intellect as having an "unlimited power of decomposing according to any law and recomposing according to any system" (CE, 101). The only contact it is capable of having with a living being is to treat it like an object: "it does what it can, it resolves the organised into the unorganised" (*ibid.*, 104). The intuitive knowledge of an organism implicitly contains the necessity of a non-exploitative relationship to it.
4. We can note here the remarkable similarity of Bergson's cosmology to complexity theory. To note just two points; first, there is the focus on an immanent and spontaneous self-organization that has to have enough stability to sustain itself as a differentiated entity (whatever that may be—a person, a business, a species, a society) within an environment, as well as enough creativity to self-organize or differentiate itself in the first place; second, there is also the applicability of this kind of model to any organization, as in the list above it could be biological, social, economic, etc. (See Waldrop, 11-12.)