Early Humboldtian Influences on Alfred Russel Wallace's Scheme of Nature

(Presented at the *Alfred Russel Wallace and His Legacy* meeting, London, 21 October 2013)

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ALFRED RUSSEL WALLACE.

***Abstract*: Alfred Russel Wallace's 1858 Ternate paper on natural selection is a famous work in the history of science. Beyond his co-discovery of the principle, moreover, Wallace is known for a large number of early applications of the idea, both to biological and biogeographical subjects. Yet how much do we really know about Wallace's own evolution of thought, and his actual intentions before his views were swallowed up by the inertia of Darwin's revolution? A number of differences between Wallace's and Darwin's views are apparent and have been much treated over the years, but related discussions dwell more on effects than on causes. In this presentation, Wallace in his early years is posed to likely have been heavily influenced by the writings of Alexander von Humboldt and his disciples.**

Alfred Russel Wallace's 1858 Ternate paper on natural selection is a famous work in the history of science. Yet it remains – not overlooked – but under-contextualized. Just sixteen months after its presentation before the Linnean Society on 1 July 1858, it was entirely eclipsed by a much weightier work, Darwin's *On the Origin of Species*, and doomed by the inertia of the older naturalist's positions. Darwin's appraisals of the Ternate essay, that Wallace "could not have made a better short extract" of his own thoughts, and how "even his terms now stand as heads of my chapters," have been regarded as the final verdict on the matter, to an extent that we have lost sight of possible essential differences between the two men's work.

It is of course true that much attention has been given to the apparent differences between the two men's opinions that emerged *after* 1858, but because it has always been assumed that they were largely steering the same course as of that date, the trajectory of Wallace's thought in particular from then on has been questioned. Thus, it is he who has been accused of "changing his mind" on crucial issues, as distinct from the possibility that he had merely stated what he felt comfortable with as of 1858, and as things turned out was forced to fight a rear-guard action from then on.

In this short presentation I should like to look at a matter I feel goes a long way toward explaining Wallace's biogeography and later deviations from a strict Darwinian track. This concerns an influence on him that made itself felt long before 1858.

1. Humboldtian Science and the Wallace Agenda

In Wallace's autobiography, *My Life*, published in 1905, he presents a passably detailed account of his early years, along the way discussing many of his influences, and early writings. He owns up to early interests in the thoughts of, among others, Robert Owen, Robert Dale Owen, Thomas Paine, George Combe, Thomas Malthus, Sir William Lawrence, Charles Darwin, Sir Charles Lyell, and Robert Chambers. On the natural history side, Chambers and Lyell have been pointed to as the main influences, leading him in a generally uniformitarian, but transmutationist, direction. Three individuals have been rather overlooked in this regard, however: Alexander von Humboldt (1769–1859), Franz Julius Ferdinand Meyen (1804–1840), and Justus von Liebig (1803–1873).

It is well known that Humboldt was an important inspiration for Wallace's travels; he mentions this later in retrospect, and Humboldt's studies are well-cited in his pre-

1857 publications. What is largely unappreciated, however, is the degree to which Humboldt's *philosophy* influenced him. Wallace was familiar with Humboldt's *Journal of Travels*, available in English by 1814, from at least his days in Leicester in 1844–1845, but this work contains relatively little philosophy, being more a straightforward accounting of Humboldt's 1799–1804 New World travels. Two other works by Humboldt, containing a good deal more philosophy of nature, were available in England during Wallace's pre-1854 years: *Aspects of Nature* (1849), and the first volumes of *Cosmos* (1847). *Aspects of Nature* had been available in French since 1808, and it appears Wallace was able to read some French, perhaps aided by his sister, who was fluent. Wallace refers to this book in his *Travels on the Amazon and Rio Negro*, published in 1853, and again cites it in his *World of Life* in 1910. He also uses the title as a section heading in three of his books, and beyond this as a phrase in the general text of six of his books and articles.

The situation with *Cosmos* is a bit more complicated. In a letter to Bates dated 28 December 1845 Wallace states how he has heard "the venerable Humboldt" supports the views expressed in *Vestiges of the Natural History of Creation*, and how he (Wallace) has "a great desire to read" *Cosmos*. He certainly did read it eventually, as later referrals indicate, but perhaps so even *before* he left for South America. An English edition became available in London in early 1847, and an 1852 library catalogue of the Neath Philosophical and Antiquarian Society, where Wallace volunteered as a curator *circa* 1845 to 1848, indicates they owned a copy of it – a copy Wallace himself might have ordered. Further, the Singapore Library owned a copy at least as early as 1860, and, more importantly, so did Sir James Brooke, when Wallace stayed with him in Sarawak in 1854 and 1855.

On reading the work Wallace would have found a wide range of expressed beliefs with which he would have sympathized. The Introduction to Volume 1 alone contains dozens of passages with themes visible in Wallace's later writings. Time permits of only a few examples here:

> **"General views lead us habitually to regard each organic form as a definite part of the entire creation, and to recognise, in the particular plant or animal, not an isolated species, but a form linked in the chain of being to other forms living or extinct. They assist us in comprehending the relations which exist between the most recent discoveries, and those which have prepared the way for them." (p. 23)**

"Who will venture to affirm, that we yet know with precision that part of the atmosphere which is not oxygen, or that thousands of gaseous substances affecting our organs may not be mixed with the nitrogen? or who will say that we already know even the whole number of the forces which pervade the universe?" (p. 32)

"…the final aim of physical geography is to recognise unity in the vast variety of phenomena, and by the exercise of thought and the combination of observations, to discern that which is constant through apparent change. In the exposition of the terrestrial portion of the Cosmos, we may sometimes find occasion to descend to very *special* facts, but it will only be for the purpose of recalling the connection existing between the laws of the actual distribution of organic beings over the surface of the globe, and the laws of the ideal classification by natural families, analogy of internal organisation, and progressive evolution." (p. 48)

Humboldt was a believer in the search for general principles, but he was an equally strong believer in the building up of science through the collection of facts. Wallace would have been delighted to hear words such as these, and coming from a leading light, at that. This was the kind of thinking that might expose the workings of great natural processes such as transmutation; at the least it suggested that change might be related to overarching – but yet unknown – characteristics of the environment connected to climate and landscape.

Around the same time Wallace seems to have consumed writings by two of Humboldt's most eminent protégés, Franz Julius Ferdinand Meyen and Justus von Liebig. Meyen died young, but before he did he turned out one of the period's classic works on plant geography, *Outlines of the Geography of Plants*. It was ten years before the work was translated into English, but by the middle of 1846 it was available in London, and Wallace's interest in it is attested by the inclusion of his name at the end of its printed list of subscribers. He almost certainly read it before leaving for South America. Humboldt's influence on the book is plain, even without considering the more than seventy-five times Meyen references the older naturalist's studies throughout it. Wallace likely would have been fascinated by its organization, which included sections titled "On the Conditions of Climate Which Determine the Presence and Distribution of Plants," "On the Conditions by Which the Soil Influences the Station and Distribution of Plants," and "The Distribution of Plants Over the Surface of the Earth." The initial pages mention Humboldt's observations on the latitudinal

gradients in plant species numbers, and the final section introduces several themes and challenges that Wallace would later take up in his own work, for example:

> **"The physiognomics of vegetation teach us, that nature, at the creation of plants, has distributed them over the surface of the earth according to certain laws, which are quite unknown to us. We have now learned some of the external causes which place the more developed and nobler forms of vegetation in the hot zones; but we know no cause, why the same species of plants are not always produced in the same conditions of climate." (p. 99)**

Liebig's name is not usually connected to Wallace's either, but in one of his later works Wallace included the following reflection on his early surveying days:

> **"Living thus almost constantly on the land and among farmers and country people, I soon took a great interest in agriculture. I studied the works of Sir Humphrey Davy and Baron Liebig, at that time the great authorities on agricultural chemistry . . . I really believe that at that period of my life I could have passed a very fair examination in theoretical and practical agriculture."**

Wallace probably knew Liebig's *Organic Chemistry in its Applications to Agriculture and Physiology*, which had reached English translation from the original German in 1840. Liebig is most remembered for his "law of the minimum," that agricultural yield is directly dependent on the least available critical nutrient, whatever that may happen to be in a particular instance. This "limiting factor" idea became a central concept in the development of ecological theory over the next one hundred years. A possible role for the "law of the minimum" in Wallace's thoughts in the 1840s and 50s should not be dismissed, as it is but a short step from the principle to natural selection itself: *i.e.*, how might organisms change in a manner allowing them to exploit environments short on particular nutrients?

Liebig was truly a disciple of Humboldt, as his emphasis on facts and precise experimental work demonstrates (not to mention a couple of crucial personal interventions Humboldt exercised in his interest). Curiously, and unlike Meyen, he cites Humboldt only once in his greatest work, but this was his habit and the truth comes out in his German edition dedication to Humboldt, in which he states, roughly translated, "I hardly know whether even a part of the little work which I make bold to dedicate to you is my own." Humboldt was also a leading advocate of the careful use

of scientific instrumentation, and this too is a theme that shows up throughout the body of Liebig's work.

But what of Charles Lyell? one might ask. Was he not a more important influence than any of these people? Consider first that Lyell himself is sometimes referred to as one of the prototypic advocates of "Humboldtian science," and his debt to the older man is clear from his roughly fifty referrals to him in *Principles of Geology*. By the seventh edition of 1847 he was beginning to mention *Cosmos.*

Wallace speaks enthusiastically of *Principles* in some of his early letters, but without many specifics. Note also that in his published writings before 1857 he mentions Lyell only twice, whereas he refers to Humboldt at least nineteen times. Wallace undoubtedly adopted Lyellian uniformitarianism, but as compared to Darwin his interest in geology was limited, and what he did publish on the subject early on was mostly casual records of observation, not the results of fieldwork *per se*. He did of course write and theorize quite a bit on the various elements of physical geography, but in this field Humboldt was king, not Lyell. In fact, uniformitarianism gave Wallace a physical framework for progressive change, but it didn't answer any questions regarding the ecological controls on change. Lyell's mistaken biogeographical views eventually did, however, provide an impetus for Wallace's progression beyond Humboldtian "terrestrial physics" to an operational transformist model.

2. Wallace and the "Simple" Model of Natural Selection

Although Wallace would end up a rather strict adaptationist, he had different pre-1858 views on the relation of adaptive structures to evolution. There was at least some kind of correlative relation involved, to be sure, but to think that every adaptation had a function was seemingly to adopt creationist or Lamarckian thinking, and Wallace would have neither of these. Thus, years of searching went on for some kind of ambient environmental influence that might "coax" transformist inertias out of existing character suites. This distinctly Humboldtian approach yielded some early writings from Wallace that sound, in retrospect, a bit odd. Most notable is the following excerpt from one of his in-the-field studies on the orangutan, published in 1856:

> **"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."

This passage illustrates just how loathe Wallace was to think that adaptive structures filled some kind of predetermined function. This nod to the probable influence of more "recondite" forces, it should be noted, is a distinctly Humboldtian notion, one he was only able to get past when it occurred to him that change need not be predetermined if adaptive evolution was a process of response in *whatever* direction that accrued advantage. In effect, the limiting factors notion had been turned upside down: those populations that were able to select out positive responses to impinging forces were those that succeeded. And, in the end, he was still left with a Humboldtian understanding, one based on the idea of a fully inter-dependent natural system, as described in the 1858 Ternate essay:

"We have also here an acting cause to account for that balance so often observed in nature, – a deficiency in one set of organs always being compensated by an increased development of some others – powerful wings accompanying weak feet, or great velocity making up for the absence of defensive weapons; for it has been shown that all varieties in which an unbalanced deficiency occurred could not long continue their existence. 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."

There is something further to take from this understanding, an implication that is important but still usually overlooked as possibly significant to biogeographic studies. Wallace's model requires engagement of the environment to effect new selection regimes; it is not itself an evolutionary understanding. Instead, it provides a representation of a state-space, an ongoing (dynamic) equilibrium played out between populations and the rest of nature. Wallace himself described natural

selection – on many occasions – as the "elimination of the unfit," and nothing more. This realization is consistent both with his steam-engine governor analogy, his reliance on environmental influence to induce change, and ultimately his frequent splits with Darwin on the relation of the principle to evolution in general.

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