

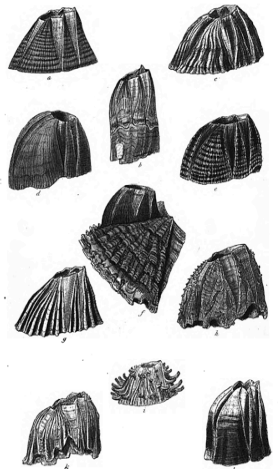
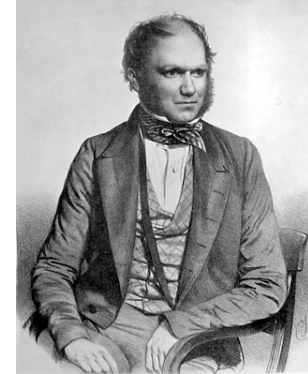
History of Evolutionary Thought

Part V: Origin of the *Origin*

BIOL 4415: Evolution
Dr. Ben Waggoner

Fact-gathering. . .

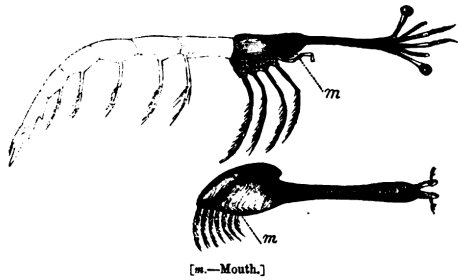
Darwin spent over twenty years gathering facts that might have some bearing on how species originated. He wrote two manuscripts laying out his theory of “descent with modification” (in 1842 and in 1844), but they were not published in his lifetime.



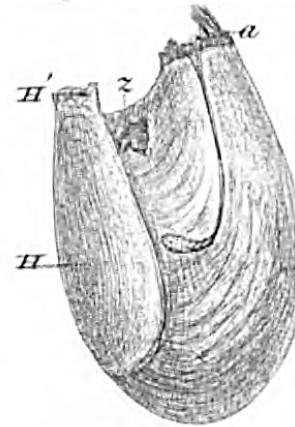
In 1845, Darwin discussed his evolutionary ideas with his friend Joseph Hooker, who wrote back: “I still maintain, that to be able to handle the subject at all, one must have handled hundreds of species with a view to distinguishing them & that over a great part,—or brought from a great many parts,—of the globe.” Darwin ended up writing four volumes on living and fossil barnacles—quietly testing and developing his evolutionary ideas.

For those who don't know: Barnacles are marine crustaceans, many with calcareous shells. Most are filter-feeders attached to hard substrates, although some rather weird forms are parasitic on other animals.



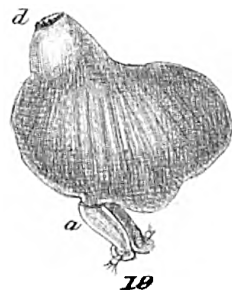


Despite their highly modified anatomy, Darwin could still match up the major parts of a barnacle with corresponding or *homologous* parts in other crustaceans.



When Darwin carefully dissected a tiny barnacle called *Cryptophialus*, which he'd collected in South America, he found that it was female. . . but an even tinier male (z) was attached to the female's body. Some specimens had as many as seven males attached. The largest females were a bit less than 2.5 mm long; the males were about 0.3 mm (300 microns).

These male *Cryptophialus* consisted of nothing but “testes, spermatozoa, and a wonderfully elongated probosciformed penis”. Yet at the attachment point, there are still traces of the larval antennae, which male *Cryptophialus* larvae, like all barnacle larvae, use to initiate attachment to a surface.



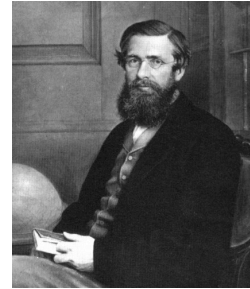
In another barnacle genus, *Scalpellum*, most species were hermaphrodites, but had attached dwarf males—Darwin called these “complemental males”. These males were also more complete, retaining most of the typical anatomy, and sometimes able to feed for themselves.



The Point?

- A strange or complex structure in one organism can often be linked with others through *functional intermediates*—species with “in-between” states.
 - Most barnacles: Hermaphrodites
 - Most *Scalpellum*: Hermaphrodites with “complemental” males
 - *Scalpellum ornatum*: Females with attached, reduced males
 - *Cryptophialus minutus* and others: Females with attached, highly reduced males
- These aren’t literal ancestors, but they show how a structure or state could possibly have evolved.

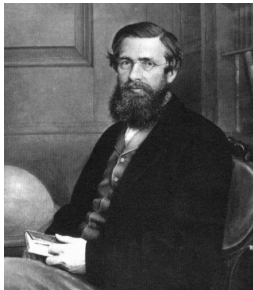
And then came the rude awakening. . .



In 1858, puttering away at a giant manuscript that would have explained all this in full detail, Darwin got a letter from this man — who had come up with the same idea independently (while in Malaysia, recuperating from a tropical fever).

Alfred Russel Wallace

(1823-1913)



- Professional collector from a poor background
- Hit upon ideas identical to Darwin’s while collecting beetles in Malaysia
- Wrote a famous letter to Darwin in 1858— which devastated Darwin, who thought he was about to be “scooped.”

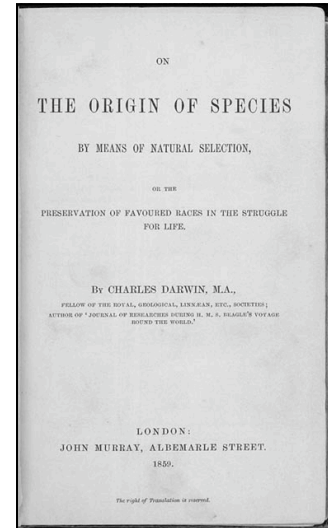
“I never saw a more striking coincidence. If Wallace had my M.S. [manuscript] sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as heads of my Chapters. . . So all my originality, whatever it may amount to, will be smashed.”

—Letter from Darwin to Charles Lyell, June 18, 1858



The Origin of Species

- Darwin's friends, including Lyell, brokered a compromise with Wallace.
 - Some modern writers have argued that Darwin and friends conspired to cheat Wallace out of his share of the credit. But Darwin had been working on evolution since 1837, and his "inner circle" of friends knew it.
- Both men presented outlines of their ideas in a jointly written paper, published in 1858.
- Darwin cut down the huge book he'd been writing to a more manageable length. . .



. . . and *On The Origin of Species By Means of Natural Selection* was published in December 1859, and rapidly became a best-seller.



Cartoon in *Punch* magazine, 1862

As you might expect, the public's reaction was rather strong. . .

Darwin hadn't actually said anything directly about human evolution, but it didn't take long for people to realize that evolution by natural selection had some very unflattering implications!

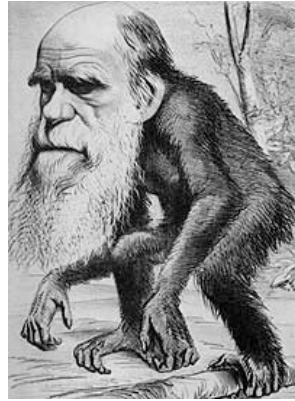


Cartoon in *The London Sketchbook*, 1874

And things *really* heated up when Darwin *did* publish his views on human evolution, in his books *The Descent of Man* (1871) and *The Expression of the Emotions in Man and Animals* (1872)!

“We must, however, acknowledge, as it seems to me, that man with all his noble qualities, with sympathy which feels for the most debased, with benevolence which extends not only to other men but to the humblest living creature, with his god-like intellect which has penetrated into the movements and constitution of the solar system—with all these exalted powers—Man still bears in his bodily frame the indelible stamp of his lowly origin.”

—*Descent of Man*, ch. 21 (1871)



Cartoon in *The Hornet* magazine, 1871

Descended from apes!
My dear, let us hope it is not true, but if it is, let us pray that it will not become generally known.

—supposedly a genuine quote from some Victorian lady, though its authenticity has been questioned



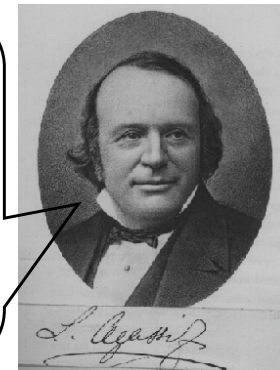
Darwin himself was too ill to defend his ideas in public speeches and debates and newspapers and such, but Thomas Henry Huxley (1825-1895) publicly promoted and defended “Darwinism” so actively that he became known as “Darwin’s Bulldog” (although privately he disagreed with Darwin about some of the details. . .)



Religious reactions varied. The Swiss-American scientist Louis Agassiz (1807-1873), carrying on the tradition of natural theology, opposed evolution for the rest of his life.

. . . all these facts in their natural connection proclaim aloud the One God, whom man may know, adore, and love; and Natural History must in good time become the analysis of the thoughts of the Creator of the Universe. . .

— “Essay on Classification” (1859)

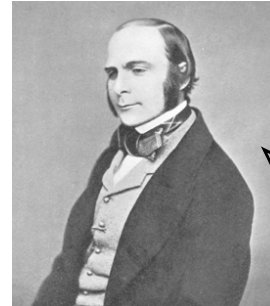


But the American botanist Asa Gray (1810-1888), a member of Darwin's "inner circle", accepted evolution but always believed that God directed it. . .



. . . the evolutionist may say with the apostle: "Howbeit that was not first which is spiritual, but that which is natural, and afterward that which is spiritual." Man, "formed of the dust of the ground," endowed with "the breath of life," "became a living soul." Is there any warrant for affirming that these processes were instantaneous?
— "Natural Science and Religion", 1880

Darwin's cousin Francis Galton (1822-1911), one of the founders of modern statistics, thought that humans should apply artificial selection to themselves to "improve the species"—an idea he called *eugenics*.



I have no patience with the hypothesis occasionally expressed . . . that babies are born pretty much alike, and that the sole agencies in creating differences between boy and boy, and man and man, are steady application and moral effort.
— *Hereditary Genius* (1869)



Soon after *The Origin of Species* was published, yet more evidence began to accumulate that supported *some* form of biological evolution. This included *Archaeopteryx*, found in Germany in 1862, that showed many reptilian skeletal traits, but also had impressions of feathers forming wings. . .

As Darwin's colleague the geologist Hugh Falconer pointed out, *Archaeopteryx's* strange blend of bird and "reptilian" features supported Darwin's ideas nicely.

. . . there has been this grand *Darwinian* case of the *Archaeopteryx* for you and me to have a long jaw about. Had the Solenhofen quarries been commissioned—by august command—to turn out a strange being à la Darwin—it could not have executed the behest more handsomely—than in the *Archaeopteryx*.
—Letter to Darwin, Jan. 3, 1863



There was also the discovery, in 1858 and 1859, in both England and northern France, of stone tools, clearly made by humans—but also definitely associated with the bones of extinct animal species, suggesting that humanity was older than anyone had suspected. . .



And even the discovery—first in 1844 in Gibraltar, then 1856 in the Neander River valley of Germany, and then at more and more places in Europe—of bones that looked human-like, but not entirely. The brows were too large, the skull vault was too long and low, the mid-face was too broad and projecting, and there was no chin. Could these be—
gasp! choke! —

human ancestors???