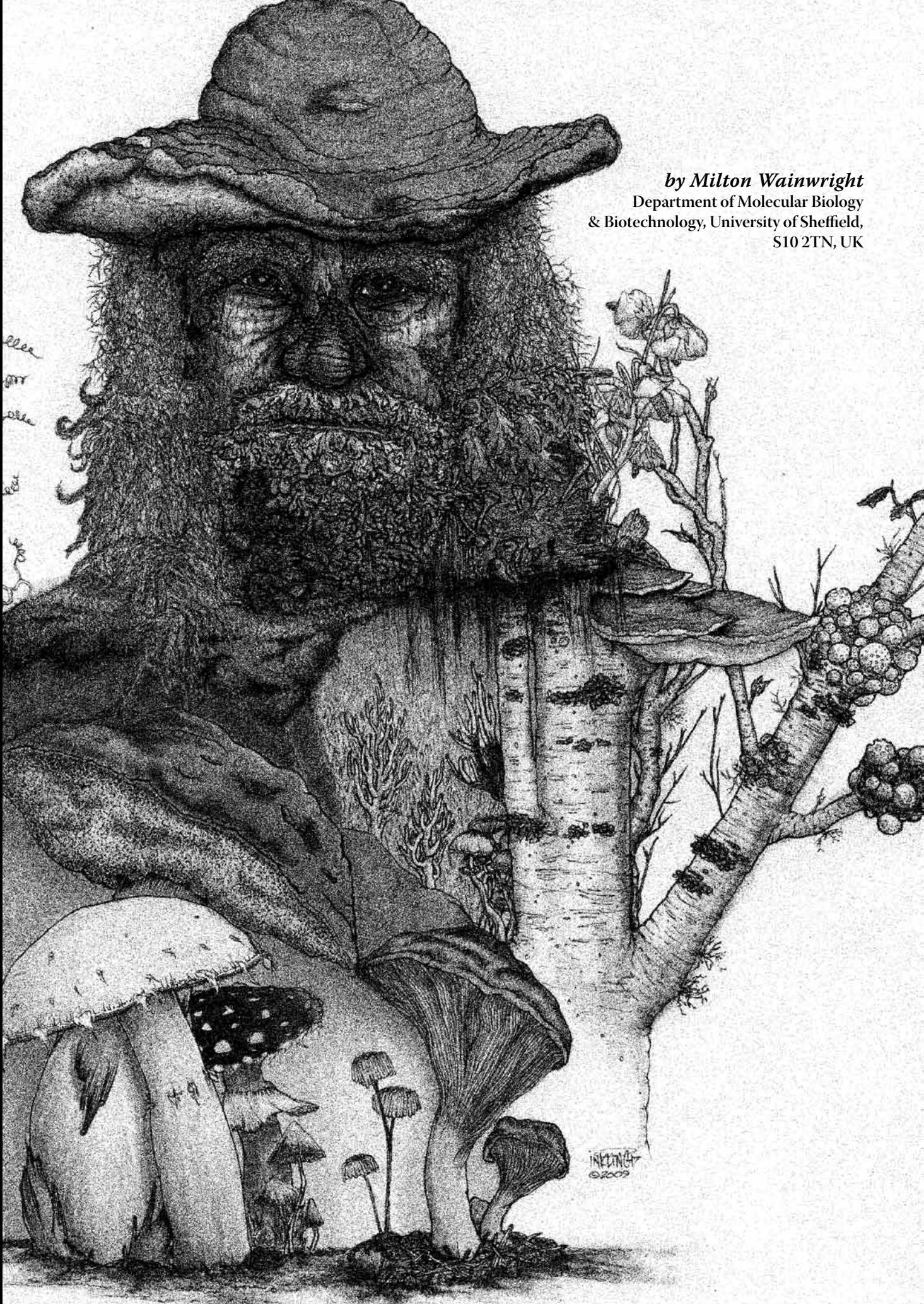


CHARLES DARWIN: Mycologist and Refuter of His Own Myth

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Abstract

Although nearly every aspect of Darwin's work has been scrutinised, his occasional studies of microorganisms and in particular fungi have been overlooked. Darwin however, took an interest in the Victorian debate over spontaneous generation and in the role of *Phytophthora infestans* in causing potato blight. Darwin was also interested in the possibility that his long-standing stomach complaint was caused by a fungus. Considerable hyperbole surrounds Darwin's work. However, while he was a first rate naturalist, Darwin, by his own admission, did not originate the ideas of evolution or natural selection. By using Darwin's own words I hope to show that the numerous myths which have grown up around Darwin diminish, rather than elevate, the great man's contribution to biology.

KEYWORDS: Darwin, Darwin myth, fungi, history of biology, history of evolution

Introduction

Although practically every aspect of Charles Darwin's life and work has been scrutinised in minute detail, the possibility that he worked on microorganisms has been largely ignored. However, considering Darwin's wide interest in natural history, it seems inconceivable that he would have ignored the opportunity to contribute to the surge in interest in bacteria and fungi during the mid-Victorian era. As we shall see, Darwin did in fact seize this opportunity and became involved in some interesting work on microbes, including fungi. While researching Darwin's contribution to mycology I soon became aware that a false impression of Darwin has emerged and that the many myths that have surrounded him have denied us a true appreciation of his achievements. So here, as well as considering Darwin's contributions to mycology, I will use the great naturalist's own words to shed some light on Darwin's true contribution to the development of the theory of natural selection.

Darwin's Contribution to Mycology

Fungi and evolutionary theory

Fungi are rarely mentioned in the history of the development of evolutionary science. Darwin (1868) however, in his *The Variation of Animals and Plants under Domestication* comments that when infected by fungi, plants often assume some of the characteristics of allied species. This observation was, in fact, first made by the German naturalist, S. Reisseck (Masters, 1860), who mused:

Suppose, the conditions originally caused by the fungus to become constant in the course of time, the plant would, if found growing wild, be considered a distinct species, or even belonging to a new genus.

The Reverend M.J. Berkeley, a leading light of Victorian mycology, thought that fungi might be used to good effect to solve the "species problem" which was to occupy the minds of so many naturalists of this era (Berkeley and Broome, 1850):

The extremely close external resemblance of objects belonging to very different genera (of fungi) would make a nice subject for amplification to those who would adopt the notion prevalent with some of the transformation of species.

Berkeley's words clearly show that the transmutation of species was already being discussed as early as 1850 and, as we shall see below, considerably earlier.

From Fuegian food to potato blight

Darwin's first contribution to mycology came when, while voyaging on the *Beagle*, he noted that fungi were a major component of the diet of Fuegians. He observed that *Cyttaria darwinii* a globular, bright-yellow fungus, grew in vast numbers on trees and was collected by women and children and eaten uncooked, as their staple diet. Darwin sent a specimen of this fungus back to England, where it was identified by the Reverend Berkeley (Darwin, 1860a).

Much later in life, Darwin took a keen interest in studies on the fungal blight which had so devastated the potato crop and caused famine throughout Europe during the 1840s. Between February 1876 and March 1882, Darwin exchanged some ninety letters with a certain James Torbitt concerning support for one of Torbitt's commercial projects aimed at developing and distributing

potato plants which were resistant to the light blight caused by the fungus *Phytophthora infestans* (Dearce, 2008). Torbitt selected the small number of plants which survived in a field infested with the blight fungus and used these to hopefully produce blight-resistant seed (Dearce, 2008). Darwin provided money to support this important work and lobbied civil servants on Torbitt's behalf in order to secure further funding.

Did Darwin suffer from a fungal infection?

It is a well known fact that Darwin suffered throughout most his life from a debilitating stomach complaint, but did Darwin's long standing complaint result from a fungal infection? Ever the experimenter, Darwin (1863) used his single lens microscope to examine a sample of his vomit and was able to inform Hooker that he found what "I suppose are vegetable cells in the limpid fluid which I throw up."

Having observed such cells or "animalcules" Darwin sought the advice of one of the leading medical practitioners of the day, Sir John Goodsir. As early as 1842, Goodsir had shown that an animalcule was present in the vomit of people suffering from gastric illness. He named the organism *Sarcina* and claimed that it was the cause of numerous stomach complaints. He then prescribed hyposulfites in order to kill the organism *in vivo*; this he claimed produced a cure. Goodsir, was arguably therefore the first person to demonstrate the presence of a microbe in an internal infection, suggest it caused the disease in question, and then provide a cure; all this some thirty years before Pasteur took an interest in microorganisms (Wainwright, 2003). A great deal was known about *Sarcina goodsir*, as it became known, by the 1860s when Darwin sent Goodsir a sample of his vomit for analysis. Some authorities regarded it as an alga, while others were certain that *Sarcina* was a fungus, even possibly a morphological form of common mold such as *Penicillium* (Wainwright, 2003); it is now known to belong to the bacteria. Goodsir eventually tested Darwin's sample for *Sarcina* but doubtless to Darwin's disappointment, failed to find the organism. Goodsir's letter (1863) states:

I will most certainly examine a slide or a small quantity of fluid with flocculent

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and tenacious matter sent in a tube or small phial. The spherical bodies are probably the eels of *Torula* and spores of *Penicillium*. If *Sarcina* be present it will be at once detected by its square form and peculiar segmentation. *Sarcina* and *Torula* often occur together. Mr (William) Jenner prescribes hydrosulphite of soda. Your medical advisor may try creosote. One drop taken at bedtime and afterwards, two drops in the forenoon and two at bedtime.

Darwin, fungi and spontaneous generation

As early as 1866, Darwin (1866a) entered the ongoing argument over spontaneous generation by stating in a letter to J.V. Carus that:

“As for myself I cannot believe in spontaneous generation.”

During the 1870s, Darwin also corresponded with John Tyndall who was then very much involved with the spontaneous generation controversy. In order to show that microbes

inhabit the air around us, Tyndall set up a large number of open tubes containing extracts of vegetables and somewhat exotic meats, like venison and pheasant (Wainwright, 1985). These, he found soon became contaminated with airborne bacteria and fungi and presumably would also infect humans and animals. Tyndall also observed numerous examples of microbial antagonism, the ability of a microbe to inhibit the growth of another. Although he noted that species of *Penicillium* could kill bacteria, he misinterpreted his observations and so missed the opportunity to discover antibiotics (Wainwright, 2003).

Tyndall sent Darwin one of his closed tubes which Darwin left exposed to the air. In a letter dated 20 October 1875, Darwin (1875) related the news to Tyndall that:

The tube of boiled infusion, dated October the 16th, was clear on the 19th, but on the 20th it was muddy and

contained bacteria in living movement.

On the first of February, 1871, Darwin wrote a letter to Hooker and again expresses his interest in the experiments that were then ongoing on spontaneous generation when he mentioned B.T Lownes’ observations that boiling does not kill certain moulds (Darwin, 1871). This he thought was curious because it contradicted Pasteur, who claimed that his boiled extracts remained sterile and would do so indefinitely.

Darwin Destroys His own Myth

Two thousand and nine, the bicentennial of Charles Darwin’s birth and the sesquicentennial of the publication of *On the Origin of Species* saw a remarkable out-pouring of non-scholarly hyperbole and misinformation about this Victorian naturalist. As a result, myths about Darwin’s role in the development of the theory of evolution by natural selection continue to be uncritically disseminated in biographies,



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documentaries and through the general media. During my studies on Darwin's interest in fungi, it became increasingly obvious to me that many of the ideas commonly attributed to Darwin were in fact originated by other Victorian naturalists and even pioneers of transmutation (later to be called evolution) who worked in the eighteenth century; other writers have also recently noticed aspects of what we might call the "Darwin Myth" (Caton, 2007). Here, I will use Darwin's own words to refute this mythology.

Myth: Darwin invented "evolution"

This is the easiest of the many Darwin myths to refute. It was doing the rounds as early as the late 1800s, as is shown by the following quote which appeared in Grant Allen's book of essays on science, called *Falling in Love* (Allen, 1891):

Everybody is aware, in a dim and nebulous semi-conscious fashion, that evolution was all invented by the late Mr Darwin.

By the time Darwin wrote his famous book in 1859, evolution, or transmutation, was a well established idea and was already under attack by theists, as well as scientists like Sedgwick and Lyell. The appearance of the *Vestiges of the Natural History of Creation* did much advance the cause of evolution. Anonymously published in 1844 by Robert Chambers (Chambers, 1844), this book took much of the sting out of attacks on Darwin's later books on evolution (Secord, 2001). Although Darwin was highly critical of Chambers' book, both Wallace and Thomas Henry Huxley were admirers. Chambers was not, of course, the first to advocate evolution; the seventeenth century contributions of Darwin's grandfather Erasmus Darwin, and most famously Lamarck preceded him. It is remarkable that the view that Darwin originated the idea of evolution has entered popular culture in the form of a mantra. Darwin is, of course, more properly associated with advocating a mechanism by which evolution mainly operates, namely natural selection. However, as we shall see, Darwin himself refuted what is perhaps the most central of all Darwin myths, namely that he originated the theory of natural selection. A myth, as we shall see, Darwin refuted in no uncertain terms.

Myth: Darwin originated the theory of natural selection

It is remarkable, considering the evidence, that the myth that Darwin originated natural selection has persisted for so long. Nearly every book and documentary on Darwin propagates this myth, despite the fact that both Darwin and Alfred Russel Wallace (who is sometimes referred to as the co-discoverer of natural selection) categorically stated that at least two other Victorian naturalists came up with the idea before them.

On April 10, 1860, Charles Darwin (1860b) wrote to a letter to Charles Lyell in which he mentions a depressing fact. He had been informed that he had been beaten to the theory of natural selection and there was simply no way of avoiding the fact. The startling news came from a Scottish tree expert, or arboriculturist, called Patrick Matthew.

Matthew was born in Dundee in 1790, into a wealthy family and died in 1874. Although he attended Edinburgh University, Matthew appears never to have graduated, but returned to his family's estate in Errol, Scotland, where he devoted the rest of his life to growing trees. It was here that he wrote his theory of natural selection, which was published in 1831 (Matthew, 1831); that is, at a time when Darwin, still a creationist and opposed to the theory of transmutation, was just about to begin his famous voyage on the *Beagle*.

The letter that Lyell received from Darwin was factual, rather than emotional (Darwin, 1860b):

Now for a curious thing. In last Saturday's Gardeners' Chronicle, a Mr Patrick Matthews (Darwin here incorrectly spells Matthew's name) publishes long extracts from his work on "Naval Timber & Arboriculture" published in 1831, in which he briefly, but completely anticipates the theory of Nat. Selection—I have ordered the book, as some few passages are rather obscure, but it is, certainly I think, a complete but not developed anticipation!... Anyhow one may be excused in not having discovered the fact in a work on "Naval Timber"

Then, in a letter to J.D Hooker, dated April 13, 1860, Darwin (1860c) wrote the following:

Questions of priority so often lead to odious quarrels that I should esteem it a great favour if you would read the

enclosed. If you think it proper that I should send it (and of this there can hardly be any question), and if you think it full and ample enough, please alter the date to the date on which you post it, and let that be soon. The case in the Gardeners' Chronicle seems a little stronger than in Matthew's book, for the passages are therein scattered in three places; but it would be mere hair-splitting to notice that. If you object to my letter, please return it, but I do not expect that you will but I thought that you would not object to run your eye over it.

In the above letter, Darwin also asked Hooker to send the following statement to the *Gardeners' Chronicle* :

I have been much interested by Mr Patrick Matthew's communication in the number of your paper dated April 7. I freely acknowledge that Mr Matthew has anticipated by many years the explanation which I have offered of the origin of species, under the name of natural selection. I think that no one will feel surprised that neither I, nor apparently any other naturalist had heard of Mr Matthew's views, considering how briefly they are given, and that they appeared in the appendix to a work on Naval Timber and Arboriculture. I can do no more than offer my apologies to Mr Matthew for my entire ignorance of his publication. If another edition of my work is called for, I will insert to the forgoing effect.

Here then, we have Darwin admitting that he was beaten to the theory of natural selection by Patrick Matthew. In a subsequent letter, written in the same month to the, American naturalist Asa Gray, April 25, 1860 (Darwin, 1860d.), he states:

Have you noticed how completely I have been anticipated by Mr P. Matthew, in Gardeners' Chronicle?

In a letter Darwin (1861) subsequently wrote to Quatrefages de Bréau on April 25, 1861, he yet again admits that Matthew has beaten him, but continues to insert the same caveats, namely the contribution was small, it appeared in an obscure book, and no one noticed it:

...an obscure writer on forest trees in 1830, in Scotland, most expressly and clearly anticipated my views—though he put his case so briefly that no single person ever noticed the scattered passage in his book.

Darwin seems to becoming somewhat
Continued on page 16.

desperate here, since (as we shall see later) he neglects to mention that two reviews of Matthew's book had in fact appeared soon after its publication, both mentioning Matthew's reference to the species problem; Darwin's claim, that no single person ever noticed Matthew's work, is therefore obviously untrue. Clearly, the fact that Darwin admitted that he lacked priority, on what is usually considered to be his theory, has not just come to light, nor was it hidden away in Darwin's letters. On the contrary, it has been in the public domain for nearly a hundred and fifty years, yet it continues to be ignored.

Darwin eventually included reference to Matthew's work in the "Historical Sketch" which he included in later editions (such as the sixth edition, in 1872) of the *Origin of Species*. After commenting that Matthew had the same views as Wallace and himself Darwin states that:

Unfortunately the view was given by Mr Matthew, very briefly in scattered passages in an Appendix to a work on a different subject, so that it remained unnoticed until Mr Matthew himself drew attention to it in the Gardeners' Chronicle on April 7, 1860. The differences of Mr Matthew's view from mine are not of much importance, he seems to consider that the world was nearly depopulated at successive periods, and then restocked...

Although Darwin admits that he does not understand much of what Matthew, writes, he concedes that: "He (Matthew) saw clearly the full force of the principle of natural selection."

What about Alfred Russel Wallace, the man generally viewed as the co-discoverer of natural selection; what did he think about Matthew's contribution? In a book review on Butler's *Evolution Old and New* Wallace (1879) made the following comments (my emphasis in bold):

*We come next to Mr Patrick Matthew, who in 1831 put forth his views on the developmental theory in a work on arboriculture: and we think that most naturalists will be amazed at the range and accuracy of his system, and will give him the highest credit as the **first** to see the important principles of human and "**natural selection**," conformity to conditions and reversion to ancestral types; and also the unity of life, the*

varying degrees of individuality and the continuity of ideas or habits forming an abiding memory, thus combining all the best essential features of the theories put forward by Lamarck, Darwin and Mr Butler himself.

And (Wallace, 1900):

These and many other passages, show how fully and clearly Mr Matthew apprehended the theory of natural selection, as well as the existence of more obscure laws of evolution, many years in advance of Mr Darwin, and myself and in giving almost the whole of what Mr Matthew has written on the subject Mr Butler will have helped to call attention to one of the most original thinkers of the first half of the 19th century.

Although Wallace does not state what he means by the "existence of more obscure laws of evolution" in Matthew's work, I assume he is referring to Matthew's mix of natural selection and catastrophism.

Since both Darwin and Wallace openly accepted that Patrick Matthew originated the idea of natural selection we need not discuss his ideas in detail. Despite the fact that Darwin (1866b) stated that Matthew's ideas on natural selection were "precisely" the same as his own and Wallace's, some recent scholars have claimed that the two ideas were different (Wells, 1973). If this is the case, then one must conclude that neither Darwin nor Wallace could have understood the concept of natural selection!

As has already been mentioned, Darwin claimed that neither he, nor anyone else knew of Matthew's work. This is clearly conjecture on Darwin's part and flies in the face of the fact that Matthew's book was reviewed. Matthew's book was also well-advertised. For example, an advert for *Naval Timbers*, published in the advertising section of the *London Literary Gazette and Journal of Belle Lettres* of 1831 states the book refers to the "the subject of species and variety." Clearly, such an advert might have drawn Fitzroy's or Darwin's attention to Matthew's book, although, as Darwin, in 1831, was not interested in the species problem, any such interest would probably have had to await his return from his voyages on the *Beagle*, when he began filling his notebooks with already published examples of work on transmutation.

The first of the above mentioned reviews appeared in the *Edinburgh Literary Journal* (Anon., 1831a). Whoever wrote this review certainly did not spare the vitriol but instead mercilessly attacked Matthew's ideas and style. Passing reference is given to Matthew's ideas on natural selection, as follows:

The very great interest of the question regarding species, variety and habit has perhaps led him a little too wide.

The next review, appearing in *Gardeners' Magazine* of 1832 (Anon., 1832) emphasized that Matthew's book was important to the welfare of Britain and to "her extension of her dominions;" it then discusses the all important Appendix which contained Matthew's ideas on natural selection, as follows:

An appendix of 29 pages concludes the book...one of the subjects discussed in this Appendix is the puzzling one, of the origin of species and varieties; and if the author has hereon originated no original views (and of this we are far from certain), he has certainly exhibited his own in an original manner.

Clearly anyone, including Darwin, who was interested in the "species question" would have read this and wondered what this somewhat elusive quote meant. The final anonymous review (Anon., 1831b), which appeared in the *United Service Journal*, commended Matthew's description of naval architecture and then states, "But we disclaim participation in his rumination on the law of nature....." The authors of these two reviews were obviously well aware that the book had something significant to say including reference to the development of species, i.e. evolution. These two reviews also give lie to the, frequently expressed, view that Matthew buried his ideas in an obscure, little known book.

Although they never met, Darwin and Matthew entered into some friendly correspondence, beginning on the 13th of June, 1862, (Darwin, 1862) when, in response to the suggestion by Matthew that they might meet, Darwin replied that he would like to meet "the first enunciator of the theory of Natural Selection" (yet another admission, by Darwin, of Matthew's priority), but that he had to decline the offer because of his poor health. In 1871, the two scientists had further correspondence in which

Matthew complained that he had always been unable to devote much time on to the question of evolution because of his long-standing commitment to politics. Darwin's wife Emma also was aware of Matthew's priority over her husband, since she wrote to Matthew (because her husband was ill) saying (Darwin (E.), 1863) "Darwin is more faithful to your own original child than you yourself;" this presumably refers to something Matthew said which Mrs. Darwin thought might weaken the theory of natural selection. It is noteworthy that one of the main purposes of Captain Fitzroy's command of the *Beagle* voyage was to study the arboriculture of the countries visited with a view to discovering where in the world British warships and merchant vessels might take on board wood for repairs (Cook, 1839). It is possible therefore that Captain Fitzroy may have taken a copy of Matthew's *Naval Timbers and Arboriculture* with him on the *Beagle*; if this was the case then Darwin would have had ample time to learn of Matthew's views on natural selection. As has been already mentioned, Matthew's book was well advertised during 1830 and 1831 in, for example, the *Edinburgh Literary Journal*, *London Literary Gazette* and *The Magazine of Natural History*, so Fitzroy had plenty of opportunity to become aware of the book before the *Beagle* left England on Dec 27, 1831.

But is it Matthew's theory?

An obvious problem facing anyone attempting to correct the record on priority in science is that the person one is championing as the discoverer of a scientific principle may likewise have been beaten to the idea. Although I have given prominence to the work of Patrick Matthew in this essay, I have not at any point claimed that Matthew was the first to enunciate the theory of natural selection. I have avoided this pitfall simply because at least three other scientists, Hutton, Edward Blyth and William Charles Wells came up with versions of natural selection before Matthew (and therefore also Darwin and Wallace). William Charles Wells' contribution is particularly interesting because Darwin admitted his priority. Wells' version of natural selection appeared in 1813, some eighteen years before Matthew's work. The famous Victorian scientist and evolutionist,

John Tyndall (1874) referred to Wells' contribution during his inaugural address of 1874, when he stated:

In 1813, Dr Wells founder of our present theory of dew, read before the Royal Society a paper in which, to use the words of Mr Darwin, "he distinctly recognises the principle of natural selection; and this is the first recognition that has been indicated."

Tyndall then goes on to add his endorsement of Wells as follows:

The thoroughness and skill with which Wells pursued his work, and the obvious independence of his character, rendered him long ago a favourite with me, and it gives me the liveliest of pleasure to alight upon the additional testimony to his penetration.

The reference to Darwin's comments on Wells' priority is given in letter to Hooker he wrote in October, 1865 (Darwin, 1865) in which he says:

Talking of the Origin, a Yankee has called my attention to a paper attached to Dr Wells famous Essay on Dew, which he was read in 1813 to the Royal Society, but not printed, in which he applies most distinctly the principle of N. Selection to the races of man. So poor old Patrick Matthew is not the first, and he cannot or ought not any longer put on his Title pages the "Discoverer of the principal of natural selection."

The last sentence relates to Matthew's habit of putting this statement, claiming ownership of natural selection, in his books and on his calling cards. It is noteworthy that Darwin, in expressing his obvious satisfaction in debunking Matthew's claim to be the originator of the theory of natural selection, assigns priority to Wells, and in so doing, once again, admits that he, and Wallace, clearly had no priority on the theory. In his *Historical Sketch* (published in later editions of the *Origin of Species*), Darwin somewhat tempered his praise of Wells by stating that:

He applies it (natural selection) only to the races of man and to certain characters alone.

By criticising Wells' priority in this way Darwin is, of course unwittingly, re-asserting Matthew's priority over him on natural selection. Wells, by the way, died in 1817, some four years after he published his theory of natural selection, so he never had the opportunity to develop, or promote his ideas.

Since Wells was born in Charleston, of Scottish parentage, it is perhaps surprising that American writers have failed to emphasise that one of their own beat Darwin to natural selection; perhaps the fact that he was a staunch loyalist in the American Revolution has counted against him (Duyckinck, 1855).

The Beagle myth

One of most enduring myths is that Darwin developed his ideas of transmutation while on the *Beagle*. However, Darwin destroyed this myth in no uncertain terms in the following quote given to Huxley (1893a):

When I was on board the Beagle, I believed in the permanence of species, but as far as I can remember vague doubts occasionally flitted across my mind. On my return home in the autumn of 1836, I immediately began to prepare my journal for publication, and then saw how many facts indicated the common descent of species, so that in July, 1837, I opened a note-book to record any facts which might appear to bear on the question. But I did not become convinced that species were mutable until I think two or three years had elapsed

The above quote by Darwin shows that it was not until after he returned from his voyages on the *Beagle*, and began studying the available literature on transmutation, that he became to be convinced that species could change or were mutable.

What then of the generally held view that Darwin observed that each island of the archipelago had its own species of tortoise and finch and that this observation lead him to begin to think of transmutation and even natural selection? In fact, it was John Gould, (and not Darwin) who first noticed the difference in the beaks of the finches, as the following quote points out (Anon, 1838a):

Gould believed that the whole of these birds to be undescribed, and remarked that their principal peculiarity consisted in the bill presenting several distinct modifications of form.

Darwin also cannot be credited with the original observation that Galapagos tortoises varied on each individual island, Darwin (1864) himself states:

By far the most remarkable feature of the Archipelago is that the different islands, to a considerable extent, are

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inhabited by a different set of beings. My attention was first called to this fact by the vice Governor Mr Lawson, declaring that the tortoises differed from different islands and that he could certainly tell from which island any one was brought.

Darwin was a Lamarckian

A persistent myth about Darwin was that he was opposed to the possibility that acquired characteristics could be inherited. This idea, whose chief proponent was Lamarck, is often regarded as being anathema to Darwin's ideas and Lamarck's views are, in consequence, generally ridiculed so as to emphasise the difference between Darwin's ideas and the view that acquired characteristics can be inherited. However, as Alfred Russel Wallace (1908a) points out in the next quote, Darwin was always open to the possibility that Lamarck was right, and that acquired characteristics could be inherited:

Darwin always believed in the inheritance of acquired characteristics, such as the results of use or disuse of organs, and the effects of climate food etc.

A less than gentlemanly affair

From the time he returned from his voyages on the *Beagle* until 1858 Darwin had been scouring the Victorian literature for anything he could find concerning the "species problem." In addition, he wrote countless letters to naturalists around the world asking for their advice on specific points concerning natural history. In this way, we see Darwin, not as original thinker but as someone determined to synthesize other people's ideas in a coherent theory of transmutation. This synthesis, of course, came to fruition in his masterpiece *On the Origin of Species*. Darwin was extremely well placed to develop such a synthesis; he was rich enough not to have to work, and so could devote his time fully to his transmutation work (at least when he was not incapacitated by illness); even the considerable cost of postage involved would have been a problem for a man of lesser means. In addition, Darwin was a well known and respected naturalist and had influential and knowledgeable contacts around the world. Darwin worked on this evolutionary synthesis for some twenty years from around 1838 until 1858, when he received a devastating letter

from another naturalist, Alfred Russel Wallace; Wallace had come up with his own version of natural selection. Wallace forwarded a letter giving his ideas to Darwin, who was obviously shocked to find that another naturalist was elaborating the theory of natural selection. Darwin (1858a) wrote to Lyell and said:

I never saw a more striking coincidence. If Wallace had my MS sketch written out in 1842 he could not have made a better short abstract.

This letter placed Darwin in a predicament. He had been working on transmutation for some twenty years and had always intended writing his big synthesis of his findings on the subject. Now he would have to pass Wallace's letter on to a publisher and lose what he had always believed was his priority on natural selection.

In another letter to Lyell, Darwin pointed out that Wallace did not get his ideas from anything he (Darwin) had written to him, and is clear that any attempt to deny Wallace his, 1858, priority of the idea would be paltry, i.e., less than gentlemanly (Darwin, 1858b):

I would far rather burn my whole book than that he or any man should think I had behaved in a paltry spirit. Do not believe Wallace originated his views from anything I wrote to him.

In order to circumvent this obvious dilemma, Darwin appealed to two of his influential contacts, Sir Charles Lyell and Joseph Hooker. In fact, the problem should have been simply solved by Darwin forwarding Wallace's letter for publication without any reference to his own work. Lyell and Hooker however, decided to pursue a different course of action and solve the problem, which they and Darwin had in fact created, by not doing this simple act. Instead they arranged for a joint presentation (not a joint paper) of Darwin's and Wallace's work to the Linnaean Society of London. The presentations included a sketch of Darwin's transmutation synthesis and a letter, detailing his ideas, which he had sent the American naturalist, Asa Gray and of course, Wallace's famous letter. This arrangement has almost universally been regarded as "a gentlemanly agreement," although Wallace (at the time residing in Ternate, now Indonesia) was not party to it.

It is clear however, that, at least

initially, Darwin (1858c) recognized that the course of action he, Lyell and Hooker were following was, underhand, and far from gentlemanly:

Wallace might say "you did not intend publishing an abstract of your own views till you received my communication, is it fair to take advantage of my having freely, though unasked communicated my ideas, and this prevents me forestalling you".....It seems hard on me that I should be compelled to lose my priority of many years study but I cannot feel at all sure that this alters the justice of the case.

Although Darwin frequently refers to his priority, in reality he had no priority whatsoever on any of his transmutation ideas, simply because he had not placed them in the public domain. In Victorian times, as is still the case, priority on a scientific idea was gained only when an idea was published, either in the form of a book or a scientific paper; Darwin had offered his work to neither of these allocators of priority, and so relinquished any priority he thought he might have had; his notebook sketches and the private letter to Asa Gray simply did not, in the academic sense of the word, constitute any form of priority. The correct, and gentlemanly, thing for Darwin to have done was to forward Wallace's paper to an editor of a scientific journal and thereby relinquish the priority he had forfeited by not publishing his ideas. In the end however, the "ungentlemanly arrangement" was made and the theory of evolution by natural selection became, because of simple alphabetical order of the two names, Darwin's theory and not Wallace's. (As we have seen, however, neither had priority on the idea.) For a while, the Victorians referred to the Darwin-Wallace theory of natural selection, but this was soon simplified to give Darwin sole billing. (There has been a recent trend to reinstate the dual recognition, again ignoring Matthew's and Well's undoubted priority on the idea.)

Darwin (1858d) accepted the above mentioned arrangement and thanked his two influential colleagues for arranging this *coup d'état* as follows:

I had however, quite resigned myself and had written half a letter to Wallace to give up all priority to him and should certainly not have changed my mind had

it not been for Lyell's and yours quite extraordinary kindness.

In the event, Wallace gained greatly from this arrangement which he had not been party to, far more in fact than he lost by unknowingly relinquishing, what should have been, his priority over Darwin (perhaps this is what he hoped would happen and why he sent the letter to Darwin in the first place). Wallace became part of the English scientific scene (although because of his beliefs in land reform, phrenology, paranormal phenomena and the afterlife, he never became part of the establishment). Until his death, Wallace remained a true admirer and disciple of Darwin (Wallace, 1908b).

Myth: Darwin was the first to suggest that Man was a single species and originated from the same line as apes

This myth can again be easily refuted. A number of philosophers and naturalists before Darwin suggested that the races of Man were a single species; examples from the 1700s include De Maillet, Erasmus Darwin and Lord Monboddo. Robert Chambers came to the same conclusion in his *Vestiges of the Natural History of Creation*, as did the naturalist and explorer, Alexander von Humboldt at around the same time. Von Humboldt (1845) concluded that:

All the races of men are forms of a single species, which are capable of fruitful union and propagation, they are not different species of one genus.

While similarly, in 1773, James Burnett (Lord Monboddo) claimed that Man arose from the same stock as the Orang outan and that “learned by accident to bend their thumbs in opposition to their fingers” (Burnet, 1773), and also that:

If nothing else were to convince me that the Orang Outang belongs to our species, his use of sticks as weapons would alone be sufficient.

Miscellaneous myths

Other Darwin myths which have been refuted include the view that he was first to suggest the “tree of life metaphor;” the way that evolving species branch; recent research has shown that Lamarck sketched a similar tree as early as 1809 (Wheelis, 2007). Darwin admitted that he did not originate this idea in the following comment given in the first edition of *On the Origin of Species*

(p.118):

The affinities of all beings of the same class have sometimes been represented by a great tree. I believe this simile largely speaks the truth.

Darwin was also by no means the first to recognise the conflict between living things, which Spencer later styled, “the survival of the fittest.” Here for example is an anonymous expression of the idea given in 1838 (Anon, 1838b):

A continued war seems to be going on among the inferior creatures of the animal kingdom, the strongest praying upon the weak, the sluggish submitting to the power of the swift, and those with obtuse instincts to others possessed of more cunning.

In conclusion, we have seen that both Darwin and Wallace admitted that they did not originate the idea of natural selection; this fact was also endorsed by John Tyndall as well as “Darwin’s bulldog,” Thomas Henry Huxley, who stated that natural selection “had been foreshadowed by Wells, 1813, and more fully stated by Matthew, the speculations of the latter writer remained unknown to naturalists until after the publication of *On the Origin of Species*” (Huxley, 1893b). This obviously diminishes Darwin’s novelty, and suggestions that he was a genius and the greatest thinker of all time. The view that Darwin was essentially a synthesizer of ideas which were already in the public domain was also expressed by Alfred Russel Wallace (1908b) as follows:

Mr Darwin has created a new science and a new philosophy; and I believe that never has such a complete illustration of a new branch of human knowledge been due to the labours of a single man. Never have such vast masses of widely scattered and hitherto quite unconnected facts been combined into a system and brought to bear upon the establishment of such a grand and new and simple philosophy.

The impact of Darwin’s two remarkably influential books, *On the Origin of Species* and *The Descent of Man* cannot however, be underestimated. As a first rate Victorian naturalist, it is not surprising that in the course of his work Darwin occasionally came across examples of the importance of fungi. We mycologists can therefore proudly claim him as one of our own.

References

- Allen, G.G.B. 1891. *Falling in Love*. London, Smith.
- Anonymous. 1831a. Literary criticism. *Edinburgh literary Journal* 2: 1-3.
- Anonymous. 1831b. On naval timbers. *United Service Journal*, part 2: 458.
- Anonymous. 1832. Matthew’s naval timbers. *Gardeners’ Magazine*, p.703.
- Anonymous. 1838a. *London and Edinburgh Philosophical Magazine* 2: 215.
- Anonymous. 1838b. *The Saturday Magazine* p.104.
- Berkeley, M.J. and C.E. Broome. 1850. On British fungi. *Annals and Magazine of Natural History* 5: 458.
- Burnett, J. (Lord Monboddo). 1773. *Origin and Progress of Language*, Vol.1. Edinburgh, Bell.
- Caton, H. 2007. Getting our history right: Six errors about Darwin and his influence. *Evolutionary Psychology* 5: 52-69.
- Chambers, R. 1844. *The Vestiges of the Natural History of Creation*, London, Churchill.
- Cook, S.E. 1839. The arboriculture of the voyages of Captains King and Fitzroy. *Gardener’s Magazine and Register of Rural and Domestic Improvements*, p.692.
- Darwin, C.R. 1858a. Letter to Lyell, C., 18, June, 1858, *Darwin Correspondence Project*, 2285.
- Darwin, C.R. 1858b. Letter to Lyell, C., 25, June, 1858, *Darwin Correspondence Project*, 2294.
- Darwin, C.R. 1858c. Letter to Lyell, C., 26, June 1858, *Darwin Correspondence Project*, 2295.
- Darwin, C.R. 1858d. Letter to Hooker, J.D., 13, July 1858. *Darwin Correspondence Project*, 2306.
- Darwin, C.R. 1860a. *A Naturalist’s Voyage Around the World*, London Murray, 1860 (1913 edition, p.377).
- Darwin, C.R. 1860b. Letter to Lyell, C., April, 10, 1860, *Darwin Correspondence Project*, 754.
- Darwin, C.R. 1860c. Letter to Hooker, J.D. 13, April, 1860, *Darwin Correspondence Project*, 2758.
- Darwin, C.R. 1860d. Letter to Gray, A., 25, April, 1860, *Darwin Correspondence Project*, 2767.
- Darwin, C.R. 1861. Letter to Quatrefages de Breaux, 25, April, 1861, *Darwin*

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Correspondence Project, 3127.

Darwin, C.R. 1862. Letter to Matthew, P., 12, June, 1862, *Darwin Correspondence Project*, 3600.

Darwin, C.R. 1863. Letter to Hooker, J.D., 25, Aug., 1863, *Darwin Correspondence Project*, 4274.

Darwin, C.R. 1864. *Journal of Researches*, New York, Harper 2: 166-167.

Darwin, C.R. 1865. Letter to Hooker, 22, Oct.1865, *Darwin Correspondence Project*, 4921.

Darwin, C.R. 1866a. Letter to Carus, J.V., 21, Nov., 1866, *Darwin Correspondence Project*, 5282.

Darwin, C.R. 1866b. *On the Origin of Species*, London, Murray.

Darwin, C.R. 1868. *The Variation of Animals and Plants Under Domestication* Vol.2 London, Murray, pp.284-85.

Darwin, C.R. 1871. Letter to Hooker, J.D., 1, Feb., 1871, *Darwin Correspondence Project*, 7471.

Darwin, C.R. 1875. Letter to Tyndall, J., 20, Oct., 1875, *Darwin Correspondence Project*, 10207.

Darwin, E. 1863. Letter from Emma

Darwin to Matthew, 21, Nov., 1863.

Darwin Correspondence Project, 4344.

Dearce, M. 2008. Correspondence of Charles Darwin on James Torbitt's project to breed blight-resistant potatoes. *Archives of Natural History* 35: 208-22.

Duyckink, E.A. 1855. William Charles Wells. *Cyclopaedia of American Literature*, New York, Scribner, Vol.1, pp.464-65.

Goodsir, J. 1863. Letter to Darwin, 21, Aug.1863, *Darwin Correspondence*, 4272.

Huxley, T.H. 1893a. *Darwiniana*. London, Macmillan, Vol.2, p.275.

Huxley, T.H. 1893b. *ibid*, Vol.2, pp.279-80.

Masters. 1860. On the relation between the abnormal and normal formations in plants. *Proceedings Royal Institute Great Britain* 3(1855-62): 223-27.

Mathew, P. 1831. *On Naval Timbers and Arboriculture*, London, Longmans.

Secord, J.A. 2001. *A Victorian Sensation*, Chicago, Chicago University Press.

Tyndall, J. 1874. The Belfast address to the British Association. *Nature* 10:

309-19.

Von Humboldt, A. 1845. *Kosmos* 1845, Vol. 1, p.387. London, Balliere.

Wainwright, M. 1985. Re-examination of John Tyndall's studies on microbial antagonism *Transactions of the British Mycological Society* 85: 562-69.

Wainwright, M. 2003. An alternative history of microbiology. *Advances in Applied Microbiology* 52: 333-56.

Wallace, A.R. 1879. Review of Butler's *Evolution Old and New*. *Nature* 20:142.

Wallace, A.R. 1900. *Human Progress Past and Future*. In: *Studies Scientific and Social*, Macmillan, London, Vol.2, pp.493-509.

Wallace, A.R. 1908a. *My Life*, London, Chapman Hall, p.237.

Wallace, A.R.1908b. *ibid*, p.197.

Wells, K.D. 1973. The historical context of natural selection: the case of Patrick Matthew. *Journal of the History of Biology*.6: 225-58.

Wheelis. M. 2007. Darwin not first to sketch tree of life. *Science* 315: 597.

[Further information on Professor Wainwright's work on Darwin can be found by searching Google for "wainwrightscience."] ♣

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