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Joseph Adams in the Judgment of Paris

Evolution's remarkable little book 45 years before Darwin

KENNETH M. WEISS

In Greek mythology, the Trojan shepherd-prince Paris was asked to decide who was the fairest of three competing goddesses, Hera, Athena, and Aphrodite (Fig. 1). Pandering to vested interests to win his vote, Hera offered Paris political power, while Athena offered him wisdom. But Aphrodite offered the love of Helen, the face of beauty among mortals. As we all learned as high school students, at an age when we could easily understand, he opted for sex, and abducted Helen back home to Troy. The rest is history.

The history of science also has multiple-choice stories to tell, but they're real, not mythological. The idea that life was molded through historical processes involving natural selection is rightly credited to Charles Darwin and Alfred Wallace, but historians have found others who anticipated the idea in various ways. There are many places, including Wikipedia, to find discussions of these people,[1–4] and some of them, including Erasmus Darwin, Charles' grandfather, are often briefly mentioned in textbooks of evolution. The idea that the traits of organisms could be changed by artificial breeding was widely accepted at the time and was highly influential to Darwin.

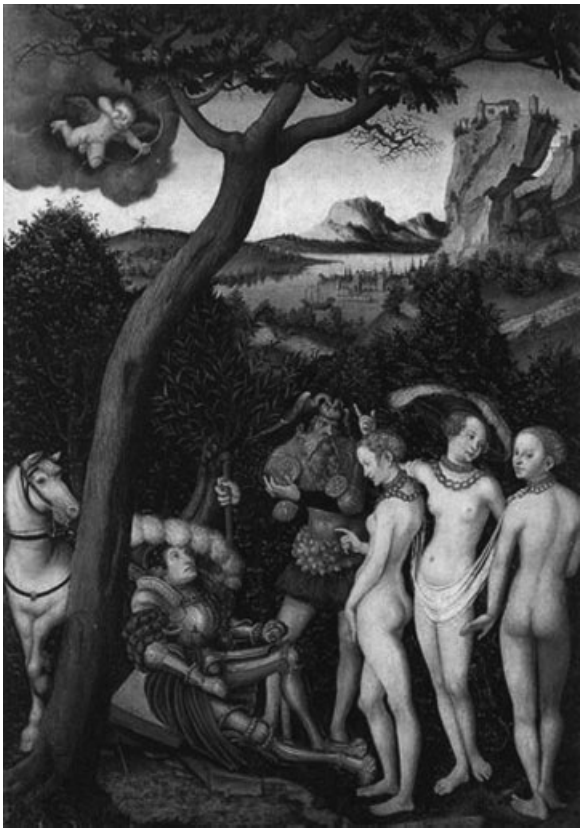

Figure 1. The Judgment of Paris: Hera, Athena, or Aphrodite? By Lucas Cranach the Elder, 1528. Public domain, from Wikimedia.

Historians debate the contributions of these progenitors. The main problem is that before Darwin most natural philosophers, as biologists were then called, had a static view of species in which their traits could change but they could not "transmute" into other species. Most prominent in the Darwinian pre-Pantheon was Jean-Baptiste Lamarck (1744–1829). He coined the term "biology" for this branch of knowledge and, in 1809, wrote his famous volume on evolution.[5] His theory addressed the origin and modification of species, but was vilified as mystical because his suggested mechanism was the inheritance of characteristics that organisms acquired as a result of what they strove to do in their daily lives. Lamarck was, in fact, a materialist, not a mystic, but in any case his mechanism did not survive the judgment of closer scrutiny.[6]

Among other notable precursors was William C. Wells (1757–1817) who, in 1813, described the origin of

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Figure 2. Joseph Adams. Reproduced with the kind permission of the President and Council of the Royal College of Surgeons of England.

human racial variation in terms of natural selection for disease resistance. He, like Darwin decades later, proposed a blending theory of inheritance that led him to suggest that racial variation had to adapt as a form of group selection because intermarriage between groups was observed to blend away their distinctive traits.[4] He recognized that selection would favor "accidental varieties...which would occur among the ... inhabitants of the middle regions of Africa" that conveyed disease resistance.[20:435] In that sense, he, unlike Lamarck, saw selection as choosing opportunistically among randomly arising variations. Wells extended his idea to other species, but not to the origin of *new* species.

In 1831, a British forestry agronomist, Patrick Matthew (1790–1874), wrote appendix material for a work on means of growing the best timber for the Royal Navy's ships, the masts that launched the ships that maintained the British Empire.[7] He referred explicitly to many of the core ideas of evolution. A "law universal in nature," he wrote, adapted the physical and mental powers of organisms to their conditions. The way to mimic nature to advance the Navy was not by immediately harvesting the best timber, but by systematically culling lesser trees to let the best ones reproduce. Matthew took his ideas to the next level, suggesting that descendants of favorable individuals might "in several generations, even become distinct species, incapable of co-reproduction." This work was obscure and unknown to Darwin, but when Matthew wrote to complain and claim credit, he was given grudging acknowledgment in later editions of *Origin of Species*.

Edward Blyth was a physician who argued some of these same points quite explicitly. In 1959, our prominent anthropological forebear, Loren Eiseley, wrote a long article suggesting that Darwin, who knew Blyth and had read his work, had cribbed key ideas from him without credit.[8] However, subsequent study of Darwin's notebooks has made this allegation untenable,[4,9] at least in the eyes of Darwin hagiographers.[10] They say this for two reasons. One is that Darwin's ideas developed gradually, rather than coming in a flash as they might have if reading Blyth's papers had turned on the light. The other is that Blyth, like most others, saw selection as a means of removing the unfit to keep the species static in its highly adapted form—what we would call purifying selection today. He did not proffer selection as a positive adapting force that screened randomly arising variation to produce new species.

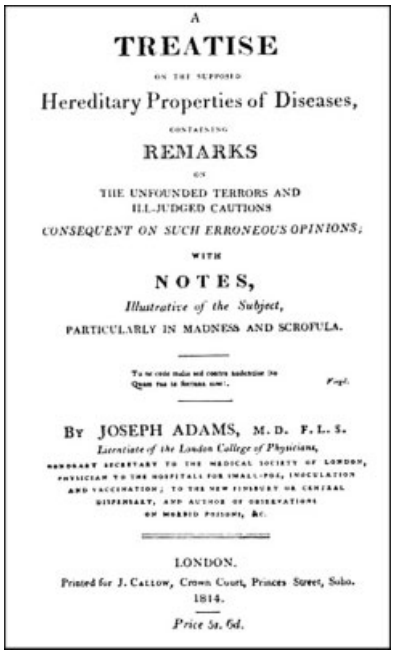
Darwin acknowledged these and other authors, though of Blythe only for other contributions to biology. He even credited his American correspondent, C. L. Brace, great-grandfather of our own C. Loring Brace (the IVth), with bringing Wells' work to his attention. In *Darwinism*, a paean to his friend,[11] Wallace gave scant credit to any predecessors, whose views were, in his judgment, "either altogether obsolete or positively absurd" (p. 5) because they did not adequately address the transmutation of one species into another. Of the authors discussed earlier, he mentioned only Lamarck, whom he immediately dismissed because his ideas did not "satisfy naturalists."

It does not demean Darwin in any way to dig hard to understand his context and antecedents. Historians have unearthed relevant contributions by many other writers whose degree of anticipation (or not) of modern evolutionary biology have been debated at length.[1,3,4,9] There are understandable reasons for the endless debate. It is impossible to get completely into the minds of people who wrote before Darwin's and Wallace's ideas became commonplace. Antecedents cannot be expected to have had exactly the same thoughts, although they did come very close. Equally important, if we have declared Darwin and Wallace to be our heroes, then there are reasons, intentional or otherwise, to lessen the insight attributed to predecessors who, necessarily, had to express ideas in terms of their own times. The main point, which isn't disputed, is that evolutionary ideas were in the air. But now I want to add another name to the list, a man who seems to have been wholly unknown to historians of evolutionary biology.

MONSIEUR PORTAL'S BAD ADVICE

In the early 1800s, educated people were quite concerned about the hereditary nature of disease, especially "madness." In 1808, a French physician, Antoine Portal, published a treatise on hereditary diseases.[12] This reflected a heightened interest in heredity in France at that time, an interest that later spread influentially to other parts of Europe.[13] Portal's popularly accessible work fed fears among people who had diseases like madness in their families and, given the typically large families of the time, many did. They feared that if they had children they would pass on the curse to their descendants and hence to posterity.

This attracted the attention of a British apothecary-turned-physician named Joseph Adams (1756–1818); (Fig. 2). As a physician, Adams was well-regarded by his British contemporaries, though he seems to have been an irritable fellow who liked recognition but not criticism and wished he were in the Royal Society.[14,15] However, he was not in the



A

TREATISE

ON THE SUPPOSED

Hereditary Properties of Diseases,

CONTAINING

REMARKS

ON

THE UNFOUNDED TERRORS AND
ILL-JUDGED CAUTIONS

CONSEQUENT ON SUCH ERRONEOUS OPINIONS;

WITH

NOTES,

Illustrative of the Subject,

PARTICULARLY IN MADNESS AND SCROFULA.

Pope.

By JOSEPH ADAMS, M. D. F. L. S.

Licentiate of the London College of Physicians,

PHYSICIAN TO THE HOSPITALS FOR SMALL-POX, INOCULATION AND VACCINATION; TO THE NEW DISPENSARY OR CENTRAL DISPENSARY, AND AUTHOR OF OBSERVATIONS ON MORBID POISONS, &c.

LONDON.

Printed for J. Callow, Crown Court, Princes Street, Soho.

1814.

Price 5s. 6d.

Figure 3. Adams' book.[16]

social inner circle and his scholarship had little influence in his time or since. Perhaps in a cranky mood, Adams read but did not like what he saw in Portal, which he felt was confused, nonspecific, and hence misleading to the public and science alike: "A caution ill-directed is a greater evil than no caution at all, inasmuch as it supersedes inquiry, by interrupting the common order of facts, and lulls us into an ideal security, when we have not advanced a step towards so desirable an end."[16:45] After all, the "dread of being the cause of misery to posterity, has prevailed over the most laudable attachment to a beloved object; and a sense of duty has imposed celibacy on those who seemed by nature the best constituted for the duties of a parent!" (p. v). Such people were not mad, but were smart enough to worry about their genes. Thus, people who were the best of the gene pool might refrain from sex!

But what is genetic? Keep in mind that this was well before our modern age, in which we can send a cheek swab to a host of "DNA-me!" companies who promise to inform us of our future or even that of our unborn children.

Adams recognized that the problem of these somber beliefs in Paris was a confusion of traits that family members might share by reason of contagion with traits that are truly hereditary. In 1814, responding to this misleading popular science, Adams wrote a short book of his own (Fig. 3).[16] He tried to clarify the nature, meaning, and origins of hereditary traits. In a prescient way, 45 years before Darwin's *Origin of Species*, he did.

Adams argued that just because several family members have a disease does not mean that it is heritable or that everyone in the family has the bad seed and will transmit it. Because of the mass confusion in concept, he made major distinctions that in their main points are perfectly modern today. He distinguished between congenital disease present at birth and disease that is likely to have later onset. He recognized the skipping of generations of what we now know as recessive disease relative to the more predictably inherited pattern of dominant disease.

Diseases that occurred in families, but only in one generation, Adams called 'familial', arguing that they were unlikely to be inherited. He then said that truly hereditary diseases fall into two categories that reflect notions of we would call 'penetrance' today, that is, the probability that a person has a disease given that he or she has inherited a particular genotype.

One category of hereditary disease involves "disposition" to the disease, meaning the inheriting person will manifest the trait at some age even in the absence of other external causes. Think of Huntington's disease. The earlier or more severe a case, the more likely it is to have a truly hereditary component. Adams correctly noted that some life-history events, like puberty, are triggering stages for disease. Indeed, as they grow older, members of affected families who remain unaffected can confidently be judged to be "as safe as the descendants from other families" (p. 39).

Adams called the other category a hereditary *pre*disposition. These inherited traits become manifest after exposure to some triggering external event, what today we call environmental or life-style factors. He pointed out that if the exposure factor were known and avoided, the trait would not arise and the person need not worry about transmitting it to his or her children. He even noticed that some traits, like gout, were consequences of sedentary or wealthy life styles; these are known today as the diseases of "western" modernization.[17] Madness could be a disposition or a predisposition, but since no one could detect its preclinical manifestations one could not determine whether environmental factors were necessary in every case or not. Far from being a clear-cut risk that people should be so fearful of that they refrained from reproducing, Adams said that madness is never hereditary except as a susceptibility and that predisposing environments can, in principle, be altered to prevent the disease. After all, babies are not born insane and even insane people have moments of sanity.

While we now know that there are exceptions, his is precisely the kind of distinction we make in modern disease genetics except that modern technology is making it possible to detect carriers of predisposing genotypes. This, we hope, will help identify predisease states or triggering exposures. It is clear today that many genetic disease susceptibilities are far less dangerous than their triggering life styles are on their own. Think of obesity and adult-onset diabetes, which were far less common last a few decades ago. Those forms of "McDonalditis" appear to have a genetic component, but one that generally confers far less risk on its own than do these exposures, regardless of genotype: Eat light, exercise right, have sex if you want to, and skip the gene test.

Adams noted that the same disease could have different causes in different families, another cornerstone of modern genetics. That is one reason that we maintain disease registries as an important epidemiological tool today. Adams suggested that they be kept so that physicians could be more properly informed about these various kinds of risk.

HOW THE TOUGH RAM GETS EWES'D

Adams justified his arguments by evolutionary concepts. He wanted to "ascertain what provisions are made by Nature to correct any apparent deviations in the human race" (p. 11). He said that his ideas on the evolution of differentiated varieties applied to other species as well as to human racial variation.

One of Adams' major insights was that truly damaging hereditary diseases like madness should be rare because their bearers do not reproduce successfully. In this context, he noted the harmful effects of close inbreeding. He also recognized the related core issues of eugenics as they arose a century later. The best people might be scared away from reproducing out of social conscience because there was madness in their families, and for many famous families of leaders and geniuses there was. But their restraint would cause the loss of their good genes (as we would say today), which would be a devastating blow to posterity. But fortunately, purely genetic behavioral diseases are either inimical to reproduction or are quickly fatal. Relatives who are still healthy by a certain age can be reassured that they don't have and won't transmit madness to their children. They should carry on: Portal's fears were groundless.

Adams was not unique among Darwin's precursors in understanding the impact of this kind of purifying selection against truly hereditary dysfunction, as we have seen. Indeed, if selection were not operating, Adam's said the accumulation of deleterious states would eventually become universal. But he also recognized that hereditary instances could arise *de novo* by what we call mutation. This occurs when a case appears spontaneously in someone whose family has a negative history of disease, after which the disease is seen in his or her descendants over several generations.

Adams went much further than the idea of purifying selection, stressing the importance of what we would call positive or adaptive selection. He said that environments such as climate put constraints on people: "By these means a race is gradually reared with constitutions best calculated for the climate: a law which, I suspect, has been too much overlooked, in our inquiries after the causes of the more marked varieties in the human species" (p. 33). People from one "race" do not always do well when they move to a different area. Adams noted that adaptation to a new area builds gradually over the generations. Indeed, he broached a subject widely discussed today: Perhaps the "endemic peculiarities" we find in some "races" or geographic areas are due to a history of local adaptive selection rather than purely environmental causation.

Adams perceptively related skin color to sunlight exposure. He also noted that there are racial differences in cold tolerance. One of life's ironies is that if he had his wish and had been a member of the Royal Society, he might have been present in 1813, the year before his book was published, to hear Wells read his paper on the origin of human racial variation. In that paper he suggested, in the passage I quoted from earlier, that dark skin color had evolved in the "middle regions of Africa" as a byproduct of adaptation to some tropical disease. Adams might have stood up at Question Time and expressed his more focused (and correct) explanation. Instead, history remembers Wells.

Adams extensively discussed the inheritance and evolution of susceptibility to diseases like scrofula and elephantiasis. He wrote before the theory of contagion was well established, but his ideas mixed contagion and susceptibility. We know today that not everyone is equally susceptible to infection, presumably in part for genetic reasons. In fact, more chronic diseases may have an infectious component than is suggested by our current determination to show that they are genetic.[18]

Adams said that his ideas applied to behavioral traits in all gregarious animals. As any shepherd knows, Adams said, "The strongest male becomes the *vir gregis* [loosely, the toughest ram of the herd] and consequently, the father of most of the offspring. In the ruder state of human society, or rather in its earliest formation, something of the same kind may prevail" (p. 32). Sociobiology is born! Indeed, Adams added a modern nuance by saying that in our more "advanced stage" of human culture women, too, are favored if they are healthy and intelligent. Selection is not all about men.

Adams distinguished between unimportant hereditary traits and those that selection would purge, which we would respectively call selectively neutral traits and traits that affect Darwinian fitness. Even Darwin was reluctant on this point, which is why neutral evolution is often called non-Darwinian. Adams noted something well-known to breeders, which was even included in the title of Wallace's initial paper on evolution (his stunning letter to Darwin). That is, without the pruning and management of artificial selection, domestic species would revert to their ancestral type.[19]

THE FORCE THAT LAUNCHED A THOUSAND SHAPES

Joseph Adams did not address the Darwinian question of species origins, but his analysis was explicit about long-term adaptation within our species. His ideas about the nature of contemporary variation were modern. His argument that serious traits that are present at birth are not likely to be purely hereditary was right on the money. Some are, of course, but they are usually rare. By the same token, most genetic susceptibility confers far less than 100% risk and usually requires environmental exposures as well, rather than dooming one, as Portal thought. Most genetic effects on normal variation are small, too.

Darwin and Wallace were, to the best of my knowledge, wholly unaware of Adams, though in many ways he was ahead of them in time. He had a clearer understanding of the nature of the hereditary mechanisms underpinning evolution, even if, as a physician, he did not discuss the transmutation of species. Still, history is a cruel mistress.

I first learned of Adams in a conversation with Arno Motulsky, a

leading medical geneticist of the last 50 years who, himself, discovered Adams only by accident. While on sabbatical leave in London, he was browsing the University College library and spotted an old book that had never been checked out of the library.[15] He realized the prescience of Adams' insights concerning medical genetics. As a clinician, however, Motulsky did not give much recognition to Adams' anticipation of evolutionary theory.[14,15] As far I have been able to tell, no one else has discovered this evolutionary thinking either. Historians of biology seem to have missed him entirely. So I hope that this column will install Adams, if not posthumously into the Royal Society, at least into the pre-Pantheon of perceptive anticipators of evolution.

The Judgment of Paris was about beauty and possession. Paris' choice of the beautiful Helen as his mistress launched the thousand Greek ships, leading to the cataclysm of Troy, after which Aeneas first abandoned the burning city, then abandoned the flaming love of Dido, *his* mistress. Aeneas went on to found Rome and thus transform Western history. We make our judgments in science, too. But it is far from clear that we would choose a beautiful face over power or wisdom. We value priority (for which, to my knowledge, there is no goddess). Darwin and Wallace win the Evolution prize because it was their ideas that transformed science history. They had antennae for what's in the air, but also the acquisitive and synthesizing ability to amass large amounts of data to support the case clearly and systematically, as something we can test, argue over, modify, and apply. Nonetheless, it is interesting to see how the other contestants, largely unaware of each other's work, but sniffing the same air, were also passing judgments on the force that is responsible for launching the beautiful shapes of nature.

NOTES

I welcome comments on this column: kenweiss@psu.edu. I have a feedback and supplemental material page at http://www.anthro.psu.edu/weiss_lab/index.shtml. I thank Anne Buchanan, Nina Jablonski, Jeffrey Kurland, Kat Willmore, Brenda Fraser, and John Fleagle for critically reading this manuscript. This column is written with financial assistance from funds provided to Penn State Evan Pugh professors.

REFERENCES

1 Eiseley LC. 1958. Darwin's century: evolution and the men who discovered it. Garden City, NY: Doubleday.

2 Mayr E. 1954. Change of genetic environment and evolution. In: Huxley J, Hardy AC, Ford EB, editors. Evolution as a process. London: Alleen and Unwin. p 157–180.

3 Green JC. 1959. The death of Adam: evolution and its impact on Western thought. Ames, IA: Iowa State University Press.

4 Gould SJ. 2002. The structure of evolutionary theory. Cambridge: Harvard University Press.

5 Lamarck JBP. 1809. Philosophie zoologique, ou, Exposition des considérations relative à l'histoire naturelle des animaux. Paris: Chez Dentu et L'Auteur.

6 Weiss KM. 2006. The clergyman's wife and the parrot. Evol Anthropol 15:3–7.

7 Matthew P. 1831. On naval timber and arboriculture. Edinburgh: A. Black.

8 Eiseley LC. 1959. Charles Darwin, Edward Blyth, and the theory of natural selection. Proc Am Philos Soc 103:94–158.

9 Mayr E. 1982. The growth of biological thought: diversity, evolution, and inheritance. Cambridge, MA: Belknap Press.

10 Gould SJ. 1987. An urchin in the storm. New York: W.W. Norton.

11 Wallace AR. 1912. Darwinism. London: Macmillan.

12 Portal A. 1808. Considerations sur la nature et le traitement de quelques maladies héréditaires ou de famille. Memoires Institute Nationale de France 8(Semestre 2):156–180.

13 Lòpez-Beltràn C. 2004. In the cradle of heredity: French physicians and *L'Hérédité Naturelle* in the early 19th century. J Hist Biol 37:39–72.

14 Motulsky A. 1959. Joseph Adams (1756–1818): a forgotten founder of medical genetics. AMA Arch Int Med 104:490–496.

15 Motulsky A. 2002. The work of Joseph Adams and Archibald Garrod: possible examples of prematurity in human genetics. In: Hook E, editor. Prematurity and scientific discovery. Berkeley, CA: University of California Press. p 200–212.

16 Adams J. 1814. A treatise on the hereditary properties of disease. London: J. Callow.

17 Pollard TM. 2008. Western diseases: an evolutionary perspective. Cambridge: Cambridge University Press.

18 Ewald P. 2000. Plague time: how stealth infections cause cancers, heart disease, and other deadly ailments. New York: Free Press.

19 Wallace AR. 1858. On the tendency of varieties to depart indefinitely from the original type. Proc Linn Soc 3:53–62.

20 Well WC. 1818. An account of a female of the white race of mankind, part of whose skin resembles that of a negro. In: Wells WC. Two essays, London: Archibald Constable. p. 425–439.

Books Received

- Stark, M.T., Bowser, B.J., and Horne, L., Eds. (2008). Cultural Transmission and Material Culture: Breaking Down Boundaries. 320 pp. Tucson: The University of Arizona Press. ISBN 978-0-8165-2675-8. $49.95 (cloth).
- Campbell, C.J., Ed. (2008). Spider Monkeys: Behavior, Ecology and Evolution of the Genus *Ateles*. 410 pp. Cambridge: Cambridge University Press. ISBN 978-0-521-86750-4. $140.00 (cloth).
- Cartwright, J. (2008). Evolution and Human Behavior: Darwinian Perspectives on Human Nature (Second Edition). 448 pp. Cambridge: MIT Press. ISBN 978-0-262-53304-1. $36.00 (paper).
- Arnold, M.L. (2009). Reticulate Evolution and Humans. 233 pp. Oxford: Oxford University Press. ISBN 978-0-19-953958-1. $120.00 (cloth).
- Cooper, D.N., Kehrer-Sawatzki, H. (2008). Handbook of Human Molecular Evolution. 1717 pp. Chichester: John Wiley & Sons. ISBN: 978-0-470-51746-8. $590.00 (cloth).
- Falk, D. (2009). Finding Our Tongues: Mothers, Infants, and the Origins of Language. 219 pp. New York: Basic Books. ISBN 978-0-465-00219-1. $26.95 (paper).