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Alfred Russell Wallace and the Evolution of the Human Mind

Charles Gross

Abstract
Today the fame of Alfred Russell Wallace is as the independent codiscoverer with Charles Darwin of the origin of species by natural selection. Although they were on very amiable terms all their lives, 11 years after announcing their discovery, Wallace and Darwin had a major disagreement on the evolution of human cognition. The author considers how this divergence and other disagreements, particularly on the role of instinct, are related to the differences in their class backgrounds, education, experience with non-European cultures, and views on socialism, phrenology, mesmerism, and spiritualism.

Keyword
Alfred Russell Wallace, Charles Darwin, evolution of human cognition, creation "science"

In February 1858, Alfred Russell Wallace, while trying to make a living in the Malay Archipelago collecting specimens for wealthy Englishmen, developed the idea of the origin of species by natural selection of heritable variations. He sent a manuscript describing these ideas to the established biologist Charles Darwin whose travel writing he had long admired (Wallace 1905). Darwin was stunned to see the ideas in Wallace’s manuscript that he had been developing for decades but had never presented publicly. On the advice of his close friends, the geologist Sir Charles Lyell and the botanist Joseph Hooker, back-to-back papers by Darwin and Wallace, on their independently arrived at theory of natural selection, were presented at a meeting of the Linnaean Society on July 1, 1858 (e.g., Browne 1995; Desmond and Moore 1994; the papers are reprinted as Darwin and Wallace 1958). Not only is there no evidence for a priority dispute between them, but for the rest of their lives they exuded extraordinary affection for each other. For example, Darwin writes to Wallace on May 28, 1864 “... but you ought not to speak... of the theory as mine, it is just as much yours as mine” (Marchant 1916) and Wallace replies the next day:

As to the Theory of Natural Selection itself, I shall always maintain it to be actually yours and yours only. You had worked it out in details that I would never have thought of, years before I had a ray of light on the subject... All the merit I claim is... having been the means of inducing you to write and publish at once (Marchant 1916).

A decade after their joint paper, Wallace radically diverged from Darwin and claimed that natural selection did not apply to human cognition. This article considers how Wallace’s background and life experiences led to this marked disagreement from Darwin.

Wallace's Background
Education. Wallace came from an impoverished family that could only support six years of formal schooling for him, all in a one-room schoolhouse. As a teenager and in his twenties he worked as a builder in London where he often frequented working class educational institutes such as the “Halls of Science” and Mechanics Institutes. There he was exposed to the ideas and movements popular among fellow “plebian autodidacts” of the day particularly the interrelated currents of Owenite socialism, phrenology, and mesmerism (Wallace 1905; Marchant 1916). Each of these movements represented working and lower middle class revolts against the established order in science, religion, and government (Cooter 1984; Winter 1997; Jones 2002; Barrow 1986; Claeys 2008; Moore 2008; Smith 2008). Each continued to exert major influences on Wallace from his teenage years until his death in 1913 (Wallace 1898, 1905; Marchant 1916).

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movements were scoffed at by the Victorian scientific elite and today are largely relegated to the dustbin of pseudoscience. In view of their importance to Wallace and his ideas, they deserve to be seen in their nineteenth-century historical context.

Socialism. Wallace wrote of Robert Owen “... I have always looked upon Owen as my first teacher in the philosophy of human nature and my first guide through the labyrinth of social science” (Wallace 1905) and “I consider Owen of the first as well as one of the greatest men of the 19th century ... but too far in advance of his time” (Marchant 1916). Owen was a Utopian socialist and agnostic and taught that humans are the product of their environment and education not of any “preexisting” condition. For Owen, each child was a blank slate:

Human nature, save the minute differences which are ever found in all the compounds of the creation, is one and the same in all; it is without exception universally plastic, and by judicious training the infants of any one class in the world may be readily formed into men of any other class (Owen 1991[1816]).

Phrenology as developed by Franz Joseph Gall and J. C. Spurzheim was based on several original principles: 1) The cerebral cortex is a set of organs that underlie different psychological faculties; 2) the development of these faculties is a function of the activity and, therefore, the size of the corresponding cortical organ; and 3) the size of each cortical organ is reflected in the prominence (bumps) of the overlying skull. At the time phrenology was a “purveyor” of materialism and rationalism that helped lay the groundwork for the acceptance of evolutionary ideas as well as the localization of psychological function in different brain areas. Gall’s originality and achievement must be seen in the context of preceding both Broca’s demonstration of localization of language function in the cortex and Fritsch and Hitzig’s and Ferrier’s demonstration of movement produced by electrical stimulation of the brain. In the long run, phrenology was a major stimulus to the development of modern neuroscience by 1) directing attention to the long neglected cerebral cortex, 2) stimulating the search for sensory pathways to the cortex, 3) initiating the systematic study of cortical cytoarchitectonics and myeloarchitectonics, and 4) encouraging the study of the effects of cortical lesions in humans and animals. The emphasis on skull morphology was quickly dropped in the scientific community although it continued in popular culture; it is about all that is still remembered of phrenology today (Gross 1998, 2009; Cooter 1984; Young 1970).

As strange as it may seem to the modern sensibility, phrenology, and Owenism, were very closely allied. This was particularly true in Britain where the leading phrenologist was George Combe. For both Combe and Owen (and Gall), individuals were morally accountable and, through education and environment, could improve their mental and moral faculties (Cooter 1984). Both provided to the thinking artisan and mechanic the goal of individual and social improvement and methods for achieving this goal.

As a teenager Wallace had read Combe’s Constitution of Man (1828) and was convinced of the validity of phrenology, even citing his own supposed “double-blind” phreno-mesmerism experiments in its support (Wallace 1905). Later, he interpreted Ferrier’s (1876) pioneering demonstration of complex behavior produced by electrical stimulation of the brain as a direct confirmation of phrenology (Wallace 1898), just as Broca described his demonstration of language function in the frontal lobe as confirming Gall (Gross 2009). In his 1898 work, The Wonderful Century, Wallace listed the neglect of phrenology as the leading failure of the 19th century. Wallace’s interest in phrenology directed his measurement of brain size in different peoples and his belief that the size of the brains, and therefore the intellectual faculties of “savages,” were equal to that of Englishmen, both germane to his differences with Darwin over evolution.

Perhaps Wallace’s ready acceptance of phrenology should not be surprising. Gall’s theory was based on a naturalistic collection of anecdotes. Similarly, Wallace’s theory of natural selection (and, at least initially, Darwin’s) was based on a large number of observations and anecdotes. Eventually, of course, Darwin (but not Wallace) added the results of experiments in selective breeding, whereas Gall always rejected experimental tests of his ideas. Punctate localization of function in the brain, first promoted by the phrenologists, was actually delayed by the experiments of J. P. Flourens, who concluded from his brain lesion experiments on pigeons that the cerebral hemispheres acted as a whole (Gross 1998).

Mesmerism was another example of “dissenting knowledge” (Cooter 1984). F. A. Mesmer was an Austrian physician who thought he could treat his ailing patients by passing a metal bar over them. He thought a magnetic type of energy passed from the metal to the patient. Eventually, he realized that the metal was not necessary and he spoke of “animal magnetism.” By the 1840s animal magnetism was being used by surgeons to carry out painless major surgery and became a widespread form of what we would now call “alternative medicine.” James Braid substituted the term hypnosis and the idea of some magnetic fluid passing between the doctor and patient fell away (Alexander and Selesnick 1966). After his conversion to spiritualism, Wallace repeatedly used hypnotism as an example of a phenomenon long ridiculed and ignored by the highest scientific authorities that was eventually proved valid. It was a case of “... facts long denied as
delusions or exaggerations admitted to be realities” (Wallace 1898).

Wallace’s life experiences before his speculations on the origin of species were radically different from Darwin’s. Leaving school as a teenager, Wallace worked for six years as an apprentice surveyor with his older brother, mostly in Wales (Wallace 1905). Parliament had just passed the “Tithe Commutation Act,” which substituted rent for traditional tithes. It was a boon to surveyors, as it required detailed surveying of each property field by field. It was also a disaster for the Welsh peasantry leading to widespread rioting and property destruction, particularly of tollgates, a symbol of another hated tax. The peasant rebels called themselves “Rebeccas” after the biblical Rebecca (Genesis 24:60) whose “seed” was “to possess the gate of those that hate them” (Moore 1997). Wallace called the new act “legalized robbery of the poor for the aggrandizement of the rich” (Wallace 1905):

The Rebecca disturbances show that [the Welsh peasant] may be roused, and his ignorance of other effectual measures should be his excuse for the illegal and forcible means he took to obtain redress . . . . It is to be hoped that he will not have to again to resort to such outrages as the only way to compel his rulers to do him justice (Wallace 1905).

Wallace left the turmoil of Wales to spend a year teaching in Leicester before going abroad with the fellow autodictat and naturalist Henry Bates to try to earn a living as a collector of plants and animals for wealthy patrons. In this period he read Malthus’s 1798 Essay on Population (Wallace 1905), which argued that the growth of human population would outstrip the resources to feed it. As Moore (1997) put it, on every page of Malthus the “paltry provisions, the filth and squalor, the rude agriculture, the ignorance, the violence” that Wallace had seen in Wales, it became the way he soon would see the natural world. In addition, the economic mapping he did in Wales probably facilitated his subsequent major biogeographical contributions. It also later helped turn Wallace into an activist for land reform, indeed for land nationalization.

For the rest of his life, even after his scientific recognition, Wallace had difficulty getting a decent job with resultant chronic financial difficulties. These were finally alleviated in 1881 by Darwin and his friends arranging for a government pension of £200 a year. This may have been adequate for his needs but was a very small fraction of the size of Darwin’s income (Browne 2002; Desmond and Moore 1994).

Charles Darwin, by contrast, came from a very wealthy family, and he enhanced this wealth by judicious and varied investments throughout his adult life (Browne 2002). He received about the best education available in his time, first in the politically and scientifically radical world of medical school in Edinburgh, then among the gentleman naturalist/professors at Cambridge and finally in the London free-thinking bohemian world of his brother. He literally never had to hold a paid job of any kind (Desmond and Moore 1994; Browne 1995, 2002).

Whereas both Darwin and Wallace were very heavily influenced and informed by their Pacific voyages, their actual experiences on them were quite different. Darwin was a gentleman naturalist aboard the Beagle with no duties at all except to be a companion for his Captain Fitzroy, which, because of strong differences over slavery, politics, and religion, he eventually failed at. He largely saw natives from the deck of the Beagle or on an occasional overland foray. These experiences reinforced his Victorian belief in the superiority of the white man as well as his abhorrence of slavery.

Wallace’s experiences abroad were quite different (Eisely 1961). He lived among various Pacific islanders, often as the sole white man, and was carried from island to island in their primitive praus (Wallace 1869b). Figure 1 shows Wallace at this period, and Figure 2 presents a replica of the boat he sailed on. From these experiences, he had no doubt that the islander’s cognitive skills were equal to that of the average Englishman.

Many other illustrations of both intelligence and morality are met with among savage races in all parts of the world; and these, taken together show a substantial identity of human character, both moral and emotional, with no marked superiority in any race or country. In intellect, where the greatest advance is supposed to have occurred this may be wholly due to the cumulative effect of successive acquisitions of knowledge handed down from age to age (Wallace 1913).

The differences between the background and experiences of Wallace and Darwin contributed to many of their differences on evolution. This article concentrates on their differences on the evolution of human cognitive functions and on the role of instinct.

The Evolution of Human Cognitive Function

Before the publication of the Origin of Species in 1859, Darwin had considered the evolution of the human mind in various notebooks and letters. He came to believe that
the final chapter: “In the future . . . much light will be thrown on the origin of man and his history.” By contrast, in 1864, Wallace charged in with a paper in the *Anthropological Review* on “The Origin of Human Races and the Antiquity of Man Deduced from the Theory of Natural Selection,” which provided an explanation of the evolution of the human body and mind by natural selection. Darwin loved it, writing to Hooker on May 22, 1864,

I have now read Wallace’s paper on Man, & think it most striking & original & forcible . . . I am not sure that I fully agree with his views about man; but there is no doubt, in my opinion, on the remarkable genius shown by the paper.—I agree, however, to the main new leading idea . . . (Darwin 1864).

The “leading idea” was that in the early stages of human evolution, natural selection had acted on both the body and the mind, but that later, natural selection operated on the mind alone. Wallace thought that once natural selection resulted in reason and moral and social sentiments; selective pressure would no longer act on their bodies but would increasingly make their brains/minds the basis of survival.

At length, however, there came into existence a being in whom that subtle force we term mind, became of greater importance than his mere bodily structure. Though with a naked and unprotected body, this gave him clothing against the varying inclemency’s of the seasons. Though unable to compete with the deer in swiftness, or with the wild bull in strength, this gave him weapons with which to capture or overcome both . . . From the moment when the first skin was used as covering, when the first rude spear was formed to assist in the chase, the first seed sown or shoot planted, a grand revolution was in effect in nature. . . for a being had arisen that was no longer necessarily subject to change with a changing universe . . . (Wallace 1864).

Then five years later, in a review of two of Lyell’s geology books, Wallace (1869a) again took up the problem of the evolution of the human mind. Darwin had some advance information about the review and wrote Wallace about it on March 27, 1869, “I hope you have not murdered too completely your own and my child” (Marchant 1916). In this review, Wallace completely reversed himself and emphatically rejected the idea that natural selection had any role at all in the origins of human cognition and brain function. Reading it caused Darwin to “groan” (in a letter to Wallace on January 26, 1870, in Marchant 1916).
Curiously, a major determinant of his rejection of a natural selection origin of human cognitive faculties seems to have been the time he spent among natives of the Pacific islands. He perceived their cognitive abilities and moral status to be equal that of his fellow Englishmen. As Gould (1980) put it:

Wallace advanced several arguments for the uniqueness of human intellect, but his central claim begins with an extremely uncommon position for his time, one that commands our highest praise in retrospect. Wallace was one of the few nonracists of the nineteenth century. He really believed that all human groups had innately equal capacities of intellect.

But, from Wallace’s strict adaptationist view, how could the abilities of “natives” in, say, math or music have arisen inasmuch as there could have been no selective pressure for such faculties in their environment (he thought)?

In the brain of the lowest savages, and, as far as we yet know, of the pre-historic races, we have an organ so little inferior in size and complexity to that of the highest types (such as the average European), that we must believe it capable, under a similar process of gradual development during the space of two or three thousand years, of producing equal average results. But the mental requirements of the lowest savages, such as the Australians or the Andaman islanders, are very little above those of many animals. The higher moral faculties and those of pure intellect and refined emotion are useless to them, are rarely if ever manifested, and have no relation to their wants, desires, or well-being. How, then, was an organ developed so far beyond the needs of its possessor? Natural selection could only have endowed the savage with a brain a little superior to that of an ape, whereas he actually possesses one but very little inferior to that of the average members of our learned societies (Wallace 1869a).

As a believer in phrenology, Wallace stressed the importance of brain size as reflecting the development and power of the intellectual, emotional, and moral faculties. The fact that the brain of the savage was about the same size as that of an Englishman (Wallace 1869b, 1870a) was a powerful argument against its origin by natural selection. Another phrenological contribution to Wallace’s excluding the human brain from natural selection was the view of the leading English phrenologist George Combe that the human brain contained faculties not found in the animal brain, namely, veneration firmness, conscientiousness, hope, wonder, ideality, wit, and imitation (Turner 1974).

In a letter to Lyell, Wallace expanded on the views he first put forward in his review:

If in his mental faculties—calculation of numbers, ideas of symmetry, of justice, of abstract reasoning, of the infinite, of a future state,—and many others can not be shown to be each and all useful to man in the very lowest state of civilization, how are we to explain their coexistence in him alone of the whole series or organized beings? Years ago I saw a Bushman boy and girl in London and the girl played very nicely on the piano. Blind Tom the idiot Negro had a “musical ear” or brain, superior perhaps to that of any living man. Unless Darwin can show me how this rudimentary or latent musical ability in the lowest races can have been developed by survival of the fittest—can have been of use to the individual or the race so as to cause those who possessed it in a fractional greater degree than others to win in the struggle for life, I must believe that some other power caused that development,—and so on with every other especially human characteristic (Richards 1987).

As he discussed in more detail in a paper the following year Wallace was quite certain about the “some other power.” It was “a superior intelligence [that] has guided the development of man in definite direction, and for a special purpose, just as man guides the development of many animal and vegetable forms” (Wallace 1870a).

Spiritualism. Wallace’s belief that a superior intelligence had guided human evolution reflected a conversion to spiritualism between the 1864 paper and the 1869 one. For Wallace, spiritualism was the belief that communication with the dead through mediums at séances was possible. He believed in a full range of psychic phenomena such as levitation, clairvoyance, slate wiring, table tapping, and Ouija boards (Fig. 3). The underlying theory was that:

Man is a duality, consisting of an organized spiritual form evolved coincidentally with and permeating the physical body . . . . Death is the separation of this duality . . . . Spirits can communicate through properly endowed mediums . . . . This leads to a pure system of morality far more powerful and effective than any which either religious systems of philosophy have put forth (Wallace 1875).

Although Wallace attended his first séances in 1865, he had long fully accepted two other apparently psychic
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phenomena, mesmerism (what we would call hypnotism) and phreno-mesmerism. In the latter, touching the phrenological location of a faculty elicited corresponding behavior or emotion. While teaching at Leicester in 1844, Wallace had seen a demonstration of mesmerism and then successfully tried it on some of his students. Being familiar with Combe on phrenology, he then tried phreno-mesmerism. Wallace randomly touched part of a subject’s skull and elicited corresponding behavior. For example when, without looking, he touched (by chance) the organ of veneration, the mesmerized subject dropped to his knees in prayer (Wallace 1905).

Wallace successfully practiced mesmerism on both his Lancaster students and South American Indians (Wallace 1905), and both in the Amazon and in Malaysia he was intimate with cultures in which psychic forces were ubiquitous.

Modern Western spiritualism began in New York around 1848 and quickly spread to England (Barrow 1986). Wallace first heard of it when abroad:

... being aware, from my own knowledge of mesmerism, that there were mysteries connected with the human mind which modern science ignored because it could not explain, I was determined to seize the first opportunity to examine into these matters (Wallace 1875).

Wallace began attending séances in 1865 and reading the growing spiritualist literature. He was completely convinced of the medium’s ability to communicate with the dead. He remained convinced through many séances for the rest of his life although virtually all the mediums had been eventually exposed as fakes. It should be stressed that some other Victorian scientists and intellectuals were equally seduced. However, Wallace made no progress in convincing his scientist friends such as Darwin, Huxley, G. H. Lewes (George Eliot’s consort), and Lyell. He repeatedly urged them to attend séances and circulated hundreds of preprints of his article supporting spiritualism titled “The Scientific Aspect of the Supernatural” (Wallace 1866). Perhaps it was this failure to convince his scientific colleagues that led him to say so little about spiritualism in his 1869 article (Oppenheim 1985; Kottler 1974). Later, particularly after Darwin died, Wallace was prolific in his writing defending spiritualism (e.g., Wallace 1898; Moore 2008).

Wallace, like many other working class intellectuals, had been attracted to phrenology and mesmerism because of their message of self-help and optimism. Spiritualism had a similar appeal to Wallace. He believed that the postdeath status of the surviving spirit depended on the intellectual and moral development during the biological lifetime, which was “a function of the degree of willful

Figure 3. A “spirit” photograph of Wallace and, supposedly, his deceased mother: Wallace (1875) described its circumstances and validity: “On March 14th, 1874 I went to Hudson’s [a photography studio], by appointment, for the first and only time by Mrs. Guppy as medium [formerly Miss Nichols, later Mrs. Volkman, a famous medium especially for her flower and fruit apparitions]. I expected that if I got any spirit pictures it would be that of my elder brother, in whose name messages had frequently been received through Mrs. Guppy. Before going to Hudson’s I sat with Mrs. G., and had communations by taps to the effect that my mother would appear on the plate if she could. I sat three times, always choosing my own position. Each time a second figure appeared on the negative with me … I recognized none of these figures in the negatives; but the moment I got the proofs, the first glance showed me that the third plate contained an unmistakable portrait of my mother—like her both in features and expression … a somewhat pensive, idealized likeness—yet still, to me, an unmistakable likeness … I see no escape from the conclusion that some spiritual being, acquainted with my mother’s various aspects during life, produced these recognizable impressions on the plate. That she still lives and produced these figures may not be proved; but it is a more safe and natural explanation to think that she did so, than to suppose we are surrounded by beings who carry out an elaborate series of impostures for no other purpose that to dupe us into a belief in a continued existence after death … [Wallace sent a copy of the photograph to his brother and sister-in-law who exclaim] ‘… Why, it’s your mother!’ … Neither my brother nor his wife knew any thing of Spiritualism, and both are prejudiced against it. We may therefore accept their testimony as to the resemblance to my mother … as conclusive.”
rejection of materialistic, self-centered goals and the adoption of an explorative, non-pre-judging, and socially-conscious attitude” (Smith 2008).

... our condition and happiness in the future life depends, by the action of strictly natural law, on our life and conduct here. There is no reward or punishment meted out to us by superior beings; but, just as surely as cleanliness and exercise and wholesome food produce health of body, so surely does a moral life here produce health and happiness in the spirit-world ...” (Wallace 1900).

Wallace saw no conflict between spiritualism and natural science. Spiritualism, he thought, should be investigated like any other natural phenomena. He saw them as “mutually supportive elements in a grander scheme of things.” Spiritualism was needed to explain natural phenomena that natural selection could not, such as human cognition and morality (Wallace 1875).

Darwin Answers Wallace on the Origins of Human Cognition
Darwin’s response to Wallace was in the form of two books, his most important after the Origin, namely, The Descent of Man and Selection in Relation to Sex (1871) and Expression of the Emotions in Man and Animals (1872). Both books stress the continuity between the mind and behavior of animals and that of humans and the plausibility of the evolution of human cognition from animals. They led directly to the systematic study of animal behavior first by Romanes (1882) and C. Lloyd Morgan (1890) and eventually to both ethology and behaviorism (Glickman 1985; 2009; Boakes 1984).

The Role of Instinct
One subject on which Wallace and Darwin’s sociopolitical differences seem to have strongly influenced their scientific views was in the role of instinct in behavior. A fundamental tenet of Owenite socialism was the educability of humans. Human nature was believed to be largely environmentally determined and this plasticity was viewed as underlying social, economic, and political improvement (Jones 2002; Owen 1816[1816]; Claesys 2008; Pollard and Salt 1971). As Owen put it “Experience has proved that Man has always been the creature of circumstances in which he has been placed and that it is the character of these circumstances which inevitably make him ignorant or intelligent, vicious or virtuous, wretched or happy” (Jones 2002).

These Owenite views led Wallace to a very different view from Darwin on the role of learning and instinct in behavior. Wallace consistently questioned and devalued the role of instinct or inheritance in favor of learning and experience. In his Malay Notebook (Wallace 1855–1859) are his earliest comments on instinct:

“[Instinct is] the performance of a complicated act absolutely without previous instruction or knowledge of it. Thus it is said and repeated that birds and insects build nests, gather & store food . . . without any instruction . . . & without knowing that such acts have been performed by others. This, however is assumed. It has never been tried. Birds reared from the egg in confinement have not been shown to make the same nest as their fellows . . . . Can a single case be shown of an animal performing any complex act no part of which has ever been seen performed? Or without having seen the result.”

Wallace then proposes to bring up a bird from the egg in an isolated environment and predicts, “I say under such circumstances it will not build a nest having the true characteristics of that of its species” (Jones 2002).

Wallace writes to Nature in 1873, arguing against the idea that dogs have a homing instinct, and suggests, rather, that in route finding they use their senses, intelligence, and memory just as humans do (Wallace 1873b, 1873c). Wallace was equally opposed to the invocation of any homing instinct in humans. He noted that Europeans were often astounded at the “homing instinct” of Malay natives and then pointed out that if you placed these individuals in a new environment, they could not make their way. “Their instinct will not act out of their own country” (Wallace 1855–1859).

More generally, Wallace opposed almost any instincts in humans. “Does man have instincts? No. He may perform some simple operations with teaching but never compound [ones]” (Wallace 1855–1859). Even infant sucking was rejected as an instinct:

As to the mere act of sucking, which has been said to be instinctive—it is on the contrary involuntary at least if breathing is so, for breathing is but sucking in air (Wallace 1855–1859).

We have a few of Wallace’s direct comments on Darwin’s views on instinct. On the way home from his Malay trip he received a copy of the Origin of Species. Here are some of the comments on instinct that he wrote in the margins (Beddall 1988):

On instinctive changes of habit or Instinct in domesticated animals: Darwin: “... It cannot be doubted that young pointers (I have myself seen a
striking instance) will sometimes point and even back other dogs the very first time that they are taken out . . . 

Wallace: “Have they not learnt at home?”

Darwin: “Domestic instincts are sometimes spoken of as actions which have become inherited solely from long-continued and compulsory habit, but this, I think, is not true. No one would ever have thought of teaching, or probably could have taught, the tumbler-pigeon to tumble,—an action, which, as I have witnessed, is performed by young birds, that have never seen a pigeon tumble.”

Wallace: “Is not this & all other such habits the result of some slight peculiarity of organization which makes ‘tumbling’ agreeable to the animals.”

On cell making instinct of the hive bee:

Darwin: “We hear from mathematicians that bees have practically solved a recondite problem, and have made their cells of the proper shape to hold the greatest possible amount of honey, with the least possible consumption of precious wax in their construction.”

Wallace: “What is this but rational building?”

In 1873, Wallace gave Darwin’s The Expression of the Emotions in Man and Animals a generally favorable review but objected to his explanation of his six-month-old child being distressed by seeing his nurse cry. Darwin suggested that the child’s upset was because “an innate feeling must have told him that the pretended crying of his nurse expressed grief; and this through the instinct of sympathy, excited grief in him.” Wallace opined instead that “the nurse’s attitude and expression were strange to the child; they made her look unlike herself, and the child got afraid and was about to cry . . . . A child at the age often cries at anything strange . . . . That seemed to me a better explanation than that the child had an innate knowledge that the nurse was grieved” (Wallace 1873a).

Wallace (1897) discussed instinct in some detail in his essay “On instinct in man and animals” in Natural Selection and Tropical Nature (1891), Wallace discusses examples of human behavior often termed instinctive and offers an alternative explanation to instinct for them. One example is suckling. He rejects the saying that the infant “seeks the breast” noting that every nurse and medical man agree with him. Although the infant sucks without teaching it is a simple act depending on what Wallace calls “organization.” Any object of suitable size in the mouth of an infant excites the nerves and muscles so as to produce the act of sucking and when at a little time later the will comes into play, the pleasurable sensations consequent in the act lead to its continuance.

Similarly, walking is evidently dependent on the arrangement of the bones and joints, their organization, and the pleasurable exertion of the muscles, which leads to the vertical position becoming gradually the most agreeable one.

Wallace’s most detailed discussion of specific behaviors, usually termed instinctive, is in his essay “The philosophy of birds nests” in Natural Selection and Tropical Nature (1891). In this essay he challenges the claims that birds built nests by instinct, whereas humans build houses by reason. He explains the fact that different species of birds build very different nests by the facts that they live
in different environments, have access to different building materials, eat different food, are equipped with different motor apparatus and abilities, are of different sizes and structures, use different tools (beak and legs), have different habits and different predators. Wallace then claims that the species-specific nests that birds make are because they learn to make them from their parents not by instinct:

“Birds brought up from the egg in cages do not make the characteristic nest of their species, even though the proper materials are supplied them, and often make not nests at all, but crudely heap together a quantity of materials . . .” Further support for the role of learning is that “the less perfect nests are built by the younger, the more perfect by the elder, birds.”

In this essay, Wallace cites a number of studies that concluded that bird song is due to learning not instinct. For example, Barrington in 1773, on the basis of a variety of rearing and cross rearing experiments, concluded that “notes [songs] of birds are no more innate than language in man and depend entirely on the master under which they are bred as far as their organs will enable them to imitate the sounds which they have frequent opportunities of hearing.”

When faced with good evidence that swallows fly well and avoid obstacles on the first attempt, that newborn pigs run to the sound of their mother, and that most young animals show fear at the voice or presence of their enemies, Wallace says:

“In all these cases we have comparatively simple motions or acts induced by feelings of liking or disliking; and we can see that they may be due to definite nervous and muscular co-ordinations which are essential to the species” (Wallace 1891).

But not instincts.

“If instincts mean anything. It means the capacity to perform some complex act without teaching or experience. It implies not only innate ideas but innate knowledge of very definite kind. And, if established would overthrow Mr. Mill’s sensationalism and all the modern philosophy of experience. That the existence of true instinct may be established in other cases is not impossible; but in the particular instance of bird’s nests which is usually considered its stronghold, I cannot find a particle of evidence of anything beyond those lower reasons in and imitative powers which animals are universally admitted to possess” (Wallace 1891).

In general, in rejecting instinct as an explanation of behavior, Wallace was rejecting innate ideas and knowledge. But he was often willing to accept what he termed “organization” of the nervous system and musculature to explain complex behavior arising without obvious experience.

Darwin’s treatment of instinct was quite different. He shows no skepticism of accounts of the most elaborate instincts, such as the ones Wallace dismissed, for example, route finding by birds and humans, innate fear, and complex nest building. Rather, Darwin was solely concerned in arguing how they could be accounted for by natural selection as in this conclusion from his chapter on instinct originally intended for his abandoned “Big Book” on the origin of species and then posthumously published as an appendix to Romanes’s Mental Evolution in Animals (1883):

“We have in this chapter chiefly considered the instincts of animals under the point of view whether it is possible that they could have been acquired through the means indicated on our theory, or whether, even if the simpler ones could have been thus acquired, others are so complex and wonderful that they must have been specially endowed, and thus overthrow the theory.”

After considering variation in instinctive behavior, its acquisition in successive steps, and the appearance of similar instinctive patterns in allied groups, Darwin suggests that a common ancestor is the most likely explanation. Even the occasional imperfections of instinctive behavior are found to fit the theory of natural selection. His final sentences illustrate the essential Darwinian position on instinctive behavior:

“. . . it is far more satisfactory to look at the young cuckoo ejecting its foster-brothers, ants making slaves, the larvae of the Ichneumidæ feeding within the live bodies of their prey, cats playing with mice, otters and cormorants with living fish, not as instincts specially given by the Creator, but as very small parts of one general law leading to the advancement of all organic bodies—Multiply, Vary, let the strongest Live and the weakest Die” (Darwin 1883).

Other Differences between Wallace and Darwin

In addition to the evolution of human cognition and the role of instinct, there were a number of other significant differences between Wallace and Darwin on evolution. One was the role of sexual selection, which Wallace was
opposed to, reflecting his much stricter emphasis on the role of adaptation than Darwin (Kottler 1985). An exception was for human females. Wallace (e.g., 1900, 1913) thought that after women had obtained their deserved educational, economic, and social equality, the human race would improve because now women could and would choose superior mates. A second was the explanation for hybrid sterility (Kottler 1985). A third, related difference was the greater emphasis on group selection than individual by Wallace (Kottler 1985).

In addition to these differences on evolution, the two Victorian savants had fundamental differences on many social and political issues. Very much unlike Darwin, Wallace was an anti-imperialist and ardent socialist, indeed an activist on land nationalization (e.g., Wallace 1892, 1898, 1900). Wallace had significantly fewer racist and sexist views than Darwin (e.g., Wallace 1900) and Darwin was a complete skeptic about psychic phenomena whereas, as detailed above, Wallace was extraordinarily gullible about mediums and their claims. Wallace had other iconoclastic views that separated him not only from Darwin but also from most Victorian scientists such as an opposition to government support of scientific research (but not public museums and public education) and to smallpox vaccination (because it was “absolutely useless” and a “delusion”) (Wallace 1870b, 1898).

**Similarities Between Wallace and Darwin**

This article has stressed differences between Alfred Wallace and Charles Darwin in their views of evolution and behavior and has suggested some extra-scientific factors that may have contributed to these differences. In closing, we note the amazing phenomenon that, in the most important development in the history of biology and one of the most important in the history of ideas, they came to an essentially identical view of the origin of species by natural selection of inherited variations. I now briefly consider what may have been so similar in their backgrounds that led them to this convergence.

From their youths, they were both driven natural history collectors and, thus, continually exposed to the variation between and within species. Second, although from such different class backgrounds, they were both exposed from an early age to materialist and anticonventional Christian views of the universe. Wallace lost any conventional faith through exposure to the ideas of Robert Owen and his son Robert Dale Owen and Thomas Paine and to phrenology and mesmerism and later spiritualism. Darwin’s grandfather and father were both agnostics. In medical school in Edinburgh, he hung out with young radicals and atheists such as William Browne; a major senior influence was the very free-thinking invertebrate zoologist Robert Edmond Grant (Desmond and Moore 1994). When he returned from the Beagle voyage he not only mixed with the scientific elite of London but also with the bohemian world of his brother Erasmus and his current girlfriend the feminist, abolitionist, free thinker, and prolific author Harriet Martineau (Browne 1995; Desmond and Moore 1994). Third, and perhaps most important, they had both read Malthus’s *An Essay on the Principle of Population* as they began to think about the origin of species (Young 1981). They both saw Malthus all around them in the natural world and Wallace had also seen Malthus’s ideas demonstrated in the conditions of the benighted Welsh peasants. Finally, they were both extraordinary in their independence of thought, although Darwin tended to keep his more subversive thoughts to himself and a few friends whereas Wallace was never shy broadcasting his unconventional ideas.

From 1858 until he died in 1913, Wallace saw himself as a strong advocate for natural selection and a devoted follower of Darwin and what he called “Darwinism.” Yet he never seemed to realize, as did Darwin immediately, that his belief that a supernatural power was responsible for human cognition totally undercut the entire theory of the origin of species by natural selection. After all, if this power was responsible for the evolution of human cognition, it could be equally responsible for the rest of evolution. Ironically, the Intelligent Design movement can and does claim Alfred Russel Wallace as their predecessor (e.g., Flannery 2008).

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