Alfred Russel Wallace Notes 35. Natural Selection by Evolution.

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Summary: Alfred Russel Wallace (1823−1913) is remembered, with Charles Darwin, as the co-originator of the concept of evolution by natural selection. But Wallace's framing of the idea increasingly became one in which natural selection itself was regarded as a law of nature, not a theory *per se*. *Key words:* evolution, natural selection, state space, Charles Darwin, Alfred Russel Wallace, Baruch de Spinoza, conatus.

Introduction

It is difficult enough to wean people from the notion that Wallace and Darwin were the 'discoverers' of evolution, – in reality they were only the formulators of a theory of evolution by natural selection – but in this essay I should like to argue for an even greater distinction. While the tag 'evolution by natural selection' is a serviceable description of the phenomena involved, and even projects satisfactorily as a 'theory' inasmuch as it suggests testable propositions, it perhaps conveys a context that doesn't quite capture the nature of the relationship involved. Instead, I suggest, we should be thinking more in terms of the concept 'natural selection by evolution.'

I have made this suggestion before (Smith 2008, 2021; Smith *et al.* 2023), somewhat in passing, but perhaps it is time to make a more concerted effort. In the following I stick largely to Wallace's interpretation of the phenomenon of natural selection, as it is his thinking on the subject, rather than Darwin's, that should cause us to take stock.

Wallace and Natural Selection

The story of Wallace's discovery of natural selection is well known; in latest February or earliest March 1858, during a bout of fever, he recognized how Malthusian constraints could be linked to biological processes in a manner implying evolutionary change. What is not so well known is that this epiphany was directly linked to a sudden realization that his prepossessions against the necessary utility of adaptive structures had gotten things backward. For example, in 1856 he had written:

> . . . Do you mean to assert, then, some of my readers will indignantly ask, that this animal, or any animal, is provided with organs which are of no use to it? Yes, we reply, we do mean to assert that many animals are provided with organs and appendages which serve no material or physical purpose. The extraordinary excrescences of many insects, the fantastic and many-coloured plumes which adorn certain birds, the excessively developed horns in some of the antelopes, the colours and infinitely modified forms of many flower-petals, are all cases, for an explanation of which we must look to some general principle far more recondite than a simple relation to the necessities of the individual. (Wallace 1856, p. 30)

Wallace had probably held this opinion since his initial musings on the subject, most likely because a disconnect between evolved form and function seemed necessary to combat teleological creationism, specifically where biological change might be viewed as mandated by a process of exploitation of *pre-existing* niche conditions. Directly after the words quoted above he writes:

> . . . We conceive it to be a most erroneous, a most contracted view of the organic world, to believe that every part of an animal or of a plant exists solely for some material and physical use to the individual, – to believe that all the beauty, all the infinite combinations and changes of form and structure should have the sole purpose and end of enabling each animal to support its existence, – to believe, in fact, that we know the one sole end and purpose of every modification that exists in organic beings, and to refuse to recognize the possibility of there being any other. Naturalists are too apt to *imagine*, when they cannot *discover*, a use for everything in nature . . . (Wallace 1856, p. 30)

By 1858, however, he must have realized that selection could operate in non-predetermined directions, effectively creating and exploiting new niches altogether. Thus, new species could evolve by productively applying 'whatever' emergent adaptations the existing environment would both tolerate and sustain.

Earlier, Wallace had been tentatively assuming that some kind of environmental force, probably geological or climatological, was causing – driving – populations to change, though just how was not at all clear (and he had already rejected Lamarckian thinking). It now became apparent that there was no singular 'driving force' operating; instead, each environmental context represented what we would now term a 'state space': that is, a balanced interaction of constraints resulting in equilibrial conditions at the energy and materials level, while sponsoring locationally-unique turnovers, including population-level change. True, this was a dynamic equilibrium rather than a static one, but it still represented a 'harmony' of conditions, a term Wallace was fond of using.

Wallace was able to make this leap because he was a student of the work of Alexander von Humboldt. One of Humboldt's fundamental positions was that the earth's surface envelope maintains itself as a function of the harmonious interaction of conflicting natural forces. Humboldt was more the geographer than a biologist, and his appreciation of the interplay of natural forces was more state-oriented than process-oriented. In short, he put more stock in the primacy of geophysical organization than he did in such things as biological origins stories. In his view, the earth's surface systems operated within various states of 'balance' or 'harmony' maintained by what we would now term feedbacks.

Early on Wallace had read plenty of Humboldt (see Smith 2013, 2018, 2024), and when it came time in his 1858 Ternate essay to characterize how populations could depart indefinitely from an original type, he identified the main influencing factors, and then described their effect in feedback interaction terms, using the analogy of the way governors operate in steam engines: "The action of this principle is exactly like that of the centrifugal governor of the steam engine, which checks and corrects any irregularities almost before they become evident; and in like manner no unbalanced deficiency in the animal kingdom can ever reach any conspicuous magnitude, because it would make itself felt at the very first step, by rendering existence difficult and extinction almost sure soon to follow." (Wallace 1858, p. 62)

Wallace shows no evidence of ever having given up on this way of understanding natural selection. It was not long, for example, before he was even referring to it as "the law of natural selection." This happened as early as his famous presentation on human race origins to the Anthropological Society in 1864 (Wallace 1864); by 1870 he had titled one of his chapters in the collection *Contributions to the Theory of Natural Selection* 'The Development of Human Races Under the Law of Natural Selection.' In 1890, in a letter to *Light* on reincarnation, he writes: "My argument in 'Darwinism' was to show that there were peculiarities in our mental nature that could not be explained by a development through the law of 'natural selection'. . . ." (Wallace 1890). He continues with the same phraseology in one of his last writings: "We have seen in the preceding chapter how every form of organic life during all the vast extent of geological time has been subject to the law of natural selection. . . . " (Wallace 1913, p. 106)

Meanwhile, in an essay written for a turn-of-the-century celebration in 1900, he had contrasted natural selection with evolution:

> . . . As a partial explanation (for no complete explanation is possible to finite intelligence) of the phenomena of nature, it [evolution] illuminates every department of science, from the study of the most remote cosmic phenomena accessible to us to that of the minutest organisms revealed by the most powerful microscopes . . . Evolution, as a general principle, implies that all things in the universe, as we see them, have arisen from other things which preceded them by a process of modification, under the action of those all-pervading but mysterious agencies known to us as "natural forces," or, more generally, "the laws of nature." (Wallace 1901, pp. 3-4)

The takeaway here is that he views Evolution, with a capital 'E', as a general process that emerges out of the interaction of some number of natural forces representing the 'laws of nature'. Given his other referrals, I expect he believes natural selection to be one of those laws of nature.[1]

But a force (or even a 'law') usually does not, by itself, distinguish a process. In this context it seems most reasonable to conclude that natural selection is what happens when the relevant 'forces' collide. In this instance the 'colliding forces' are the superfecundity of natural populations, the limited carrying capacity of the environment, variation among individual organisms, and the ability of the latter to pass on their physical characteristics to the next generation. This notion is textbook Humboldt: constantly changing environments (which include the organisms themselves) call for constantly shifting biological responses – processes – that optimize the management of the energy flowing through the system. So, under the auspices of that constantly changing context emerges a continually changing set of populations: the same basic collaborating forces remain, even as the individual actors produced by them change. Natural selection describes what

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[1] Daniel Crouch, in personal correspondence, notes that ". . . this type of 'law' would be one where the empirical evidence supporting the *conditions* is much stronger than the evidence for the *outcomes*. In a scientific theory, this is usually reversed, and there is much more evidence for the outcomes. Wallace uses the word 'law' a lot, but what we felt really showed that he was using the word in this precise way was the table in the 1870 article, which you . . . reference." Crouch suggests reading works of his (Crouch & Bodmer 2024) and Weale (2015) on Patrick Matthew's own formulation of the natural selection 'law' to gain further perspective.

inevitably happens when these forces interact, as viewed through the biological results. In short, ‘natural selection by evolution’: natural selection is a result, not a process.

Wallace’s approach to this matter contrasts with Darwin’s, and this is no more evident than in the way the two treated artificial selection. For Darwin, the changes arising through deliberate domestication efforts represented close analogs to those produced through natural selection. To be sure, such efforts did show that a selection process could indeed yield generational changes in morphology, but Wallace must have remained worried that this eventuality did not mirror the ‘whatever’ situation lying at the core of *natural* influence. As I have recently discussed (Smith 2023), shortly after Wallace began to take spiritualism seriously, in 1866, he sent Darwin a letter expressing his concern that:

> I have been so repeatedly struck by the utter inability of numbers of intelligent persons to see clearly, or at all, the self-acting and necessary effects of Natural Selection that I am led to conclude that the term itself, and your mode of illustrating it, however clear and beautiful to many of us, are yet not the best adapted to impress it on the general naturalist public. The two last cases of this misunderstanding are (1) the article on “Darwin and His Teachings” in the last *Quarterly Journal of Science*, which, though very well written and on the whole appreciative, yet concludes with a charge of something like blindness, in your not seeing that Natural Selection requires the constant watching of an intelligent “chooser” like man’s selection to which you so often compare it; and (2) in Janet’s recent work on the “Materialism of the Present Day,” reviewed in last Saturday's *Reader*, by an extract from which I see that he considers your weak point to be that you do not see that “thought and direction are essential to the action of Natural Selection.” The same objection has been made a score of times by your chief opponents, and I have heard it as often stated myself in conversation. Now, I think this arises almost entirely from your choice of the term Natural Selection, and so constantly comparing it in its effects to man’s selection, and also to your so frequently personifying nature as “selecting,” as “preferring,” as “seeking only the good of the species,” etc., etc. To the few this is as clear as daylight, and beautifully suggestive, but to many it is evidently a stumbling-block. I wish, therefore, to suggest to you the possibility of entirely avoiding this source of misconception in your great work (if not now too late), and also in any future editions of the “Origin,” and I think it may be done without difficulty and very effectually by adopting Spencer's term (which he generally uses in preference to Natural Selection), viz. “Survival of the Fittest.” This term is the plain expression of the *fact*; Natural Selection is a metaphorical expression of it, and to a certain degree *indirect* and *incorrect*, since, even personifying Nature, she does not so much select special variations as exterminate the most unfavourable ones.
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> Combined with the enormous multiplying powers of all organisms, and the “struggle for existence,” leading to the constant destruction of by far the largest proportion – facts which no one of your opponents, as far as I am aware, has denied or misunderstood – “the survival of the fittest,” rather than of those which were less fit, could not possibly be denied or misunderstood. Neither would it be possible to say that to ensure the “survival of the fittest” any intelligent chooser was necessary, whereas when you say Natural Selection acts so as to choose those that are fittest it is misunderstood, and apparently always will be. Referring to your book, I find such expressions as “Man selects only for his own good; Nature only for that of the being which she tends.” This, it seems, will always be misunderstood; but if you had said, “Man selects only for his own good; Nature by the inevitable survival of the fittest, only for that of the being she tends,” it would have been less liable to be so.

> I find you use the term Natural Selection in two senses – (1) for the simple preservation of favourable and rejection of unfavourable variations, in which case it is equivalent to "survival of the fittest"; (2) for the effect or change produced by this preservation, as when you say, "To sum up the circumstances favourable or unfavourable to natural selection," and, again, "Isolation, also, is an important element in the process of natural selection": here it is not merely "survival of the fittest," but change produced by survival of the fittest, that is meant. On looking over your fourth chapter, I find that these alterations of terms can be in most cases easily made, while in some cases the addition of "or survival of the fittest" after "natural selection" would be best; and in others, less likely to be misunderstood, the original term might stand alone… (Marchant 1916, pp. 140-142)

Darwin was reasonably open to these complaints, and indeed opted to make use of the term 'survival of the fittest' in his subsequent writings and editions of the *Origin*. But he never really changed his appreciation that natural selection was a *process*, the result being that objectors continue to raise issues as to whether natural selection represents circular logic; *i.e.*, that adaptations are produced through a process we term adaptation, a tautology (*see*, for example: Romanes 1890; Paul 1988, p. 422n; DelMonte 2011). With the 1866 letter Wallace, meanwhile, had now freed himself from the domestication argument altogether. 'Natural selection' and 'survival of the fittest' are both phrases, but the latter is more suggestive of an outcome than a driving cause, whereas the former encourages one to think in vague terms of some kind of entity (nature) that is actively effecting selection events. That may seem an unimportant distinction, but it is one that suited Wallace's evolving position on spiritualism, which had left him open to the criticism that the action of the alleged 'Spirit Realm' in modifying human behavior resembled a 'humankind as God's domestic animal' kind of relationship. Not so, Wallace argues. Early on he suggests, in defending his own position, that: "It merely shows, that the laws of organic development have been occasionally used for a special end, just as man uses them for his special ends; and, I do not see that the law of 'natural selection' can be said to be disproved, if it can be shown that man does not owe his entire physical and mental development to its unaided action. . . ." (Wallace 1870, p. 370)

The next year, sensing an incompleteness in his argument, he added:

> . . . Some of my critics seem quite to have misunderstood my meaning in this part of the argument. They have accused me of unnecessarily and unphilosophically appealing to "first causes" to get over a difficulty – of believing that "our brains are made by God and our lungs by natural selection;" and that, in point of fact, "man is God's domestic animal." An eminent French critic, M. Claparède, makes me continually call in the aid of – "une Force supérieure," the capital F, meaning I imagine that this "higher Force" is the Deity. I can only explain this misconception by the incapacity of the modern cultivated mind to realise the existence of any higher intelligence between itself and Deity. (Wallace 1871a, p. 372)

Unfortunately, even this 'clarification' does not quite get to the crux of the matter, nor do his treatments of the issue for the next forty years. But in a 1910 interview he finally explains himself, in response to a question an interviewer poses about spirit influence and continuity: "I do not mean that the control is absolute or that it is of the nature of interference. The control is evidently bound by laws as absolute and irrefragable as those which govern man and his universe. It is certainly dependent on us in a very large measure for its success. I believe we are influenced, not interfered with..." (Begbie 1910). Otherwise

put, in ‘communicating with us’ the alleged spirits are delivering information that may either be acted upon or ignored, as we see fit. He believes this kind of causality avoids the ‘interference’ objection, much in the same way that environment offers opportunities for niche evolution through natural selection – in contrast with the more deterministic kind of influence or ‘forcing’ adopted in late nineteenth century neo-Lamarckian thinking.

In erecting this scenario of increasingly ‘more recondite’ causes, Wallace is further extending his debt to von Humboldt. Let us take this one step further here by relating the whole to some Spinozian ideals.

Epiphenomena and the Spinozian ‘Conatus’

There would be little point in drawing attention to the ‘which-way?’ relationship between natural selection and evolution were there no gains to be made thereby. Among the most obvious plus for the ‘natural selection by evolution’ stance is that it separates the relationship from any framework of determinism – especially environmental determinism, but also the one involving first causes-based influences. But there is another, and ultimately more important, consequence.

The basic questions most central to evolution studies are: (1) just what, exactly, is evolving?, and (2) how is this to be distinguished from related epiphenomena?. Scale, both temporal and spatial, are key factors in our current day assessment of what constitutes an ‘evolutionary’ condition: for example, stars and biological lineages may be said to ‘undergo evolution’, but individual organisms or cells are not. This may or may not be a wholly useful separation, however. The exact characteristics of system origination and collapse may differ widely, but perhaps there are more useful ways of identifying underlying unity of operational function.

This brings us to Baruch de Spinoza (1632-1677). Among the core ideas in Spinoza’s philosophy is the concept of the ‘conatus.’ Nadler (2020, p. 21) describes Spinoza’s conatus thusly: “The finite parcel of power that constitutes each singular thing in Nature is what Spinoza calls *conatus*, which can be variously translated as ‘striving,’ ‘tendency,’ or ‘endeavor.’ He also calls it ‘the power of acting,’ or the individual’s ‘force of existing.’ In any particular finite thing, this power is a striving to maintain itself as that thing” [note the way Nadler avoids using the word ‘living’ in this description]. And, to quote from the almighty authority Wikipedia:

> . . . Understanding what is meant by “most elevated and desirable state” requires understanding Spinoza's notion of *conatus* (*striving*, but not necessarily with any teleological baggage) and that “perfection” refers not to (moral) value, but to completeness. Given that individuals are identified as mere modifications of the infinite Substance, it follows that no individual can ever be fully complete, i.e., perfect, or blessed.
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> . . . Spinoza rejects the dualistic assumption that mind, intentionality, ethics, and freedom are to be treated as things separate from the natural world of physical objects and events. . . . According to Spinoza, “each thing, as far as it lies in itself, strives to persevere in its being” (*Ethics*, part 3, prop. 6). Since a thing cannot be destroyed without the action of external forces, motion and rest, too, exist indefinitely until disturbed. His goal is to provide a unified explanation of all these things within a naturalistic framework, man and nature

> must be unified under a consistent set of laws; God and nature are one, and there is no free will. . . . Spinoza explains seemingly irregular human behaviour as really *natural* and rational and motivated by this principle of the *conatus*. Some have argued that the *conatus* consists of happiness and the perpetual drive toward perfection.

Otherwise put, all self-guided natural entities are supposed to be endowed with a native urgency to survive which, in the case of non-thinking entities, is enacted automatically, and, where human beings are concerned, in the form of considered responses.

Spinoza's philosophy has sometimes been viewed as atheistic, but because he merely treats the concepts of God and nature as being one in the same it is better viewed as an extreme form of pantheism (*i.e.*, God is not only 'in' all things natural, but is literally indistinguishable from such). Importantly, the "each thing, as far as it lies in itself" line above suggests Spinoza has identified finite actors that, while sustained by an organization resting on the modifications to the energy and materials that course through them, maintain their being through (matching, and appropriate) responses to the contingencies of their external environment. Now, if "lying in themselves" entities are all that exist in the universe (at various, and often overlapping, spatial and temporal scales), I suggest it follows, by definition, that all interactions occurring * *between/among* * such entities must be considered epiphenomenal in nature.

Wallacean natural selection is, I would argue, one such epiphenomenon: as suggested earlier, it is recognizable as an interaction state, in the manner of Humboldtian thinking, between particular 'lying in themselves' actors – individual organisms/populations – and their environments (which are also self-driven, input/output entities, just at a larger scale). One might object that the "no free will" element stated above implies forced will and predestination, but again, the 'striving for' aspect is generalizable to both thinking and non-thinking conatuses – it merely means that the agent of action will, *as well as it is capable of*, always respond to stimuli in a fashion striving to promote its survival/persistence. This may take the form of considered decisions for a human being, tropistic reactions to its environment for a microorganism, or even simply remaining in an established orbit for an evolving planetary body.

For just about everything below humans in the evolutionary order the epiphenomenal interaction states operate pretty much automatically, following out the implications of the first and second laws of thermodynamics, as energy and matter are issued forth and follow their natural paths. For us, things are not really any different, though there is one complication. This is what Wallace described as 'provident' behavior, spelled out in the 1864 human races paper. In that paper Wallace identifies the idea that human beings are able to think/feel in a fashion that can identify causalities existing at remote locations, and/or that might/will only take place in the future (or, as potential lessons useful to our decision-making, have taken place in the remote past). This allows us to plan ahead, thus extending our evolution in ways ordinary plants and animals cannot. This continues to mean matching appropriate actions to the challenges posed, however, so the conatus concept still holds: we 'evolve' by improving our understanding of the forces facing us, and developing new ways to counter their future possible ill effects.

To repeat a point I have often made in the past, this is the real reason for Wallace's interest in spiritualism. Rightly or wrongly, he came to think that the supposed 'Spirit Realm' could deliver the kinds of mental feedback that would help people change for the better. This would occur through dreams (and perhaps other subliminal, emotion-targeted, processes) in a manner that was noncoercive: more to the point, it was a way of getting us to review the results of our past actions, and whether we might want to do things somewhat differently in the future. Thus, an evolving 'provident' population increasingly capable of recognizing the nature of universal limitations.

Regardless of whether there is anything like a 'Spirit Realm' in existence, this view of nature has another possible implication: that the conatuses at all levels of spatial/temporal existence might share organizing principles that are fundamental to their status as complex, energy- and materials-throughputting systems. Again, some ideas from Spinoza are suggestive. Spinoza argues that these conatuses exist as individual expressions of what he terms 'Substance', a more or less pantheistic notion of the whole of reality (*i.e.*, God/nature). Such expressions are made possible through what he terms the 'Fundamental Attributes': spatial extension, and thought. Unlike our current usage of the term 'attribute' (to designate elemental qualities such as shape, coloration, or weight), Spinoza's Attributes appear to more resemble 'rules of order' which manifest forms observe as the most fundamental organizational aspect of their existence. To wit: perhaps these 'rules of order' are themselves describable as objective realities – that is, as basic properties of physical existence that have so far eluded us.

In several papers over the years (e.g., Smith 2014, 2015; Smith & Derr 2012; Smith *et al.* 2023) I have set out a pair of models along these lines. This is not the place to try to describe these, but my studies have progressed to a point including simulation results that are suggestive, and even some empirical tests (involving natural patterns analysis) that have lent support for them. Even if these ideas should turn out to fall short, they represent an example of a manner of approach that might lead to some to-this-point undiscovered properties of complex systems.

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