JAMES MARK BALDWIN WITH ALFRED NORTH WHITEHEAD ON ORGANIC SELECTIVITY: THE "NOVEL" FACTOR IN EVOLUTION

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ABSTRACT: The aim of this paper is to show how James Mark Baldwin's theory of Organic Selection (also known as the "Baldwin effect") can be fruitfully integrated with Alfred North Whitehead's speculative philosophy, as part of the endeavor to develop a comprehensive process-relational evolutionary cosmology. In so doing, it provides an overview of the theory of Organic Selection and points to several concrete examples from the Galapagos Islands which elucidate Baldwin's claim that organisms, through their selective activities and behavioral adjustments, play a causal role in directing evolutionary processes. I emphasize some of the affinities between Baldwin's theory of Organic Selection and Whitehead's theory of prehensions, especially focusing on the latter's notion of "prehensive selectivity." Overall, while Baldwin's theory of Organic Selection provides a biological ground for a comprehensive process-relational evolutionary cosmology to be developed, illuminating the importance of Whitehead's theory of prehensions for evolutionary theory, Whitehead's overall speculative scheme can, in turn, strengthen the metaphysical, epistemological, and ethical foundations of Baldwin's theory. In the course of merging the two views, I arrive at an enlarged conception of Organic Selection, placing it in context with Darwin's principle of Natural Selection. At the end of the paper, I take up the resulting question of the ethics of selectivity in general, arguing that the merger of Baldwin's and Whitehead's ideas constitutes a "non-reductionistic critical pan-selectionism." This position stands in contrast to the antagonistic standpoints of "Selectionism" and "Anti-Selectionism" in the ongoing debates over the ethical dimensions of Darwinian evolution.

KEYWORDS**:** James Mark Baldwin; Alfred North Whitehead; The Theory of Organic Selection; The Baldwin Effect; Habit; Accommodation; Process-Relational Evolutionary Cosmology; Prehensive Selectivity; Natural Selection; Selectionism; Anti-Selectionism; Critical Pan-Selectionism

INTRODUCTION

Over the last century, a perennial controversy has concerned the notion of whether the psychologist and philosopher, James Mark Baldwin (1861-1934) is truly a discoverer of a legitimate, "new" factor at work in evolution, in which organisms are considered to be selective agents, having a meaningful, causal role in evolutionary processes. Baldwin's

description of "A New Factor in Evolution," as the title of his seminal 1895 / 1896 paper suggests, implies that an explanatory principle, previously undeveloped, in relation to evolutionary processes had been arrived at, namely, one supplementary to Darwin's principle of Natural Selection.[1] Of course, Baldwin, in describing his theory as "new," was not so much interested in its "newness" as he was in its "trueness."[2] In his writings, Baldwin uses the notion of Organic Selection to explain how it is the case that by learning, by making behavioral accommodations, and by developing new habits of activity, namely, by their own mentality and selective activities, the individual organism can indirectly chart the course of the evolution of their species.[3] As expressed by Baldwin, the theory of Organic Selection "extend[s] the general principle of selection through fitness to the *activities of the organism*."[4] As such, Baldwin's theory may be termed a form of "organismic evolutionism," as contrasted with "materialist evolutionism."[5] Baldwin, along with British psychologist, Conway Lloyd Morgan (1852-1936), and paleontologist, Henry Fairfield Osborn (1857-1935) arrived independently at the theory of Organic Selection in 1895 / 1896. The name of the theory, "Organic Selection" was proposed by Baldwin and adopted by Morgan and Osborn.[6] Much later, in 1953, George Gaylord

1. According to Baldwin, "it seems proper … to call the principle of organic selection 'a new factor'; for it gives a method, hitherto undeveloped, of accounting for the parallelism between the progressive gains of evolution and the continued accommodations of individuals" (*Development and Evolution: Including Psychophysical Evolution, Evolution by Orthoplasy, and the Theory of Genetic* Modes, New York, The Macmillan Company / Elibron Classics, 1902 / 2005, p. 103). According to Baldwin, Darwin himself had come close to grasping the principle that he had in mind, but he had not fully worked it out. He states that "neither [Darwin's] putting the factors together, nor the results which follow from it—the opportunity it gives to mind to guide and direct evolution, by preserving and forwarding variations in *intelligent and social lines*—occurred to Darwin" (Baldwin, *Darwin and the Humanities*, Baltimore, Review Publishing, pp. 18-19).

2. Baldwin, *Development and Evolution*, p. 153.

3. In F. H. Osborn's synopsis, "the hypothesis [of Organic Selection] … is, briefly, that ontogenetic adaptation … enables animals and plants to survive very critical changes in their environment. Thus all the individuals of a race are similarly modified over such long periods of time that, very gradually, congenital variations which happen to coincide with the ontogenic adaptive modifications are collected and become phylogenetic. Thus there would result an apparent but not real transmission of acquired characters. What appears to be new … in Organic Selection is, first, the *emphasis* laid upon the almost unlimited powers of individual adaptation; second, the extension of such adaptation without any effect upon heredity for long periods of time; third, that *heredity slowly adapts itself to the needs of a race in a new environment along lines anticipated by individual adaptation, and therefore alone definite and determinate lines*" (Baldwin, *Development and Evolution*, pp. 339-340).

4. Baldwin, 'Physical and Social Heredity,' *American Naturalist*, 1896, p. 427.

5. Since Baldwin's theory of Organic Selection alludes to the notion that individual accommodations, made on the part of organisms in relation to their behaviors and activities, have a meaningful impact on the course of evolution, if true, it can also be seen as undoing the neo-Cartesian assumption that organisms are simply preprogrammed automatons, completely lacking mentality, agency, and the ability to learn new behaviors.

6. Baldwin writes, "the term 'organic selection' was proposed … on two grounds: (1) because the organism, by effecting accommodations, screens its characters, and so gives them a chance of being kept alive; and (2) because the organism thus, so to speak, selects itself; that is, it is its own accommodations which are instrumental in securing its survival. It is the behavior of the organism, therefore, which is important, and not the variations alone, as in simple natural selection generally—and hence the adjective 'organic.' It is in so far the *organic* functions, reactions, struggles, efforts, conscious choices, etc. —which really count and

Simpson termed a version of the theory, "the Baldwin effect."[7]

At first glance, the theory of Organic Selection seems to offer questionable theses in light of mainstream biological research which operates under the paradigm known as "the modern synthesis." "The modern synthesis," a development in biology which took place from the 1920s to the 1950s and was assisted by figures such as Julian Huxley, Theodosius Dobzhansky, and Ernst Mayr, largely involved the merging of Darwin's theory of evolution by Natural Selection with Mendelian and population genetics. "The modern synthesis" also involved a rejection of views running counter to these core principles, such as was found in Lamarckian,[8] orthogenetic, and saltational theories. Philosophers and psychologists have employed the term "neo-Darwinism"[9] to designate a

determine what sort of characters shall be saved by natural selection" (Baldwin, 'Organic Selection' in *Dictionary of Philosophy and Psychology*, 1901, Or-Oz 2-3).

7. According to Richards, *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*, Chicago, University of Chicago Press, 1987, pp. 490-502, while Baldwin "never overtly claimed priority" for its discovery, nor did anything "intentionally deceitful" to assert his claim over it, he did doing the best job of the three in controlling the language surrounding discussion of the theory. Also, Baldwin repeatedly alluding to the genesis of the idea in his work, and published the others' papers as fully-acknowledged appendices in his work. For these reasons, Baldwin's name was largely given priority in the advancement of the notion in the scholarly culture. Later, Baldwin's priority was virtually cemented over the concept, the theory was dubbed, the "Baldwin effect" by George Gaylord Simpson. I am not at ease with the implications of the title, the "Baldwin effect." Although most scholars seem to embrace it, not only does it characterize the theory as simply the Baldwin's discovery, but the word "effect" implies a focus on the net evolutionary result of the phenomenon, thereby neglecting Baldwin's original reference to the role of organisms in making individual accommodations as an indirect cause of the direction the evolutionary processes. This, I believe, implies a mechanistic interpretation of the theory. Therefore, I prefer to return to Baldwin's term, "Organic Selection." This stance in terms of terminology is also helpful in deciphering between Baldwin's original and authentic formulations of the theory, some of its more contemporary neo-Baldwinian interpretations, as well as even looser, more popular interpretations which use the term to describe pretty much any quirk or wrinkle that is at odds with the standard version of evolutionary theory. It also signals that in the foregoing, amidst subsequent interpretations and re-interpretations over the past century, in my analysis, I shall be endeavoring to go "back to Baldwin" to try to grasp the original meaning of the theory that he articulated, and then to develop some novel cosmological speculations concerning the meaning of Organic Selection.

8. Waddington defines Lamarckism as follows: "[Lamarck] supposed that evolution had come about by means of processes which involved causal interactions between the organism and its surrounding circumstances, the environment … The first stage in an evolutionary change is for the organism … to decide by an act of will to change its environment—to move into a new region or to carry on its life in some different way from that it had used in the past. Its new habits created what Lamarck called new 'besoins', and new structures then arose in the animal in correspondence with these … Lamarck was arguing that when an animal is faced with new necessities in the carrying on of its life it will develop new structures or abilities suitable for performing what is being required of it. Moreover, Lamarck urged that these new structures or facilities would be passed on to the offspring through heredity so that they would result in a true evolutionary change" (*Nature and Life*, New York, George Allan & Unwin Ltd. / Athenaum, 1961 / 1962, p. 79).

9. Following Francisco Ayala's commentary in Cobb (ed.), *Back to Darwin: A Richer Account of Evolution*, Grand Rapids, William B. Eerdman's Publishing Company, 2008, p. 53, to the effect that the term, "neo-Darwinism" is employed almost exclusively by critical observers from philosophy and psychology and not by biologists themselves, namely, that "the term 'neo-Darwinism' has little currency among evolutionary biologists [and that] … in current use, it seems that the term 'neo-Darwinism' and its cognates are mostly confined to the writings of philosophers and theologians," in the foregoing, I shall employ this term as

rigid adherence to the set of assumptions emerging from "the modern synthesis" that is found in the mainstream of biology. From the "neo-Darwinist" perspective, the theory of Organic Selection is generally characterized as a residue of Lamarckism or of Vitalism, or is dismissed as offering explanations based on notions of "purpose" and of "final causality." In mainstream biology, Larmarckian explanations, holding that phenotypic variations take place as a direct result of the environmental conditions that organisms face, have essentially been relegated to an instantiation of the fallacy of "false cause," and have been summarily dismissed as "in conflict with the principle of causality in vogue in the materialistically-minded modern science."[10] In a parallel manner, proponents of "the modern synthesis" have recommended that Baldwin's theory of Organic Selection be disbanded altogether "as either a trivially true example of normal natural selection at work or a flatly false regression to Lamarckism."[11] However, throughout his work, Baldwin maintains that the hypothesis of Organic Selection is explicitly "Darwinian." Consistent with the theory of Natural Selection, it attempts to provide an account for the appearance of the inheritance of useful variations on the part of organisms arising by way of the influence of the environment, without the need to embrace Lamarckism or neo-Lamarckism. It is also not a Vitalistic theory, because it does not assume that the minds of organisms are directly responsible for evolutionary advances.[12] Rather, it claims only an indirect causal role for mentality in evolutionary processes that is consonant with Natural Selection. From these considerations, the theory of Organic Selection deserves a deeper investigation and should not be simply made subject to the *Semmelweis Reflex*, or the habit of biologists to automatically reject appeals to the mentalities, the behaviors, and the activities of organisms as playing a role in evolutionary processes.

Later in the twentieth century, theoretical biologist Conrad Hal Waddington's notion of "genetic assimilation" was held to be analogous to some aspects of Baldwin's theory of Organic Selection.[13] As Jablonka and Lamb (2005) suggest, Waddington's

> genetic assimilation experiments show how Darwinian mechanisms can produce apparently Lamarckian evolution … [but far more importantly] they show how, when faced with an environmental challenge, induced developmental changes

sparingly as possible, so as to avoid the "essentialist fallacy" in my descriptions of various biological researches.

10. Dobzhansky 1940, quoted in Gould, *The Structure of Evolutionary Theory*, Cambridge, Harvard University Press, 2002, p. 454.

11. Mayr and Dobzhansky 1963, quoted by Depew in Weber and Depew (eds.), *Evolution and Learning: The Baldwin Effect Reconsidered*, Cambridge, The MIT Press, 2003, p. 4.

12. For Baldwin, the theory of Organic Selection allows for "consciousness [to be seen as] a 'factor' [in evolutionary processes] without resorting to the vague postulates of 'self-adaptation,' 'growth-force,' 'will-effort,' etc., which have become so common of late among the advocates of the new vitalism" (*Development and Evolution*, p. 70).

13. One source goes so far as to describe Waddington as "a champion of the principle of 'organic selection', in which environmentally induced changes in somatic (body) cells can result in hereditary changes, not because they affect the hereditary material (DNA) itself, but because they enable the population to survive long enough to allow the accumulation and selection of similar hereditary changes"
(see http://encyclopedia.farlex.com/Waddington,+Conrad+Hal).

> unmask already existing genetic variation, which can then be captured by natural selection.[14]

In one experiment, Waddington

> raised fruit flies on a high-salt medium and selectively bred flies that developed larger anal papillae in response, which helped the flies to excrete salt from their bodies. After twenty-one generations of selective breeding, this new phenotype (larger anal papillae), although initially elicited only in response to an adverse environmental condition, developed in the absence of the high-salt condition.[15]

This experiment, as well as many others, provided evidence for the phenomenon of "genetic assimilation," since it is probable that in response to an environmental stress, the flies' evolutionary pathway was directed toward a particular phenotypic character of adaptive value (i.e. larger anal papillae, which became encoded genetically), regardless of the continuance of that environmental condition.[16]

In carrying out his genetic assimilation experiments, Waddington was preoccupied with achieving a "synthesis of development and evolution, to resolve what he experienced as a conflict between the ordered transformations of epigenesis on the one hand and the randomness of neo-Darwinism on the other."[17] In so doing, Waddington hypothesized that there is an "analogous interaction between developmental processes and evolution, whereby developmental adaptations 'guide' or 'canalize' evolutionary change"[18] along a developmental path or "creode,"[19] in a manner that has been interpreted to be

14. Eva Jablonka and Marion Lamb, *Evolution in Four Dimensions: Genetic, Epigenetic, Behavioral, and Symbolic in the History of Life*, Cambridge, MA: MIT Press, 2006, p. 274.

15. Ellis and Bjorklund, *Origins of the Social Mind: Evolutionary Psychology and Child Development*, New York, Guilford Press, p. 52.

16. In a previous experiment, "Waddington (1975) subjected pupal fruit flies (*Drosophilia melanogaster*) to heat shock. In response to this treatment, some of the surviving flies developed wings that contained few or no cross-veins. Waddington subsequently bred the no-cross-vein flies and exposed the pupal flies of that second generation to heat shock as well. This produced a second generation of fruit flies that also had few or no cross-veins in their wings. After fourteen generations of selective breeding, some fruit flies developed the no-cross-wing phenotype *without* the preexposure to heat shock; that is, Waddington showed that a new phenotype was eventually seen in the developing offspring, without exposure to the original activating environmental event. Waddington referred to this phenomenon as genetic assimilation, which he defined as 'the conversion of an acquired character into an inherited one; or better, as a shift towards a greater importance of heredity in the degree to which the character is acquired or inherited' (Bering 61)" (Ellis and Bjorklund, *Origins of the Social Mind: Evolutionary Psychology and Child Development*, p. 52).

17. Goodwin and Saunders (1989) continue, "[Waddington] saw the basis for this in terms of the potential of developmental processes for adaptive response to environmental influences and the stabilization, or as he preferred to call it, canalization, of particular pathways through the epigenetic landscape to the adult form" (*TheoreticalBiology: Epigenetic and Evolutionary Order from Complex Systems*, Edinburgh, Edinburgh University Press, 1989, p. xi).

18. Anderson, 'How Adaptive Antibodies Facilitate the Evolution of Natural Antibodies,' *Immunology and Cell Biology*, vol. 74, 1996, p. 286.

19. According to Waddington, a "creode" is "a path of development [which] … exhibits a balance between inflexibility … and flexibility." The notion "brings together considerations [of] … two separate bodies of theory, one of which dealt with the effects of genes on development and the other with the effects of the environment in modifying the characters of the organism." He continues, "the creode is an expression of

akin to the theory of Organic Selection.[20] Although Waddington maintained that there were strong conceptual differences between his own findings and Baldwin's ideas, his results ended up helping to revive them from within the mainstream of biological research. Interestingly-enough, Waddington was also an avid reader of the philosophical works of Alfred North Whitehead.[21] Like Whitehead, he was devoted to re-conceiving life and evolution in a holistic, "organismic" light.

As described by Brian Goodwin (1994), who was a pupil of Waddington's, one problem that has arisen due to the dominance of "reductionist" biology, is that it has obscured the true complexity of biological processes and has led to the "disappearance of organisms from Darwinism" as "the fundamental units of life," since they are seen as "nothing but the vehicles for genes."[22] Goodwin continues, "in neo-Darwinism, organisms [are seen to] have no agency, because they do not exist as real entities, reduced as they are to genes and their products."[23] In contrast to this "genocentric" viewpoint, Goodwin argues for an "expanded" and more "balanced biology," in which "inheritance and natural selection [do] continue to play significant roles … but [are] parts of a more comprehensive dynamical theory of life that is focused on the dynamics of emergent processes."[24] From this perspective, which contrasts especially with Richard Dawkins' brand of neo-Darwinism, "organisms [would] cease to be [considered] mere survival machines [or 'vehicles' that are subordinate to their genes conceived as 'replica-

the potentialities derived from [a] whole set of genes … [where] the degree of canalization of the creode is a function of the whole set of genes" (*Nature and Life*, pp. 64-65).

20. In defending an "organismic" perspective on evolution, Waddington writes, "the first point that confronts us, for instance, is that before an organism's environment can exert natural selection on it, the organism must select the environment to live in … even within a single species different individuals differ hereditarily in their behaviour; for instance, in their choice, out of a number of alternatives of an environment to live in, or out of a number of alternatives of an environment to live in, or a member of the opposite sex to mate with" (*Nature and Life*, p. 89). Waddington also admits of a non-vitalistic, non-Lamarckian role for mentality in evolutionary processes, stating that "we have considerable grounds for believing, then, that mentality in the broad sense, or at least behavior … is a factor of importance in evolution. But it is not necessary to suppose, … that an Act of Will brings into being an appropriate hereditary variation. The situation is that existing modes of behavior … combine with external circumstances to determine the nature of the effective environment" (*Nature and Life*, p. 91).

21. See Waddington, *The Evolution of an Evolutionist*, Ithaca, Cornell University Press, 1975, pp. 3-5; also see Slack, 'Conrad Hal Waddington: The Last Renaissance Biologist?' *Nature Reviews, Genetics*, vol. 3, Nov. 2002, pp. 889-895. According to Waddington, "it was, more than anyone else, the philosopher Whitehead who provided the new way of looking at the situation which de-horned the dilemma [between mechanism and objective vitalism] … Whitehead's thought was certainly strongly influenced by that of the emergent evolutionists such as Alexander. In fact his ideas about biology can to some extent be regarded as emergent evolution seen from the other end. We start from a variety of observable phenomena, and from these we construct concepts (or models) of simpler entities, by combinations of which we can account for what we have observed. These simpler entities remain, however, mysterious things about which we know no more that we have been able to discover by inspecting the phenomena in which they take part" (*Nature and Life*, pp. 19-20).

22. Goodwin, *How the Leopard Changed Its Spots: The Evolution of Complexity*, New York, Charles Scribner's Sons, 1994, pp. xv, 1.

23. Goodwin, *How the Leopard Changed Its Spots*, p. 172.

24. Goodwin, *How the Leopard Changed Its Spots*, p. xvi.

tors'] and [would] assume intrinsic value, having worth in and of themselves."[25]

Partly as a result of the interest that was generated by Waddington's researches, and partly as a result of the urge, on the part of biologists and philosophers of biology such as Goodwin, to go beyond neo-Darwinism and to develop a broader view of the biological world, in the last twenty years, there has been a small resurgence in terms of scholarly and scientific attention to the theory of Organic Selection. For instance, in *Developmental Plasticity and Evolution* (2003), Mary Jane West-Eberhard argues that in the attempt to develop a more coherent picture of evolutionary processes in biological research, beyond the mainstream gene-centered biology, "there is good reason to resurrect a modern expanded version"[26] of the theory of Organic Selection. According to her, the theory rightly challenges the mainstream assumption, held by "most biologists," that genetic "mutation is ultimately the *only* legitimate source of evolutionary novelty."[27] The theory of Organic Selection is, for West-Eberhard, consistent with the notions that genes can be "followers in evolution" and that "behavioral change often precedes and directs morphological change."[28] West-Eberhard further suggests that "certain conventional ideas about adaptive evolution have to change."[29] Other publications, such as Bruce Weber's and David Depew's *Evolution and Learning: The Baldwin Effect Reconsidered* (2003) have also contributed to this resurgence, providing an occasion for "Baldwin boosters," namely, those who think that the theory has real scientific merit, to "face off" with "Baldwin skeptics," or those who think that it does not. One notable contributor to that volume, Daniel Dennett, has been described as a "Baldwin Booster" in utilizing Baldwin's theory to advance his philosophy of mind, although he may be seen to emphasize it from what may be termed a "neo-Darwinist" perspective.[30] While Dennett questions Baldwin's motivations in coming up with the theory, believing that what Baldwin truly aimed at was a "skyhook," he does admit that "the Baldwin effect" is a useful, explanatory "crane" that does not rely on an appeal to the power of a capital-M "Mind" for its legitimacy. In contrast, "Baldwin skeptic," Paul E. Griffiths, in his contribution to the volume, argues that "excessive attention has been given to the theory," simply because it gives false hope that in allowing "'mind' to 'direct' evolution" we may be saved "from the barren Darwinian vision of a world ruled by chance and necessity."[31] Also, in the book, Terrence Deacon, associates Baldwin's theory with the concept of "niche construction," the notion that by their actions, organisms modify their environment, thereby impacting on their own chances of survival as well as those for other organisms.[32] In another recent work, *Evolution in Four Dimensions* (2005), Jablonka and Lamb

25. Goodwin, *How the Leopard Changed Its Spots*, p. xvi, my additions.

26. West-Eberhard, *Developmental Plasticity and Evolution*, New York, Oxford University Press, 2003, p. 24.

27. West-Eberhard, *Developmental Plasticity and Evolution*, p. 143.

28. West-Eberhard, *Developmental Plasticity and Evolution*, pp. 157, 24.

29. West-Eberhard, *Developmental Plasticity and Evolution*, p. 157.

30. It may be speculated that Dennett thinks approvingly of Baldwin's theory of Organic Selection because he considers it to be a precursor of B. F. Skinner's notion of "operant conditioning" in relation to evolution, but would want to see the mentalist elements of Baldwin's theory eliminated.

31. Weber and Depew (eds.), *Evolution and Learning*, p. 194.

32. Later in this paper, it will become evident that the notion of "niche construction" is compatible with

point to the "Baldwin effect" as part of their overall thesis that there are four legitimate, interconnected inheritance systems (the genetic, the epigenetic, the behavioral, and the symbolic) which need to be taken into account if we are to truly arrive at a comprehensive interpretation of evolutionary processes. Baldwin's theory figures prominently in the book, especially in their account of the behavioral dimension, as they argue toward their more holistic understanding of evolution.

A host of other publications that either claim that certain investigations of biological phenomena provide proof of the theory, or give descriptive relevance to the theory of Organic Selection have also emerged.[33] Some of these are constituted by creative reinterpretations of the theory, which have gone beyond the intentions of the original. Moreover, the "Baldwin effect" has recently been assimilated by researchers in other emerging domains of investigation, such as in evolutionary computation. This development was spurred on by the research of Hinton and Nowlan (1987), who initiated a computational model of how the theory "works" in relation to simulated evolution of neural networks. Others, such as prominent geneticist, Francisco Ayala suggest, although questionably, that the theory of Organic Selection has already been assimilated into the mainstream of biology, in the sense that it is already employed by biologists as a viable explanatory tool.[34] West-Eberhard warns, however, that in order to avoid conflating Baldwin's ideas with more recent developments and theories, readers and researchers should read Baldwin's original work, "rather than rely on second- or third-hand accounts."[35] It is in this

what Whitehead depicts as "the neglected side of the evolutionary machinery" (*Science and the Modern World*, New York, The Free Press, 1925 / 1967, p. 111).

33. For example, see Anderson, 'How Adaptive Antibodies Facilitate the Evolution of Natural Antibodies,' pp. 286-291. Anderson states that it was Waddington who "revived [Baldwin's] essential argument within the Modern Synthesis when he proposed an analogous interaction between developmental processes and evolution, whereby developmental adaptations 'guide' or 'canalize' evolutionary change" (p. 286). In the article, Anderson argues that "the Baldwin effect is manifested in the genetics of the immune system. The conventional B cell population has all the requisite elements of a learning system [and that] … learning by the adaptive antibody population facilitates the evolution of a natural antibody repertoire" (p. 286).

34. Ayala's statement in Cobb (ed.), *Back to Darwin*, p. 193, that the "Baldwin effect" has already been assimilated into the mainstream of biology is highly debatable. As he suggests, "the hypothesis [having been] elaborated and made more precise during the twentieth century, in conjunction with the advance of genetic knowledge. [It] became incorporated into the modern theory of evolution, largely through the Russian evolutionist I. I. Schmalhausen, whose main book was translated into English in 1949 by Theodosius Dobzhansky, a principle author of the synthetic theory.: However, this statement omits the summary dismissal of the theory by figures like Dobzhansky. It may also omit the impact of Schmalhausen's relation to the Lysenko affair, which may have served to undercut attention to his reference to Baldwin. Cobb also questions Ayala's interpretation. For Cobb, "it is interesting that when [Ayala] deals with the Baldwin effect … he describes it in a way that omits any reference to the subjectivity, or even the activity, of the animals involved" (p. 25). He later continues, "Ayala assures us that the Baldwin effect as he defines it has been assimilated into the dominant theory. My objection is that when the dominant theory of summarized, this new feature is omitted. Ayala, presumably, does not consider it important enough to make it explicit" (p. 222). Furthermore, if it is the case that Baldwin's theory of Organic Selection has already been assimilated into the mainstream of biology, then one might ask, for example, why even a mention of it was curiously omitted in S. J. Gould's, otherwise comprehensive volume, *The Structure of Evolutionary Theory*.

35. West-Eberhard, *Developmental Plasticity and Evolution*, p. 151.

spirit that this paper has been written. At the very least, whether or not they are fully understood by researchers, the persistence of Baldwin's ideas demonstrates that they constitute an irreducible chapter in the unfolding of the history of biology.

Process philosopher, Ian Barbour has recently suggested that scholars of philosophies of Alfred North Whitehead and Charles Hartshorne should

> welcome this renewed interest in the Baldwin effect, even though it is [still] only found in a minority of evolutionary biologists. Process metaphysics postulates at least a minimal novelty and creativity in integrated entities at all biological levels. In this framework, one would expect that initiatives of organisms to have significant long-term consequences.[36]

In a similar vein, in his recent book, *Back to Darwin: A Richer Account of Evolution* (2008),[37] process theologian John Cobb recounts that the "Baldwin effect" is one of the keys to rescuing the process philosophical conception of the living organism from some of the more rigid assumptions of mainstream biological research. According to Cobb, some of this research is dominated by the search for laws, material causal explanations, and mechanisms which underlie evolutionary process, thereby assuming a reductionist metaphysics and imposing it onto reality. To be sure, Cobb makes the case that, from the "neo-Darwinist" outlook, there is a tendency to view organisms as complexes of mechanical parts that are entirely conditioned by their environment, or as mere potentialities for mutational variation, or to presume that they are "nothing but"[38] subordinate vehicles for the reproduction of their genotypic constitutions.[39] Cobb also takes issue with the widespread view that genes are largely considered to be "atomic" structures that are entirely insulated not only from the phenotype, but also from the environment.[40]

36. Barbour, 'Evolution and Process Thought,' *Theology and Science*, vol. 3, no. 2, July 2005, p. 167, my addition.

37. Cobb's *Back to Darwin* contains much of the proceedings of a conference on the topic of evolutionary theory in Claremont, California in October 2004. Also see Cobb's 'The Limitations of Neo-Darwinism and Evidence for a Whiteheadian Theory of Evolution,' *Worldviews*, vol. 11, no. 1, 2007, pp. 32-43.

38. Ayala in Cobb (ed.), *Back to Darwin*, p. 77. For a further explanation of the "nothing but" fallacy and the contrasting view, see Ayala's "Guernica" metaphor in *Darwin's Gift* (2007), 162-163, as well as his "gazpacho" metaphor in *Back to Darwin*, p. 81.

39. This point of view is, to a certain extent, defended by Dawkins, in his statement that the phenotype of the organism is a vehicle for gene replication; it is a "survival machine—robot vehicles blindly programmed to preserve the selfish molecules known as genes" (*The Selfish Gene*, New York, Oxford University Press, 1976 / 2006, p. xxi). Admittedly, for Dawkins, this is not the whole story, as he states "in some chapters of this book we have indeed thought of the individual organism as an agent, striving to maximizing its success in passing on all its genes. We imagined individual animals making complicated 'as if' calculations about the genetic benefits of various courses of action. Yet in other chapters the fundamental rationale was presented from the point of view of genes. Without the gene's-eye view of life there is no particular reason why an organism should 'care' about its reproductive success and that of its relatives, rather than, for instance, its own longevity" (*The Selfish Gene*, p. 234).

40. This viewpoint was originally handed-down by August Weismann's "hard inheritance" thesis. As Ayala describes it, Weismann "established that there is a separation between the 'germ track' and the 'somatic track' from the very begging of an individual's life, and thus nothing that happens to the soma can be communicated to the germ plasm" (see Cobb (ed.), *Back to Darwin*, p. 51).

On the contrary, Cobb notes that a Whiteheadian conception of organisms sees them as "unit[s] of emergent value"[41] which are constituted by their relations to other organisms, as well as to their environment, and which are thoroughly engaged in their own creative life-processes. Like Baldwin's theory of Organic Selection, a process-relational view of evolution will emphasize the notion that the mentalities, activities, behaviors, and purposes of organisms play a role in the struggle for existence and in the direction of evolutionary processes.

In this paper, I intend to show how Baldwin's theory of Organic Selection can be integrated with Whitehead's theory of prehensions, as part of the endeavor to arrive at a comprehensive and systematic process-relational evolutionary cosmology that is inclusive of the vital role of the behavior of organisms as agents of selection. Furthermore, a process-relational evolutionary cosmology will maintain that the selective activities of organisms are to be placed among the efficient causes of evolutionary processes. Such a standpoint is validly sought by Cobb and other scholars of process-relational philosophy as an alternative to the dominant mechanistic-materialistic outlook which is assumed in mainstream biological research.[42] In the process of bringing Baldwin's and Whitehead's ideas together, I show, on the one hand, that Baldwin's theory of Organic Selection provides a biological ground for such a cosmology to be developed, illuminating the importance of Whitehead's theory of prehensions for evolutionary theory. On the other hand, Whitehead's overall speculative scheme can, in turn, strengthen the metaphysical, epistemological, and ethical foundations of Baldwin's theory. For example, it helps Baldwinian thought to overcome some of the lingering sensationalist presuppositions regarding cognition and experience which are present in Baldwin's theorizing. In the process of integrating the two views, I further propose an enlarged conception of the theory of Organic Selection, one that is more thoroughly reflective of Whitehead's notion of "prehensive selectivity." This enlarged conception of the theory is placed in context with Darwin's principle of Natural Selection. At the end of the paper, I take up some of the imminent questions concerning the ethical dimensions of notion of selectivity, as it pertains to evolutionary theory, which emerge from this enlarged conception of the theory of Organic Selection. However, first, I shall provide a brief sketch of Baldwin's intellectual career as it pertains to the genesis of the theory of Organic Selection.

PART 1: BALDWIN AND THE GENESIS OF THE THEORY OF ORGANIC SELECTION

James Mark Baldwin lived and worked in the blooming period of the American intellectual scene at the turn of the twentieth century. Prior to receiving his doctorate at Princeton under James McCosh in 1888 for a thesis which was largely constituted by a "refutation of materialism,"[43] Baldwin studied briefly in Germany under Wilhelm Wundt.

41. Whitehead, *Science and the Modern World*, p. 107.

42. As Cobb suggests, the role and purpose of the book, *Back to Darwin* "is to develop a Whiteheadian alternative to the presently dominant form of evolutionary theory" (p. 26).

43. Broughton and Freeman-Moir (eds.), *The Cognitive Developmental Psychology of James Mark Baldwin*,

Over the course of his career, he taught psychology and philosophy at Lake Forest, Toronto, Princeton, and Johns Hopkins. In 1889, Baldwin published the first volume of his *Handbook of Psychology*, subtitled, *Senses and Intellect* in which he articulated the basic assumptions of his integrative mental philosophy and his physiological-psychology that he had developed in his earlier studies and travels. The second volume of the *Handbook*, entitled *Feeling and Will* (1891), extended his mental philosophy "to the problems of feeling, emotion, and voluntary action."[44] In it, he established the conceptual foundation for his later writings, focusing on the meaning of the notions of habit, accommodation, and the importance of imitation and the exercise of choice in the cognitive development of children.

In between the publication of the two volumes of the *Handbook*, he took up the project of editing two of an eventual three volumes of the *Dictionary of Philosophy and Psychology* (1887, 1891, 1905), to which many major intellectual giants such as Royce, Peirce, James, Dewey, Bosanquet, and G. E. Moore contributed. This work was a seedbed for the further development of his ideas. It also helped him to cultivate and advance many mutually cross-fertilizing scholarly relationships and friendships, such as with James, Dewey, and Royce, and it was a "ladder" to establishing his own intellectual prominence. Furthermore, at this time, Baldwin developed a focus on the central role of "selection" in cognitive attention and interest. In this regard, Baldwin's work was mutually influencing on James' *Principles of Psychology* (1890), who refers to Baldwin's *Handbook* as a chief resource.[45] Along with several of his other writings, it also inspired Royce, especially, in the latter's *Outlines of Psychology* (1903).

In his 1894/1895 book, *Mental Development in the Child and the Race* (by which he means "species"), Baldwin's investigations were in the domain of comparative psychology. He examined the psychology of children[46] and developed parallels with animal behavior.

Norwood, NJ., Ablex Publishing Corporation, 1982, p. 26.

44. Broughton and Freeman-Moir (eds.), *The Cognitive Developmental Psychology of James Mark Baldwin*, p. 30.

45. While to a large extent, Baldwin agrees with the pragmatists' connection of truth and utility, and he uses their analyses in his writings as part of his theory of Organic Selection, he did depart from them. While he holds that "not only is all truth selected for its utility, but apart from its utility it is not truth," he also thinks that "reality is only the content of the system of beliefs found useful as a guide to life" (Broughton and Freeman-Moir (eds.) *The Cognitive Developmental Psychology of James Mark Baldwin*, p. 95). On this note, it is my view that Whitehead's theory of prehensions provides the most systematic philosophical account of the themes raised through the philosophical contemplations of James, Royce, and others. While there is no evidence that Whitehead read, or was in direct contact with Baldwin's ideas in articulating, they may have been on the peripheries of his awareness, namely, having second-order contact through his knowledge of James, Royce, and Morgan. It is clear that Whitehead was inspired by the nexus of concepts of selectivity, discrimination, exclusion, negation, and transmutation, generated by these figures, in formulating the theory of prehensions.

46. Later, Jean Piaget, Lawrence Kohlberg, and Lev Vygotsky were heavily influenced by Baldwin's discoveries and methods stemming from *Mental Development* onward, especially in relation to the advancement of the concepts of accommodation, assimilation, and equilibrium in biological evolution, cognitive development, and learning. See especially Piaget, *Adaptation and Intelligence: Organic Selection and Phenocopy*, trans. Stewart Eames, Chicago, University of Chicago Press, 1980) and the Piaget interview in Broughton and Freeman-Moir (eds.) *The Cognitive Developmental Psychology of James Mark Baldwin*, pp. 80-86).

His genetic analysis centered on the notion that cognition was "a growing, developing activity" in the individual child, namely, a process, "instead of a fixed substance."[47] In this work, as well as his other earlier works, his reflections oscillate between two poles of study: the ontogenetic, namely, involving the study of the development of the single individual from the "point of view of the [learned] functions which an organism performs in the course of his life history" and the phylogenetic, by which he means the study of the development of the history of the species and of animal life in relation to "the factors … which show themselves in evolutionary progress from generation to generation."[48] Methodically, he extrapolates his findings surrounding the individual child's development of advantageous behaviors, habits, and functions to an interpretation of their development in the species and their adoption by society. He also establishes parallels between cognitive development in human beings and the psychologies of non-human organisms in their interaction with, and adaptation to their environment, which, in turn, leads him back to consider further insights into the mental development of the child.

Overall, Baldwin's research in *Mental Development* is premised on the notion that "all stages of mental accommodation and development can be construed by the same principles of [biological] adaptation."[49] In this regard, *Mental Development* constituted a chief step toward the development of the theory of Organic Selection and to a coherent position standing in contrast to the Weismannian "neo-Darwinism" of his day. As Baldwin describes,

> neo-Darwinians hold that natural selection, operating upon congenital variations, is adequate to explain all progressive race gains. This theory, therefore, is able to dispense with the ontogenetic acquirements of the particular organism. It accordingly denies that what an individual experiences in his lifetime, the gains he makes in his adaptations to his surroundings, can be transmitted to his sons."[50]

However, Baldwin outlined a valid, non-Lamarckian explanatory principle which could account for their, albeit indirect, transmission to future generations.

Baldwin's paper, "A New Factor in Evolution," in which he first advanced the theory of Organic Selection in a fully coherent form, was presented just after Christmas before the Academy of Science in New York in 1895, and was published in *American Naturalist* in 1896. In it, he showed that "evolution is, not more biological than psychological,"[51] and that organisms have a degree of agency in directing evolutionary processes. According to Baldwin, organisms do "not wait for chance, but go right out and effect new adaptations to [their] environment,"[52] in turn, playing a causal role in channelling the direction of the evolutionary novelties appearing in subsequent generations of a species. Baldwin postulated that, especially in times of environmental duress, members of a species may

47. Baldwin, *Mental Development in the Child and the Race: Methods and Processes*. New York, The Macmillan Company / Kessinger Publishing, 1894 / 1906, p. 2.

48. Baldwin, 'A New Factor in Evolution,' *American Naturalist*, 1896, pp. 442, 446.

49. Baldwin, *Mental Development*, p. 202.

50. Baldwin, *Mental Development*, pp. 193-194.

51. Baldwin, 'A New Factor in Evolution,' p. 547.

52. Baldwin, 'A New Factor in Evolution,' p. 547.

manage to make accommodations to their dominant modes of behavior, developing and selecting new habits or functions which allow them to adapt to their conditions and keep themselves temporarily alive. Such new habits may be imitated, learned by, or passed on to other members of the species. Meanwhile, certain individuals in subsequent generations of the variety may, with reference to the eliminative processes belonging to the principle of Natural Selection, inherit congenital or mutational variations which will serve to accentuate, amplify, or perfect the performance of the new behavior, habit, or function, giving them an advantage in the struggle for existence. In this way, the evolutionary destiny of a species will have been indirectly "channelled" by way of the behavioral selections, initially, of one or a few organisms.

Baldwin's paper was paralleled at the same conference by Lloyd Morgan's own independent articulation of the "new" idea. A few months later, Osborn announced his discovery of an idea which turned out to be virtually the same as Baldwin's. Baldwin further developed the theory of Organic Selection in *Social and Ethical Interpretations in Mental Development* (1897) and *The Story of the Mind* (1898). He then consolidated the theory in *Development and Evolution* (1902), extending to it the notion of "orthoplasy," referring to "the general fact that evolution has a directive determination through organic selection,"[53] and indicating that such directive determination could be studied scientifically. In it, Baldwin further aimed to bring psychology and biology closely in line by investigating evolution as a psycho-physical phenomenon, taking the mind and body as mutually dependent on one another. While this work is exceedingly repetitive in style due to his effort to unify his various articulations of the theory of Organic Selection, it constitutes Baldwin's most mature and comprehensive expression of it. Afterward, he did not revisit or expand the theory in a direct or substantial manner.

A scandal, which forced him to resign and to depart the American intellectual scene, largely divides Baldwin's early intellectual career from his later work. He left the United States and pursued intellectual work in Paris and Mexico. During the First World War, he played a role in strengthening ties between France and America. While in Paris, he became associated with the Institut de France and came in contact with such notable French philosophers as Henri Poincaré, Pierre Janet, and Henri Bergson. During this time, he completed three volumes of *Thought and Things* (1906, 1908, 1911), which lead to a final volume, *The Genetic Theory of Reality* (1915). This stream of work culminated in his theory of Pancalism, which emphasizes that "the organ of the apprehension of the real in its complete, synthetic, and … absolute form" is "aesthetic contemplation."[54] His Pancalist standpoint was constituted largely by the merging of many of the main ideas attributable to Darwinian evolution, Jamesian Pragmatism, and Roycean Absolute Idealism. Since Whitehead was also influenced by the writings of these figures, and placed emphasis on beauty and on aesthetic experience in his own speculative philosophy, scholars may, perhaps quite fruitfully, compare it with Baldwin's Pancalism. At any rate, in what follows, I shall focus on Baldwin's earlier research in order to provide a more

53. Baldwin, *Development and Evolution*, p. 142.
54. Baldwin, *The Genetic Theory of Reality*, New York, G. P. Putnam's Sons, 1915, p. 302.

detailed account of Baldwin's "two-part" theory of Organic Selection.

PART 2: AN OVERVIEW OF BALDWIN'S THEORY OF ORGANIC SELECTION

Baldwin is largely in agreement with Darwin in respect to the latter's stance on the existence and scope of animal mentality. In *The Descent of Man* (1871), while Darwin held that "no animal has the power of abstraction, or of forming general concepts, is self-conscious and comprehends itself, … [or] believes in God," he placed the human species on a continuum of intelligence with animals, distinguishing between them merely by the level of the "higher development of … mental powers."[55] Darwin believed that, like human beings, the higher animals have instincts, even social instincts, as well as many of the same "senses, intuitions, sensations, passions, affections, and emotions,"[56] including curiosity and wonder. For Darwin, evidence of mentality in animals was indicated through the expression of emotions, as he studied thoroughly in *The Expression of the Emotions* (1872). Darwin also defended himself against the critical claim that in *The Origin of Species* (1859), he had "attribute[d] all changes of [both] corporeal structure and mental power [in the animal world] exclusively to [heredity and] natural selection." He stated that he was open to the notion that "some amount of modification [is due] to the direct and prolonged changed conditions of life"[57] and that "intelligent actions, after being performed during several generations, become converted into instincts and are inherited."[58] Furthermore, it was Darwin himself who had opened the door to the psychological investigation of the behavior of non-human animal. At the end of *Origin of Species*, he anticipated "open fields for far more important researches" suggesting that "psychology will be based on a new foundation [and will investigate the] … acquirement of each mental power and capacity by gradation"[59] in the animal world.

In light of the fact that Darwin had held that mental life was a function of biological life, in *Development and Evolution*, Baldwin writes that "the occurrence of a psychological change in an animal is a fact in the same sense that the animal's process of digestion is. And the genetic explanations which we find it possible to offer, in this case or that, may draw upon the facts of psychology."[60] In addition to being inspired by Darwin, Baldwin was also influenced by George Romanes' *Mental Evolution in Animals* and by Spencer's *System of Synthetic Philosophy*, in their respective investigations of animal mentality.[61] Es-

55. Darwin, *The Descent of Man*, New York, Prometheus Books, 1871 / 1998, pp. 81, 88.
56. Darwin, *The Descent of Man*, p. 81.
57. Darwin, *The Descent of Man*, p. xxix.
58. Darwin, *The Descent of Man*, p. 69.
59. Darwin, *The Origin of Species by Means of Natural Selection*, New York, Penguin Books, 1859/1968, p. 458.
60. Baldwin, *Development and Evolution*, p. 4.
61. Baldwin writes, "with the two great exceptions, Spencer and Romanes, I know of no biologists approaching the first rank, who have attempted to bring the phenomena of mental development—the class of facts most open to scrutiny and most important everywhere in the animal series—and those of organic adaptation, under the terms of a single concept" (*Mental Development*, p. 202).

pecially, Baldwin adopts Romanes' notion that animals have a "function of selective discrimination—[a] power of discriminating among stimuli and responding to those which are the stimuli to which responses are appropriate,"[62] and he incorporates Spencer's analysis of animal reactions to pleasurable and painful experiences into his scheme.

Coinciding with William James' definition that "the pursuance of future ends and the choice of means for their attainment [are] … the mark and criterion of the presence of mentality"[63] as well as his investigations of the animal psyche, Baldwin maintains that animals of various species satisfied, to lesser or greater degrees, the attribution of mentality. Like James and Royce, and in a way reminiscent of Whitehead's analysis of consciousness in *Process and Reality*, Baldwin emphasizes that the chief characteristic of mentality is attention, which implies operations of discrimination[64] and selection. He describes that "the central fact of consciousness, its prime instrument, its selective agent, its seizing, grasping, relating, assimilating, apperceiving—in short, its accommodating element and process—is attention."[65] Baldwin believes that such selectivity is potentially universal through the organic world. For even if the purposes of organisms simply involve the choice of, and pursuit of food and a mate out from a multitude, the selection of function or behavior, the determinate growth in directions as a discriminative response to the stimulations from the environment, the relation to objects in the environment, or the selective response to what was beneficial in their environment in contrast to what was damaging in it, then a degree of mentality could be attributed to them. He suggests that "even plants must grow in determinate or 'select' directions in order to live, and their reactions are responses to stimulations from the environment."[66] Additionally, Baldwin thinks that Darwin's notion of Sexual Selection involved psychological processes, and more accurately, a selective activity, stating that "one animal's recognizing another and being led by this recognition to carry out the act of mating, we have a com-

62. Baldwin, *Mental Development*, p. 188, note 1.

63. James, *The Principles of Psychology* (Vol. 1), New York, Dover Publications, Inc., 1890 / 1950, p. 8. According to Richards (1987), for James, "the most important function of consciousness … was that it established goals and selected interests. Man and higher organisms, in James' judgment, clearly revealed purpose in their behavior; they became fascinated by certain interests—from seeking food to seeking beauty—to the exclusion of others. This could not result from a passive accommodation to the occurrent environment, since goals and ideals were precisely those things beckoning from the future, and interests often transcended the commonplace and the present time. In James' view, goals, ideals, and interests could be understood only as spontaneous mental variations that, in the life of higher creatures, had been selected to steer them through their natural and social terrain. 'Consciousness,' in James' pugnacious metaphor, 'is a fighter for ends'" (*Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*, p. 432).

64. According to Royce, even "decidedly low organisms and … in general the plants may respond in what seems to us a decidedly discriminating way to disturbances of the environment, when nevertheless the psychologist finds it of no service to his science to attributed mental life to the organisms in question. In recent biological research a tendency has consequently appeared to describe the apparently sensitive and discriminating reactions of lower organisms in terms of a phraseology that does not presuppose the existence of any mental life whatsoever" (*Outlines of Psychology: An Elementary Treatise With Some Practical Applications*, New York, The Macmillan Company, 1903, p. 28).

65. Baldwin, *Mental Development*, p. 221.

66. Baldwin, *Development and Evolution*, p. 118.

plete series of events involving the psychological process of recognition, joined with that of mating."[67] Baldwin further notes that "Darwin's personal use of the principle of sexual selection … seemed to require a very high psychological development on the part of the choosing mate, the female."[68] Consequently, Baldwin agrees with Romanes' notion that "it is best to draw no line at all between life and life with consciousness."[69] This is not to say that Baldwin attributed consciousness or even self-consciousness to all organisms, since some animals have a very low degree of sentience. Rather, he holds to a "middle position" in this regard, by recognizing that experience does not necessarily involve consciousness, but experience is never completely void of mentality. For Baldwin, mentality is not to be considered a static substance, but is rather to be constituted as itself a process of growth and development, with reference to the organism's ongoing struggle to become better adapted to its environment. For him, mentality is not completely unconditioned or transcendent. At the same time, mentality is not shackled to sensation and to outer experience. Rather, very much like Whitehead (although we must here recall the latter's criticism of the sensationalist doctrine as presupposing consciousness), Baldwin holds to a realism in which the sensations from outer experience

> give the mind its material to work upon; and it gets no material in the first instance from any other source. All the things we know, all our opinions, knowledges, beliefs, are absolutely dependent at the start upon this supply of material from our senses; although, as we shall see, the mind gets a long way from its first subjection to this avalanche of sensations which come constantly pouring in upon it from the external world. Yet this is the essential and capital function of Sensation: to supply the material on which the mind does the work in its subsequent thought and action.[70]

Furthermore, in Baldwin's view, mental life is not to be conceptualized as somehow disconnected from the body. Rather, it is a function of organic life. Hence, his analysis is what he terms a "psycho-physical" interpretation in which "the development and evolution of mind and body [are] taken together."[71] For him, body and mind are considered to be parallel, continuous, uniform, and mutually dependent on one another, yet they are distinct. For instance, he holds that although mind and brain are mutually dependent terms, mentality cannot simply be reduced to the inherited "hard-wiring" of brain functioning.

Baldwin's theory of cognitive development and learning depends on the fluctuating interplay of two factors: habit and accommodation. On the one hand, Baldwin defines the notion of "habit" as the "readiness for function, produced by previous exercise of that function" which, in general, involves the "loss of oversight, diffusion of attention, subsiding consciousness."[72] On the other hand, the notion of "accommodation," involv-

67. Baldwin, *Development and Evolution*, p. 4.
68. Baldwin, *Development and Evolution*, p. 155.
69. Baldwin, *Mental Development*, p. 200.
70. Baldwin, *The Story of the Mind*, New York, Bibliobazaar, 1898 / 2007, p. 23.
71. Baldwin, *Development and Evolution*, p. 8.
72. Baldwin, *Mental Development*, p. 160.

ing an effort to learn and to acquire new movements and co-ordinations of new movements, means the "breaking up of a habit, the widening of the organic for the reception or accommodation of a new condition," which, in general, implies "reviving consciousness, concentration of attention, voluntary control."[73] In a parallel manner, in relation to the biological world, he states that by habit and accommodation,

> two great gains are made possible to the organism: first, the repetition of what is worth repeating, with the conserving of this worth: this is Habit; and, second, the adaptation of the organism to new conditions, so that it secures, progressively, further useful reactions, which at an earlier stage would have been impossible: this is Accommodation.[74]

In respect to human psychology, Baldwin discovers that the child carries out novel actions by way of a variety of interconnected factors, such as through imitation and copying (for example, of parents and siblings), maternal instruction, play, use and disuse, trial-and-error, spontaneous reflex and motor reaction, sheer luck and accident, and by way of variations on overproduced movements. Also, he finds that a selective activity, which has for its criteria the feelings of pleasure and/or the feelings of pain produced by the new movements, is central in respect to the child's repetition and transformation of them into habits. In one passage in *Development and Evolution*, Baldwin employs the term "selective accommodation,"[75] to designate the process of the organism forming new mental structures. In any event, as part of his theory of Organic Selection, Baldwin carries all of these notions over into his analysis and his description of the "exploratory activities" of organisms which produce novelties in terms of behavior and of habit, from which it selects.

Imitation is one of the chief ways in which new movements and new combinations of movements are selectively acquired and assimilated by organisms.[76] The ability to imitate constitutes one chief characteristic of mentality. Baldwin describes imitation as a "'circular' process" in which, internalized reproductions or copies of the actions of another organism are selected by a subject, and are modified. According to Baldwin, in imitation, the actions are then "reinstated by the act of imitation,"[77] namely, by a re-

73. Baldwin, *Mental Development*, p. 160.

74. Baldwin, *Mental Development*, p. 161.

75. Baldwin, *Development and Evolution*, p. 22.

76. Baldwin writes that "the principal agency for the learning of the animals, and for the supplementing of their instincts, is Imitation. The sight of certain movements on the part of the adult animals, or the hearing of their cries, calls, notes, etc., leads the young to fall into an imitation of these movements or vocal performances. The endowment which such a young animal has in the direction of making movements and cries similar to those of his species aids him, of course, in imitating these in preference to others. So the endowment and the tendency to imitate directly aid each other in all such functions, and hurry the little creature on in his acquisition of the habits of his species. We find young animals clinging even in their imitations pretty closely to their own proper fathers and mothers, who are enabled to bring them up *comme il faut.* There is every reason to think, moreover, that the tendency to imitate is itself instinctive. Young animals, notably the monkey and the child, fall spontaneously to imitating when they reach a certain age. Imitation shows itself to be instinctive in the case of the mocking bird, the parrot, etc. Furthermore, the mechanism of this function of imitation is now very well known" (*The Story of the Mind*, p. 36).

77. Baldwin, *Development and Evolution*, p. 28.

enactment of the selected, modified copy on the part of the subject. Baldwin claims that "the young of animals, and especially of young children [learn new] functions [and develop new Habits] by direct conscious imitation of their elders."[78] As evidence, he quotes Lloyd Morgan's citing of Douglas Spalding's experiments in relation to the fact that young chicks imitate the movements of older fowl (i.e. throwing their heads up in the air) when learning to drink water.[79] In relation to the acquisition of necessary functions, such as recognizing warning colors signaling a distasteful or poisonous food source (e.g. the redness of a Virgin Tiger Moth), one can imagine the holocaust of organisms that would occur if each organism had to learn by its own experience each time, instead of imitating its kin.

In further pointing to the importance of imitation, Baldwin hypothesizes that "it is probable that many of the most 'innate' powers of the animals, are brought out, perfected, and constantly kept efficient, by imitation within the group or species."[80] Imitation is not always successful, and organisms generally need to develop the muscular coordination in order to perform the copied actions. Also, there are limitations to the types of movements that can be learned or performed, pertaining to the bodily and muscular apparatus with which the creature is endowed. Nevertheless, for Baldwin, imitation is a chief means which enables the individual organism to acquire novel movements, and to repeat them. In the course of attempting and repeating such movements, accidental, chance, and sometimes creative variations may arise. From Baldwin's account, no two instantiations of a similar action are ever exactly the same and learning by imitation does not involve a strict one-to-one reproduction of it. Rather, learning by imitation depends on novel variations made on the part of the organism. To be sure, as Jablonka and Lamb (2005) argue in relation to the behavioral dimension of evolutionary processes, in learning, each organism "develop[s] its own, idiosyncratic technique."[81] According to them,

> what is learned and transmitted depends on the ability of an individual to select, generalize, and categorize information relevant to the behavior and, no less important, to reconstruct and adjust the behavior about which it has learned. The receiving animal is not just a vessel into which information is poured … Neither the transmitting nor the accepting animal is passive in [social] learning.[82]

As Baldwin points out, some of these variations are useful sources of novelty. They may be selected, repeated, and/or developed into new habits of behavior.[83] Some novel

78. Baldwin, *Mental Development*, pp. 246-247.

79. Another more recent example might be a herd of water-buffalo fighting off a pack of lions, where the one buffalo imitates its fellow's charging and goring method, as is possibly evidenced by the famous and spectacular wildlife footage, "Battle at Kruger" (see www.youtube.com/watch?v=LU8DDYz68kM). One could also point to the imitation of domesticated apes of human behaviors, such as smoking. However, cross-species imitation may be dangerous to an organism as in the case in which a chick attempts to imitate the behavior of the old duck swimming rather than that of the old hen.

80. Baldwin, *Mental Development*, p. 282.

81. Jablonka and Lamb, *Evolution in Four Dimensions*, p. 170.

82. Jablonka and Lamb, *Evolution in Four Dimensions*, p. 172.

83. Baldwin explains, "by this organic concentration and excess of movement many combinations and

movements may need to be developed gradually and laboriously, requiring several stages in which the organism selects from among its activities and makes slight adjustments. In any case, according to Baldwin, the "process of taking in elements from the social world by imitation and giving them out again by a reverse process of invention … —this process never stops. We never outgrow imitation, nor our social obligation to it."[84] Imitation is the chief means by which organisms cross-fertilize each other's behavior, and when it comes to survival in the natural world, the ability to imitate is, for him, crucial.

Baldwin is open to the possibility that while some animal instincts are innate[85] in a species and/or are generally fixed traits passed down from generation to generation through biological heredity, others are acquired through "social heredity" and "tradition," namely, the set of adopted habits of the species or group of organisms in question, to which the individual organism generally conforms by imitation of its peers and elders.[86] However, Baldwin thinks that organisms are neither completely determined by their environment to behave in fixed ways, nor are they completely unconditioned. While generally, sticking to a habit points the way to the survival of the species, at certain times, survival and living well is conditional on such habits being overcome. In his writings, Baldwin places emphasis on the notion that habits that procure a deficient survival value can be transcended. He stresses that organisms have the ability to select and to change their behaviors and habits, and do so, especially when under the "storm and stress"[87] of Selective pressures, such as when a food source has been outstripped in their environment or when migrating into a new environment.

Baldwin calls the organism's process of learning new movements, "functional selection." He uses this term to designate the selection of actions to repeat, largely, but not entirely, based on the pleasure and pain that they experienced on previous occasions. For example, a fishing or hunting strategy, or a killing method which has beneficially procured suitable nourishment for the organism stands a better chance of being selected and repeated by the organism, than actions which were unsuccessful or lead them into danger. Organisms generally react with adversion to pleasure and to react with aversion to pain, but the development of new behaviors cannot be said to be com-

variations are brought out, from which the advantageous and adaptive movements may be selected for their utility. These then give renewed pleasure, excite pleasurable associations, and again stimulate the attention, and by these influences the adaptive movements thus struck are selected and held as permanent acquisitions" (*Development and Evolution*, p. 110).

84. Baldwin, *Mental Development*, p. 324.

85. The word, "innate," is not to suggest that instincts are eternal endowments of species, belonging to their essential nature as such. Baldwin takes issue with the view that "animal instinct simply a matter of original created endowment, whereby each animal was made once for all 'after his kind,' and according to which there is no further reason that the instincts are what they are than that they were made so" (*The Story of the Mind*, p. 37) on the basis that animal instincts may be perfected, and/or are carried out imperfectly.

86. An example of a fixed habit which has become part of a species' "tradition" and/or an "innate instinct" might be that of the behavior of Nazca Boobies (*Sula Granti*) on the Galapagos Isles, which while producing two or three eggs, allow older and stronger hatchlings to expel the younger or weaker hatchlings from the nest, thereby killing them off.

87. Baldwin, *Mental Development*, p. 228.

pletely reducible to the contrast of pain and pleasure. For instance, higher organisms exhibit "will-power" which enables them to not be fully determined in their behaviors by the immediate feelings of pleasure and pain, sometimes taking on short-term pain for the sake of a higher pleasure or end, or even making decisions beyond the reference to pleasure or pain. To further explain Baldwin's account of how animals learn new movements, under domestication, animals can be trained to perform certain tasks by their masters, usually with the inducement of food rewards. This ability to train animals proves that they learn, and that the selections of organisms can influence the selections of other organisms.[88] In contrast, in the wild, animals essentially train themselves, for instance, by the success or failure in procuring nourishment, which either produces feelings of pleasure or pain. In short, for Baldwin, the development of behavioral variations largely depends on the contrast of feelings of pleasure and pain, which, in general, acts as a guide to organisms in regards to whether or not to select and to repeat a certain action, thereby transforming it into a habit. Whereas, for the most part, movements which cause pain do not tend to be repeated, movements that cause pleasure are repeated by the organism.[89] As he writes, habit "expresses the tendency of an organism to repeat its own movements again and again ... [and thereby] to secure and to retain its vital stimulations."[90] For Baldwin, the recollection of feelings of pleasurable and painful experiences in the higher organisms is a vital factor in recognizing and selecting which movements to repeat and which to disband, and in forming new habits. Memory enables the higher organisms to anticipate the probable future on the basis of the past, and it is therefore, a trait which heightens survival value. Baldwin, following Darwin, further hypothesizes that emotions in animals are exhibited through muscular contraction and arise largely, but not entirely, as a result of the contrast of pleasure and pain. Emotions,

88. Baldwin writes, "in the training of the domestic animals and in the education of show-animals the trainer aids them and urges them on by use of the associations of pleasure and pain spoken of above. He supplements the animal's feeling of pain and pleasure with the whip and with rewards of food, etc., so that each step of the animal's success or failure has acute associations with pain or pleasure. Thus the animal gradually gets a number of associations formed, avoids the actions with which pain is associated, repeats those which call up memories of pleasure all the way through [and] … the result … so closely counterfeits the operations of high intelligence" (*The Story of the Mind*, p. 44).

89. Baldwin cites the following evidence: "soon after birth a young chick begins to learn as we say 'by experience.' He pecks instinctively at all objects of appropriate size, and by trial learns those which are good to eat and those which should be avoided. How can this be called imitative? In the first place, we may say there is in consciousness only the visual image of the object, and the native reaction of pecking follows upon it. The result of this is to give the chick either a good or a bad taste. In the former case the experience of the good taste becomes associated with the sight of the object—say a caterpillar—so that at future meetings with the same sort of caterpillar, the instinctive tendency to peck is reinforced by the imitative tendency to repeat the good taste. This reinforcement tends to modify and even to supersede the original instinctive manner of reacting, as is readily seen in the way the expression of the instinct of pecking is modified by the experience. In the other case—that of a bad taste, let us say, using Professor Lloyd Morgan's example of the taste of a cinnabar caterpillar—the effect of imitation is the reverse. With the sight of the worm now comes up by association the bad taste. The imitative reaction is now to avoid the taste; this tends to keep the instinct of pecking in check; and by repetition gradually suppresses it altogether in the particular case of this worm" (*Mental Development*, pp. 471-472).

90. *Mental Development*, pp. 203-205.

for him, are also acquired by organisms by way of the imitation of other members of their group, in a manner consistent with Darwin's theories.

To recapitulate, in Baldwin's analysis, novelty in terms of the behavior of organisms is due to the interaction of habit and accommodation, which are active functions of mentality. As he further explains,

> a mental organism is subject, at any stage, to the two principles, Habit and Accommodation … Habit represents what is congenital with what it tends most naturally to do, under the guidance of experiences up to date. Accommodation represents the degree of openness or adaptability, in giving the new reactions, which new stimulations or arrangements of stimulations call upon it to make.[91]

On the one hand, since habit "is the tendency of an organism to continue more and more readily processes which are vitally beneficial,"[92] conformity to habit, in general, can preserve an organism, under "ordinary" circumstances. However, even through such conformity, new behaviors can be produced by way of chance variations on repeated, habitual movements, and those which are successful potentially lead to their selection by the organism and to behavioral adjustments. Again, Baldwin calls the operation by which the organism sets the direction for its behavior(s) in selecting which to rely on, "[functional] selection from overproduced movements."[93] On the other hand, new skills and behavioral novelties can be developed through the organism's own exploratory activities, such as in animal play by which new movements are attempted and tested through bite, roll, and tumble with fellow creatures, the effective or "fit" ones being selected for future use, while the ineffective ones are eliminated or are rendered inoperative.

Those novel behaviors or strategies that are employed by organisms and, as Dennett describes, either produce or constitute a "good trick,"[94] whether in terms of its function or in altering their environment, may be imitated, selected, and refined by others members of the species or group. If a species or group faces Selection pressures and the selected "good trick" becomes requisite for the survival or well-being of the species or group, unless they are mastered by the other individuals, then they stand to be eliminated via Natural Selection. It is in this sense that Baldwin describes the principle of Organic Selection as supplementary to Darwinian Natural Selection, since "it recognizes the positive accommodations on the part of individual animals by which they keep themselves alive and so have an advantage over others under the operation of natural

91. *Mental Development*, p. 366.

92. *Mental Development*, p. 452.

93. Baldwin, *Mental Development*, p. 434. As Baldwin describes, "all new movements which are adaptive or 'fit' are selected from overproduced movements, or movement variations, just as organisms are selected from overproduced variations by the natural selection of those which are fit. This process, thus conceived, is there called 'functional selection,' a phrase which emphasizes the fact that it is the organism which secures from all its overproduced movements those which are adaptive and beneficial" (*Development and Evolution*, p. 87).

94. Dennett, Darwin's Dangerous Idea: Evolution and the Meanings of Life, New York, Simon & Schuster, 1995, p. 77.

selection."[95] When faced with Selection pressures, the organism's capacity to change its habits can mean the difference between life and death. As a result, the development of the skill and the capacity to develop it may become pre-eminent in the species. It is for this reason that Baldwin places a premium on the plasticity[96] of organisms in the struggle for existence, namely, on whether the organism can respond flexibly and can make adaptive accommodations to its environment, rather than merely being fixedly attached to habit. For a new behavior can give a species the time, or the "breathing space," it needs to be able to inherit variations which will help, at least temporarily, to secure its existence. On the one hand, those organisms which are flexible and can make accommodations, thereby adapting themselves better to the environment, stand more of a chance of surviving and of reproducing. On the other hand, those species in which the individual members cannot make such accommodations stand to become extinct. At the same time, Baldwin recognizes that extreme plasticity, without any recourse to "tradition" as the foundation for the new behaviors, would equally be detrimental to the survival of the organism or of the species.[97]

As emphasized by Baldwin, organisms develop habits of behavior, but these may need to be "broken up" and to be overcome, especially when the organism faces severe Selection pressures, when their environment changes, such as food-sources becoming scarce or unavailable, when they migrate into a new environment, or even when a species itself becomes "too successful" and outstrips its environment of needed resources. In these cases, if it is to survive, "the organism must be ready, by a habit of acting, to impair the habits of acting it already has,"[98] and to make behavioral accommodations.[99] That is to say, plasticity with respect to the ability to embrace beneficial behavioral novelties is

95. Baldwin, *Development and Evolution*, p. 170.

96. As defined by West-Eberhard, plasticity means "responsiveness," "flexibility," or the "ability for an organism to react to an internal or external environmental input with a change in form, state, movement, or rate of activity" (*Developmental Plasticity and Evolution*, p. 32).

97. For example, if, when facing overpopulated conditions or shrinking habitats, an adult hippopotamus bull deviates radically from the "tradition" of its species by developing a habit of devouring male hippopotamus calves, even its own, so that it does not enter into later reproductive competition with them, it may be said to be impacting detrimentally on itself and on the evolution of its own species.

98. Baldwin, *Social and Ethical Interpretations in Mental Development*, New York, The Macmillan Company / Elibron Classics, 1897 / 2005, p. 55.

99. For Baldwin, Organic Selection applies analogously to the development of original ideas and to changing habits on the part of human beings, which not only affect biological evolution, but also social progress, and he sets out how this is the case in *Social and Ethical Interpretations in Mental Development* (1897). Certainly, for example, the advent of dating and relationship self-help books for men, which enable them to make behavioral accommodations and to learn new habits, has both social and biological effects. Again, here, no strict separation can be made between the human and natural worlds. Another example is that, today, we can all hope that human beings have the intelligence and plasticity to make selective accommodations (reducing energy use, increasing energy-use efficiency, and to develop the capacity to use novel sources of energy, such as wind and solar power) which will serve to develop alternatives to our "fixed attachment" to the habit of burning of fossil fuels, i.e. oil. And it is the case that human beings are starting to face real Selection pressures due to environmental problems that the oil Habit of produces, such as Global Warming. From a neo-Baldwinian perspective, to have a degree of plasticity and to engage in exploratory activities, rather than "wait for the variations," would be the best course of action.

a key to the survival of the organism. Providing that the acquisition of the new behavior is requisite for survival, or among a handful of behaviors that would serve to keep creatures of that type alive, the organisms that are not able to throw off old habits in order to make the necessary accommodations would be eliminated through Natural Selection. But this is not the whole of Baldwin's theory of Organic Selection and we now come to the second part of the theory.

Baldwin writes that "individual accommodations may keep a species afloat" but there are also "certain results in the sphere of phylogeny,"[100] and in heredity, which are accounted for by the theory of Organic Selection. Precisely, the behavioural accommodations, which keep the organism alive may be partial novelties of function; that is, they may be partial adaptations which have not yet fully developed to their most mature potential and highest effectiveness. These adaptations would allow the organism to survive temporarily, but not necessarily to be well adapted to the environment. Further beneficial adaptation would require accompanying phenotypic traits which are coincidental with, or correlative to the new behaviour(s), which would further supplement the skill and enable the organism to master and perfect it, thereby arriving at a higher degree of equilibrium in relation to the environment. For long-term survival, in contrast to the short-term subsistence, depends on an organism being adequately adapted to one's environment, and it not only requires plasticity, but also the phenotypic "equipment" and traits which enhance the success of the novel accommodations.[101]

According to Baldwin, successful accommodations which are transformed into habits "'set' the direction of evolution,"[102] because individual organisms in subsequent generations which have inherited variations that serve to accentuate, amplify, or perfect, the new, successful behaviors, pushing them to maturity and to their highest effectiveness, will be preserved via the principle of Natural Selection, while the others will be eliminated. In time, the new skill or function can be perfected by further practice or exercise, but also by having inherited correlated or coincidental congenital variations or traits (either physical or mental or a psycho-physical combination) that serve to accentuate, amplify, or perfect it. Of course, for Baldwin, the sequence of such inheritance of mutational variations will be "random," or more accurately, "indeterminately distributed" in the variety or species.[103] In any case, "those organisms which do

100. Baldwin, *Development and Evolution*, p. 98.

101. My distinctions between "long-term survival" and "temporary / short-term" survival, "subsistence" and "living well," as well as between a "species as a whole" and "select members," serve to undercut one of the chief criticisms of the theory of Organic Selection, namely, that if accommodations are effective in keeping an organism alive, then the organism has already passed the test of Natural Selection.

102. Baldwin, *Development and Evolution*, p. 99.

103. According to Cobb's interpretation of Ayala, in current usage, the meaning of the notion of "random" mutations is that: (1) mutations "are rare exceptions to the regularity of the process of DNA replication, which normally involves precise copying of the hereditary information, encoded in the nucleotide sequence"; (2) "there is no way of knowing whether a given gene or genome will mutate in a particular cell or in a particular generation"; and (3) the mutations "are unoriented with respect to adaptation" (*Back to Darwin*, pp. 216-217).

not secure the modifications fall by the principle of natural selection,"[104] whereas those that do will be able to subsist, and perhaps reproduce successfully. Thus, according to Baldwin, to a certain extent, the evolutionary destiny of a species can be directed by the agency of the organism, whose selected behavioral accommodations "run ahead" and "channel" the course of subsequently inherited mutational variations. As Baldwin describes it, the novel accommodations "screen" the variations that individuals in future generations will be Selected for. That is to say, it is by way of such accommodative adjustments that "natural selection [is] compelled to act along a certain path,"[105] since, for example, organisms that inherit morphological variations that are detrimental to, or do not help to amplify the new habit or function which enables them to survive, will tend to be eliminated.

Baldwin realizes that inherited variations which are coincident with, or correlate to the new, successful, behavior may not appear all-at-once. Rather, they may take several generations to "mature." Baldwin cites "bony protuberances in places where horns afterwards develop, and … certain small changes in the evolution of mammalian teeth" as examples of such gradual changes, which "afterwards progress regularly from one generation to another until they become of [more] utility."[106] But the speed of the variations or the accumulation of variations does not discount the theory of Organic Selection, because as Darwin suggests, even the slightest variations can give an organism an advantage in the struggle for existence. For Baldwin, from generation to generation, evolution takes place by way of the Selection of individuals which are endowed with inherited variations that supplement, are coincident with, or correlate with the acquired behaviors enabled them, in the first place, to subsist, at least temporarily, in their environment. At the same time, he is open to the possibility that phenotypic traits may gradually disappear in a species due to disuse, especially in the wake of the newer ontogenetic adaptations transcending, replacing, or advancing older behavioral habits.

Overall, from a Baldwinian standpoint, the individual organism's selection of its behaviors and activities can be considered an important "directive" or causal factor participating in evolutionary processes. The selected ontogenetic variations, having become pre-eminent habits, give rise to correlated or coincidental inherited variations in the species, via the operations of Natural Selection. Baldwin notes that the theory of Organic Selection "opens a great sphere for the application of the principle of natural selection upon organisms" because Selection is shown to operate "on the basis of what [organisms] do, rather than of what they are; of the new use they make of their functions, rather than of the mere [pre-]possession of certain congenital characters."[107] In other words, the theory of Organic Selection allows for "the organism itself [to] cooperate[] in the formation of the modifications which are effected."[108] Baldwin calls the "directive influences" of the behavioral modifications or accommodations, as well as

104. Baldwin, *Development and Evolution*, p. 119.
105. Edward Poulton, quoted by Baldwin in *Development and Evolution*, p. 47.
106. Baldwin, *Development and Evolution*, p. 141.
107. Baldwin, *Development and Evolution*, p. 117, my addition.
108. Baldwin, *Development and Evolution*, p. 119.

all agencies of such accommodation, including for example, organic plasticity, imitation, selectivity, and intelligence, which play a role in bringing about the coincidental or correlative inherited variations, "orthoplastic influences."[109] He further employs the associated term, "orthoplasy" to designate the fact of the "directive determination"[110] of Organic Selection in relation to evolutionary processes, as well as to the possibility of its study. Baldwin entertains the notion that the theory of Organic Selection could serve as an explanatory hypothesis for research into gaps and transitions in the fossil record. Of course, the behaviors of organisms are not exhibited in fossils. Nevertheless, due to the correspondence between the series of individual accommodations and the series of adaptations in the species, the theory could offer a framework for anticipating future evolutionary directions and novelties in a species. In any event, on the whole, Baldwin's theory of Organic Selection may be summarized as the notion that "organisms which survive through individual modification [novel behavioral accommodations] will hand on to the next generation any 'coincident variations' [i.e. congenital variations in the same direction as the individual modifications] which they may chance to have, and also allow further variations in the same direction."[111] Having now provided an overview of Baldwin's theory of Organic Selection, in the next section of this paper, I shall take up some imminent criticisms of it.

PART 3: SOME IMMINENT CRITICISMS OF BALDWIN'S THEORY OF ORGANIC SELECTION

A first contention in relation the theory of Organic Selection involves Baldwin's apparent conflation of two distinct meanings of the term, "selection," leading to the claim that Baldwin is committing the fallacy of equivocation in his writings. However, in response to this criticism, in *Development and Evolution*, Baldwin takes up a query from W. H. Hutton about the meaning of the notion of the word "selection." Baldwin distinguishes between two different senses of the term, of which he recognizes both. First, he agrees with Hutton's suggestion that "selection means the act of picking out certain objects from a number of others, and it implies that these objects are chosen for some reason or other."[112] With respect to this first meaning, elsewhere, Baldwin states that there is "no reference to [species]-progress" and it presumably means "the 'conscious choice' of psychology and pre-Darwinian theory,"[113] implying, to some degree, the selective activities

109. Baldwin, *Development and Evolution*, p. 142.

110. Baldwin, *Development and Evolution*, p. 142.

111. Baldwin, *Development and Evolution*, pp. 149-150, first addition mine, second addition from West-Eberhard, *Developmental Plasticity and Evolution*, p. 152. Baldwin continues, "in any given series of generations, the individuals of which survive through their susceptibility to modification, there will be a gradual and cumulative development of coincident variations under the action of natural selection" (p. 150). Elsewhere, Baldwin defines the theory of Organic Selection as "the process of individual accommodation considered as keeping single organisms alive, and so, also securing the accumulation of variations, determining evolution in subsequent generations" (p. 119).

112. Baldwin, *Development and Evolution*, p. 168-169.

113. Baldwin, *Social and Ethical Interpretations in Mental Development*, p. 550.

of the organism in general. At the same time, he also preserves the "Darwinian" meaning of the term as synonymous with the theory of Natural Selection, namely, that having the connotation of "advantage gained in the struggle for existence, either by the individual or the species."[114] Distinguishing between the two senses, Baldwin suggests that "there is only one thing to do, that is to recognize the two general uses of the term, 'Selection,' the pre-Darwinian (or conscious) Selection 'for some reason or other,' and the Darwinian (or post-Darwinian) Selection of which survival on grounds of utility is the sole criterion."[115] As will be alluded to later in this paper, Baldwin defends the conceptual unity of Organic Selection and Natural Selection, which may be said to "overlap" in the sense that the selective operations of organisms play a role in Natural Selection. In any case, in order to distinguish between the two meanings when not employing qualifying terms (i.e. "Organic," "Artificial," "Natural"), in this paper, I use a lower-case "s" to designate the meaning of the organism's own selective activities, and an upper-case "S" to indicate Natural Selection. In a later part of this essay, it will further be shown that an analogy can be made between the former meaning and Whitehead's notion of "prehensive selectivity." Attention to this distinction between selection and Selection, as well as their interrelation, will especially be important in Part Six of this paper where I develop an enlarged conception of Organic Selection.

A second criticism emerges from the apparent self-reflexivity of privileged terms such as "mentality," "selectivity," "imitation," "plasticity," "habit," and "accommodation" in relation to whether they should be considered characteristics that are inherited by organisms and hence, the products of evolution, or whether they belong universally to organic life. In *Mental Development*, Baldwin sets out the two alternatives: either

> life existed before selective reaction; in which case—holding that mind is coextensive with life—he must give up his criterion of mind … [or] life began with selective reaction as part of its original endowment, and with consciousness withal, that is, with feelings of pleasure and pain."[116]

Given this antinomy, the Whiteheadian metaphysical outlook of panpsychism or panexperientialism would certainly defend a synthesis of the two, based in the notion that all organisms have experience to greater or lesser degrees,[117] but at the same time, admitting that the faculties upon which experience depends can be refined through evolutionary processes. Regarding the apparent self-reflexivity of the notion of organic selectivity, Baldwin speculates that

114. Baldwin, *Development and Evolution*, p. 169.

115. Baldwin, *Development and Evolution*, p. 169.

116. Baldwin, *Mental Development*, pp. 200-201.

117. As part of his speculative cosmology, Whitehead embraced panpsychism or pan-experientialism. For him, subjectivity, mentality, and feeling pervade the organisms of the natural world, and whether or not the entities in question are considered either animate or inanimate, they participate in the overall creative advance and evolution of the universe. For Whitehead, creativity is "universal throughout actuality" (*Process and Reality: Corrected Edition*, New York, The Free Press, 1929 / 1978, p. 164), namely, all temporal creatures participate interdependently in the creative evolution of the universe, and they have importance in terms of the whole cosmological scheme of things.

> organisms that did not have some form of selective response to what was beneficial, as opposed to what was damaging in the environment, could not have developed very far; and as soon as such a variation did appear it would have immediate preeminence. So we have to say either that selective nervous property, with consciousness, is a variation, or that it is a fundamental endowment of life and part of its final mystery.[118]

Concerning the ability of organisms to imitate others, Baldwin hypothesizes that it may "represent a form of variation which would be in the direction of the plasticity of intelligence, and creatures would be selected who performed [it],"[119] whereas the evolution of plasticity would be a complex and gradual process which may have "taken place by the cooperation of accommodation using the variations toward plasticity already present and thus saving and developing such variations."[120] In this sense, selectivity, imitation, and plasticity might be seen as functions of the evolutionary development of the acquisition of the ability to make accommodations in general, which presupposes a degree of mentality. Certainly, it is hard to imagine mentality, selectivity and imitation in the single-celled prokaryotic life-forms or in some of the creatures of Burgess Shale ilk. But it is somehow less hard to imagine whether these beings had experiences. In any case, even if selectivity and imitation are inherited characters, from a Baldwinian perspective, they are operative structures of the evolutionary processes that are prevalent in our contemporary epoch, and hence, this criticism, which is recognized (but admittedly not fully resolved) by Baldwin, should not be seen to diminish the theory of Organic Selection as an explanatory scheme.

A third criticism involves the claim that even if the behaviors and activities of organisms do have some role in the direction and channelling of evolutionary processes, it is an extremely marginal one, and definitely not worth all of the attention given to it. This was certainly Alfred Wallace's standpoint. While at first, Wallace endorsed the theory of Organic Selection in his review of Morgan's *Habit and Instinct* (1896), he later became increasingly less convinced of its importance as an explanatory principle. Wallace wrote to Baldwin stating that "your account of Organic Selection … is very clear and I have no doubt is occasionally a real factor in evolution. But I do not think that it is an important or even an essential one."[121] More recently, Simpson (1953) and Griffiths (2003) are among those who also think this. As described by Depew (2003), Simpson believed that there is "singularly little concrete ground for the view that the Baldwin effect is a frequent and important element in adaptation … apply[ing] at best to unusual cases in which a population under very strong selection pressure" at "the margin of its range."[122] Certainly, one of the most "anemic" aspects of the presentations of the theory of Organic Selection by "Baldwin-boosters" has been the lack of concrete examples they give in support of their claims of its legitimacy. Although Baldwin maintained that

118. Baldwin, 'A New Factor in Evolution,' pp. 550-551.
119. Baldwin, *Development and Evolution*, p. 29.
120. Baldwin, *Development and Evolution*, p. 38.
121. See Richards, The *Emergence of Evolutionary Theories of Mind and Behavior*, p. 494, note 114.
122. Weber and Depew (eds.), *Evolution and Learning*, p. 16.

selectivity was potentially universal in the animal world, stating that "organic selection becomes, accordingly, a universal principle, provided, and in so far as, accommodation is universal,"[123] even he referred repeatedly to well-worn examples. On this note, in what follows, I have provided a few examples of the theory of Organic Selection which may be said to provide evidence that: (1) behavioral habits are developed by organisms via the processes that Baldwin identifies; and that (2) behavioral accommodations indirectly channel out the course of subsequent congenital or mutational variations in a species or variety of organisms. Afterward, I will respond to some further criticisms of the Baldwinian interpretation of these phenomena.

3-1 The Vampire Finch

The Vampire Finch is a variety of the sharp-beaked ground finches, *Gesospiza Difficilis Septentrionalis*, living on the dry climate of Wolf Island in the Galapagos, where insects are less abundant and plant-based food sources become scarce rapidly. They are "the only bird in the world whose primary objective in foraging is to obtain blood."[124] Vampire Finches, aptly named, developed the purposeful penchant for drinking the blood, exclusively, of Nazca Boobies, through their straw-like beaks. Prior to developing this habit, they engaged in a beneficial symbiotic relationship with Nazca Boobies, eating the ectoparasites that regularly infested the boobies' bodies. It is hypothesized that at some point in the process of eating ectoparasites, one finch "accidentally broke the skin of the booby, thereby getting that first taste of blood."[125] The blood was more nutritious than other food sources and the finches that imitated and performed this parasitical action survived when other food sources were scarce. Furthermore, booby blood was available at all times of the year. It is now believed that the activity of drinking booby blood has become "innate" in the variety, and that the genetic differences between the Vampire finch and the other varieties of sharp-beaked finches, developed later. Some phenotypic differences have appeared which are related to beak size, length, sharpness, and shape, which have served to amplify their capacities to drink booby blood, variations which other finch varieties, which have not taken to this habit, do not have. Vampire Finches have the largest and pointiest beak of all *G. difficilus* varieties. The boobies, grudgingly still accepting this parasitical behavior, can have five or six finches drinking their blood at a time.

3-2 The Blue-Footed Booby

Three quarters of the world's "dunce-like" Blue-Footed Booby (*Sula Nebouxi*) population lives in the Galapagos. The Blue-Footed Booby has at some point developed the habit of dive-bombing for fish from great heights farther away from the shore, rather

123. Baldwin, *Development and Evolution*, p. 38.

124. 'Blood Birds: Speciation of Avian Sanguivores in the Galapagos,' http://www. stanford.edu/class/anthsci110sc/2005_galapagos_website/papers/keil.doc, 1.

125. 'Blood Birds,' p. 3.

than fishing in the shallows, even though they risk the dangers of the sea or breaking their wings. With a piercing whistle directing them, the dive-bombing has become perfectly synchronized with other members of a flock, the many birds performing this action all at once in order to overwhelm their prey. Blue-Footed Boobies have evolved a thick skull, complete with air sacks and neck cushioning, which has served to offset the negative repercussions of their habitual crashing into the water. With their beautiful webbed blue feet, sharp bills, and streamlined tails, the boobies swim a short distance underwater in order to catch fish. That said, ingesting saltwater is harmful to boobies, as it is for most birds. As such, they have evolved specialized nostrils which close and prevent salt-water from being forced in when they dive, and have resorted to breathing out of the corners of their mouths.

3-3 The Marine Iguana

Marine Iguanas (*Amblyrhynchus cristasus*) are the only sea-going lizards in the world and are found mostly on the volcanic islands of the Galapagos which are strewn with barren, black volcanic rock and where there is little to eat. It is assumed that they are genetic descendants of other land-based iguana forms, and they comprise the only variety which dares to risk the dangers of the sea. While their origins are much debated, they are thought to have evolved from a common South American iguana ancestor, having perhaps arrived in the Galapagos via driftwood. In such a harsh environment, marine iguanas developed and selected the behavior of diving and swimming underwater to feast on the algae on the ocean floor, holding their breaths during submergence. Like other iguanas, they have a nasal gland that enables them to remove salt from the body, to excrete or snort out salt crystals, so as to maintain electrolyte balance. But since eating marine algae forces them to digest sea salt, marine iguanas rely on this gland more than other iguanas. They have evolved a blunter snout with which to effectively scrape algae off of rocks, and a flatter, longer, more muscular tail than other iguana varieties, which enables them to swim effectively. They have larger claws than other varieties which enable them to cling to rocks when exiting the water. Also, because marine iguanas forage in the cold water, they must regulate their body temperatures. Marine Iguanas are physiologically able to shunt blood away from the surface of their bodies to conserve heat, and they can reduce their heart rate and metabolism. They also warm up on land by huddling together with others and by basking in the sun on rocks near the shore. The Marine Iguana's unique black and more somber coloration, among iguana species, assists in this process. Darwin called them "imps of darkness" during his visit to the Galapagos Islands. Marine Iguanas suffered hardships in the 1980s when higher water temperatures killed off vast tracts of undersea algae.

3-4 The Woodpecker Finch

The Woodpecker finch (*Camarhynchus pallidus*) has developed a behavior that is now believed to be "innate." The finch "uses cactus spines and twigs as tools" in order to root

out "hard to reach arthropods: inside tree trunks and branches." According to ethologists, "the behavior is a learned one: as it involves multiple steps (finding a stick, fashioning the stick, using the stick) and the steps in themselves do not offer any selection benefits."[126] The probability of a finch developing a genetic basis to perform all the actions which are necessary to carrying out the complete function is extremely low. But while the behavior is suggested to have once been learned, woodpecker finch juveniles "can [now] perform the behavior [with their own idiosyncratic techniques] without ever seeing a model."[127]

3-5 The Flightless Cormorant

Flightless Cormorants (*Phalacrocorax harrisi*) comprise a rare species and are unique among cormorant varieties in that they have lost the ability to fly. Flightless Cormorants swim underwater for great distances, using their webbed feet as fins to search out octopus, eels, and small fish, and to collect seaweed for nests. Over time, they have developed comparatively tiny wings than other cormorant varieties, enabling the birds to tuck them in to their sides, so that they do not arrest forward movement while underwater. Certainly, while appearing to be subject to the laws of use and disuse, larger wings would prevent underwater movement. They have also developed changes in bone and muscle density, as well as feather structure which enable them decrease their buoyancy, allowing them to stay underwater for longer periods. Because the population of these creatures is so few, chance climactic events can change the structure of the variety significantly, since under these circumstances, the traits of weaker members may be passed on.

3-6 The Galapagos Tortoise

Galapagos tortoises (*Geochelone Nigra*) can live for almost one hundred and fifty years. While most of the tortoise species on each of the Galapagos islands have round or domed shells, each is distinct. However, on one of the drier islands to which some of the tortoises migrated, the majority of the vegetation that the tortoises had to rely on for water and nourishment did not grow low down near the ground. Furthermore, the *Opuntia* cactus, providing them with much of their nourishment and water through its dew and sap, also become taller and more tree-like. As such, the tortoises engaged in the behavior of stretching their necks up as vertically as they could in order to reach their foodstuffs. Over time, the tortoises on the island developed shells with a shoulder arch (called "saddle-back" shells) that would allow for their neck to stretch as vertically as possible, accentuating this behavior. Prized for their meat and oil, sailors, explorers, and whalers, who visited the islands, hunted several of the species of Galapagos Tortoise to virtual extinction.

126. 'Blood Birds,' p. 3.
127. 'Blood Birds,' p. 3, my addition.

3-7 Subsequent Criticisms of the Theory of Organic Selection

All of the cases mentioned above seem to display concrete inductive evidence for the theory of Organic Selection in its articulation that learned behavior plays an indirect role in the direction of the types of congenital or mutational variations that will be inherited, and selected for, in future generations of a variety or species. This is not to say that such observations and Baldwinian conclusions are absolutely failsafe, for there are still a number of problems with them that can be raised. First, there is the charge that these examples merely depict Natural Selection working in its normal way, those organisms which do not have the phenotypic constitutions which enable survival in a given environment dying out, whereas those which do will generally be preserved, each organism passing on its favorable mutational variations to its young. While these are indeed normal cases in which the Natural Selection is doing its causal work, in mechanistic accounts, there is a tendency to omit reference to the behaviors and activities of the organisms, regardless of whether they are representative of biological functions of finding food and/or a mate. However, from a Baldwinian standpoint, behavior must be included in the account. Especially, attention must be placed on behavior as a factor that indirectly channels the direction of evolutionary novelty. One cannot assume that in all cases, organisms simply know *a priori* how to use any favorable characters or variations to their advantage. Also, there is no singular, essential, and/or necessary function that any particular character or variation is to be used for. It is a creature's behavior that is, for the most part, learned in the process of its life, which helps to determine how it will use its mutational variations to its advantage. Without reference to behavior, biology cannot truly dispense with, or explain the Lamarckian appearance of acquired characteristics from environmental conditions.

Second, in respect to the interpretation that the behavior has a causal role, albeit indirect, in the evolutionary process, Baldwin's theory of Organic Selection presupposes a behavioral "cause" and a hereditary "effect," where the former "precedes" the latter. On the one hand, the "cause" is seemingly the organism's selective modification of its behavior. On the other hand, there are the evolutionary "effects," including the resulting mutational variations and traits that are "associated with" or that are "in the direction of" the behaviors selected, and which are handed down to future generations of a species. Sceptics could here invoke neo-Humean scepticism concerning causality which points out the lack of identification of the "necessary connection" between the development of the habit and the resulting inherited variation or mutation, and at best, we could say that there is a relationship of "accompaniment" between the two phenomena, especially given the notion of the "indeterminate distribution" of inherited traits. In defense of the Baldwin's theory, one could point to West-Eberhard's (2003) statements that genes can be "followers" in evolution and that behavior can "take the lead in evolution … behavioral plasticity can be the first step in evolutionary change, followed by morphology."[128] However, even the question of precedence would not fully solve the problem of "causality" here. From the neo-Humean perspective, mere precedence does

128. West-Eberhard, *Developmental Plasticity and Evolution*, pp. 157, 180.

not necessarily imply causality, and there must be an empirically-verifiable link between the putatively-stated cause and the effect, if we are to conclude that there is a causal relationship between them. On the contrary, in defending the theory of Organic Selection against this neo-Humean challenge, one could equally point to Whitehead's metaphysics of relatedness which holds that there is no empirical observation of a separation between the two factors.[129]

Third, in relation to the first remaining criticism that was discussed above, there are empirical problems in relation to the time-frame of evolution, the changes happening ever so gradually that they cannot be observed, and in regards to whether the development of new habits and behaviors precede or proceed from the congenital variations developed in select individuals. Correspondingly, there are empirical problems in relation to the enormous difficulty of catching the organism "in the act" of recognizing useful movements, of developing new habits, and of making selective accommodations. While these observations may be more readily observable in domesticated species, in Nature, it is extremely difficult. As Gould (2002) suggests, factors, such as those implied in the theory of Organic Selection, "cannot [easily] be studied directly because they work only in the untestable immensity of deep time, or occur so rarely that we can entertain little hope for direct observation during the short span of human history."[130] In this vein, Simpson (1953) doubted whether "the alleged effect is empirically instantiated very often, and, if it is, whether this can be definitively shown."[131] Nevertheless, in response to this criticism, one could apply the same criticism to Darwin's hypothesis of Natural Selection. And this criticism also points to the problem of the unobservable character, for example, of mentality, which is a difficulty faced by Psychology as a whole. Hence, one might argue that these criticisms of this inductive "evidence" for Baldwin's theory of Organic Selection should only be leveled if and only if, one is willing to level them to Darwin's theory of Natural Selection and to the disciplines of Biology and Psychology as a whole.

PART 4: WHITEHEAD AND THE PROBLEM OF A PROCESS-RELATIONAL EVOLUTIONARY COSMOLOGY

Thus far in this paper, I have focused on providing a general synopsis of Baldwin's theory of Organic Selection, including a treatment of some of the major criticisms that psychologists and biologists have levelled against it. I come now to Whitehead, and to asking how Baldwin's views on biological evolution may be integrated with the former's speculative scheme, as part of the attempt to arrive at a comprehensive and systematic process-relational evolutionary cosmology. For starters, in contrast to the mechanist and

129. For a treatment of a Whiteheadian response to Humean scepticism regarding causality, see Scarfe, 'On Determinations of Causal Connection with Respect to Environmental Problems: Hume, Whitehead, and Hegel,' *Process Studies Supplements*, Issue 9, 2006, www.ctr4process.org/publications/ProcessStudies/PSS/.

130. Gould, *The Structure of Evolutionary Theory*, 119-120.

131. Simpson quoted by Depew in Weber and Depew (eds.), *Evolution and Learning*, p. 4.

materialist assumptions held by mainstream biologists, Whitehead states that his own aim is to sketch "an alternative philosophy of science in which *organism* takes the place of *matter*,"[132] a standpoint one might aptly call "organismic evolutionism" in contrast to "materialist evolutionism." In so doing, he takes issue with the abstractions which are created by the reductionistic methods of some biologists, and with the materialistic metaphysics that they "tacitly presuppose."[133] At the same time, he grants some leeway for the employment of the reductionistic methods of scientific inquiry in general, which are requisite for it to carry out its study of the natural world in general. As such, Whitehead opts for a synthesis between the two sides, describing his overall philosophical framework as the philosophy of "organic-mechanism."[134] These ideas provide definite clues for our project of arriving at a comprehensive process-relational evolutionary theory, but before being able to proceed further with an analysis of its relevance to Baldwin's theory of Organic Selection, a substantial lacuna must be overcome.

In a 1985 article entitled "Evolutionist Theories and Whitehead's Philosophy," George Lucas wages a sharp criticism against scholars who naïvely assume that Whitehead was successful in developing a comprehensive process-relational evolutionary theory or cosmology, namely, one based in the notion of the creative advance into novelty. According to Lucas, "it is clear that Whitehead himself does not formulate an explicit evolutionary cosmology, although he is understood to have formulated a process cosmology."[135] In the article, by way of a canvassing of all of Whitehead's major works, Lucas finds that "evolution and evolutionist theories play no significant role in Whitehead's metaphysics" and in many of his key works, "there is simply no reference to evolution what[so]ever."[136] He further charges that "when 'evolution' is mentioned or discussed at all [by Whitehead in *Process and Reality*] … it is in a general, offhand, and vague fashion."[137] Overall, Lucas concludes that

> no clearly definable doctrine of evolution is in evidence in his philosophy. His statements about evolution and the emergent evolutionists are vague, and occasionally even contradictory. He does not appear overly concerned with giving further interpretation to the idea of evolution, and evidently had not clearly thought through his own position on evolution in anything approaching a systematic sense.[138]

Admittedly, Whitehead's views on evolution are indeed scattered throughout his writ-

132. Whitehead, *Science and the Modern World*, pp. 193-194.

133. Whitehead, *Adventures of Ideas*, New York, The Free Press, 1933 / 1967, p. 154.

134. Whitehead, *Science and the Modern World*, pp. 80, 107.

135. Lucas, 'Evolutionist Theories and Whitehead's Philosophy,' *Process Studies*, vol. 14, no. 4, Winter 1985, p. 290.

136. Lucas, 'Evolutionist Theories and Whitehead's Philosophy,' pp. 287, 292.

137. Lucas, 'Evolutionist Theories and Whitehead's Philosophy,' p. 294.

138. Lucas, 'Evolutionist Theories and Whitehead's Philosophy,' p. 298. According to Lucas, these apparent weaknesses in Whitehead's speculative philosophical scheme contribute to the discrediting of process thought, especially in analytic circles, "as a throwback to the worst examples of unrestrained nineteenth-century speculative nonsense" (p. 290). It seems that Whitehead did pay lip-service to figures like Conway Lloyd Morgan, expressing the suggestiveness of the latter's book, *Emergent Evolution* (1923), but rarely did he treat or mention evolution in an explicit manner.

ings. However, upon further inspection, there are some extremely important passages concerning evolution which must be brought to light. In a passage in *Science and the Modern World* (1925), he states that

> a thoroughgoing evolutionary philosophy is inconsistent with materialism. The aboriginal stuff, or material, from which a materialistic philosophy starts is incapable of evolution. … Evolution, on the materialistic theory, is reduced to the role of being another word for the description of the changes of the external relations between portions of matter. … [From this perspective] there can merely be change, purposeless and unprogressive. But the whole point of the modern doctrine is the evolution of the complex organisms from antecedent states of less complex organisms. The doctrine thus cries aloud for a conception of organism as fundamental for nature. It also requires an underlying activity—a substantial activity—expressing itself in individual embodiments, and evolving in achievements of organism. The organism is a unit of emergent value, a real fusion of the characters of eternal objects, emerging for its own sake. Thus in the process of analyzing the character of nature in itself, we find that *the emergence of organisms depends on a selective activity* which is akin to purpose.[139]

Here, Whitehead is summing up his criticisms of the dominance of the materialist outlook in biological research, and he is arguing that from this perspective, it operates in a manner that is inconsistent with what it studies. For him, organisms not only have a "physical pole," but also a "mental pole" that is not to be considered as simply pre-programmed genetically. Also, organisms are "life-forms," where the "primary meaning of" the word "life," for Whitehead, involves the notion of "the origination of conceptual novelty—novelty of appetition."[140] Furthermore, at the end of the passage, Whitehead's emphasis on the notion of *selective activity*, implying "purpose" and "creativity," provides us with a clue which assists our overall project to construct a process-relational evolutionary cosmology. Here, he is referring to the principle Natural Selection, but also, in a manner quite like Baldwin, he is emphasizing the selective activities of organisms, which, as he says, play a role in and affect evolutionary processes.

Whitehead calls this selective and creative activity of organisms "the neglected side … of the evolutionary machinery involved in the development of nature."[141] As was

139. Whitehead, *Science and the Modern World*, p. 107, my emphasis. It is clear that Whitehead does not accept chief components of the standard formulation of Darwinian evolution and its materialism, since he suggests elsewhere that Darwin and "Huxley had grasped the principle of evolution in material life, but it never occurred to them to ask how evolution in material life could result in a man like, let us say, Newton. … Darwin's dismissal of the transmission of acquired characteristics is another lapse. Who knows where our bodies begin or end, or how characteristics may be transmitted otherwise than by heredity? There may be a thousand predispositions in a child due to the occupations of his immediate forebears. *A certain type of activity may have been going on in the family for generations and the child is predisposed to it. Is that 'environment' or is it heredity?*" (Price, *Dialogues of Alfred North Whitehead*. Boston, Little, Brown, and Company, 1954, p. 284, my emphasis). While this quote is highly suggestive of Lamarckism, it does not logically omit a Baldwinian interpretation. Also see the first chapter of *The Function of Reason* (1929) for Whitehead's challenge to the theory of Natural Selection.

140. Whitehead, *Process and Reality*, p. 102.

141. Whitehead, *Science and the Modern World*, p. 111.

highlighted in respect to the concrete examples of Baldwin's theory, in the mechanistic account of evolutionary processes, there has been a tendency on the part of mainstream biologists to omit reference to an organism's selective activities, its behavior, and its learning. This "neglected side" stands in contrast to the privileged materialist (rather than developmental) focus in biological research on the adaptation of organisms to their environment in the struggle for existence. Whitehead clarifies that there are

> two sides to the machinery involved in the development of nature. On one side, there is a given environment with organisms adapting themselves to it. The scientific materialism of the epoch in question emphasized this aspect. From this point of view, there is a given amount of material, and only a limited number of organisms can take advantage of it. The givenness of the environment dominates everything. Accordingly, the last words of science appeared to be the Struggle for Existence, and Natural Selection. Darwin's own writings are for all time a model of refusal to go beyond the direct evidence, and of careful retention of every possible hypothesis. But those virtues were not so conspicuous in his followers, and still less in his camp-followers … The other side of the evolutionary machinery, the neglected side, is expressed by the word *creativeness*. The organisms can create their own environment. For this purpose, the single organism is almost helpless. The adequate forces require societies of cooperating organisms. But with such coöperation and in proportion to the effort put forward, the environment has a plasticity which alters the whole ethical aspect of evolution.[142]

One highlight of this passage is Whitehead's statement that when organisms band together, such selective activities enable them to "create their own environment," Whitehead considering the environment, in contrast to the individual organism, to be "plastic."[143]

With these key passages in mind, two questions must here be asked in light of Lucas' criticisms: first, where do we find the resources in Whitehead's work for arriving at a process-relational evolutionary cosmology? The answer to this question is that such resources reside in the first chapter of *The Function of Reason*[144] in which he: (1) offers a critique of the dogmatic fallacy of invoking Natural Selection as an all-encompassing mechanism which explains every detail of evolutionary processes, without reference to the contingencies of life and to the agency of each organism in its struggle for survival;[145] (2) alludes to the fact that organisms engage in behaviors that transform their

142. Whitehead, *Science and the Modern World*, pp. 111-112.

143. Whitehead, *Science and the Modern World*, pp. 111-112.

144. Lucas suggests that while this text "seriously challenges his conclusions" as to the lack of treatment of evolutionary theory in Whitehead's corpus, "these lectures [mentioning 'emergence' and evolution] are almost entirely absorbed with developing a philosophy of culture. Very little is actually said about evolution—and what is said is once again quite general and innocuous" ('Evolutionist Theories and Whitehead's Philosophy,' p. 296). He continues, "the attempt to portray (*The Function of Reason*) as a significant piece of evolutionist philosophy utterly fails" (p. 298).

145. Whitehead, *The Function of Reason*, Boston, Beacon Press, 1929 / 1969, pp. 4-7. In relation to Whitehead's notion of the "evolutionist fallacy," which is an instantiation of "the fallacy of misplaced concreteness," he writes, "I must at once join issue with the evolutionist fallacy suggested by the phrase 'the survival of the fittest.' The fallacy does not consist in believing that in the struggle for existence the fittest survive to

environments;[146] (3) provides criticisms of the rejection of final causation and of "purpose," on the part of the natural sciences, in the effort to explain evolutionary processes, as well as of biology's narrowness in terms of the evidence that is admitted, stemming from the materialist outlook;[147] (4) recognizes the importance of (what amounts to) plas-

eliminate the less fit. … The problem set by the doctrine of evolution is to explain how complex organisms with such deficient survival power ever evolved. … It may be possible to explain 'the origin of species' by the doctrine of the struggle for existence among such organisms. But certainly this struggle throws no light whatever upon the emergence of such a general type of complex organism, with faint survival power. This problem is not to be solved by any dogma, which is the product of mere abstract thought elaborating its notions of the fitness of things. The solution requires that thought pay full attention to the empirical evidence, and to the whole of that evidence. … [The fallacious way of considering evolutionary processes under the 'evolutionist fallacy'] embraces the doctrine of evolution, and interprets the vanishing of species and of sporadically variant individuals, as being due to maladjustment to the environment. This explanation has its measure of truth: it is one of the great generalizations of science. But enthusiasts have so strained its interpretation as to make it explain nothing, by reason of the fact that it explains everything. We hardly ever know the definite character of the struggle which occasioned the disappearance. … If the mere fact of dying out be sufficient proof of maladjustment to the environment, the explanation is reduced to a tautology. The importance of the doctrine of the struggle for existence depends on the assumption that living beings reproduce themselves in sufficient numbers of healthy offspring, and that adaptation to the environment is therefore the only decisive factor. This double assumption of prolificness and of healthiness is obviously not always true in particular instances. There are limitations to the doctrine of Malthus" (my additions).

146. Whitehead, *The Function of* Reason, pp. 7-8. Whitehead states, "there is another factor in evolution which is not in the least explained by the doctrine of the survival of the fittest. Why has the trend of evolution been upwards? The fact that organic species have been produced from inorganic distributions of matter, and the fact that in the lapse of time organic species of higher and higher types have evolved are not in the least explained by any doctrine of adaptation to the environment, or of struggle. In fact the upward trend has been accompanied by a growth of the converse relation. Animals have progressively undertaken the task of adapting the environment to themselves. They have built nests, and social dwelling-places of great complexity; beavers have cut down trees and dammed rivers; insects have elaborated a high community life with a variety of reactions upon the environment. Even the more intimate actions of animals are activities modifying the environment. The simplest living things let their food swim into them. The higher animals chase their food, catch it, and masticate it. In so acting, they are transforming the environment for their own purposes. Some animals dig for their food, others stalk their prey. Of course all these operations are meant by the common doctrine of adaptation to the environment. But they are very inadequately expressed by that statement; and the real facts easily drop out of sight under cover of that statement. The higher forms of life are actively engaged in modifying their environment. In the case of mankind this active attack on the environment is the most prominent fact in his existence." We may compare Deacon's concept of "niche construction" to these statements regarding the fact that animals transform their environments.

147. Whitehead, *The Function of* Reason, pp. 10-17, 25-28. Whitehead writes, "those physiologists who voice the common opinion of their laboratories, tell us with practical unanimity that no consideration of final causes should be allowed to intrude into the science of physiology. In this respect physiologists are at one with Francis Bacon at the beginning of the scientific epoch, and also with the practice of all the natural sciences. In this rejection of final causation the testimony seems overwhelming … we all start by being empiricists. But our empiricism is confined within our immediate interests. The more clearly we grasp the intellectual analysis of a way regulating procedure for the sake of those interests, the more decidedly we reject the inclusion of evidence which refuses to be immediately harmonized with the method before us. Some of the major disasters of mankind have been produced by the narrowness of men with a good methodology. … The particular doctrine in question is, that in the transformations of matter and energy which constitute the activities of an animal body no principles can be discerned other than those which

ticity in organic life, as well as in biological research and culture, which preserves the possibility of the "upward trend" in terms of evolutionary novelties;[148] and (5) emphasiz-

govern the activities of inorganic matter. No reactions between material components of an animal body have been observed which in any way infringe the physical and chemical laws applying to the behavior of inorganic material. But this is a different proposition from the doctrine that no additional principles can be involved. … The point I wish to draw attention [to] is the mass of evidence lying outside the physiological method which is simply ignored in the prevalent scientific doctrine [for example, the recognition of purpose and final causation in organic life]. … The trained body of physiologists under the influence of ideas germane to their successful methodology entirely ignore the whole mass of adverse evidence. We have a colossal example of anti-empirical dogmatism arising from a successful methodology. Evidence which lies outside the method simply does not count. … The problem is to understand the operations of an animal body. There is clear evidence that certain operations of certain animal bodies depend upon the foresight of an end and the purpose to attain it. It is no solution of the problem to ignore this evidence because other operations have been explained in terms of physical and chemical laws. The existence of a problem is not even acknowledged. It is vehemently denied. … 'Purpose' is a category [deemed] irrelevant for the explanation of their bodily activities … Another reason for the extrusion of final causation is that it introduces a dangerous mode of facile explanation. This is certainly true. The laborious work of tracing the sequence in physical antecedents is apt to be discouraged by the facile suggestion of a final cause. Yet the mere fact that the introduction of the notion of final causation has its dangers is no reason for ignoring a real problem" (my additions).

Later, Whitehead suggests that "the orthodox doctrine of the physiologists demands that the operations of living bodies be explained solely in terms of the physical system of physical categories. … In the animal body there is, … clear evidence of activities directed by purpose. … The rejection of purpose dates from Francis Bacon at the beginning of the seventeenth century. As a methodological device it is an unquestioned success so long as we confine attention to certain limited fields. Provided that we admit the category of final causation, we can consistently define the primary function of Reason … to constitute, emphasize, and criticize the final causes and strength of aims directed towards them … A satisfactory cosmology must explain the interweaving of efficient and final causation … What we seek is such an explanation of the metaphysical nature of things that everything determinable by efficient causation is thereby determined, and that everything determinable by final causation is thereby determined. The two spheres of operation should be interwoven and required, each by the other. But neither should arbitrarily limit the scope of the alternative mode" (*The Function of* Reason, pp. 25-28). Accordingly, one commentator suggests that today "there remains some legitimate role in biology for the concept of a trait's function or purpose, understood as what the trait or what it is directed towards" (Lewens, *Darwin*, New York, Routledge, 2007, p. 52).

148. Whitehead, *The Function of* Reason, pp. 18-24. Whitehead states, "the birth of a methodology is in its essence the discovery of a dodge to live. … When any methodology of life has exhausted the novelties within its scope and played upon them up to the incoming of fatigue, one final decision determines the fate of a species. It can stabilize itself, and relapse so as to live; or it can shake itself free, and enter upon the adventure of living better. In the latter event, the species seizes upon one of the nascent methodologies concealed in the welter of miscellaneous experience beyond the scope of the old dominant way. If the choice be happy, evolution has taken an upward trend: if unhappy, the oblivion of time covers the vestiges of a vanished race. With a happy choice, the new method quickly reaches its meridian stage. There is thus a new form of the good life, with its prolongation depending on the variety of contrast included within its methodical scope. On the whole, the evidence points to a certain speed of evolution from a nascent methodology into the middle stage which is relatively prolonged. In the former event, when the species refuses adventure, there is relapse into the well-attested habit of mere life. The original method now enters upon a prolonged old age in which well-being has sunk into mere being. Varied freshness has been lost, and the species lives upon the blind appetitions of old usages. … This relapse eliminates those flashes of novel appetition which have constituted the means of ascent to the existing stage of complex life. … There has been a relapse into mere repetitive life, concerned with mere living and divested of any factor involving effort towards living well, and still less of any effort towards living better. This stage of life … represents a

es the role of mental experience (not necessarily involving consciousness) as the "organ" of appetition, agency, and novelty in organic life.[149] Other highly suggestive passages are contained in the chapter, "The Order of Nature" in *Process and Reality*, where he discusses how the plastic, flexible, or "unspecialized society can survive through important changes in its environment [by] … tak[ing] on different functions in respect to its relationship to a changing environment."[150] However, the main resources for arriving at a

slow, prolonged decay in which the complexity of the organism gradually declines towards simpler forms. … [But] in the animal body, we can observe the appetition towards the upward trend, with Reason as the selective agency."

149. Whitehead, *The Function of* Reason, pp. 32-34. He writes, "every occasion of experience is dipolar. It is mental experience integrated with physical experience. Mental experience … is the experience of forms of definiteness in respect to their disconnection from any particular physical experience, but with abstract evaluation of what they *can* contribute to such experience. Consciousness is no necessary element in mental experience. … Mentality is the urge [of] … appetition. It is emotional purpose; it is agency. … The higher forms of intellectual experience only arise when there are complex integrations, and reintegrations, of mental and physical experience. Reason then appears as a criticism of appetitions. … Mental experience is the organ of novelty, the urge beyond. It seeks to vivify the massive physical fact, which is repetitive, with the novelties which beckon. … In its lowest form, mental experience is canalized into slavish conformity [to habit]. It is merely the appetition towards, or from, whatever in fact already is. … This lowest form of slavish conformity pervades all nature. It is rather a capacity for mentality, than mentality itself. But it *is* mentality. In this lowly form it evades no difficulties: it strikes out no new ways: it produces no disturbance of the repetitive character of physical fact. … It is degraded to being merely one of the actors in efficient causation. But when mentality is working at a high level, it brings novelty into the appetitions of mental experience. In this function, there is a sheer element of anarchy. But mentality now becomes self-regulative. It canalizes its own operations by its own judgments. It introduces a higher appetition which discriminates among its own anarchic productions."

150. Whitehead, *Process and Reality*, p. 100. Whitehead continues, "in general the defining characteristic of such a society will not include any particular determination of structural pattern. By reason of this flexibility of structural pattern, the society can adopt that special pattern adapted to the circumstances of the moment. Thus an unspecialized society is apt to be deficient in structural pattern, when viewed as a whole. Thus in general an unspecialized society does not secure conditions favourable for intensity of satisfaction among its members, whereas a structured society with a high grad of complexity will in general be deficient in survival value. In other words, such societies will in general be 'specialized' in the sense of requiring a very special sort of environment. Thus the problem for Nature is the production of societies which are 'structured' with a high 'complexity', and which are at the same time 'unspecialized.' In this way, intensity is mated with survival. There are two ways in which structured societies have solved this problem. Both ways depend on that enhancement of the mental pole, which is a factor in intensity of experience…" (pp. 100-101); "the two ways in which dominant members of structured societies secure stability amid environmental novelties are i.) elimination of diversities of detail [via negative prehensions], and ii.) origination of novelties of conceptual reaction. As the result, there is withdrawal or addition of those details of emphasis whereby the subjective aim directs the integration of prehensions in the concrescent phases of dominant members" (p. 102).

Earlier, he states that "the members of the society are alike because, by reason of their common character, they impose on other members of the society the conditions which lead to that likeness. This likeness consists in the fact that i.) a certain element of 'form' is a contributory component to the individual satisfaction of each member of the society; and that ii.) the contribution by the element to the objectification of any one member of the society for prehension by other members promotes its analogous reproduction in the satisfactions of those other members. Thus a set of entities is a society i.) in virtue of a 'defining characteristic' shared by its members, and ii.) in virtue of the present of the defining characteristic being due to the environment provided by the society itself…" (p. 89); "a society is, for each of its members, an environment with some element of order in it, persisting by reason of the genetic relations between its own

comprehensive process-relational evolutionary cosmology reside in Whitehead's theory of prehensions, which is the mantelpiece of his speculative philosophical scheme, and specifically, in reference to the role of "prehensive selectivity" within the creative process. Most importantly, it is through the theory of prehensions that Whitehead can be said to account for the "neglected side of the evolutionary machinery." Consistent with Baldwin's theory of Organic Selection, Whitehead is concerned to advance an understanding of this side of the evolutionary processes.

Second, how might scholars of process thought arrive at a process-relational evolutionary cosmology? In part, a process-relational evolutionary cosmology can be arrived at by reading and interpreting these Whiteheadian resources in the light of Baldwin's theory of Organic Selection. The passages cited above certainly correspond with a Baldwinian outlook. But a reading of the theory of prehensions, with a focus on the theme of "prehensive selectivity," provides the central analogy to Baldwin's account of the process by which organisms develop and select behavioral novelties for future actualization, as they confront their environment, namely, the "first part" of his theory of Organic Selection, as described above. The "second part" of Baldwin's theory concerning the "orthoplastic" inheritance of correlated characteristics and mutuational variations which accentuate novel behavioral modifications may generally be integrated with Whitehead's doctrine of "objective immortality," in which the selective accommodations an individual organism makes in its lifetime are inherited by subsequent generations of its species. In the next section of this paper, I shall provide the basic "skeleton" for such an integration by drawing out some of the chief tenets of the theory of prehensions which coincide with Baldwinian themes.

PART 5: WHITEHEAD'S THEORY OF PREHENSIONS

In previous publications,[151] I have argued that operations of prehensive selectivity, involving the interplay of positive and negative prehensions, constitute the efficient cause of the creative process. Whitehead's descriptions of the creative process can also be interpreted as the learning process of an organism, and can also account for the process by which behavioral novelties are arrived at by organisms, as alluded to in Baldwin's scheme. Like Baldwin, Whitehead holds that all organisms have some degree of mentality. Consciousness, for him, is chiefly attributable to the higher organisms, and it is in conscious experience that operations of negation and selectivity are at their most intense. While Whitehead agrees with both Darwin and Baldwin that human beings can

members" (p. 90).
Chapter two on "Expression" in Whitehead, *Modes of Thought*, New York, The Free Press, 1938 / 1968, pp. 20-41 is also quite suggestive of the origin of novelty, as are the final chapters, "Nature Lifeless" (pp. 127-147) and "Nature Alive" (pp. 148-169), although these would not satisfy Lucas' critique. *Adventures of Ideas* also contains some suggestive passages for a comprehensive process-relational evolutionary cosmology.

151. See Scarfe, 'Negative Prehensions and the Creative Process,' *Process Studies*, vol. 32, no. 1, 2003, pp. 94-105, and Scarfe, 'Prehensive Selectivity and the Learning Process,' in Riffert (ed.), *Alfred North Whitehead on Learning and Education: Theory and Application*, Newcastle, Cambridge Scholars Press, 2005, pp. 123-158.

be placed on a continuum with other animals in terms of mentality, he holds that selectivity is more acute in the higher experiences (e.g. conscious experience) of the higher organisms, such as human beings. To be sure, Whitehead writes that "in the passage from our lower type animal experience to our higher type human [conscious] experience, we [acquire] a *selective emphasis* whereby the finite occasions of experience receive clear definition."[152]

In contradistinction to the traditional philosophical notions of "perception" or "sense-perception," which are "shot through and through with the notion of cognitive apprehension," Whitehead's term, "prehension" refers to the "apprehension" of data at the root of experience, an activity which may or may not be cognitive. Hence, the word, "prehension" in Whitehead's cosmological scheme refers to the "uncognitive apprehension" of experienced data.[153] The word "prehension" also means "feeling," "grasping," "taking account of," or "seizing," pointing to operations which are not necessarily cognitive in nature. A prehension, analogous to biological processes such as the ingestion of food, designates an organism's "appropriation," for "the foundation of its own existence, the various elements of the universe out of which it arises."[154] That is to say, an organism, as a "prehending subject" appropriates data, food, or resources from its environment for its own process of self-development and growth. For Whitehead, every act of prehending involves a process of selection in which some data are (positively) accepted and appropriated into the organism's constitution in virtue of data that are excluded or eliminated. Specifically, he depicts that experience is constituted, in part, by the fluctuation of "positive" and "negative" prehensions. Prehensions of the positive and negative varieties operate conjunctively in virtue of a process of selection. While a positive prehension "is the definite inclusion of [data] into positive contribution to the subject's own real internal constitution," a negative prehension involves "the definite exclusion of [data] from positive contribution to the subject's own real internal constitution."[155] A positive prehension involves an organism's seizure, inclusion, and retention of data as potentialities for future actualization, whereas a negative prehension consists in the elimination or the rejection of data from entering into its constitution, or of holding the data inoperative. For Whitehead, organisms "eliminate, by negative prehension, the irrelevant accidents in [their] environment"[156] in virtue of eliciting attention to data which impress upon them or which are relevant to their aims. For example, an injured land iguana that is away from its nest, and which is a potential source of nourishment, is generally more interesting to a short-eared owl than a piece of volcanic rock on the empty landscape. In Whitehead's scheme, all positive prehensions are accompanied by negative prehensions, and it is in virtue of the elimination of irrelevant data that relevant data are accepted. Through alternating prehensive integrations and eliminations, selected data are objectified and are assimilated by the organism. For Whitehead, the

152. Whitehead, *Modes of Thought*, p. 77, my emphasis.
153. Whitehead, *Science and the Modern World*, p. 69.
154. Whitehead, *Process and Reality*, p. 219.
155. Whitehead, *Process and Reality*, p. 44.
156. Whitehead, *Process and Reality*, p. 317.

process of selective appropriation involving the fluctuating interplay of positive and negative prehensions, occurs at each phase of concrescence (i.e. from simple physical feelings to conscious experience in the higher animals), and is written into the very fabric of organic experience in general.

Whitehead's theory of prehensions can be said to comprise a descriptive framework that accounts for how organisms learn, how they imitate other organisms, and how they selectively make novel accommodations, developing new habits and engaging in novel behaviors, in a parallel manner with Baldwin's theory of Organic Selection. The Whiteheadian notion of prehensive selectivity, which does not necessarily imply conscious experience, accounts for the organism's agency (neither fully conditioned by the environment, nor fully transcendent of it) in the creative life-process. The process of concrescence runs through three general phases: (1) a selective appropriation of data physically-felt, (2) the conceptual feeling and the creative transformation of the prehended data, and (3) the attainment of the "satisfaction" of the organism, whereby novelties in terms of behavior are successfully realized, and are, in turn, prehended and/or assimilated by other organisms. Here, I shall provide a general outline of some of the general phases of the creative process which warrant parallels with Baldwin's theory of Organic Selection, and which may serve to strengthen and/or improve upon the latter's account of organic experience.

5-1 Physical Feelings

In tracing the various phases of the creative process with reference to Baldwinian themes, Whitehead's analysis commences with what he calls "physical feelings," in which the data felt involve "objectifications of other actual entities."[157] Like Baldwin, Whitehead's philosophy of organism is "provisionally-realistic," holding to the notion that all the "resources" or the data that are entertained in mental operations are derived from physical experience. According to Whitehead, simple physical feelings are among the most primitive type of feelings, being the "bedrock" of organic experience. Physical feelings involve the feeling of "the here and now" and nothing further. The notion of a simple physical feeling comprises a generalization from Hume's notion of "impressions of sensation," without the sensationalist presupposition of consciousness (which Baldwin, to a certain extent, assumes). In contrast to conscious experience, which involves a high-level of abstraction from physical experience, simple physical feelings involve the immediacy of bodily experience of organisms, which are at once, caused by, and seized from other actualities. The data are felt as they are received by, impact on, or "bombard" the organism's physical body and sensory organs. The physical reception of the data in the environment is the starting point for the creative process. Simple physical feelings also involve the visceral bodily reactions of the organism to stimuli in the environment, muscular contractions, shivering from the cold, or shuddering due to fear of the possibility of a predator in the environment. They also involve emotions, where "emotions

157. Whitehead, *Process and Reality*, p. 245.

are accompanied by the clearest recognition of other actual things reacting"[158] on the prehending organism. In relation to physical feelings, whereby some data produce positive feelings (e.g. sweet taste and bodily pleasure) are while other data produce negative feelings (e.g. bitter taste and bodily pain), a process of selection ensues. In part, Whitehead's analysis here can be said to parallel Baldwin's account of the organism's selection of experiences and movements for repetition, on the basis of the pleasure or pain that they produce. In any case, while Whitehead holds that "physical and mental operations are incurably intertwined,"[159] each organism having a physical and mental experiential pole, one can imagine that many of the lower organisms do not get very far beyond physical experience and/or transcend nervous functioning of this type.

5-2 Conceptual Feelings

According to Whitehead, "conceptual prehensions, positive or negative, constitute the primary operations among those belonging to the mental pole of an [organism]."[160] Conceptual experience is largely characterized by a mental reproduction and re-enactment of objective data, which have been prehended physically. The notion of conceptual experience, for Whitehead, implies mentality, but it does not necessitate the attribution of consciousness. Conceptual experience arises as the objective datum of a physical feeling, selected via negative prehensions, enters into the organism's internal constitution as a potentiality for future actualization. There is a conceptual reproduction of the datum, perhaps a new movement, which the organism may re-enact in mentality. For Whitehead, finite organisms cannot reproduce every element of their physical experience mentally, and therefore, via the fluctuation of positive and negative prehensions, they must make a selection of which to copy mentally. The mental operations of conceptual reproduction and re-enaction constitute the basis for the entertainment of conceptual data and for the development of conceptual novelties. The data may be further integrated into the prehending organism's internal constitution and selected, such as to be repeated, potentially in the process of becoming a habit for it. Conceptual feeling is constituted by "the feeling of an unqualified negation; that is to say, it is the feeling of a definite eternal object with the definite extrusion of any particular realization."[161]

Whitehead's notion of an "eternal object" can be said to account for Baldwin's "copies" in the first phase of the circular reaction that is imitation. Eternal objects have their origins in conceptual data, selected from physical experience, which are entertained in mentality. For Whitehead, conceptual experience is more than just "simple reproduction … [rather], it selects, it emphasizes, it adds."[162] An eternal object "may be included positively by means of a conceptual feeling; but it may be excluded by a nega-

158. Whitehead, *Process and Reality*, p. 146.
159. Whitehead, *Process and Reality*, p. 317.
160. Whitehead, *Process and Reality*, p. 240.
161. Whitehead, *Process and Reality*, p. 243.
162. Whitehead, *Essays in Science and Philosophy*, New York, Philosophical Library, 1948, p. 149.

tive prehension,"[163] and is subject to a further process of selection. By way of the fluctuation of positive and negative conceptual prehensions, some reproductions and re-enactions are selected and kept as eternal objects, introducing creative purpose in the sense of being novel potentials for future actualization, while others are held to be irrelevant and are left inoperative, as in movements which are not to be repeated because they produce pain. Still others are creatively modified, transformed, or enhanced by their synthesis with component data derived from reproductions of other occasions, which adds "value" to them, and the reproductions may become novel potentialities for future actualization. However, according to Whitehead "if the mental activity involves no introduction of ideal novelty, the data of the conceptual feelings are merely eternal objects already illustrated in the initial phase of re-enaction."[164] In conceptual experience, negative prehensions are the chief operation involved in the process in which the organism valuates eternal objects and selects those which are relevant to it, eliminating those which are not. Those eternal objects which are selected by the organism will be potentials for future actualization which will be further integrated into its internal constitution. Through conceptual feelings, the organism "values up, or down, so as to determine the intensive importance accorded to the eternal object."[165] In valuating eternal objects as to their intensive relevance, organisms select which contents and movements are important to them, to some extent on the basis of the pleasure or pain felt as a result, and to their own adaptive success, thereby establishing novel habits, "subjective aims," and the means to attain such appetitions. This selective valuation at the root of conceptual experience can be said to account for Baldwin's notion of "functional selection," whereby the organism selects a behavior on the basis of the recollection of a movement (e.g. a particular hunting movement) or event in which it successfully procured the resources it needed, and which produced feelings of pleasure over pain. At the level of conceptual feelings, there is a selection of eternal objects, some being said to constitute novel potentialities (e.g. anticipations for future actualization or future behavior) to be repeated, while some of which constitute older habits. Baldwin's emphasis on "plasticity" can be said to be accounted for in Whitehead's scheme by the ability to select novel eternal objects in the process of making novel accommodations to behavior, while "fixity" can be interpreted as acting in a repetitive manner in correspondence with specific eternal objects. In any case, it might be suggested that mainstream biological research largely omits reference to what Whitehead calls the "mental pole"[166] of the organism in the evo-

163. Whitehead, *Process and Reality*, p. 239.

164. Whitehead, *Adventures of Ideas*, p. 194.

165. Whitehead, *Process and Reality*, p. 241.

166. In explanation of the notion of the "mental pole" of an organism, Whitehead writes "mental operations determine their subject in its character as an efficient cause. … the mental pole is the link whereby the creativity is endowed with the double character of final causation, and efficient causation. The mental pole is constituted by the decisions in virtue of which matters of fact enter into the character of the creativity. It has no necessary connection with consciousness; though, where there is origination of intellectual feelings, consciousness does in fact enter into the subjective forms" (*Process and Reality*, p. 277). According to Whitehead, for many organisms, but not all, the "mental pole" is a center of reaction and control (p. 108).

lutionary process, and, in some cases, assumes that, in every instance, the "mental pole" is genetically pre-programmed and pre-determined. However, under both Baldwin's and Whitehead's explanations, the "mental poles" of organisms are crucial in the process of its adaptation to the environment. Whereas physical feelings provide the materials for mental experience, conceptual feelings are at the root of creative novelty, of accommodation, and of the development of novel behavioral habits.

5-3 Transmutation and Transmuted Feelings

For Whitehead, conceptual reproductions and re-enactions of physical feelings originate mental experience, but the phase of transmutation and transmuted feelings is a further stage which refers back to physical experience. Whitehead's notions of "transmutation" and "transmuted feelings" involve a process whereby conceptual experience re-acquires its reference to actuality, thereby integrating the conceptual with the physical. Through transmutation, the organism "transmutes the datum of [a] conceptual feeling into a contrast with the nexus of those prehended actual entities."[167] In other words, the organism ascribes an eternal object onto actualities physically felt, perhaps applying its selected movements to a similar situation, or attributing "danger—avoid" to a certain group of organisms which attempted to eat it, thereby causing it pain. Transmutation may also involve the organism may be the anticipatory first step toward the repetition of selected hunting movements, the development the muscular coordination in order to be able to perform them, and/or the application of them to this or that situation. For example, the short-eared owl of the Galapagos, repeating its particular movement of hiding in the frigate bird's den in order to catch its prey as it returns to its nest. In transmutation, the organism applies the selected movement to this or that situation, for instance, to catch this or that type of prey to the elimination of others. Since no two instantiations of a movement are the same, variations and novelties on it accrue in its performance. In transmutation, "novelty of circumstance is met with novelty of functioning,"[168] where error in the natural world, in sense of the application of the novel movement to the wrong situation can result in the organism's death. The organism anticipates and imitates its conceptually-reproduced "copy" of the action, via transmuted feelings, thereby closing the loop of the "circular reaction" that, as Baldwin describes, is at the root of imitative behavior. In the process by which the actualities are felt in conjunction with an eternal object, in transmutation the feelings of the eternal object are ascribed to the actualities in question. And the set of actualities in question is felt in conjunction with the feelings of a valuated eternal object. If the actualities are associated with an eternal object which was positively prehended in conceptual experience and was valued upward in terms of its intensive importance to their own adaptation to their environment (e.g. in relation to the accessibility of food), then the organism will generally react with adversion to those actualities. However, if the actualities are associ-

167. Whitehead, *Process and Reality*, p. 240.
168. Whitehead, *Adventures of Ideas*, p. 207.

ated with an eternal object that was valued downward (e.g. bad tasting food), then the organism will generally react with aversion. Adversion and aversion are exemplified by emotional responses toward the actualities felt with reference to the feeling of the eternal objects ascribed to those actualities. As Whitehead writes, "anger, hatred, fear, terror, attraction, love, hunger, eagerness, massive enjoyment, are feelings and emotions closely entwined with the primitive functioning of 'retreat from' and 'expansion towards'."[169] In any event, transmutation and transmuted feelings do not necessarily involve conscious experience. For Whitehead, while all organisms have a degree of mentality, most organisms do not attain to consciousness.

5-4 The Higher Levels of Experience: Propositional Feelings and Consciousness

The higher organisms are distinct from the lower organisms in respect to the intensity of their selective operations and their capacity for conscious decision-making. According to Whitehead, "mentality as it emerges into coordinated activity has a tremendous effect in selecting, emphasizing, and disintegrating."[170] For him, only the higher organisms can entertain propositions and propositional feelings (involving symbolic reference and language), as well as comparative intellectual feelings involving intuitive judgments and consciousness, the hallmarks of which are operations of negation, decision (in the root sense of a "cutting off"), and the negative intuitive judgment, wherein negative prehensions are at their most intense. To be sure, the Latin root, *intellectus* means "chosen among" exemplifying the fact that the selective capacity is the most intense at this level. But consistent with his standpoint on non-cognitive "prehensive" experience, Whitehead writes that "the word 'decision' does not … imply conscious judgment, [al]though in *some* 'decisions' consciousness will be a factor,"[171] the difference being in the intensity of the negation in question.

In further getting at the meaning of consciousness, Whitehead holds that "it is the mark of a high-grade organism to eliminate, by negative prehension, the irrelevant accidents in its environment, and to elicit massive attention to every variety of systematic order."[172] But like both James and Baldwin, he further reminds us that "that portion of experience irradiated by consciousness is only a selection. Thus consciousness is a mode of attention … provid[ing] the extreme of selective emphasis"[173] which involves a high degree of abstraction in contrast to physical experience and which makes us liable to error. For Whitehead, consciousness is "the crown of experience, only occasionally attained, not its necessary base."[174] Consciousness, involving judgments concerning the comparison of selected conceptual contents and selected actualities, beyond the criteria of pleasure and pain, enables human beings to have a high degree of plasticity

169. Whitehead, *Symbolism*, New York, Fordham University Press, 1927 / 1955, p. 45.
170. Whitehead, *Adventures of Ideas*, p. 100.
171. Whitehead, *Process and Reality*, p. 43, my emphasis.
172. Whitehead, *Process and Reality*, p. 317.
173. Whitehead, *Adventures of Ideas*, p. 270.
174. Whitehead, *Process and Reality*, p. 53.

and adaptability to the environment. Whitehead writes that "mankind is that factor *in* Nature which exhibits in its most intense form the plasticity of nature. Plasticity is the introduction of novel law."[175] Furthermore, it is by way of consciousness, language, and reason that human beings conceptually *divide* and *decide* the form of their environment, enabling them a higher degree of control of it. However, Whitehead writes that "the right coordination of negative prehensions is one secret of mental progress … but unless some systematic scheme of relatedness characterizes the environment, there will be nothing left whereby to constitute vivid prehension of the world."[176] That is to say, sheer negation, decision, and negative prehension without positive prehension does not allow for the selectivity necessary for creative novelty in general. Analogously, from a Whiteheadian point of view, the sheer eliminative aspect of Natural Selection, without the advantageous variations and their preservation, can produce no creative novelty. In any event, Whitehead's treatment of conscious experience, which involves propositional and intellectual feelings can be interpreted in light of inquiry into the symbolic dimension of evolutionary processes, as for example, in biosemiotics and in memetics.[177]

5-5 Organic Satisfaction and Objective Immortality

The creative discovery, on the part of an organism, of a novel movement which is both successful and repeatable, enables the creature to become better adapted to its environment. In some measure, as Whitehead writes, the organism has attained a degree of plasticity, namely, an "originality of response to stimulus … its reactions [being] inexplicable by any tradition of pure physical inheritance."[178] The success of the novel accommodation leads to what Whitehead describes as the "the contentment of the creative urge by the fulfillment of [the organism's] categoreal demands,"[179] namely, to its "satisfaction" of function or purpose. With the attainment of a novel activity that enables it to be better adapted to its environment, the organism may leave its mark on the species and is, in general, in a better position to be able to reproduce successfully, thereby further leaving its mark on subsequent generations in the species. The satisfaction derived from the organism's success in making behavioral accommodations which allow it to be better off is reflected in Whitehead's notion of "objective immortality."

Objective immortality, by which Whitehead generally means the irreversibility or the stubborn fact of organic attainments, can be said to channel the direction of the future organic activity as well is generally consistent with the second part of Baldwin's theory of Organic Selection. Whitehead calls the successful organism a "subject-superject." At every stage of life, an organism can be considered a "subject" or an agent, yet it is always already a "superject," although it may be considered so to various degrees

175. Whitehead, *Adventures of Ideas*, p. 78.
176. Whitehead, *Process and Reality*, p. 254.
177. See Jablonka and Lamb's (2005) discussion of the "Symbolic Dimension" of evolution in *Evolution in Four Dimensions*, especially pp. 298-310.
178. Whitehead, *Process and Reality*, p. 104.
179. Whitehead, *Process and Reality*, p. 219.

"according to the relative importance of the novel factors in its final satisfaction."[180] As "objectively immortal" and as a "superject," the organism's novel behavior becomes "becomes a real component in other living immediacies of becoming."[181] As such, the organism's "own activity in *self*-formation passes into its activity of *other*-formation,"[182] and it becomes "a datum for succeeding generations of actual entities."[183] These Whiteheadian statements can be interpreted as generally suggestive of the Baldwinian notion that organisms hand down their successful attainments to other members of their species, which, for example, prehensively appropriate and imitate such successful movements, thereby improving themselves in terms of their adaptation to the environment. And Whitehead writes that each organism emerges with reference to decisions that are made "for it" by other organisms, and "provides decisions for other [organisms] which supersede it."[184]

New habits which are introduced into a population in conjunction with the development of novel phenotypic traits can unify the members of a variety or species. As Whitehead explains, in order to constitute what he calls a "society," there must be a "genetic derivation from other members of that same society … the members of the society [being alike] because, by reason of their common character, they impose on other members of the society the conditions which lead to that likeness."[185] In other words, members of a species or variety are unified through their habits in terms of their behavior. Behavioral accommodations pass from the one individual organism to the many organisms, although Whitehead writes that in the process by which "the novelty is introduced conceptually [it may] disturb[] the inherited 'responsive' adjustment of subjective forms"[186] belonging to the species' or variety's "tradition." The selection and imitation of new movements by the other members of the variety or society further reinforces it, and make it ever more fixed as a habit in the species. From this perspective, the "concrescence" or growing together of actual occasions does not only pertain to the physical merging of the members of a variety of organisms, but to also to the merging of species, through the selection of common functions and behaviors. But especially when competing activities hold the key to survival, the novel behavior may also divide a species, causing a split between those members that prehend and imitate the novel action and those that do not, which potentially creates new varieties, and even new species.

As in Baldwin's theory of Organic Selection, in subsequent generations of the species, individuals which inherit mutational variations that are coincidental and/or correlative to the novel behavior or function have an advantage in the struggle for existence and tend to be Selected for. Thus, the new movement has an indirect causal role

180. Whitehead, *Process and Reality*, p. 102.

181.Whitehead, *Process and Reality*, pp. xiii-xiv.

182. Whitehead, *Adventures of Ideas*, p. 193.

183. Sherburne, A *Key to Whitehead's Process and Reality*, Chicago, University of Chicago Press, 1966, p. 206.

184. Whitehead, *Process and Reality*, p. 43, my addition.

185. Whitehead, *Adventures of Ideas*, pp. 203-204.

186. Whitehead, *Process and Reality*, p. 104.

in the evolutionary advance of the species, in terms of the useful phenotypic variations that accrue. However, corresponding to Whitehead's standpoint of "organismic evolutionism," the tracing of the evolution of enduring "patterns" or "structures of activity,"[187] which allow organisms to adapt and to creatively modify their environments, deserves an equivalent emphasis. As such, Whiteheadians might attempt to decenter the all-out emphasis placed by materialist evolutionists and mainstream biologists on the inherited mutational variations in terms of the overall importance and meaning of evolutionary processes, and may seek to include common and enduring behavior amongst organisms within its definition of a species. Nevertheless, while not expressed by Whitehead, from a process-relational perspective, those coincidental variations which serve to accentuate, amplify, and perfect the new function, would lead to further intensities in terms of function in the species. In this light, Baldwin's elaboration on the organism giving "determinate direction" to evolution is thoroughly compatible with Whitehead's scheme, especially when interpreted as an extension of the doctrine of objective immortality. However, in order to more thoroughly integrate Baldwin's theory into Whitehead's scheme, new phases of concrescence may need to be elaborated. A further consideration is that the novel creative activity that unites members of a species in a common function, in relation to subsequently changing environments, may again have to be overcome if the species is to be preserved. Overall, according to Whitehead, the successful adaptation and the flourishing of a species take place especially when the "influence of each organism on the environment [is] favourable to the [*development* and] *endurance* of other organisms of the same type."[188] At any rate, from the preceding analysis, it is clear that Baldwin's theory of Organic Selection can be successfully and fruitfully integrated with Whitehead's theory of prehensions in the project to arrive at a comprehensive process-relational evolutionary cosmology. At the same time, Whitehead's philosophy provides the much-needed metaphysical and epistemological underpinning for Baldwin's theory, enriching it by offering a universal, conceptual framework with which to interpret the meaning of organic selectivity, and deepening the Baldwinian understanding of the selective processes of organisms which, as he depicts, guide and inform evolution. Especially, Whitehead's account of non-cognitive (i.e. prehensive) selectivity is helpful to Baldwin's thought, in overcoming the lingering sensationalist assumptions that remain present in his work, and in further distinguishing between mentality and consciousness. It also serves to highlight the fact that Organic Selection can by no means be considered the mere "coarse filter"[189] of cognition, but rather, it involves the vast complexity of experience, mental and physical. For example, it involves feelings or prehensions, emotions, and mental events which may be conceived as lasting for nanoseconds. In the next section of this paper, the two schemes will be further brought together in order to develop an enlarged notion of Organic Selection, one which is, in turn, more thoroughly integrated with Darwin's principle of Natural Selection.

187. Whitehead, *Science and the Modern World*, p. 108.
188. Whitehead, Science and the Modern World, p. 110.
189. Goodwin, *How the Leopard Changed Its Spots*, p. 157.

PART 6: AN ENLARGED CONCEPTION OF ORGANIC SELECTION: SOME BALDWINIAN-WHITEHEADIAN COSMOLOGICAL SPECULATIONS

In further merging Baldwin's theory of Organic Selection with Whitehead's theory of prehensions, a subsequent question pertaining to the meaning of Darwin's chief notion of Natural Selection must be answered. Standing for the notion that some organisms survive and reproduce successfully, passing on their characteristics to future generations, while others are eliminated, the principle of Natural Selection is depicted by Darwin as being the efficient cause and/or the chief mechanism that explains evolutionary processes. That said, for him, it is not the only causal factor. In the *Origin of Species*, Darwin describes Natural Selection as "the main but not exclusive means of modification,"[190] Nature having a "multiply dependent structure" in which the causes of evolution are only to be found among "a tangled bank of organic relations."[191] For Darwin, the eliminative operations of Natural Selection are

> daily and hourly scrutinizing, throughout the world, every variation, even the slightest; rejecting that which is bad, preserving and adding up all that is good; silently and insensibly working, whenever and wherever opportunity offers, at the improvement of each organic being in relation to its organic and inorganic conditions of life.[192]

Consistent with Darwin's view, Baldwin interprets the notion of Natural Selection to mean that

> some living creatures survive and propagate their kind when others … cannot. Those that survive and propagate appear to have been 'selected'; but they are naturally selected, without any … further reason of any kind than just the fact that they survive naturally when others die.[193]

Furthermore, in Baldwin's synopsis, the principle of Natural Selection involves the concurrence of four factors: the overproduction of organisms and variation, the struggle for existence, the survival of the fittest, and the inheritance of characters and mutational variations.

An important question that has been raised by evolutionary theorists ever since Darwin in regards to the principle of Natural Selection, is what, exactly, is doing the "selecting." In response to this question, Darwin himself employed "the analogy of a 'Being' who superintends the operations of natural selection … invit[ing] us to imagine that the Creator is really in charge of natural evolution" to help explain the selection by the environment of better adapted organisms. As one commentator suggests, stemming from Darwin's anthropocentric metaphor, it is "all too easy to think of nature as a conscious selecting agent [and/or] … as an arm of divine providence."[194] It is obvious that

190. Darwin, *Origin of Species*, p. 69.

191. Richards, 'Darwin on Mind, Morals, and Emotions,' in *The Cambridge Companion to Darwin*, Cambridge, Cambridge University Press, 2003, p. 112.

192. Darwin, *Origin of Species*, p. 133.

193. Baldwin, *Darwin and the Humanities*, p. 4.

194. Bowler, *Evolution: The History of an Idea*, Berkeley, University of California Press, 1989, p. 169.

this analogy is not the answer that inquirers are looking for. For it would mean that a Creator consciously presides over a great holocaust of organisms and over the eliminatory "cruelties"[195] of Nature. Rather, evolutionary theorists would do well to employ a non-anthropocentric conception of Nature or of the environment.

In order to answer the question of what is doing the selecting from the perspective of a process-relational evolutionary cosmology, one can, in part, draw from Whitehead's *The Concept of Nature* (1919), in which he defines Nature as a felt "complex of related entities [wherein] the 'complex' is fact as an entity for thought, to whose bare individuality is ascribed the property of embracing in its complexity the natural entities."[196] This statement is suggestive that organisms are not only *in* Nature but that they are *compositional of* Nature, each creature belonging to the total complex of many organisms comprising Nature.[197] To be sure, elsewhere, Whitehead describes Nature as an "organic extensive community"[198] which is thoroughly *in process* and composed of living organisms, or what he calls "actual entities" or "actual occasions." Actual entities are finite "creatures which become,"[199] each of which is engaged in its own creative life-process and partly constituted by its various relations with other actual entities. As such, from a process-relational perspective, each individual organism (including each individual human being) is a *part* of Nature, a notion which, today, has currency in environmental philosophy. However, at the same time, it cannot be said that each individual organism is identical to, or is synonymous with the total complex of entities that *is* Nature. To be sure, Whitehead states that while "no entity can be considered in abstraction from the universe [,]… no entity can be divested of its own [distinct] individuality,"[200] again pointing to the notion that the individual organism cannot be regarded as identical to, or synonymous with the total complex of organisms that, together, compose Nature. From this outlook, neither the individual organism, nor a finite multiplicity of organisms is itself Nature.[201] Never-

195. Ayala, *Darwin's Gift to Science and Religion*, Washington, D.C., Joseph Henry Press, 2007, p. 158. Francisco Ayala uses the idea of the "cruelties" of nature, namely, the numerous predators eat their prey alive; parasites destroy their living hosts from within; and, as noted, females of many species of spiders and insects devour their mates" (p. 158), as part of a counter-claim against William Paley's argument from Design.

196. Whitehead, *The Concept of Nature*, New York, Cambridge University Press, 1919 / 1995, p. 13.

197. As Cobb writes in *Back to Darwin*, pp. 224-225, "from a Whiteheadian perspective, the distinction between organisms and environment is not sharp. Strictly speaking, the environment is composed entirely of other organisms, and every organism is part of the environment of others … organisms affect the nature that then 'selects' the ones that survive and reproduce."

198. Whitehead, *Process and Reality*, p. 289.

199. Whitehead, *Process and Reality*, p. 35.

200. Whitehead, 'Mathematics and the Good,' in Paul A. Schilpp (ed.), *The Philosophy of Alfred North Whitehead*, New York, Tudor Publishing Company, 1941 / 1951, p. 678, my addition.

201. While the individual organism is not Nature, Whitehead suggests that "an individual entity, whose own life-history is a part within the life-history of some larger, deeper, more complete pattern, is liable to have aspects of that larger pattern dominating its own being, and to experience modification of that larger pattern reflected in itself as modifications of its own being. This is the theory of organic mechanism. According to this theory the evolution of laws of nature is concurrent with the evolution of enduring pattern. For the general state of the universe, as it now is, partly determines the very essences of the entities whose modes of functioning these laws express. The general principle is that in a new environment there is an

theless, from these premises, an insight into the relationship between Organic Selection and Natural Selection becomes clear. Specifically, the individual organism's selective activities by which it learns, and chooses its behavior, its activities, its food sources, its ways of life, its associations with other organisms, its mate(s),[202] its breeding of stock,[203] may all be included under the umbrella of Baldwin's term, Organic Selection. Equally, they may all be accounted for via an analysis of the operations of prehensive selectivity that are illuminated by Whitehead as pertaining to the creative life-processes of organisms in his theory of prehensions. At the same time, each of these modes of selectivity can also be said to be contributing aspects of the total principle of Natural Selection.

In *Social and Ethical Interpretations in Mental Development* and in *Development and Evolution*,[204] Baldwin provides us with schemas which list all the modes and the biotic levels of selection that researchers, up until his time, had hypothesized as playing a causal role in evolutionary processes: Natural Selection, Germinal Selection, Intra-Selection, Functional Selection, Organic Selection; Artificial Selection, Personal Selection and/or Sexual Selection, Group Selection, Social (or Community) Selection, Imitative Selection, Physiological Selection, and Reproductive or Genetic Selection. In the schemas, he also provides a list of the means or the criterion of each of the modes of selection, as well as their results. While many of these manners of selection have since either been summarily dismissed, re-interpreted, re-formulated, or are still being debated by evolutionary theorists, what is clear is that operations of *selection* of various sorts, occurring at various biotic levels, are held to be efficient causal forces in evolutionary processes. Furthermore, many of these modes of selection hinge upon the *decisions* (both non-cognitive and cognitive) that are made by individual organisms in their respective life-processes, consonant with Whitehead's theory of prehensions. And many of the forms of selection that are outlined by Baldwin may be said to overlap with others.

Drawing on Baldwin's schemas, one may speculate that Organic Selection can be said to include Darwin's notion of Artificial Selection within it. Darwin used the term, Artificial Selection, namely, "the process by which animal breeders improve domesticated species,"[205] thereby, directing the evolution of their stock of animals by crossing only those with desirable traits,[206] as part of an argument by analogy for Selection under

evolution of the old entities into new forms" (*Science and the Modern* World, p. 107).

202. Here I am alluding to Darwin's notion of "Sexual Selection," for which Baldwin reserves the term "Personal Selection" when discussing this notion in terms of the human species

203. Here I am alluding to Darwin's notion of "Artificial Selection" which belongs to human beings and pertains to the breeding of domesticated animals.

204. Specifically, see Baldwin's Social and Ethical Interpretations in Mental Development, pp. 547-550, and his Development and Evolution, pp. 165-172.

205. Lewens, *Darwin*, 164.

206. Artificial Selection, for Darwin, was "the one area where organic change could be observed ... animal and plant breeding offered an experimental way of studying the effects of variation. But it is no accident that the significance of both variability and hard heredity were recognized first by breeders, who knew that they owed their success to manipulation of these factors by selection. Darwin always presented natural selection through an analogy with the artificial form. The breeder picks out those individuals in his group which possess something of the characteristic he seeks and breeds his next generation solely from

Nature. He described that "the key is man's power of accumulative selection: nature gives successive variations, man adds them up in certain directions useful to him."[207] While this analogy occurred to Darwin after he had arrived at the latter theory, it was an important feature of his overall argument for Natural Selection in which the Malthusian struggle for existence substituted for the breeder's power of choice, selecting (both consciously and non-consciously) those individuals best adapted to their environments and eliminating the others.[208] In expressing the connection between Organic Selection and Artificial Selection, Baldwin writes, "'organic selection' supposes [organisms to be selecting themselves], in an important sense. It is a sort of artificial selection put in the hands of the animal himself—that is, so far as the results go."[209] Baldwin further suggests that

> the effectiveness of the method of screening and of so accumulating certain variations in producing well-marked types is seen in artificial selection, where certain creatures are set apart for breeding. But any influence, such as the individual's own accommodation to his environment, which is important enough to keep him and his like alive, while others go under in the struggle for existence, may be considered with reason a real cause in producing just such effects. Thus by the processes of accommodation, a weapon analogous to artificial selection is put into the hands of the organism itself, and the species profits by it.[210]

In a parallel manner, human beings are also animals and are themselves a part of Nature, helping to compose it. In reality, although we cannot merely conflate human beings, much less any other organism or set of organisms, with Nature (as was argued for above), there is no strict division where the natural and human realms begin, such that Artificial Selection is still a mode of selection which falls under the umbrella of Natural Selection. Human animals, through their conscious and unconscious activities of selection, are making decisions for other animals which direct the evolutionary destinies of the animal species. Consequently, the notion of Organic Selection might be construed as an extension of the notion of Artificial Selection to the rest of the animal king-

these. He thus isolates the desired characteristics and by selecting further variations in the same direction can improve it in later generations" (Bowler, *Evolution: History of an Idea*, p. 166). However, here we need to recall the limits of the power of the breeder in that "the variations nature gives are not themselves under the control of the breeder, he or she merely chooses from what is on offer. By showing that artificial selection has worked in the improvement of breeds, Darwin thereby shows that variation has the characteristics needed to enable selection—whether artificial or natural—to generate adaptation. Artificial selection, too, would be ineffective if variation were not plentiful, or if correlations of growth were so tightly bound as to prohibit the gradual improvement of any one trait. By reminding us of the efficacy of artificial selection, Darwin supports his case for the efficacy of natural selection" (Lewens, *Darwin*, p. 50).

207. Darwin, *Origin of Species*, p. 90.

208. Here, we need to remember that "this analogy with artificial selection might suggest an image of nature selecting individual organisms to breed or to die according to the beneficence of their variations, just as a sheep breeder picks out, or selects, some individual ewe for further breeding, according to the quality of her wool. In contrast to this image, selection today is not understood as a force affecting individual organisms … (but frequencies of a trait in a population)" (Lewens, *Darwin*, p. 62).

209. Baldwin, *Development and Evolution*, pp. 170-171.

210. Baldwin, *Development and Evolution*, p. 175.

dom, rather than merely representing a human activity, exclusively. Organic Selection, which places emphasis on the organism's own selective activities in its own life-process, can also be said to include Functional Selection, Artificial Selection, Personal Selection, Sexual Selection,[211] Social Selection,[212] Imitative Selection, and perhaps others to some extent. These modes of Selection are examples which, to some extent, hinge upon the selective activities of organisms in their life-processes.

The above speculations form the basis for an enlarged and fully "process-relational" conception of Organic Selection, standing for the total process by which organisms selectively prehend their environment and each other. Organic Selection stands for the organism's selective filters, the choices, and the decisions it makes for itself, for example, in relation to its own activities and behavior, as well as those it makes, either consciously or unconsciously, for other organisms.[213] Organic Selection, standing for the sum total of the selective activities of organisms, including both those by which the creature directs itself, as well as those by which it acts on other organisms, is an "appendage" of the principle of Natural Selection. From this perspective, not only are all organisms selective agents presiding over their own lives, but as a part of the natural environment, they

211. Sexual Selection is "the process by which the struggle to find a mate leads to behavioural, anatomical, or psychological modification. Darwin believed that sexual selection was important throughout the animal kingdom. He thought it could account for the gaudy plumage of male birds, and the differences between human races and human sexes" (Lewens, *Darwin*, p. 269). According to Darwin, "sexual selection depends on the success of certain individual over others of the same sex, in relation to the propagation of the species; whilst natural selection depends on the success of both sexes, at all ages, in relation to the general conditions of life. … The sexual struggle is of two kinds; in the one it is between the individuals of the same sex, generally the males, in order to drive away or kill their rivals, the females remaining passive; whilst in the other, the struggle is likewise between the individuals of the same sex, in order to excite or charm those of the opposite sex, generally the females, which no longer remain passive, but select the more agreeable partners" (Darwin, *The Descent of Man*, p. 638).

212. Group selection is "a process of natural selection that occurs between groups. Darwin usually writes in terms of selection at the level of the community, rather than the group. Modern biologists are divided on how to understand what group selection is, and on whether it is an important evolutionary process" (Lewens, *Darwin*, p. 265).

213. Piaget summarizes the refinement of definitions of the notion of selection in the 1970s as follows: "the doctrine on this subject [evolution], which was quasi-official among biologists some years ago, consisted in explaining everything by reference to purely random mutation and selection 'after the event'. Such an explanation now inspires less and less confidence. One reason for this is that the idea of selection has been subjected to serious reconsideration. It was formerly compared with a sifting process, a simple automatic sorting which led only to a broad dichotomy between elimination and survival. Selection has since emerged, however, as a considerably more refined and complex concept, as regards both its results and the mechanism to which they are attributed. Its effect is thought to be the probabilistic modification of the various coefficients and propositions at work in a prevailing state of genetic homeostasis—but it has a further and subsequent effect upon an organism's capacity for modification, the number of its possible responses, and so on. *Above all, the operation of selection is increasingly understood to be bound up with factors of choice, in that an organism chooses its environment as well as being dependent upon it. It is bound also to the teleonomic and regulating systems of the organism's internal environment—processes of organic selection as important as those which remain the responsibility of the external environment.* As the concept of selection undergoes this refinement of definition, the role of chance in the production of variants must, to the same extent, be limited. Selection can then be readily be imagined, for reasons of symmetry, as tending to operate by means of exploratory 'trials' (known also as 'scanning')" (*Adaptation and Intelligence*, p. 7, my italics).

are themselves agents of Natural Selection. That is to say, all organisms participate, by their own selective activities, in the process by which the total environment preserves or eliminates other organisms, and as Baldwin has argued, by which their evolutionary destiny is charted. To lesser or greater extents, through their selective activities, all organisms exert a causal impact on the life-processes of other organisms, and on the process by which other organisms are Selected for and/or are eliminated as implied by the principle of Natural Selection, as well as on the evolutionary destinies of their species. All organisms are both subject to, and play a participating causal role in the preservations and/or eliminations of other organisms belonging to the meaning of the principle of Natural Selection, as well as are orthoplastic influences, helping to direct the evolutionary destiny of other species. When placed into context with the principle of Natural Selection in this manner, the selective activities of organisms which are elucidated by Baldwin's notion of Organic Selection and by Whitehead's theory of prehensions, can indeed be considered what Whitehead calls the "neglected side of the evolutionary machinery."[214] As was suggested earlier in this paper, a process-relational evolutionary cosmology will emphasize this side (involving the selective activities of organisms in their life-processes) of the "evolutionary machinery."

The enlarged conception of Organic Selection that has been developed here further implies the notion of "pan-selectionism," meaning that: (1) Selection at various biotic levels (micro- through macro-) and from various aspects is the efficient cause of evolutionary processes; (2) the organisms of Nature, as part of their life-processes, are engaged in selective activities which may or may not be cognitive in nature; (3) all organisms can be conceived as compositional parts of total complex that is Nature; (4) all organisms, by their own selective activities, both participate in, and are a causal factor in respect to the eliminations and preservations which belong to the meaning of the principle of Natural Selection as well as to other modes of Selection; and (5) all organisms, by their own selective activities, are orthoplastic influences, helping to determine the direction that evolution will take in respect to the mutational variations and characters that are inherited by their own, as well as by other species. It must be noted that the term, "pan-selectionism," as defined here, should not be conflated with the same term that is employed in molecular biology, nor with its usage in respect to Weismann's and Wallace's views of the "all-sufficiency" of Selection.[215]

In light of the enlarged conception of Organic Selection that has been developed here, from a Whiteheadian perspective, today, humanity's emphasis on instrumental reason and technological thinking, which are the chief ways by which it exerts the massive causal impact of its selective powers and "directs its attack on the environment,"[216]

214. Whitehead, *Science and the Modern World*, p. 111.

215. See Gould, *The Structure of Evolutionary Theory*, pp. 198-203, 505. While biologists have traditionally contemplated the question regarding the "what?" question regarding Selection: hypothesizing that the "units" or subjects of Selection are one or more of a range from micro- to macro- levels, gene to cell, to organism, to group or clade, to local populations of a species (demes), and to species, here we are contemplating the "who?" question.

216. Whitehead, *The Function of Reason*, p. 8.

has contributed to its dominance over all other life-forms on the planet. Through these means, and by its own selective activities, the human species, as a part of the environment that other creatures must live in, creates great Selection pressures which impact on other organisms, and has, almost single-handedly, determined the evolutionary destinies of entire species.[217] As compared with the selective activities of other animals, as Jablonka and Lamb (2005) point out,

> without doubt, humans are the major selective agents on our planet, and have carried out the most dramatic reconstruction [usually destruction] of environments. Today, in addition to changing plants and animals by artificial selection, humans [whether consciously or unconsciously] can alter the genetic, epigenetic, and behavioral state of organisms by direct genetic, physiological, and behavioral manipulation.[218]

These statements give rise to questioning concerning the ethics of selectivity in general, a topic that I shall address in the last section of this paper. In further integrating the views of Baldwin and Whitehead, it will be shown that Whitehead's cosmology can also serve to provide an ethical foundation for Baldwin's theory.

PART 7: BALDWINIAN-WHITEHEADIAN REFLECTIONS ON THE ETHICS OF SELECTIVITY

The enlarged sense of the notion of Organic Selection that was developed in the previous section would seem to stand at "the center of the storm" of the contemporary "creationism-versus-intelligent-design debate" that is still raging across the globe. For many religious believers, Darwin's theory of Natural Selection, as an explanation of the main mechanism behind evolutionary processes, is only a theory and can be, on that account, dismissed as *not* being representative of what *is*. From their vantage point, the principle of Natural Selection implies that evolutionary advances are the product of eliminatory "cruelties,"[219] arising as a result of biotic competition, which manifest themselves either consciously or non-consciously, and either overtly or covertly. As a result, many Christians hold that the theory of Natural Selection diminishes the notion of God, since it implies that any would-be deity presiding over Nature could be said to be responsible for a holocaust of organisms. Furthermore, some religious believers claim that Darwin's theory of Natural Selection, defined as the efficient cause of evolutionary processes, is a materialistic and mechanistic standpoint which implies a Godless, purposeless universe. For some, this leads inevitably to the bleak view that the only aim in life is to engage in a biotic struggle for resources toward reproductive success, thereby

217. Whitehead writes in relation to the coordinated selective activities of human beings in transforming their environment, "the environment has a plasticity which alters the whole ethical aspect of evolution. The increased plasticity of the environment for mankind, resulting from the advances in scientific technology, is being construed in terms of habits of thought which find their justification in the theory of a fixed environment" (*Science and the Modern World*, p. 112).

218. Jablonka and Lamb, *Evolution in Four Dimensions*, p. 241, my addition.

219. Ayala, *Darwin's Gift to Science and Religion*, p. 158.

converting the theory into an imperative to selectively exterminate the "less fit."

In responding to this lacuna regarding the ethical dimension of evolution, Darwin himself employed the notion of "Social," "Group," or "Community Selection." Community Selection is a mode of Selection that is subordinate to Natural Selection. Through it, Darwin provides an account of ethical behavior as a natural phenomenon. For him, human beings have evolved ethical and altruistic characteristics since they have learned, through experience, that if one helps one's fellows cooperatively and acts for the common good, for the most part, one will receive aid in return, thus, in turn, increasing one's own chance of being well off, happy, secure, and of reproducing successfully. However, one unresolved philosophical issue is that Community Selection assumes selectivity in the application of ethical principles, since, for example, human beings tend to privilege members of their own immediate family or group, taking care of them to the exclusion and the potential elimination of others. As such, Darwin's naturalistic explanation of morality can be described as an inherently instrumentalist position, namely, as a strategy of biological survival. Certainly, Dawkins' (1976, 1982) perspective exemplifies this Darwinian standpoint. This ethical instrumentalism is also at odds with Kantian conceptions of morality, as well as with some Christian conceptions, which hold that human beings ought to apply universal ethical principles, i.e. non-selectively, and without a concern for consequences and what one "gets out of" being moral (e.g. well-being, happiness, security, and reproductive success). In other words, the Kantian and some Christian perspectives on morality contrast with the Darwinian instrumentalist position, holding to the notion that morality is not simply reducible to one's self-interest in the biological game of life.

From a Baldwinian point of view, the debate over the ethical dimension of evolution centers directly on the selective activities of organisms and on the causal role that they play in the preservation or elimination of others. While maintaining that Organic Selection is supplementary to the principle of Natural Selection, Baldwin held that Natural Selection itself is

> not a positive agency; it is entirely negative. It is simply a statement of what occurs when an organism does not have the qualifications necessary to enable it to survive in given conditions of life; it does not in any way define positively the qualifications which do enable other organisms to survive … Organic Selection presents a new qualification of a positive kind which enables the organism to meet its environment and cope with it, while natural selection remains … the negative law that if the organism does not succeed in living, then it dies.[220]

220. Baldwin, 'A New Factor in Evolution,' pp. 549-550. That Natural Selection is not a positive or creative force was also a view held by H. F. Osborn, Theodore Eimer, and many others. Osborne held that "Selection is not a creative principle, it is a judicial principle" (Osborne quoted by Gould in *The Structure of Evolutionary Theory*, p. 568). Eimer, whose work influenced Baldwin, states "Selection can create nothing new, but can only work with characters that already exist and are useful in and of themselves." He continues, "natural selection can, as I have repeatedly remarked, create nothing new. It only so far contributes to the growth of the organic world that it selects the forms which are most fitted for life, and preserves them for the future action of new stimuli and of crossing … Thus the power of selection lies chiefly in the promotion and diversification of organic growth. It is … only an indirect cause of the evolution of living beings" (Eimer

In this respect, the theory of Organic Selection is, seemingly, a source of "hope" in terms of rescuing some aspect of agency and freedom on the part of the organism from biological determinism. However, at the same time, the enlarged conception of Organic Selection that I have developed in the previous section renders this interpretation problematic and amplifies the debate over the ethical dimension of evolution, because it stresses the fact that organisms themselves are partially responsible for the eliminations of other organisms which are inferred by the principle of Natural Selection and by other biological modes of Selection. But upon further inspection of Whitehead's statements surrounding this issue, it is clear that the Baldwin-Whitehead integration that has been developed in this paper offers a concrete way to mitigate it.

Like Baldwin's judgments concerning the principle of Natural Selection, Whitehead held that "in unthinking Nature 'natural selection' is a synonym for 'waste.'"[221] For him, without the positive valuation of conceptual data, sheer negation is not creative, and analogously, without the positive valuation of creatures, sheer elimination could not produce evolutionary novelties. Rather, as was alluded to previously in this paper, in the theory of prehensions, Whitehead emphasizes the importance of positive prehensions and valuations of conceptual data, within the context of the selective operations representative of the efficient cause of the creative process. Correspondingly, in his writings, Whitehead holds to a "middle-position" in the debate over the ethical dimensions of the theory of evolution. On the one hand, Whitehead takes issue with the religious impulses of his time which stubbornly resisted adaptation or adjustment to the established facts of science. Furthermore, he admits the reality that "in the struggle for existence the fittest [in order] to survive eliminate the less fit," stating that "the fact is obvious and stares us in the face."[222] On the other hand, Whitehead provides a critique of the biological sciences, which, adopting the conclusions of Malthus, held that

quoted by Gould in *The Structure of Evolutionary Theory*, pp. 359-361). Similarly, William Bateson, who later coined the word, "genetics", argued that "natural selection, as a negative force, can make nothing, but can only choose among variants produced by another process" (Bateson, quoted by Gould in *The Structure of Evolutionary Theory*, p. 412). He wrote, "selection is a true phenomenon; but its function is to select, not to create" and that "selection determines along which branch evolution shall proceed, but it does not decide what novelties that branch shall bring forth" (Bateson quoted by Gould in *The Structure of Evolutionary Theory*, p. 413). Hugo de Vries agreed and pointed out that in *Origin of Species*, Darwin had said, "the doctrine of natural selection or the survival of the fittest, which implies when variations or individual differences of a beneficial nature *happen to arise*, these will be preserved" (Darwin, quoted in *Structure* 417). Furthermore, De Vries held, in contrast to Darwin, that variations are "usually too small for natural selection to act upon, having hardly any influence in the struggle for life" (De Vries, quoted by Gould in *The Structure of Evolutionary Theory*, p. 416). De Vries modified the Darwinian theory in that it is mutational variations, rather than (solely) indeterminately distributed (or "random") variations that can account for the creative force of evolution. On the contrary, G. G. Simpson proclaimed that "selection is a truly creative force and not solely negative in action. It is one of the crucial determinants of evolution, although under special circumstances it may be ineffective, and the rise of characters indifferent or even opposed to selection is explicable and does not contradict this usually decisive influence" (Simpson, quoted by Gould in *The Structure of Evolutionary Theory*, p.530). Here, one useful analogy might be that Natural Selection is akin to the artist's cutting of the block in the creative production of the sculpture.

221. Whitehead, *Adventures of Ideas*, p. 159.

222. Whitehead, *The Function of Reason*, p. 4.

> the destruction of individuals was the very means by which advance was made to higher types of species. [While] this was [Darwin's] famous doctrine of Natural Selection … the exclusive reliance upon Natural Selection was not characteristic of Darwin's own theory. For him, it was one agency among many others. But, in the form in which the doctrine reigned in thought from that day to this, Natural Selection was the sole factor to be seriously considered. As applied to human society this theory is a challenge to the whole humanitarian movement. The contrast between the dominant theories of Lamarck and Darwin made all the difference. Instead of dwelling on the brotherhood of man, we are now directed to procure the extermination of the unfit. Again the modern doctrines of heredity, gained partly from the experience of breeders of stock, partly from practical horticulturalists, partly from the statistical researches of Francis Galton, Karl Pearson, and their school, partly from the laws of heredity discovered by Mendel … —these doctrines have all weakened the Stoic-Christian ideal of democratic brotherhood … In the concurrence of … these strands of thought the liberalism of the early nineteenth century lost its security of intellectual justification.[223]

Here, Whitehead is pointing out the general frame of the perennial debate concerning "social Darwinism" that has arisen ever since Darwin's *Origin of Species* was first published. Precisely, in relation to the notion that the truth of the biological world is "nothing but" the principle of Natural Selection, namely, as an exact representation of what *is*, Whitehead is pointing out the danger of taking this to mean that we *ought* to maximize biotic competition among human beings and to purposefully carry out the instrumental selective elimination of "the less fit."[224]

These claims are nothing new, but they do point the way to a novel perspective concerning the ethical dimension of evolution. As Steven Jay Gould (2002) states, even Darwin had "justly argued that nature cannot provide the source of morality,"[225] and the debate which was further defined by figures such as Thomas Henry Huxley and Herbert Spencer, ended up pitting "Selectionists," namely, those who defend Darwin's theory of Natural Selection as an explanation of biological evolution, against "Anti-Selectionists," or those who do not. The question is: where does the Darwin's concept of Natural Selection, as expressing the efficient cause of evolution, leave considerations of morality? Again, the enlarged sense of Organic Selection that I have argued for in this paper may be said to amplify this debate. For it holds that, in part, by their own selective activities (which may or may not be cognitive in nature), organisms, in part, constitute the environment within which others struggle to survive, and hence, are partially responsible for the eliminations implied by the principle of Natural Selection. And with respect to the human species, such selectivity, to a certain extent, spills over into society. To be sure, Whitehead states that

> it is folly to look at the universe through rose-tinted spectacles. We must admit the

223. Whitehead, *Adventures of Ideas*, pp. 35-36.

224. This is, quite obviously, a restatement of Hume's *is / ought* fallacy and/or G. E. Moore's "naturalistic fallacy," in relation to evolution.

225. Gould, *The Structure of Evolutionary Theory*, p. 121.

> struggle [for existence]. The question is, who is to be eliminated. In so far as we are educators, we have to have clear ideas upon that point; for it settles the type to be produced and the practical ethics to be inculcated.[226]

Here, Whitehead is alluding to the fact that even educational evaluation is based in a process of selection, which has some relation to Natural Selection. Grading, for example, involves a selective evaluation of students (passing versus failing) which may partly determine their future social and economic lot in life, preserving some and eliminating others. While human society appears to be insulated from Nature, the truth is that modern societies are to a large extent guided by selective processes which are related to the Selective processes that are at work in biological evolution.[227]

Religiously-motivated "Anti-Selectionists" typically deny the theory of Natural Selection as an *is*, in order to prevent it from being carried out as an *ought*. For the most part, they prefer an account of Nature based in Intelligent Design, Creationism, and/or Natural Law. Moreover, for them, the crucifixion of Jesus Christ is held as the ultimate sacrifice against such eliminatory Selectionism, and many Christians attempt to imitate the Anti-Selectionist standpoint in terms of behavior and action that He emphasized.[228] Philip Kitcher, in *Living With Darwin*, explains that most contemporary "Anti-Selectionists"

> allow that the complex forms that emerge are descendants of significantly less complex ancestors, denying only that natural selection could have been responsible for the change. In a sense, there is still room for something like 'creative activity' but the products of that activity are new traits, organs, or structures in the descendants of ancestors who lacked such characteristics, rather than newly created whole organisms. This is the core of the official position of leading champions of intelligent design, and I shall call it 'anti-Selection'.[229]

Kitcher concludes that

> all we learn from the full gamut of [anti-Selectionist] literature … is that they conceive of Intelligence as whatever it is that produces the outcomes they identify as too complex to be attained through the operation of selection. The line of reasoning seems to be this: these phenomena, unattainable by selection, look designed or planned, and, as a result, the mechanism that produced them must be intelligent.[230]

226. Whitehead, Science and the Modern World, p. 205.

227. As Goodwin (1994) states, "Darwin's vision of evolution by random variation of inherited characteristics in organisms and by selection of the fitter variants is so simple and so convincing that once you have grasped it, you feel you are in possession of a universal truth. And indeed, this idea, or simple variations of it, tend to be applied to everything in our culture that is complex and changing—to the evolution of social and economic systems, to competition and survival in the business world, even to the development of new ideas themselves" (*How the Leopard Changed Its Spots*, p. 18).

228. One might ask, from a biological perspective, whether religious sensibilities emphasizing particular behavioral habits provide us with an example of the theory of Organic Selection.

229. Kitcher, *Living With Darwin: Evolution, Design, and the Future of Faith*, New York, Oxford University, Press, 2007, p. 18.

230. Kitcher, *Living With Darwin*, p. 101.

But the contemporary debate concerning the notion Selectionism is not to be construed merely as a contention between science versus religion. For example, Brian Goodwin (1994) and Robert Reid (2007) offer well-reasoned and non-religiously-motivated critiques of neo-Darwinist Selectionism, which are based in the notions of "dynamic stabilization" and "biological emergence." As Reid defines the term, "Selectionism is the belief that natural selection is the primary cause of evolution"[231] and he levels the criticism that Natural Selection is inadequate in providing an account for how "complex novelty" and evolutionary "innovation is generated."[232] Citing Goodwin's bracketing of the principle of Natural Selection in order to expand upon generative principles in evolutionary processes, Reid goes on to argue for a "replacement of selection theory with an emergence theory."[233] For him, "emergentism could release biology from the genocentric universe in which it is confined and restore it to one in which whole organisms and their interactions are the stars of the biological and ontological fundament."[234]

The debate over Selectionism is also not so simple as to be a simple contention between merely two sides. Drawing from both Kitcher's and Reid's stances on Selectionism, one can logically conceive of the various positions, distinguishing between "Weak" and "Strong" versions of both "Selectionism" and "Anti-Selectionism," notions which force us to conceive of the contention across a continuum. On the one hand, "Strong Selectionism" holds that the theory of Natural Selection *is* a true representation of the realities of the biological world, and that we *ought* to carry out the elimination of "the less fit" for the good of our species. It thereby recommends an engagement in an unbridled struggle for existence and competition permeating all areas of life.[235] However, the position of "Weak Selectionism" holds that the theory of Natural Selection *is* a true representation of the biological world, but that the realm of humanity is, to a certain extent, separate from it, and we *ought not* carry out the elimination of "the less fit." On the other hand, "Weak Anti-Selectionism" is the view that the theory of Natural Selection *is not* a true representation of biological reality, yet in this perspective, there is little in the way of consideration of the connection between our own selective activities, whether conscious or unconscious, and their capacity to enhance or diminish the lives of other organisms and/or to eliminate them. "Strong Anti-Selectionism" is generally the rejection of the principle of Natural Selection. For some, this rejection has for its basis a sheer subjective

231. Reid, *Biological Emergences: Evolution by Natural Experiment*, Cambridge, MA, The MIT Press, 2007, p. 4.

232. Reid, *Biological Emergences*, pp. 6, 15.

233. Reid, *Biological Emergences*, p. 401.

234. Reid, *Biological Emergences*, p. 24.

235. "Strong Selectionism" essentially involves the tendency to see the struggle for existence (or in the "global marketplace") in the human realm beginning at the age of a small child. Here, I am alluding to the fact that modern culture emphasizes selectivity of every type from. In the global marketplace, commercial selection pits business against business, employee against employee in an all-out war to eliminate the competition. Employment hiring and firing decisions go on everyday and are manifestations of selectivity in which some persons are able to live well, while others, by the selection of others, are relegated to mere subsistence. At the extreme, racism, sexism, gender discrimination, eugenics, genocide, and abortion via pre-natal screening may be said to be conscious manifestations of human selectivity. "Strong selectionism" is ethical egoism pure and simple.

preference for Intelligent Design and Creationism, which, in turn, are held to offset the notion that it is imperative to eliminate "the unfit." For others, it involves the notion that Natural Selection cannot account for the generative aspect of evolution. It counters the Darwinian theory both as an *is* and as an *ought*.

Another position concerning these distinctions emerges from the Baldwinian-Whiteheadian theoretical integration that has been postulated in this paper, as well as from the enlarged sense of the notion of Organic Selection that has been developed in it. Let us call this position, "non-reductionistic critical pan-selectionism." Again, as defined in this paper, pan-selectionism involves the notion that all organisms are a part of, and are compositional of Nature and by their selective activities, play a role in the eliminations that belong to the principle of Natural Selection. Non-reductionistic critical pan-selectionism involves the notion that Natural Selection and modern genetics are satisfactory explanatory mechanisms of the biological sciences, which are based in materialism. However, these cannot be said to be true in the "nothing-but" sense, especially when reference to the "mental poles," to the selective activities, and to the decisions and behaviors of organisms (i.e. the "neglected side" of the evolutionary machinery) is omitted, or where it is assumed that these are genetically pre-programmed and determined in every respect. Non-reductionistic critical pan-selectionism is open to many aspects of the decentering of Selectionism, for example, by theories of biological emergence. Recognizing the vast complexity (i.e. the tangled web) of causal factors which have contributed to the evolution of life, non-reductionistic critical pan-selectionism does not accept a static reduction of the origins of biological life to Natural Selection *only*. At the same time, recognizing the positive aspect of Selection as a preserving and generational force, it does not reduce the principle of Natural Selection to being a mere "coarse filter that rejects utter failures,"[236] a characterization that, in some respects, was held by Baldwin himself. Furthermore, it does not seek to explain away the meaning of ethics and of religion through evolutionary notions, such as Community Selection.[237] Rather, non-reductionistic critical pan-selectionism involves the recognition of the important role of the selective activities (which may or may not be cognitive), the habits, the behavior, and the purposes of organisms in the charting the evolutionary destiny of life on the planet.

Critical pan-selectionism emphasizes the need for critical reflection on the notion that one's own selective activities, both cognitive and non-cognitive, play a role in the eliminations that are subsumed under Darwin's principle of Natural Selection and other modes of Selection. Critical pan-selectionism involves the advancement of an awareness of the impact of each person's own selective activities (be they cognitive or non-cognitive): their own feelings, emotions, choices, judgments, decisions, divisions, discriminations and/or their own selections both on fellow human beings and on other organisms. At the same time, pan-selectionism involves the notions that: (1) all organisms are en-

236. Goodwin, *How the Leopard Changed Its Spots*, p. 157.

237. Here I am alluding to Dennett, *Breaking the Spell: Religion as a Natural Phenomenon*, New York, Penguin Books, 2006, and to Harris, *The End of Faith: Religion, Terror, and the Future of Reason*, New York, W. W. Norton & Company, 2004.

gaged in selective activities; that (2) that experience as an organism in general requires such activities of selection; and that (3) creativity, freedom, purpose, and evolutionary advance require operations of selection in various modes and at various biotic levels. For organisms, there is no escape from operations of selectivity, but this fact implies the need for a high degree of ethical scrutiny over our selective activities.

Non-reductionist critical pan-selectionism emphasizes those forms of selectivity which are "positive," such as the ability to think critically,[238] and it involves the authentic desire to reduce the negative impacts of one's selections, divisions, discriminations, and decisions on fellow organisms. As "critical," it calls for a continuous epistemological inquiry into the selective activities of organisms in their life-processes, and their interrelationship with the various modes of biological Selection, in general so as to inform ethical *praxis* concerning selectivity in general. This position involves the attempt to diminish those selections that are destructive to organisms, such as by way of violence, warfare, eugenics, discrimination, unbridled marketplace competition, excessive consumerism, as well as the limitless employment of instrumental reason on the part of human beings, as for example, made manifest in genetic selection, selective cloning, and biotechnology.[239] In any event, from these distinctions, both the evolutionary cosmology and the ethical standpoint accompanying it that are arrived at by way of the merging of Baldwin's and Whitehead's respective epistemologies can be branded with the term, non-reductionistic critical pan-selectionism. Such a position might further be said to have strong links to environmentally and socially-engaged Buddhism and/or may be fruitfully advanced as a Buddhist philosophy of evolution.

CONCLUSION

The preceding analysis has demonstrated that Baldwin's theory of Organic Selection can be integrated with Whitehead's theory of prehensions in the project to arrive at a comprehensive process-relational evolutionary cosmology, which will constitute a viable alternative to the mechanistic and materialistic outlook of mainstream biology. In the process of this integration it has become clear that Baldwinian and Whiteheadian modes of thought can each provide many important insights: biological, metaphysical, epistemological, and ethical, for the other, thereby mutually strengthening the other. While preserving the structural "cathedral"[240] of mainstream biological inquiry,

238. As Dewey suggests in *Construction and Criticism*, New York, Columbia University Press, 1930, p. 12, critical thinking involves "judgment engaged in discrimination among values. It is taking thought as to why the better is better and why the worse is worse" as well as discriminating between true and false statements, and sound and unsound arguments. And within the deliberation process that is characteristic of critical thinking, by which we arrive at our values, Dewey states that "there is the problem of selection, of choice, of discrimination" (p. 24).

239. Of course, figures like Dawkins are bound to accuse this "non-reductionist critical pan-selectionist position" as being inauthentic and of being "selfishly altruistic," namely, as the byproduct of the determinism of our selfish genes.

240. Gould, *The Structure of Evolutionary Theory*, p. 2.

this integration is consistent with some current trends in evolutionary theory.[241] Sources for the project to arrive at a comprehensive process-relational evolutionary cosmology may also be found in connection with theories of biological emergence and in other researches concerning the relationship between genetic inheritance and the environment.[242] A comprehensive process-relational evolutionary cosmology will emphasize the important causal role of the learned behaviors, the selective activities, and the mental poles of organisms in charting the direction of evolutionary processes, which constitute, as Whitehead states, "the neglected side of the evolutionary machinery." As constituting a "critical pan-selectionist" standpoint, it also will also emphasize the need to critically recognize the negative impacts of the selective operations of organisms on other organisms, and to reflect on the ethical responsibilities that accrue from them. We might further speculate as to what the impact of a critical pan-selectionist position, widely adopted, would be in terms of human development, both cultural and evolutionary. Finally, Baldwin's arguments for the notion that the selective activities of organisms play a causal role in terms of determining the direction of evolutionary processes give new meaning to Whitehead's final statements in *Process and Reality*, concerning the realization of the everlastingness of organic attainments, namely, the "ever-present, unfading importance of our immediate actions, which perish and live forevermore."[243]

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241. For instance, see West-Eberhard's *Developmental Plasticity and Evolution*, as well as Jablonka and Lamb's *Evolution in Four Dimensions*.

242. For example, it is still in question as to whether a person's continuous exposure to environmental factors, such as oil waste pits, causing cancer in individuals, will lead to the genetic inheritance of the propensity for cancer in their children.

243. Whitehead, *Process and Reality*, p. 351.

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