

Happy 150th Birthday Natural Selection!

George Beccaloni

Today we celebrate the 150th anniversary of the first public announcement of what Richard Dawkins has called "...the most momentous idea ever to occur to a human mind." He was of course referring to the theory of natural selection, the primary mechanism driving the evolution of life on our planet; an idea actually discovered independently by two minds, not just one. Whilst the owner of one of these brains, Charles Darwin, is rather well known, the possessor of the other, Alfred Russel Wallace, is not exactly the household name he once was. So who was Wallace and how did he come to be the co-discoverer of what is probably the most revered (and reviled) idea in human history?

Wallace was born near Usk, Monmouthshire, England (now part of Wales) on the 8th of January 1823 to a downwardly mobile middle-class English couple. Due to his father's deteriorating financial situation he was forced to leave school aged 14 and work for his brother doing land surveying. This job involved roaming all over the English and Welsh countryside and it was at this time that his strong interest in natural history developed. Wallace became an evolutionist in 1845 whilst living in Neath in Wales, after being inspired by Robert Chambers' controversial book *Vestiges of the Natural History of Creation*. So interested in the subject did he become that in 1848 he suggested to his friend Henry Walter Bates that they go on an expedition to the Amazon rainforest in Brazil to collect animals and plants and try to solve the great "mystery of mysteries" of how evolutionary change has taken place. Although Wallace made many important discoveries during his four years in the Amazon Basin he did not manage to find the elusive mechanism. That would have to wait until some time later.

In 1854 Wallace left England again on an ambitious collecting expedition to the Malay Archipelago (now Malaysia and Indonesia). He would spend nearly eight years in the region, and undertake sixty or seventy separate journeys resulting in a combined total of around 14,000 miles of travel. He visited every important island in the archipelago at least once, and several on multiple occasions, and collected almost 110,000 insects, 7500 shells, 8050 bird skins, and 410 mammal and reptile specimens, including over a thousand species new to science.

In February 1855 whilst in Sarawak, Borneo, Wallace wrote what was probably the most important paper published on evolution up until that point. His "Sarawak Law" article made such an impression on the famous geologist Charles Lyell that in November 1855, soon after reading it, Lyell started writing a "species notebook" in which he began to contemplate the implications of evolutionary change. In April 1856 Lyell paid a visit to Darwin at Down House, and Darwin divulged his theory of natural selection to Lyell for the first time: an idea which Darwin had been working on, more or less in secret, for about 20 years. Soon afterwards Lyell sent a letter to Darwin urging him to publish the theory lest someone beat him to it (he probably had Wallace in mind!), so in May 1856 Darwin, heeding this advice, began to write a "sketch" of his ideas for publication. Finding the "sketch" unsatisfactory, Darwin abandoned it in about October 1856 and instead began to write an extensive book on the subject.

In February 1858 Wallace was suffering from an attack of fever on the remote Indonesian island of Halmahera when suddenly the idea of natural selection occurred to him. As soon as he had sufficient strength he wrote a detailed essay explaining his theory and sent it together with a covering letter to Darwin, who he knew from correspondence was interested in the subject of species transmutation (as evolution was then known). He asked Darwin to pass the essay on to Lyell if Darwin thought it was sufficiently interesting:- evidently hoping that Lyell would ensure that it was published in a good journal. Lyell (who Wallace had never been in contact with) was one of the most respected scientists of the time and Wallace must have thought that he would be interested to learn about his new theory because it explained the evolutionary "law" which Wallace had proposed in his 1855 paper. Darwin had mentioned in a letter to Wallace that Lyell had found his "Sarawak Law" paper noteworthy.

Unbeknownst to Wallace, Darwin had of course discovered natural selection many years earlier. He was therefore horrified when he received Wallace's letter and immediately appealed to his friends Lyell and Joseph Hooker for advice on what to do. They famously decided to present Wallace's essay (without first asking his permission!), along with two unpublished excerpts from Darwin's writings on the subject, to a meeting of the Linnean Society of London on July 1st 1858. These documents were published together in the Society's journal a month later as the paper "On the Tendency of Species to Form Varieties; And On the Perpetuation of Varieties and Species by Natural Means of Selection". Darwin's contributions were placed before Wallace's essay, thus emphasising Darwin's priority to the idea. Wallace later grumbled that his essay "...was printed without my knowledge, and of course without any correction of proofs", contradicting Lyell and Hooker's statement in their introduction to the joint papers that "...both authors...[have]...unreservedly placed their papers in our hands". This unfortunate episode prompted Darwin to abandon writing his big book on evolution and instead, he rushed to produce an "abstract" of what he had written up until that point. This "abstract" was published fifteen months later in November 1859 as *On the Origin of Species*: a book which Wallace once remarked would "...live as long as the 'Principia' of Newton."

In spite of the theory's traumatic birth (which in the case of Darwin's ideas was more like a caesarean section!) Darwin and Wallace developed a genuine admiration and respect for one another. Wallace frequently stressed that Darwin had more claim to the idea of natural selection than he did and he even named one of his most important books *Darwinism*!

Wallace spent the rest of his long life developing and defending the theory of natural selection, as well as working on a very wide variety of other (sometimes controversial!) subjects. By the turn of the century he was very probably Britain's best known naturalist and by the time of his death in 1913, he may well have been one of the world's most famous people. So why then is he so poorly known today? This is a tricky question, because the explanation has to take into account that during Wallace's lifetime he was widely acknowledged to be the co-discoverer of the theory. In fact natural selection was often called the Darwin-Wallace theory and the highest possible honours of the land were bestowed on him for his role as its co-discoverer. These include the Darwin-Wallace and Linnean Gold Medals of the Linnean Society of London; the Copley, Darwin and Royal Medals of the Royal Society (Britain's premier scientific body); and the Order of Merit (awarded by the ruling Monarch as the highest civilian honour of Great Britain). It was only in the 20th century that Wallace became almost totally eclipsed by Darwin. My working hypothesis to explain the overshadowing of Wallace by Darwin is as follows: In the late 19th and early 20th century natural selection as an explanation for evolutionary change became very unpopular, with most biologists adopting alternative theories such as neo-Lamarckism, orthogenesis, or

the mutation theory(see http://en.wikipedia.org/wiki/The_eclipse_of_Darwinism). It was only with the modern evolutionary synthesis of the 1930s and 1940s that natural selection became the generally accepted mechanism of evolutionary change. By then, however, the history of the discovery had been forgotten by many (there was a new generation of biologists) and when interest in the theory revived, many wrongly assumed that the idea had first been published in Darwin's *On the Origin of Species*. Thanks to the 'Darwin Industry' of recent decades, Darwin's fame has risen exponentially, eclipsing the important contributions of his contemporaries, like Wallace.

The downward spiralling of Wallace's fame is reflected in the way that important anniversaries of the July 1st meeting have been celebrated by the Linnean Society: the 50th anniversary of 1908 and 100th anniversary of 1958 were very grand affairs, with foreign dignitaries and members of the Darwin and Wallace families in attendance (Wallace himself participated in the 1908 celebrations). The celebration today at the Society will, in contrast, be a considerably more modest event and the prestigious Darwin-Wallace medal which the Society traditionally awards to the world's most prominent evolutionary biologists every 50 years on the July 1st anniversary will not be presented this year as expected. Instead the medal will be awarded on February 12th next year - Darwin's 200th birthday!

I leave you with some pertinent extracts from the Linnean Society's publication which was produced to commemorate the 50th anniversary of the reading of the Darwin-Wallace papers (it is available in full here: <http://darwin-online.org.uk/content/frameset?itemID=A281&viewtype=text&pageseq=1>):-

The President of the Linnean Society said:-

"We are met together to-day to celebrate what is without doubt the greatest event in the history of our Society since its foundation. Nor is it easy to conceive the possibility in the future of any second revolution of Biological thought so momentous as that which was started 50 years ago by the reading of the joint papers of Mr. Darwin and Dr. Wallace, "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection," communicated to our Society by Sir Charles Lyell and by Sir Joseph Hooker, whom we have the happiness of seeing with us to-day.....The presence among us of Dr. Wallace, one of the two creators of the theory, and of Sir Joseph Hooker, who brought it into the world, is in itself enough to render our meeting memorable, and to ensure its success...

In presenting the gold medal the President said:-

Dr. ALFRED RUSSEL WALLACE, We rejoice that we are so happy as to have with us to-day the survivor of the two great naturalists whose crowning work we are here to commemorate.

Your brilliant work, in Natural History and Geography, and as one of the founders of the Theory of Evolution by Natural Selection, is universally honoured and has often received public recognition, as in the awards of the Darwin and Royal Medals of the Royal Society, and of our own Medal in 1892.

To-day, in asking you to accept the first Darwin-Wallace Medal, we are offering you of your own, for it is you, equally with your great colleague, who created the occasion which we celebrate.... I ask you, Dr. Wallace, to accept this medal, struck in your honour and in that of the great work inaugurated 50 years ago by Mr. Darwin and yourself."

On being awarded with a silver version of the medal Darwin's cousin Francis Galton remarked "...I may say that this occasion has called forth vividly my recollection of the feelings of gratitude that I had towards the originators of the then new doctrine which burst the enthralment of the intellect which the advocates of the argument from design had woven around us. It gave a sense of freedom to all the people who were thinking of these matters, and that sense of freedom was very real and very vivid at the time. If a future Auguste Comte arises who makes a calendar in which the days are devoted to the memory of those who have been the beneficent intellects of mankind, I feel sure that this day, the 1st of July, will not be the least brilliant."

It is a shame that few today realise the significance of this date.

Dr George Beccaloni (aka 'Wallace's Rottweiler') is an evolutionary biologist/entomologist with a particular fondness for cockroaches - a group of insects even more maligned than Wallace! He founded the A. R. Wallace Memorial Fund (<http://wallacefund.info/>) which has restored Wallace's neglected grave and erected monuments to him at his birthplace and elsewhere.

George is co-editor of the book *Natural Selection and Beyond: The Intellectual Legacy of Alfred Russel Wallace*, which will be published by Oxford University Press in November 2008.

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