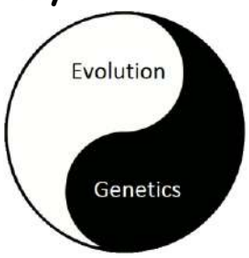
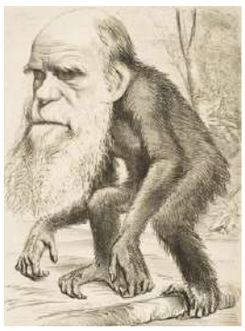
Chapter 1 So, what exactly, did Darwin and Lamarck really say?



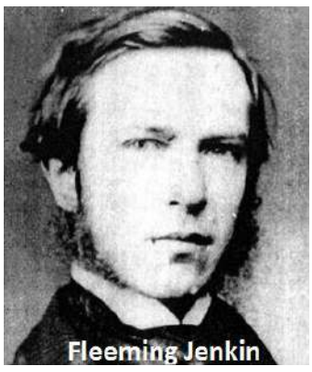
Historically and conceptually, modern Genetics and modern Evolutionary Theory are closely intertwined. Mendel and Darwin both published their masterpieces in the mid-1800s and both were promptly misunderstood, discarded and forgotten for almost half a century. Both were resurrected around the same time.



Darwin subscribed to a "blending theory" of inheritance by mistakenly believing in the inheritance of acquired characteristics including the "effects of use and disuse" That is correct; Darwin's theory of genetics, called "Pangenesis", is no different than what textbooks today would call "Lamarckism". Darwin shared Lamarck's belief that reproductive tissue somehow responded directly to environmental stimuli in order to generate adaptive changes in the next generation.

http://www.literature.org/authors/darwin-charles/the-origin-of-species/chapter-05.html

Historical irony is compounded further, upon consideration that Gregor Mendel, a (frustrated and perhaps sexually preoccupied?) celibate Catholic clergyman clearly recognized that sexual reproduction necessarily contradicted "blending inheritance". Consider the offspring of any couple; individuals of the next generation are decidedly masculine or feminine and not intermediate. (Please – No gratuitous Michael Jackson jokes! – Let the poor man rest in peace…). Accordingly, we are supposed to believe that Mendel' new laws should have been able to rescue Darwin's theory, had Darwin only known.



True, Mendel's cerebral work was theoretical and his convoluted purple prose almost incomprehensible. But, there was little chance that Mendel's principles, predicated on the peculiarities of pea plants would have ever been acknowledged "Scientific Law" at the time. Animal genetics (human genetics in particular) appeared to follow a different and non-particulate; in other words, decidedly non-Mendelian model. The offspring of African and European parents present a "mixed-race", i.e. apparently "blended" phenotype. Henry Charles Fleeming Jenkin (inventor of the cable-car) "conclusively" contradicted Darwin with a decidedly racist rebuttal – so egregiously racist in fact, that modern textbooks refrain from even whispering a mention of that nasty exchange. Darwin had already conceded that "blending inheritance" contradicted Natural Selection but was unable to resolve the discrepancy.

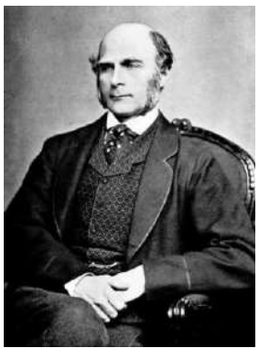
In correspondence with Wallace, Darwin himself appreciated that a correct and proper appreciation of genetics was required to rebut Fleeming Jenkin. Fleeming Jenkin rebuttal was premised on "Blending inheritance" which presumed that the mechanics of inheritance was the mixing of fluids from both the mother and the father.

... Suppose a white man to have been wrecked on an island inhabited by negroes.... Our shipwrecked hero would probably become king; he would kill a great many blacks in the struggle for existence; he would have a great many wives and children, while many of his subjects would live and die as bachelors.... Our white's qualities would certainly tend very much to preserve him to good old age, *and yet he would not suffice in any number of generations to turn his subjects' descendants white*.... In the first generation there will be some dozens of intelligent young mulattoes, much superior in average intelligence to the negroes. We might expect the throne for some generations to be occupied by a more or less yellow king; but can anyone believe that the whole island will gradually acquire a white, or even a yellow population ...?

Here is a case in which a variety was introduced, with far greater advantages than any sport every heard of, advantages tending to its preservation, and yet powerless to perpetuate the new variety.

- North British Review, June 1867, 46:277-318.

Darwin said that this objection gave him more trouble than any other. "Blending inheritance" indeed contradicts Natural Selection obliging Darwin to propose his alternative model of "particulate inheritance". Darwin suggested a hypothesis called Pangenesis, in which parts of the body emitted "gemmules" that accumulated via the circulatory system in the gonads. Heredity has something to do with "bloodlines".

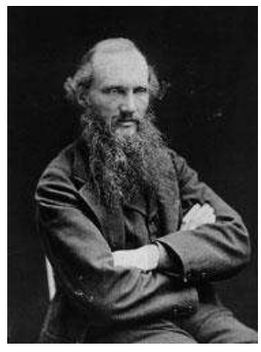


Francis Galton the great Victorian polymath (and Darwin's cousin) experimented with different lines of rabbits and determined that blood transfusions did not change their inheritance.
http://galton.org/hereditarian.html

Of course, not all organisms have circulatory systems, so Darwin invoked other means of transport were also possible such as simple diffusion, but clearly his theory was in trouble.

Modification of inherited characters as selected by natural selection would then require modification these gemmules. How were these gemmules to be modified? Darwin proposed that parental response to the environment impacted gemmules which were then passed on to the next generation. This is starting to sound a lot like what modern textbooks incorrectly call Lamarckism.

To make matters even worse, the great Lord Kelvin (in whose great honor a brand new temperature scale had been named) toppled the other pillar of Evolutionary Theory; namely "geological time". Shortly after Darwin's publication, Lord Kelvin calculated the age of Earth to be a mere 20 million to 400 million years. Our planet at some point was a molten sphere, which means it must still be relatively early in its process of cooling. Kelvin's calculations were indeed precise, but grossly inaccurate; as they failed to account for the heat generated by radioactive decay.

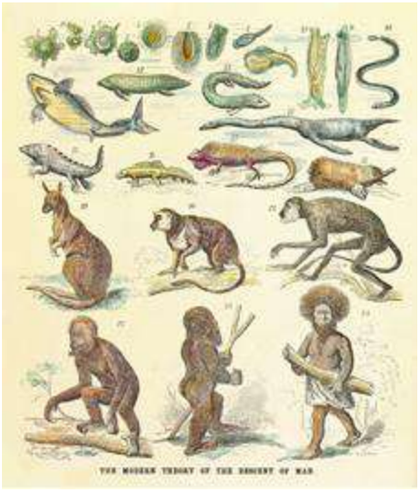


The inexorable accumulation of stable and heritable variability constituted one half of Darwin's great Theory. Natural Selection constituted the other. Darwin and his supporters knew Evolutionary Theory just had to be true. If Victorian English farmers can produce novel breeds of pigeons; then, Natural Selection can produce new species! The devil was in the details, requiring resolution by pursuing further scientific inquiry. The millstones of scientific progress sometimes grind slowly. Another fifty years were required before neo-Darwinism rose again like a phoenix.

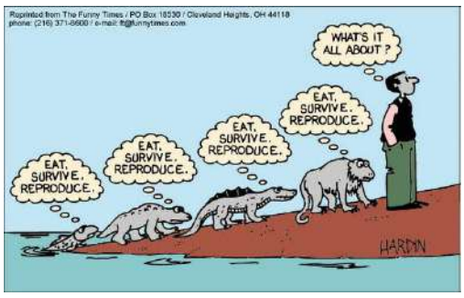
The specious Darwin vs. Lamarck dichotomy so often misrepresented in current textbooks is really a vestige of a much later Neo-Darwinism vs. Neo-Lamarckism debate that actually occurred latter in the 20th Century. Several historians,

including Stephen Jay Gould, have contended that modern textbooks unjustly deal Lamarck a bad rap. Not only did Jean-Baptiste Lamarck coin the new verb "evolve"; Lamarck was also the first naturalist brave enough to publicly conjecture that human beings had evolved from apes (Philosophie zoologique, 1809)

Lamarck believed that a change in an animal's habits eventually resulted in a change of heritable of characteristics; a response acquired through "effort" or "will". (Remember those hungry giraffes stretching their necks.) Étienne Geoffroy Saint-Hilaire (a colleague of Lamarck) took his line of reasoning one step further: Geoffroy Saint-Hilaire suggested heritable changes could also include more direct responses to the environment such as the inheritance of characteristics through use or disuse. At this point, vocabulary becomes confusing enough to require a flow chart: "Geoffroyism" and "Lamarckism" have both been subsumed into the compass of what Ernst Mayer would later call "soft inheritance". Regrettably, various versions of "soft inheritance", with all their disparate nuances and subtleties (including a conditional embrace of "Natural Selection") have since been incorrectly labeled as "Lamarckism" (more on that later).



Darwin's original "Pangenesis" in many ways resembles Lamarck's (and Geoffroy's) version of events. Darwin took for granted the now discredited idea of the "effects of use and disuse". Darwin however did part paths with Lamarck on one key point: Lamarck embraced metaphysics, by imagining evolution to be a goal-driven process or "teleological". Another name for this misconception textbooks often identify as "Lamarckism" often has another name: i.e. "Orthogenesis", a version of events espoused by many 19th Century Naturalists such as the celebrated Ernst Haeckel of "ontogeny recapitulates phylogeny" fame.



Darwin on the other hand recognized the capricious randomness of the natural order. According to Darwin, Evolution does not correspond to some specious "vector of progress", otherwise known as the "*Scala Naturae*" as espoused by Lamarck, Haeckel and many other Naturalists even as recently as Teilhard de Chardin in the 1950s.