

*Articoli/8*

## ***Bergson, Materialization, and the Peculiar Nature of Space***

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It is often assumed that Bergson's intuition is a dead end: much goes into it, but nothing comes out of it. In this article I attempt to show that this is not so. Intuition is understood by him as containing noetic content (ideas, notions) which can be developed in the sciences and elsewhere. In this article there is an effort to show how his notions of variable lived space and the dynamic character of physical matter could lead, for example, to theories of fractal dimension and theories of the creation and expansion of matter. Bergsonian intuition can never be the simple acceptance of our ordinary ideas as we customarily think them. It involves two gestalt shifts: one that takes us from our ordinary spatial concepts to a fundamental dynamic insight, a second shift which takes us from the insight to a new approach to the world. One is made to leave the cave and then, newly enlightened, to return to it.

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This essay purports to establish three things. First, that Bergson's fundamental discovery, duration, is far from being a vague and formless flux. It has structure whose parts and relations can be distinguished and understood. That structure is qualitative and dynamic, like heard music. But it is structure nonetheless. Second, that duration can be shown to have 'dimensions' or fundamental extents. In the first part of this essay, horizontal and vertical dimensions are examined and clarified. Later in the essay a third, 'lateral', dimension is explored. Taken together these three dimensions make it possible to make sense of a concept found everywhere in Bergson's thought, but has seldom been thought through in its basic structure: the concept of materialization. It will be possible both to spell out the different modes of materialization and to distinguish them into three kinds.

The third point is perhaps surprising. Bergson's notions of hierarchies of durations and of durational materialization led him to two significant discoveries (perhaps one should say premonitions): the concept of a dynamic (big bang) cosmology, and a notion of extensity which prefigures current ideas of fractal dimension.

It is often argued that ‘philosophy bakes no bread’. Bergson provides a counterexample. His philosophical method made it possible for him to suggest genuinely new and applicable ideas.

## 1. Duration Versus Space

The most basic idea of Bergson’s philosophy – duration – is summed up in *Time and Free Will* (1890):

What is duration within us? A qualitative multiplicity with no likeness to number; an organic evolution which is not yet an increasing quantity<sup>1</sup>.

Out there in the world things are very different:

What duration is there existing outside us? The present only, or, if we prefer the expression, simultaneity<sup>2</sup>.

The inner self, dynamic and unbroken, is a continuous flow. It grounds our spontaneity, forms the basis for our creative acts. The outer world, in dramatic contrast, is frozen. Made up of timeless instants, it does not flow. It is static.

Bergson’s inner duration is the cornerstone of his concept of freedom.

[...] the process of our free activity goes on, as it were, unknown to ourselves, in the obscure depths of our consciousness at every moment of duration, that the very feeling of duration comes from this source, and that without this heterogenous and continuous duration, in which our self evolves, there would be no moral crisis<sup>3</sup>.

He adds that the free act arises only in such crises, which are rare<sup>4</sup>. Bergson’s thought may be understood as an attempt to explore the fundamental features of duration. He defends it against efforts to spatialize, fragment, or otherwise ‘freeze’ it. He persists in deepening and more adequately exploring its structure.

Many have applauded Bergson’s descriptions of freedom and of the stream of consciousness. But in his first book, these are accompanied by significant problems. How is it possible for our inner freedom to affect the extended body given that it (i.e. freedom) is outside of space<sup>5</sup> and that space and its contents are static? How can the dynamic inner self, on this theory, relate to the static outer world at all? How, for example, can we perceive it?

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<sup>1</sup> H. Bergson, *Time and Free Will*, translated by F. L. Pogson, London 1950, p. 226. All future reference to this work will be cited as TFW.

<sup>2</sup> TFW 227.

<sup>3</sup> TFW 237-238n.

<sup>4</sup> TFW 167, 231, 240.

<sup>5</sup> TFW 21.

Those familiar with the history of philosophy will recognize Bergson's problem here as closely analogous to that of René Descartes. Descartes argued that mind and body are two substances whose essences are radically distinct. The mind's essence is to think; the body's essence is to be extended. Unfortunately, Descartes could find no fundamental character or essence to connect them. Bergson, similarly, holds that the self is a process and the world is a static geometrical array. For him, as for Descartes, the self and the world are entirely incompatible. The difference between the two is that the 'mind-world' (not merely 'mind-body') problem is now stated by Bergson in temporal terminology, and not in terms of the metaphysical concept of substance, as with Descartes. But the difficulty remains. How can the two sides of his new dualism, process and static geometry, ever be brought into some understandable relation?

An equally significant problem, but less evident, involves the structure of duration. Duration is described in *Time and Free Will* as dynamic, continuous, and qualitative, in contrast to the static character of mathematical space. Yet no account is given of the characteristics of different moments of duration in their relation to each other, however complex these relations may be. This is not only because in his first work he has focused only on the present, not on the past or future. He also has not analyzed the relations of the successive moments of duration to each other, or the way in which contemporary durations overlap.

## 2. Contrasting the Breadths of Duration: Horizontal and Vertical

In *Matter and Memory* (1896) Bergson's earlier, largely amorphous stream of consciousness is transformed. More precisely, it is shown to have form<sup>6</sup>. The first such form can be termed horizontal. It involves the conjunction of present moments with their predecessors and their successors. The second is vertical.

We are not, Bergson now insists, isolated in the present. We are accompanied by the whole of our past: by what he calls «pure memory»<sup>7</sup>. Though we ordinarily disregard it, this accumulated reminiscence follows us through our daily lives. The concept of the integral survival of personal memory was picked up by Bergson's cousin, Marcel Proust, and forms the basis for his vast novel *À la Recherche du Temps Perdu*<sup>8</sup>. Reading Proust provides a vivid sense of the sheer massiveness of personal memory.

To think of duration not as an isolated 'now' but as a process including the past is to think of duration as having breadth. The idea of duration as exhibiting longer and briefer rhythms is fundamental to the argument of *Matter and*

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<sup>6</sup> H. Bergson, *Matter and Memory*, translated by N. Margaret Paul and W. Scott Palmer, London-New York 1929, p. 194. All further references to this work will be cited as MM.

<sup>7</sup> MM 167.

<sup>8</sup> Pete A. Y. Gunter, *Bergson and Proust: A Question of Influence*, in *Understanding Bergson, Understanding Modernism*, edited by P. Ardoin, S. E. Gontarski, L. Mattison, New York 2013, pp. 157-176.

*Memory*, in which there are many durations of many breadths. In his first book, Bergson writes as if all durations march to the same clock; in *Matter and Memory* there are many contrasting clocks. When these are arranged serially, one after the other, they can be said to have a horizontal dimension. When they are arranged so as to overlap each other, the longer presiding over the briefer, their dimension can be said to be vertical<sup>9</sup>.

Bergson's stream of consciousness is described by him in *Time and Free Will* as essentially continuous. Even there, however, the creativity which he describes in the free act involves a break, hence a discontinuity, with the past. (It is genuinely novel: hence the break.) In his second work, he describes duration as being given in 'rhythms' or 'tensions' which are of varying breadths and are distinguishable. This does not mean that they are to be distinguished as are points or regions in space. It does mean that they are not simply continuous and that we can readily tell one and its characteristics from another.

To deal with this matter in depth would require an extended parenthesis<sup>10</sup>. It is enough to point out here that the horizontal structure or dimension of duration for Bergson consists of varying breadths which are distinguishable, hence not simply continuous.

The vertical 'dimension' of duration is different. Here, as noted above, prolonged durations overlap the briefer, these overlap the briefer still, and these the still briefer. We are, for Bergson, more or less immanent in the world, depending on the level of duration at which we exist. When relaxed, we descend to briefer levels of duration. When more focused and self-possessed, we ascend to higher levels of duration. He states:

There are, in short, different tones of mental life, or, in other words, our psychic life may be lived at different heights, now nearer to action, now further removed from it, according to our degree of attention to life<sup>11</sup>.

Bergson terms these contrasting levels «tensions»<sup>12</sup> or «tensions of duration»<sup>13</sup>.

Ordinary language has an interesting way of expressing these distinctions. At lower levels of duration we may describe ourselves as 'spaced out' or just 'not together'. One way of characterizing being together is to say we are 'wound up'; its opposite would be to be 'strung out'<sup>14</sup>.

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<sup>9</sup>This is the author's terminology, not Bergson's.

<sup>10</sup>It would be necessary, for example, to compare Bergson's duration with the temporal notions of both William James and Alfred North Whitehead.

<sup>11</sup>MM xiv.

<sup>12</sup>MM 221, 222, 227, 238, 257.

<sup>13</sup>MM 275, 279.

<sup>14</sup>One of the interesting things about these levels of duration is the slowing down of duration at lower levels as a multitude of briefer durations succeed each other in one experience. Conversely, at higher levels, far longer durations are felt as passing more quickly. Cf. Randall E. Auxier, *In Vino Veritas*, «Southwestern Philosophy Review», XXX, 2014, 1, pp. 39-66. Professor Auxier explores alcohol's effect on the slowing-down of experience.

In stressing the vertical dimension of duration, it is necessary to add two more fundamental factors. These are (1) the approach that the briefer durations make to geometrical space and (2) their increasing plurality. That is, the phrase 'spaced out' would usually evoke a state of exhaustion. Equally, in such moments we are much less 'together', much more dispersed, than we would like to be. These two distinctions ('detension' towards space and increasing pluralization, or fragmentation) will be developed later in this essay<sup>15</sup>. However, it will help to deal first with the integral, Proustian memory mentioned above.

There are, Bergson holds, two contrasting sorts of memory. The first, spontaneous memory, occurs continually, with no particular effort, registering the moments of our lives in great detail. It is not, he argues, contained in the brain. Habit memory, by contrast, is embodied in our brain and nervous system. An example of habit memory would be the learning of the multiplication table or the spelling of a word; it is established by repetition and requires effort.

The integral or Proustian memory mentioned above is synonymous with Bergson's spontaneous memory. This notion has been adopted by contemporary psychology, which now terms it 'episodic' (sometimes 'contextual') memory. The appropriation of this Bergsonian concept and its opposite, habit memory, proved fundamental to the creation and development of today's memory science<sup>16</sup>.

### 3. Materialization

So far we have noted spontaneous or epochal memory to help make sense of the basic structures of duration. Here it will be necessary to add the concept of materialization. The example used here will be that of the materialization of memory images in perception.

Ordinarily we think that when we want to remember something we 'reach back' to recover a recollection. The opposite is true for Bergson. Rather, we assume the right attitude and the sought-for memory comes to us.

The truth is that memory does not consist in a regression from the present to the past, but, on the contrary, in a progression from the past that we place ourselves at a stroke. We start from a 'virtual state' which we lead onwards, step by step, through a series of difference *planes of consciousness*, to the goal where it is materialized in an actual perception<sup>17</sup>.

The mass of episodic memories which we carry with us are not ornaments. If memories survive,

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<sup>15</sup> These two factors in memory will be discussed later, along with the third (lateral or transverse) factor of duration in the section dealing with Bergson's theory of the creation of matter.

<sup>16</sup> Pete A. Y. Gunter, *A Tale of Two Memories: Bergson and the Rise of Memory Science*, «Mind and Matter», XI, 2013, 1, pp. 1-16.

<sup>17</sup> MM 319.

it is with a view to utility at every moment they complete our present experience, enriching it with experience already acquired<sup>18</sup>.

To take an ordinary example: personal, episodic memory reminds me of a cup of coffee and of how to grasp it. The confluence of recognition and behavioral familiarity creates my ability to know and grasp the cup. Without personal memory, we could not recognize the world around us<sup>19</sup>.

The fundamental thrust is: memory, rich with the accumulation of prior experience, flows into our present moment. Memory is a fundamental ingredient in the stream of consciousness. But memory can aid us in dealing with our physical environment, though it can also transcend this use. Memory, Bergson teaches, is fundamental to the free act:

Not only, by its memory of former experience, does this consciousness retain the past better and better, so as to organize it with the present in a newer and richer decision; but, living with an intenser life, contracting, by the memory of the immediate experience in its present duration, it becomes more capable of creating acts of which the inner determination... will pass more easily through the meshes of necessity<sup>20</sup>.

The nature of Bergsonian duration is to materialize out of the past into the present, remaking it. The past, rather than limiting us, is a condition of new and broader possibilities.

I want to apologize in advance for the following caricature. It is as if recognition consisted of a right triangle whose vertical axis represents the various levels of duration and whose horizontal axis represents the horizontal movement of time. The hypotenuse in this cartoon would be a downward escalator carrying images which, as they approach the ground floor, take on specific, ever more definitive shapes, finally arriving definite and pictorial: they are, thus, materialized.

The point of such a representation is, however, to make it clear that Bergson is dealing with specific, if dynamic and qualitative, structures. The process of materialization, which appears everywhere in his philosophy from *Matter and Memory* on, is not a fantasy. It is an understandable process resulting in definite materialized structures. But since none of these structures can step out of duration and become geometry, they will have durational characters of their own. This is particularly important when it comes to Bergson's philosophy of biology, which is rooted in the notion of biological time, which is itself a product of an evolutionary creativity.

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<sup>18</sup> MM 70.

<sup>19</sup> The major difference between Proust and Bergson is that for Bergson the past is vectored towards the future and coping behavior. For Proust the past is viable, simply, as such.

<sup>20</sup> MM 332.



#### 4. From Psychological Duration to Physical Duration

So far we have dealt, however briefly, with the horizontal and vertical structures of duration. Here we will deal again with vertical dimension: now not for its own sake, but in order to understand its lowest level: material duration, or matter. We recall that the vertical aspects of matter involve the way in which durations of different lengths 'stack', the longer extending over the briefer. It is more helpful in this respect to think not of stacking (a heavily spatial image), but of an extended melody enduring over briefer melodic forms, and these over briefer rhythms still. It is this many-level musical *Gestalt* which Bergson finds to be the precondition not only of creative acts, but of our perception of the 'outer' world.

In *An Introduction to Metaphysics* (1903) Bergson describes the vertical character of duration and its end-point: the extraordinarily brief durations (frequencies) of matter. Our awareness of our own duration, he states:

brings us into contact with a whole continuity of durations which we must try to follow, whether downwards or upwards; in both cases we can extend ourselves indefinitely by an increasingly violent effort, in both cases we transcend ourselves. In the first we advance towards a more and more attenuated duration, the pulsations of which, being rapider than ours and dividing our simple sensation, dilute its quality into quantity; at the limit would be pure repetition, that pure repetition by which we define materiality<sup>21</sup>.

This passage was written at a time when Newtonian physics was at its height. But if what Bergson is saying is true, we are going to have to change some fundamental physical notions. Matter here becomes a series of successive durations, of 'rhythms'. It is no longer an aggregate of hard, inert particles, the same at each instant. Rather, Bergson argues that matter is an «ever-renewed present»<sup>22</sup> comprised of «...*modifications, perturbations, changes of tensions of energy, and nothing else*»<sup>23</sup>. No matter how brief its pulsations, the temporality of matter is never instantaneous.

Any number of issues arise in relation to Bergson's temporalist theory of matter. That it resembles quantum physics in central respects has been widely noted and discussed. To discuss it here would be to write not an article but a long monograph. Instead I will cite physicist Louis de Broglie's essay on Bergson's theory of matter as a good introduction to this fascinating subject<sup>24</sup>. Closely allied to this issue is the question of how Bergson's theory of matter relates to

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<sup>21</sup> H. Bergson, *An Introduction to Metaphysics*, translated by T. E. Hulme, edited by J. Mullarkey and M. Kolkman, Houndmills 2007, p. 37. All future references to this work will be cited as IM.

<sup>22</sup> MM 178.

<sup>23</sup> MM 266.

<sup>24</sup> See L. de Broglie, *The Concepts of Contemporary Physics and Bergson's Ideas on Time and Motion*, in *Bergson and the Evolution of Physics*, edited and translated by Pete. A. Y. Gunter, Knoxville 1969.

physical cosmology. This question will be dealt with below, in conjunction with an examination of his notion of the creation (that is, materialization) of matter. Equally interesting is the question of how Bergson's qualitative durations relate to mathematics, i.e. to mathematical descriptions of nature.

It is surprising, considering his insistence on the qualitative character of duration, that Bergson is able to find quantitative relations between the duration of consciousness and that of matter. The briefest possible human perception, he notes, citing Exner, is 1/500 of a second. In this brief moment, red light accomplishes 400 billion vibrations<sup>25</sup>. As is true for Bergson in all cases of perception of the world around us, human awareness extends over the durations of matter, bringing the sets of durations of very different extents into direct contact.

It is thus true both that duration is qualitative, dynamic, and interpenetrating, yet can sustain mathematical relationships. His 'take' on quality and quantity is similar to that of Leibniz, whose monads – the fundamental reality of his universe – sustain mathematical relationships, including natural laws. The monads themselves are fundamentally qualitative. Bergson's «*durée*» thus must be understood as having both qualitative and quantitative aspects.

## 5. A Summing Up: Expression and Materialization

This essay so far has attempted to explore factors as remote from each other as personal memory and the duration of matter, temporal hierarchy and human freedom. These investigations have a central point: to make clear not only that duration has structure, but that this structure sustains and makes possible creative or productive acts. I will call the initiation of such acts expression, and their completion (their embodiment) materialization.

In any case of expression-materialization, four factors must be satisfied. That is, each instance of materialization proceeds (1) from a relative past into a present moment; (2) from a longer duration through briefer to briefest durations; (3) from lesser to greater extensity; and (4) from greater unity and simplicity to greater plurality or dispersion.

Not all cases of materialization are creative, or, for that matter, successful. Bergson describes three types or modes of materialization. These are:

1) Those involving successful embodiment (the free act, artistic or scientific creativity, biological speciation...);

2) Those whose results do not add to their initial insight (ex. the recall of memories) but merely materialize it in detail; and

3) Those which express diminished creativity (failed conceptual creativity; in psychology, neurosis, the amnesias...).

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<sup>25</sup>MM 46.



The third of these is seen in Bergson's account of the creation and entropic descent of matter, to which we now turn.

To repeat myself: these structures are found everywhere in Bergson's writings, from *Matter and Memory* on. Also, like Kantian categories or Whitehead's categorical scheme, they help us to understand the coherence of Bergson's thought.

## 6. Philosophical Insight and Scientific Discovery

If at first glance there would seem to be little in common between a human stream of consciousness and the nature of physical matter, the comparison Bergson makes between that stream (soon, as we will see, to be transformed into a waterfall) and the birth and development of the physical universe must seem strange indeed. But that is exactly what Bergson does. Using the notions of temporal structure and materialization that we have just examined, he proposes a physical cosmology which is a cosmogony: an account of the creation and expansion of the universe. A universe which expands from an initial moment is defined as a 'big bang' cosmology.

Bergson's notion of materialization is fundamental to his theory of the genesis of matter. As we have seen, human activity proceeds out of a past into a present, from a unified 'higher' duration into a plurality of 'lower' durations. In attentive perception, recollections are actualized as images which help us to cope with our surroundings. As we will see, he also applies the notion of materialization to natural processes. This includes cosmology, as we have just said. But it also includes biological evolution. We find this notion at the center of *Creative Evolution* (1907).

An unapologetic, full-blown metaphysics, *Creative Evolution* presents the striking vision of a universe in constant motion, perpetually transforming itself. At the center of his vision is the phenomenon of life: biological evolution.

Evolution for Bergson is not the simple accumulation of accidental variations, but is a creative process. If it is not the product of accidental variations, however, neither is it the point-by-point filling-in of a plan. Rather, it is the product of a «vital impetus»<sup>26</sup> which embodies itself, diverging to create innumerable life forms. Bergson treats speciation as a materialization of the original impetus. Each species expresses one aspect of that 'push', but in a limited way.

The evolution of life and the descent of materiality are portrayed in *Creative Evolution* as opposites:

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<sup>26</sup>H. Bergson, *Creative Evolution*, translated by A. Mitchell, edited by K. A. Pearson, M. Kolkman, M. Vaughan, Houndmills 2007, pp. 153, 167. All future references to this work will be cited as CE.

life is a movement, materiality is the inverse movement, and each of these two movements is simple...<sup>27</sup>.

As life proceeds towards the creation of new life forms with higher degrees of temporality, matter embodies increasing dispersion, increasing production of entropy, and a strong tendency towards loss of form.

Initially, Bergson points out, matter was endowed with very high energy states, which have constantly eroded. The second law of thermodynamics, which describes the degradation of these states, cannot explain their initial condition. Where did this initial (to use E. Schrödinger's term) «negentropy» come from? Bergson concludes that it is the result of an initial creation, from which the universe begins<sup>28</sup>.

This view of things contrasts dramatically with previous cosmologies. Prior to and well into the twentieth century, it was widely assumed that the world in its basic structure is fundamentally stable: its basic structures do not change. It was this opinion to which Einstein deferred when he introduced his famous cosmological constant into relativistic cosmology. This constant (which Einstein insisted was the only mistake he ever made<sup>29</sup>) guaranteed that the universe can never expand and that it had no origin. It is striking that in 1907 Bergson proposed that the universe does expand and has an origin at a single moment. Given the then almost universal belief in a stable universe, it was a daring speculation.

The first scientific expanding universe theory was introduced by Georges Lemaître in 1927. His view was later supported by Harlow Shapley's discovery of redshifts in distant galaxies. (If, as these testify, galaxies are all moving away from us, the cosmos in which they exist must be expanding.) In 1931 Lemaître extended his theory to include the hypothesis of a «primordial atom», a single material point from which the universe springs<sup>30</sup>.

Subsequent investigations have led beyond Lemaître's theory to general acceptance of the «inflationary» cosmology championed by Alan Guth<sup>31</sup>. On this model the major features of the physical world emerge in an initial period of rapid cosmic expansion. In this cosmology no primeval atom explodes to create the first moments of the universe. Instead there is at the beginning a 'singularity' – a mere 'this' about which nothing more can be said. From this inexplicable 'x', all reality is said to emerge.

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<sup>27</sup> CE 160.

<sup>28</sup> CE 134, 159.

<sup>29</sup> Cf. H. C. Ohanian, *Einstein's Mistakes: The Human Failings of Genius*, New York 2008, p. 394.

<sup>30</sup> G. Lemaître, *The Primeval Atom: An Essay in Cosmology*, New York 1950, p. 186. It would be interesting to know whether Lemaître had come across *Creative Evolution*. So far as I know, no scholarship has been done on this question.

<sup>31</sup> A. Guth, *The Inflationary Universe: The Quest for a New Theory of Cosmic Origins*, Cambridge MA 1998, p. 358.

Bergson's cosmological speculations were not based on his philosophical and psychological ideas alone. Recently astronomers had shown that galaxies are still being formed<sup>32</sup> – a fact which strongly suggested to him that the universe is not complete but is still being formed. More fundamentally, as just noted, he depended on thermodynamics.

Bergson's notions of the creation of matter and its subsequent expansion are interesting both for their tracking of subsequent science and in themselves as examples of speculative philosophy. But they also provide fundamental insights into both of Bergson's concepts of duration and materialization. We have explored so far two fundamental 'structures' of duration, terming them horizontal and vertical dimensions. A third has been mentioned: duration's 'transverse' or 'lateral' dimension. This structure or fundamental characteristic consists of a set of simultaneous or, better, contemporary events. Using again a musical analogy: when a group of drummers in a marching band manage to get in synch, we have many rhythms occurring at the same time and at the same beat (tempo). So with the many rhythms of matter: when they pulsate together (have roughly the same frequency; for example, two electrons) they are contemporaneous, constituting a shared dynamic structure. This structure, found pervasively in the natural world, can be termed a dimension.

To introduce the notion of multiple shared rhythms is to begin to make clearer not only Bergson's concept of duration, but also his notion of materialization as well. In discussing materialization, not enough attention has been paid to the increasing diversity or plurality that occurs at each step. Expression, consistently for the French intuitionist, begins with unity and proceeds through stages of increasing plurality. His treatment of the creation of matter makes clear this systematically growing multiplicity. As we have seen, he traces physical materiality back to a single point. But he then follows it towards its embodiment in the almost unthinkable plurality of physical 'particles' that constitute our universe. Expression-materialization, however different it may be in different cases, always, besides proceeding from higher to lower durations, with a concomitant increase in the number of briefer durations, moves towards a greater plurality of contemporary parts: towards greater simultaneous multiplicity.

Here Bergson's concept of the materialization of matter meets the concept of matter worked out in *Matter and Memory*. That is, the matter deriving from an initial 'creation', according to the nature of materialization, would be so many very brief pulses or rhythms of duration. But this is the view he had developed earlier, that of matter as an ever-renewed present consisting of changes of tension or energy. Materialization, a temporal process, always produces temporal structures<sup>33</sup>.

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<sup>32</sup> CE 159.

<sup>33</sup> This realization helps add content to Bergson's vital impetus, which would be interpreted as producing organisms understandable through their temporal structures. This would be a chronobiology stressing the vertical structure of duration: biological times overarching biological times.

## 7. Bergsonian Extensity and Fractal Space

Throughout this essay, Bergson's notion of partial extension has been cited, usually along with the kindred notion of temporal hierarchy. This is not an easy concept to 'get'. It would appear that the pen with which these words are written is either three-dimensional or it is not a pen. The notion that it is not quite three-dimensional seems at best peculiar – one of those ideas best left to the philosophers.

But this counterintuitive notion of space has been saved from philosophical oblivion by mathematicians, most notably by Benoit B. Mandelbrot, the founder of fractal geometry<sup>34</sup>. Mandelbrot's mathematics is fascinating both in itself and for its applications. It is also useful in helping us understand Bergson's notion of a lived, incremental space.

For standard geometry dimensions, height, width, and depth are understood to be whole numbers or integers. They are presumed to be homogenous (have the same character in all directions) and continuous (smooth). None of these assumptions hold for fractal geometry. Most strikingly, in this geometry there can be fractional dimensions. These would be dimensions having 1/2, 2/3, 3/4, 7/18 extent. The character of these dimensions changes throughout their range and instead of being 'smooth' they are 'rough'. Graphs of fractals are typically as uneven as a fever chart; those of standard unitary dimensions are, whether curves or straight lines, smooth.

The parallels between Bergsonian qualitative extensity and fractal geometry are striking. Just as a fractal dimension can be asymptotically closer and closer to a unitary dimension (as 0.9999 approximates 1.0), so Bergsonian extensity, as we have seen, approximates standard mathematical space without reaching it. The spatiality which he finds to be ingredient in all our experience approaches mathematical space only as a limit. This is true of matter at the cosmological scale. If he often uses phrases like «detends into space»<sup>35</sup> it is clear that Bergson does not presuppose there is a space into which matter disperses. In *Time and Free Will* he describes such a space as, in Kant's sense, a form of perception, a way of perceiving and ordering the world<sup>36</sup>. In *Creative Evolution* he defines space as a mere "schema" towards which matter detends<sup>37</sup>.

But there is more. In *Creative Evolution* Bergson adds to his notion of a created, expanding universe an additional speculation. That is, he argues that materiality gains in complexity as it disperses. Typically, he uses a philosophical/psychological model to describe this process. If, as we listen to a poet read his poem, our focus of attention relaxes,

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<sup>34</sup> B. B. Mandelbrot, *The Fractal Geometry of Nature*, New York 1983, p. 468.

<sup>35</sup> CE 130, 135, 152. Bergson often uses the term «detension» in describing physical matter's descent into space, never the term «extension». The meaning of *détendre* in French is helpful. To detend is to relax, stretch out, loosen, unbend. See *Bantam New College French and English Dictionary*, New York 1986, p. 27.

<sup>36</sup> TFW 97, 236.

<sup>37</sup> CE 130.

the successive sounds will become more individualized; as the phrases are broken down into words, so the words will scan into syllables which I perceive one after another<sup>38</sup>.

If we were to go farther in the direction, continuing to lose focus, our awareness heads towards a dreamlike state. At the limit, the words will become letters and lose their solidity<sup>39</sup>.

There is, he believes, a basic simplicity to the poem. But as we lose track of this simplicity we encounter greater and greater complexity. The further this detension into space is prolonged, the more complexity is created<sup>40</sup>. For Bergson this amounts to a kind of law. To the degree that materiality «detends», its degree of complexity increases, and *vice versa*. Hence a Bergsonian temporal dimension creates a growing order in a growing complexity. A fractal dimension is defined as measuring complexity or a «a ratio of change in detail to change of scale»<sup>41</sup>. But – and surprisingly to this writer – this notion of a fractal dimension as an ‘index of complexity’ precisely parallels the French philosopher’s notions of the relations between increasing extensity and increasing complexity.

In the prior section of this article it was argued that Bergson, in 1907, proposed a big bang cosmology. This is true, but needs qualification. His universe, unlike the present inflationary cosmology, does not presuppose a classic 3-D space of unitary dimensions, but, as we have seen, an incremental space closely analogous to fractal dimensions. This too could be set aside as still another philosopher’s folly. But while inflationary theory continues to be the most widely accepted cosmology, it is interesting to note that big bang cosmologies using fractals are now being proposed by some contemporary scientists<sup>42</sup>.

## 8. Some Concluding Reflections

An article like this, which covers many and diverse subject-matters, is by its very nature unable to explore any one of them in depth. The author must then apologize for the relatively superficial treatment of any number of fields

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<sup>38</sup> CE 134.

<sup>39</sup> Bergson is saying that as we lose focus of attention, our attention span moves down the temporal ladder, becoming briefer at each level. Hence, we are aware of briefer and briefer segments of the poem: down to the letters.

<sup>40</sup> CE 135.

<sup>41</sup> G. P. Williams, *Chaos Theory Tamed*, Washington D.C. 1997, pp. 237-243, 291-299. For a remarkably clear exposition of the concept of fractal dimension (in the concept of strange attractors and nonintegrable dimensions), cf. S. H. Kellert, *In the Wake of Chaos*, Chicago 1993, pp. 15-19.

<sup>42</sup> G. Calcagni, *Quantum Field Theory, Gravity, and Cosmology in a Fractal Universe*, «Journal of High Energy Physics», March 2010, pp. 1-37; M. Reuter and F. Saueressig, *Asymptotic Safety, Fractals, and Cosmology*, in *Quantum Gravity and Quantum Cosmology*, edited by G. Calcagni, L. Papantonopoulos, G. Siopsis, N. Tsamis, Berlin 2013, pp. 185-226. Mandelbrot seems to have glimpsed this possibility early on. Cf. his *foreword* to Y. Barysher and P. Teerikorpi, *Discovery of Cosmic Fractals*, New Jersey 2002, pp. xvii-xxiv.



(memory science, cosmology, fractals...) in the present essay. He writes only an essay, not a monograph.

But what is true of the scientific aspects of this manuscript is true of its philosophical side as well. Three dimensions or fundamental structures of duration have been spelled out here. But it needs to be stressed that none of them exists in isolation. Each is internally related to the others so that the character of one at any time is influenced by the others. Equally, the way in which psychological time is influenced by and (I believe, affects) the many and interrelated rhythms of the brain and body is nowhere dealt with. I can only promise to make an effort to deal with them in the future.

The author would like to make another, particularly general, point here. That is, if one finds conjoined structures of duration and of materialization everywhere in Bergson's philosophy, their presence throughout testifies to an overarching coherence in his thought which is rarely understood. If he seems in his writings to be tackling subjects of exceptional diversity – from the nature of dreams, memory, and perception to the nature of space, matter, and cosmology – the same dynamic structures are found throughout. In the manner of A. N. Whitehead's categorical scheme,<sup>43</sup> they hold his thought together and embody the same basic insights. This weighs strongly against attempts to view him as an anti-intellectual or, more bizarrely, an irrationalist philosopher<sup>44</sup>.

Finally, I hope the part that memory plays in all instances of materialization has been made clear. If it has not, this is the place to insist on it. Recognition of perceptual objects, moral acts, biological evolution, the creation/dispersion of matter: all the examples one might give of materialization involve the carry-over of the past into the present that Bergson calls memory<sup>45</sup>. This carry-over often merely recapitulates the richness of the past. But it can also involve a creativity which, presuming and requiring the past and memory, transcends them.

In spite of these and other limitations, it seems to this writer that this essay does establish two things. The first concerns the status of Bergson's thought. Is it antiscientific? The answer may depend on how the question is meant. Unquestionably, Bergson is critical of the sciences. But his critiques of the science of his time were intended to lead to new and fruitful insights. The two cases examined in this article – big bang cosmology and quasi-fractal space – show that there were points where he was able to succeed.

The second point concerns the status of philosophy *per se*. Is philosophy to be understood as the vain quest for an elusive certainty which never seems to appear? Or might it be conceived as a difficult and problematic effort to arrive at fresh conceptual insights, insights which can be fruitful – that is, useful in the broadest possible sense? If the latter option can be taken seriously, then Bergson's thought provides a case in

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<sup>43</sup> Cf. A. N. Whitehead, *Process and Reality*, Corrected Edition, New York 1978, pp. 18-30.

<sup>44</sup> The reference here is particularly to B. Russell, *The Philosophy of Bergson*, London 1914, p. 36.

<sup>45</sup> The exception would be the habit memory noted briefly above, which simply repeats patterns engrained in the nervous system.



point. His way of doing philosophy, though hardly beyond criticism, has proved fruitful in any number of ways. He must have gotten something right.

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