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The Actual Indefinite in Bergson and Whitehead

by **Pete A.Y. Gunter**

University of North Texas
Denton, TX, U.S.A

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1. Whitehead and Bergson

- ¶1. Is there anything, in the world or in our experience of the world which is, but which is not a specific, well-delineated property? There is a prejudice in contemporary philosophy against admitting that such is possible. For many, the mere possibility of the actual indefinite would be morally or perhaps epistemologically distasteful.^[1] But I think that in part this is because the actual indefinite is habitually confused with two other concepts: the ambiguous and the vague.^[2]

- ¶2. All of us who are teachers realize that one of our first tasks is to instruct our students in the avoidance or extirpation of ambiguity or vagueness in their writing. An amphiboly is a fallacy, not an achievement. If the newspaper text states "A wood warbler was discovered by Hazel Miller of Concord, while walking along the branch of a tree, singing, and in full view," the reporter is advised to rescramble his or her syntax and rescue Miss Phipps from an ambiguous existence. Similar considerations apply to vagueness. Like a weed, it sprawls unchecked through our students' papers. No quantity of logical herbicide seems able to stamp it out. Certainly, no philosopher wants to be accused of encouraging such growth.

- ¶3. By what right then do I, against the grain of my own practice and the avowed imperatives of western philosophy, argue for the reality of the actual indefinite? Impugners of the actual indefinite will complain that whoever indulges (no doubt self-indulges) in the indefinite is trying to urge the nose of the camel of the irrational under the tent of rationality. But the goal of this essay is hardly irrationalism. It is, rather, a more satisfactory recourse to experience, coupled with a more cautious approach to the relations between language, whether formal, common, or other, and experience. If the result is a denial of the absolute hegemony of language and an affirmation of the right of the actual indefinite to exist, then I can at least protest that the gain in flexibility, imaginative possibility, and intellectual modesty provided by these conclusions might pave the way for increased insight—and perhaps for new linguistic, and hence, conceptual inventions. In any case, I will insist that it is possible to hold that the actual indefinite exists, and that one can do so with good intellectual conscience.
- ¶4. The question of the actual indefinite could be approached from any number of standpoints. I propose to do so through a comparison of two twentieth-century philosophers, Alfred North Whitehead and Henri Bergson, whose attitudes towards the interface of language and reality, and towards indefiniteness, are in sufficient contrast to make the comparison worthwhile. Whitehead, the champion of language, ultimately, of the symbolic, logical language of *Principia Mathematica*, fears for human rationality unless this language can be made perfectly consistent with process, creativity, and becoming. Bergson, the critic of language, finds that language can be expanded and made profounder by its confrontation with process, i.e. duration, but insists that no language can quite capture process, creativity, or becoming in flight.
- ¶5. It might be helpful here to mention a few facts about these two thinkers. Bergson's and Whitehead's lives overlapped. Born two years after Bergson, Whitehead outlived his French contemporary by six years, dying in 1947, after Bergson had died in 1941. Bergson was famous for his *Creative Evolution*, published in 1907; Whitehead for *Science and the Modern World* published in 1925, and especially for *Process and Reality*, published in 1929, which was his *magnum opus*. Both philosophers denied the reversibility of time, insisted on the reality of indeterminism, and explored the nature of creativity. But Bergson welcomed the indefinite, while Whitehead attempted to exorcize it. I will begin with an exposition and criticism of Whitehead, then proceed to explore Bergson's thought.

2. Whitehead's Exorcism of the Actual Indefinite

- ¶6. The following passage, from *Science and the Modern World*, sums up Whitehead's philosophy, especially his philosophy of nature:

The doctrine which I am maintaining is that the whole concept of materialism only applies to very abstract entities, the products of logical discernment. The concrete enduring entities are organisms, so that the plan of the *whole* influences the very characters of the various subordinate organisms which enter into it. In the case of a living animal, the mental states enter into the plan of the total organism and thus modify the plans of the successive subordinate organisms, such as electrons...[\[3\]](#)

There is thus a subtle top-down causality for Whitehead in all living beings. For him the whole influences the subordinate parts. The converse is also true: in the case of a living animal the mental state is also profoundly influenced by the state of the body in its full complexity. But Whitehead's philosophy extends this conceptual scheme universally:

...the principle of modification is perfectly general throughout nature, and represents no property peculiar to living bodies...this doctrine involves the abandonment of the traditional scientific materialism, and the substitution of an alternative doctrine of organism.[\[4\]](#)

The Cartesian impasse is thus outflanked. The world is comprised of organisms. Each has a mental and a physical pole, which affect each other.

- ¶7. While I commend Whitehead for his goals in seeking an organic, non-reductivist, concept of nature as well as for many of the plausible, imaginative ways in which he attempts to achieve them, it will become clear that I am not satisfied with many of his fundamental concepts as they now stand. I will argue in what follows that Whitehead's treatment of the realm of eternal ideas makes novelty as an ultimate fact a relative notion and reduces creativity to a choice between preexisting possibles. I will also contend that his insistence on atomicity as fundamental to perception fails to deal adequately with our experience of qualitative continuity, and that this same insistence on atomicity produces a strangely abstract notion of internal relations, which amounts not to an organismally related universe but to a set of entailments or mutual entailments between discrete parts. Reacting against mechanistic theories, I will conclude, Whitehead takes up the atomistic premise common to most forms of mechanism, and creates a philosophy which in the end is an immense essay in combinatorial analysis. Though he will often use terms like vague or indefinite to describe experience, in the end we do not find an "actual indefinite" in his system.

- ¶8. The elements of which Whitehead's universe is composed are termed eternal objects. Examples of simple eternal objects would be a patch of color, such as a red, brown, or blue sense datum, or a triangular shape. Plato's eternal objects or forms are, in general, conceived by Plato as transcendent, while the world viewed by the senses is understood as only an imitation of a transcendent reality. Whitehead inverts this rubric. In themselves the eternal objects are only potentialities. Only in the actual, sensed world are they real.
- ¶9. But there is a bit more to it. The eternal objects in their entirety are said by Whitehead to be envisioned by God prior to any ingression into the world. Prior to this vision they are unordered, or disjunct. Viewed by God they are an organized set of potentials capable of ingressing, that is, becoming instantiated in the world, and thus, one suspects, something more than bare potentiality. In any case, the important point here is to note that on Whitehead's view the eternal objects are all present:

The primordial created fact is the unconditioned conceptual valuation of the entire multiplicity of eternal objects. This is the primordial nature of God. [5]

There can be no question here of Whitehead's meaning. God achieves for Whitehead the "complete conceptual valuation of all eternal objects." [6] All eternal objects are present and all are known.

- ¶10. But there are two kinds of eternal objects: individual eternal objects, which Whitehead calls individual essences, [7] and relational eternal objects, which he calls relational essences. [8] If God envisions all eternal objects, he sees every combination of all of them whatsoever: all the individual essences as related in every possible way by all the relational essences. If this is true, and I believe this interpretation is inescapable, God sees every possibility, including all details, even if these be infinite in number. He thus sees the manuscript of Aristotle's *Nichomachean Ethics* before it is written and also the other possible versions of that work. What he does not see is exactly what version will in fact be written. All possibles are given, and in total detail. Two things follow from this. The first is that in the last analysis there is no novelty in the universe. Or rather, there is only relative novelty: novelty relative to what has transpired up to some present time, in the world. But one will search the world in vain for the slightest shred of concrete existence which escapes the iron law of possibility. Anything new in fact has always been.

- ¶11. Something else follows. Creativity is in a sense the most fundamental concept in Whitehead's categorical scheme: it is the universal of universals.^[9] But it is reduced, once again, in the last analysis, to a choice between preexisting possibles. Since all possibility is present down to the last, most evanescent detail in the primordial nature of God, no other conclusion can follow. To create is to choose between preexistent possibles. Finite creatures might complain in this context that they are deprived of the capacity to create ultimately novel content. But they share in this inability with God himself. God too can only choose between possibles, as Leibniz contended.
- ¶12. Almost any Whiteheadian will object—should object—that these criticisms do not do justice either to Whitehead's amply demonstrated sense of the fluidity of the universe and of the reality of the new, of freshness. Equally, Whiteheadians will—and should—object that these criticisms do no justice to the subtlety of Whitehead's treatment of creativity. I concede this. Nonetheless, I see no way to escape these two conclusions: For Whitehead no ultimate novelty exists, and creativity reduces to choice.
- ¶13. One further conclusion follows. If Whitehead is correct in his analysis of ultimate creativity, creativity neither contains nor expresses anything indefinite. All possibles are given as conceptually distinct; there are no fuzzy sets here. Any indefiniteness concerns, simply, the choice between such possibles. If this involves indefiniteness, it is a barren indefiniteness. My next two sorts of criticism concern not the timeless completeness of the eternal objects but their discreteness. The first concerns Whitehead's treatment of continuity: the second concerns his notion of internal relatedness.
- ¶14. According to Whitehead, all perceptual contents are distinct and externally related. He calls these eternal objects *sensa*, which, in Anglo-American philosophy are often called sense data. At the same time he holds that in ordinary sense perception we encounter continuity. Continuity is correlated by him not with reality but with appearance: it is only potential.^[10] By this he means that continuity exists as material fit for unique division into distinct parts. But this assumption about continuity lacks phenomenological support. Take an ordinary visible color spectrum. Whitehead believes that, logic being logic, the spectrum must consist of distinct *sensa*: discrete shades of color, each of a different hue. But it is clear that a color spectrum presents us with a continuous qualitative transition every bit as real and, indeed, more fundamental than any collection of distinct shades we might choose to isolate from it. That is, in this transition there are no natural breaks. Rather, there is interpenetration. The violet at the end of the spectrum interpenetrates the violets towards the left, which, finally, interpenetrate the dark blue. If someone were to say that to talk in this way is to surrender to irrationalism, I would respond, first, that rationality must surely involve the closest attention to the content and the texture of experience and, second, that admission of interpenetration into the data of perception does not eliminate real distinctions. We continue to correctly distinguish the purple from the blue and the blue from the green. We are not left conceptually stranded. But it is not simply a

matter of the color spectrum. We find ourselves confronted with countless continuous *qualia*: the sea-change of dawning light, the clarinet glissando at the beginning of *Rhapsody in Blue*, the auditory Doppler effect, etc. Such examples, I believe, successfully resist Whitehead's atomistic analysis of continuous *qualia*. Where there is interpenetration, no continuum can be cut without the loss of a fundamental character, unless, of course, one means by continuum a mathematical continuum or its analogue. But, to cut the argument short, a mathematical continuum presents us with discontinuity, infinitely repeated. Observed continua, involving interpenetration, also involve an actual indefinite.

- ¶15. The third criticism, as noted above, concerns Whitehead's treatment of internal and external relations. Roughly: an external relation is one in which the terms of a relation in no way require each other. Two Newtonian mass particles, or two ships that pass in the night without a foghorn audible, embody external relations. If one did not exist, the other would remain exactly as it always was. Internal relations, again, roughly speaking, are those whose terms in some sense require each other. In his *Whitehead and Bradley: A Comparative Analysis*,^[11] Leemon B. McHenry argues convincingly that Whitehead's treatment of internal and external relations derives from his effort to find a way between the extreme monism of F.H. Bradley and the extreme atomism of, for example, David Hume. Whitehead is convinced that individual essences, such as a shade of red, must be taken to be indivisible. Hence each eternal object is a kind of conceptual and perceptual atom, even when ingressed. Beyond such termini of perception and conception there is no further distinction. It then follows that all such simple eternal objects^[12] are externally related to each other. The patch of red does not infest the adjacent patch of green with its character. At most they form a contrast.^[13] And yet, Whitehead insists that internal relations are absolutely necessary to the universe generally and his own philosophy in particular. His doctrine of internal relations, however, turns out to be puzzling. It might be thought that an internal relation is one in which the terms of the relation, however many, are changed by being in the relation. Friendship seems to be a case in point: a lasting friendship to some extent transforms both of its participants. This, however, is not acceptable for Whitehead, for whom relations, as we have seen, cannot transform their terms. What Whitehead means by internal relations, then, is disjunct entailment or mutual entailment. That is, internal relations are necessary relations, but not exclusively so. A line necessarily is required in a triangle, or in a square, or in an, e.g., acute angle. The line is not transfigured by this relationship, in any degree. But it is required by and necessitated in the triangle.

- ¶16. The problem with this is that any wholes in Whitehead's universe turn out to be comprised of atomic elements. These are to be held together by logical entailments, whose multiplicity marks the limits of what is possible. A straight line might be necessarily related to triangles, rectangles, tetrahedrons, etc. Though Whitehead sometimes speaks of eternal objects as being "a unity" [14] or an "integration" [15] or "mutually sensitive," [16] in the concrescence, or coming to be, of the actual occasions that make up the world, the concrescent unity is for him both static and purely formal. The components of a concrescence cannot be sensitive to each other. They are by definition indifferent to each other. Again, no actual indefinite is allowed to exist in actual occasions, though Whitehead's language might lead one to think otherwise.
- ¶17. For many contemporary philosophers, as I have noted in the introduction, this conclusion will come not as a criticism but as a mark of excellence. Surely perfect clarity is what we want. The problem is that Whitehead often speaks as if this were not the case, and that indefiniteness, vagueness and ambiguity were important, even fundamental features of experience and of the world. This is especially evident in his very helpful distinction between perception in the mode of presentational immediacy and perception in the mode of causal efficacy.[17] Presentational immediacy is clear, crisp, definite; causal efficacy, by contrast, is vague,[18] indistinct,[19] dim.[20] These two modes of perception are as different as clear vision at noon on a sunlit day and the dim disorientation experienced in waking at early dawn. This distinction is, I believe, an important addition to our concept of perception, and Whitehead is right to insist on its primacy. The problem is that in Whitehead's universe, given his most fundamental assumptions, everything that is perceived, in whatever mode, is made up of *sensa* and each *sensum* is radically distinct from every other. It follows that the data of causal efficacy are also to be analyzed into *sensa*. It will not be surprising, then, to find Whitehead pointing out that perception in the mode of causal efficacy consists of the transmission of eternal objects,[21] consisting of elements A,B,C,[22] and sharing eternal objects with the mode of presentational immediacy (PR168-183). [23] Inescapably, for his philosophy the dim, the vague and the indeterminate turn out to be discrete, crisp, and definite after all.
- ¶18. Much more could be said along these lines. But I will spare the reader and proceed to talk briefly about Bergson's philosophy where, as will be easily surmised, the actual indefinite is given not free reign but at any rate, the right to exist.

3. The Actual Indefinite in Bergson

- ¶19. Where Whitehead develops a classical metaphysical system, with each mode of being carefully demarcated and all consequences accurately and, in his case, mutually deducible, Bergson takes a quasi-experimental, more phenomenological approach; gradually developing his vision of the nature of things through what he terms integral experience.[\[24\]](#) Such a philosophy need not be unbalanced or inconsistent, however. All of his investigations maintain the concept of duration as a creative and preservative becoming throughout, while attempting to see how this concept is developed in broader and contrasting realms of discourse. Where Whitehead assumes coherence, as an axiom, Bergson searches for it.
- ¶20. Bergson's concept of duration was formed through an effort to transcend mathematical and quasi-mathematical concepts as these were found particularly in associationist psychology and in Newtonian physics. I cannot help noting here that associationist psychology is an introverted version of the same paradigm of which Newtonian Physics is extroverted version. In the case of the self, Bergson's methodical probings arrived at data concerning the human self, which he believed had never been clearly grasped before:

What I find beneath these clear-cut crystals and this superficial congelation is a continuity of flow comparable to no other flowing I have ever seen. It is a succession of states each one of which announces what follows and contains what precedes. Strictly speaking they do not constitute multiple states until I have already got beyond them, and turn around to observe their trail. While I was experiencing them they were so solidly organized, so profoundly animated with a common life, that I could never have said where any one of them finished or the next one began. [\[25\]](#)

It follows from this that each component or state is not like the states presumed in associationist psychology. Bergson holds, like Whitehead, that there are a multiplicity of states, though he protests, as we will see, that each of these is, in itself, fugitive, [\[26\]](#) unstable,[\[27\]](#) and fluid.[\[28\]](#) He adds that these data interpenetrate.[\[29\]](#) As in a holograph, so in the self, each part is contained in each part. That is, not only is it not clear that we can carve out even the simplest mental content without losing something in the process, but also it is even less clear that such states, if isolated in some way, will be fixed, static, unchanging. The ease with which Whitehead finds distinct *sensa* of the subjective species in the human self ought to put us on guard. If we probe deeply enough beneath Humean psychological appearances, is this what we really find?

- ¶21. It will be objected that at least some way of analyzing the states of consciousness must be produced, and Whitehead, in vivid contrast to Bergson, allows this. Bergson seems merely to protest that we shouldn't try to find the parts of mental life: or so it appears. But I believe that this is not true, in spite of appearances. Bergson in fact develops a conceptual scheme which allows us to discriminate real parts^[30] or actual parts^[31] of consciousness from partial notions or fragmented parts. In the Fall-Winter, 1999 number of *Process Studies* I have shown that Bergson develops a qualitative calculus analogous to the infinitesimal calculus of the mathematicians, a qualitative calculus which enables him to differentiate the real parts of consciousness, showing them to be briefer durations than the duration of consciousness per se.^[32] Parts of these briefer durations, if indeed these exist, may be differentiated by deriving these as briefer durations still. Consciousness thus can be broken down not as a set of discrete units all on the same level but as a hierarchy of durations, giving us parts, and, if needed, parts of these parts, etc. The fundamental theorem of the calculus, on which this procedure is modeled, allows the mathematician to differentiate and thus to arrive at a derivative, and then differentiate this again to get the second derivative, and so on *ad indefinitum*. Bergson's qualitative and durational calculus allows the analogous procedure. Few have understood this aspect of Bergson's thought. My purpose in introducing it here is to show that Bergson's position allows him to segregate the parts of consciousness without losing their fluidity. To differentiate consciousness we do not have to be sense data theorists. Hence the following conclusion: Bergson's notion of the self and its components makes room for the actual indefinite both at the level of the self and of its subordinate durations, since at all levels each component contains content derived from participation in higher levels of duration and since each level is conceived as dynamic. To use a well-known example from the history of philosophy, each component of the self, even if differentiable, is for Bergson still personal in the way that Descartes' piece of wax still contains the color and the smell of the honeycomb from which it is taken. For Bergson, real indefiniteness exists at all levels.
- ¶22. Bergson's extends his key notion of duration after his first analysis of it in *Time and Free Will* (1890) to the question of mind-body, and hence mind-matter, relationships in *Matter and Memory* (1896). His concept of intuition and his corollary qualitative calculus are developed in *An Introduction to Metaphysics* (1903). In *Creative Evolution* (1907) his theory of knowledge and his metaphysics are extended to include a theory of physical cosmology and a vitalistic theory of evolution. Finally, in *The Two Sources of Morality and Religion* (1932) his ideas receive their final form in a theory of religious and social evolution.

- ¶23. In the section above on Whitehead, three fundamental doctrines of Whitehead are examined: his treatment of creativity, his understanding of continuous *qualia*, and finally, his treatment of internal and external relations. To deal fully with Bergson's treatment of his most basic notion of qualitative transition, i.e. duration, would require another lecture, much longer than the present one. I will therefore deal with it below briefly and schematically. Here I will deal with the differences between Bergson's and Whitehead's notions of creativity.
- ¶24. If for Whitehead, as I have argued, creativity is defined in the last analysis as choice between preexisting possibles, for Bergson, creativity expresses something which is initially at least partly indefinite: indefinite because the shape of things to come is nowhere fully preformed, nowhere precise. This is because for him possibilities are created, not presupposed *sub specie aeternitatis*. Bergson thus states, in his essay "The Possible and the Real":

The fault of those doctrines—rare indeed in the history of philosophy - which have succeeded in leaving room for indetermination and freedom in the world, is to have failed to see what their affirmation implied. When they spoke of indetermination, of freedom, they meant by indetermination a competition between possibles, by freedom a choice between possibles—as if possibility was not created by freedom itself! As if any other hypothesis, by affirming an ideal pre-existence of the possible to the real, did not reduce the new to a mere rearrangement of positive elements![\[33\]](#)

For Bergson to be creative is literally to create possibilities. It follows from this that the new, i.e. novelty, cannot be a rearrangement, however complex, of pre-existing possibles. Creativity would thus involve not only some real indefiniteness in the future of the present event, in the sense that all possibles could not be spelled out ahead of time; it would necessarily involve actual indefiniteness in the present, where the creative act is being prepared. But it should be added that where Bergson believes that to define possibility and creativity as Whitehead does is to be condemned to strict determinism, Whitehead's example proves that this is not true. So far as I can see, Whitehead has every right to his indeterminism.

- ¶25. As for the question of continuous *qualia*, the example of the color spectrum appears to me entirely convincing. But the color spectrum is inherently static. The really serious question for process-relational philosophy is whether the so-called stream of consciousness is continuous or discontinuous. Whitehead appears on this question to be the champion of sheer discontinuity, Bergson the proponent of sheer continuity. I can not accept either horn of this dilemma as given: Bergson's rhythms of duration allow for elements of discontinuity, while Whitehead's concepts of transition,[\[34\]](#) prehension,[\[35\]](#) and the vector character of prehension,[\[36\]](#) suggest the possibility of an element of continuity between present and past. On these points I would like to signal Jorge Nobo's treatment of this issue in his *Whitehead's Metaphysics of Extension and Solidarity*.[\[37\]](#)
- ¶26. To deal with these questions would require an extensive analysis. I would like to move the question of the continuity/discontinuity of duration to a different level, that of the duration of non-living matter: composed, Whitehead states, of actual occasions. Here a real question emerges. People who knew Whitehead often recounted to me Whitehead's description of the train ride from Cambridge down to London, understood in terms of quantum physics. The distance is sixty miles, and Whitehead used to jest that in quantum terms this involved spending one minute at each milepost. It is a trip I have taken many times, and Whitehead's example never failed to strike me. The trouble is that quantum physics as later developed fails to give this reassuringly simple picture. Where Whitehead describes successive actual occasions as each taking up a definite quantum of space and time, classical (post-1926) quantum physics fails to find such definite quanta. Rather, one's quest for them is interrupted by Heisenberg's uncertainty relations. If we look for definite location, infinite momentum emerges. If we look for definite time, we find ourselves beset with infinite energy. Most students of Whitehead concede that Whitehead never dealt with this problem. It is easy to see why. It would have required a thoroughgoing reworking of his categorial scheme.
- ¶27. It is possible that at some later date quantum physics will be again reformulated, perhaps in a way that reinstates the sheer discontinuity of pre-classical quantum theory. Or some very different picture may emerge. As things now stand, however, it is not difficult to find the actual indefinite at the level of quantum measurement in physics, or in Bergson's treatment of material duration.

Conclusion

- ¶28. I'd like to make two final points. This paper began with the admission that ambiguity and vagueness are quite reasonably regarded as bad things, to be avoided or preempted. I hope that what has been said so far makes it clear that some sorts of ambiguity and vagueness, arrived at through a process of reflective analysis, are not a function of confusion or of thoughtlessness, but rather of the world we inhabit and, legitimately, of thought.
- ¶29. At the beginning of this paper, some mention was made of concepts of the nature and function of language. I will simply state my conviction that Whitehead's magnificent metaphysical construction was developed with an eye to the precise application of mathematics to reality. Views which accept the actual indefinite are more likely not to propose such a stringent criterion of applicability as Whitehead does. But they are, if understood, more likely to suggest that forms of mathematics might be found which, though extremely fruitful, do not require a one to one correspondence of mathematics to the presumed precise articulations of reality. I refer here, in conclusion, to fractional and fractal geometries, nonlinear dynamics, chaos theory, the theory of fuzzy sets, and theories of dissipative structures. Goedel's Proof, also indicates that no precise, and therefore, definite correspondence is to be expected between a discrete and complete mathematical or linguistic system and reality.

END NOTES

1. I would like to thank Professor Lik Kuen Tong for providing me with a distinction which has been extremely useful. That is, the distinction between the crisp definite (my own term) and the “actual indefinite.”
2. Prof. Tong might also agree with me on this matter.
3. Alfred North Whitehead, *Science and the Modern World* , New York: Free Press (1967), 79.
4. *ibid.*, 79-80.
5. Alfred North Whitehead, *Process and Reality* , New York: Free Press (1978), 31.
6. *ibid.*, 32.
7. *ibid.*, 115.

- [8.](#) *ibid.*, 115.
- [9.](#) *ibid.*, 20.
- [10.](#) *ibid.*, 61.
- [11.](#) Leemon McHenry, *Whitehead and Bradley: A Comparative Analysis*, Albany: State University of New York Press (1992), 213.
- [12.](#) Alfred North Whitehead, *Process and Reality*, New York: Free Press (1978), 114-115.
- [13.](#) *ibid.*, 24, 228.
- [14.](#) *ibid.*, 108.
- [15.](#) *ibid.*, 290.
- [16.](#) *ibid.*, 285.
- [17.](#) *ibid.*, 168-183.
- [18.](#) *ibid.*, 116.
- [19.](#) *ibid.*, 169.
- [20.](#) *ibid.*, 176.
- [21.](#) *ibid.*, 58.
- [22.](#) *ibid.*, 116.
- [23.](#) *ibid.*, 168-183.
- [24.](#) Henri Bergson, *The Creative Mind*, New York: Philosophical Library (1946), 237.

- [25.](#) [ibid.](#), 192.
- [26.](#) Henri Bergson, *Time and Free Will*, New York: Allen and Unwin (1950), 132.
- [27.](#) [ibid.](#), 132.
- [28.](#) [ibid.](#), 129.
- [29.](#) [ibid.](#), 100.
- [30.](#) Henri Bergson, *The Creative Mind*, New York: Philosophical Library (1946), 202.
- [31.](#) [ibid.](#), 198.
- [32.](#) Pete A. Gunter, *Bergson, Mathematics, and Creativity*, *Process Studies*, 28 (1999), 268-288.
- [33.](#) Henri Bergson, *The Creative Mind*, New York: Philosophical Library (1946), 123.
- [34.](#) Alfred North Whitehead, *Process and Reality*, New York: Free Press (1978), 55.
- [35.](#) [ibid.](#), 19, 168.
- [36.](#) [ibid.](#), 19, 317.
- [37.](#) J L. Nobo, *Whitehead's Metaphysics of Extension and Solidarity*, Albany: State University of New York Press (1986), 439.

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IIFB - Fairfield University - Fairfield, CT - 06430
Tel: (203) 254-4000 Ext. 2857, 2851 Fax: (203) 254-4074
ltkong@iifb.org -- cnaser@iifb.org -- <mailto:cnaser@iifb.org>

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