LAMARCK

e7 Life's ramifying evolution from inanimate starting places < evolution, acquired characteristics, extinction a meaningless concept >

> And, striving to be man, the worm / Mounts though all the spires of form.
> — Ralph Waldo Emerson. *May-Day*.[1]

Jean-Baptiste Lamarck (***Figure e7.1***) in *Animaux sans Vertèbres* (Animals without backbones invertebrates), 1801, classified invertebrates. In *Philosophie zoologique* (Zoological Philosophy), 1809, he stated four supposed laws: "First: Life, by its proper forces, continually tends to increase the volume of every body which possesses it and to increase the size of its parts, up to a limit which it brings about. Second: The production of a new organ in an animal body results from the supervention of a new need which continues to make itself felt, and of a new movement which this need gives rise to and maintains. Third: The development of organs and their power of action are constantly in ratio to the employment of these organs. Fourth: Everything which has been acquired, impressed upon, or changed in the organization of individuals during the course of their life is preserved by generation and transmitted to the new individuals which have descended from those which have undergone those changes." [2]

The false principle that *functional* attributes acquired by ancestors can be passed on to descendants (Lamarck's 4th Law) has its appeal. This is because it can be confused with the true principle that *learned* behaviors (culture) *can* be passed on to the offspring. The proverb: *Habits form as second nature*, expresses the common knowledge that a changing or a changed environment results in the appearance of new norms. Organisms cope and, Lamarck opined, pass on adaptations of their habits *and* (what is not true) their physical change to their offspring. With this (false) view he could ignore an already proposed (partially correct) theory of evolution based on successive, fortuitous mutations within species in *Vénus Physique*, 1751, by Pierre de Maupertuis (1698-1759)[3] and disagree with Buffon's (correct) claim that environmental change can cause some organisms to go extinct.

To his credit, Lamarck was instrumental in modernizing the concept of a museum. At the founding of the Museum of Natural History in Paris in 1793, he argued that collections "ought to be arranged in a methodical or properly systematic order" (rather than be merely for the display of curiosities collected by well-meaning amateurs,[4] as was for example the first natural history museum in the United States founded, as a combination of freak show, school, and art gallery, by portraitist Charles Wilson Peal and opened in Philadelphia in 1786). At the Paris museum, Lamarck's enlightenment was that *fossil* organisms can be compared to *living* organisms in a systematic way that indicates relatedness and evolution. He also recognized that the type of fossil in a deposit could by comparison to living forms indicate the environment in which it had lived. His book *Zoological Philosophy* supports a view of life arranged in its diversity from simple to complex as forms on a scale of being up which an evolutionary force continually propels the forms.[5] At any time, all positions on this scale are not occupied. Misfortunes can cause gaps. But these will fill from below as life evolves continuously from inorganic materials. This scheme denies the finality of extinctions and also any obvious use of fossils as time markers.

The idea of an innate force that "tends to incessantly complicate organization" and so propels ongoing evolution of organisms, is a great advance over the Aristotle's static *Scala Naturae*. This 18th century Enlightenment idea was not original to Lamarck but to it he added the caveat that evolution may be laterally forced aside from its upward progress by adaptations leading to novel lineages. These, lead away from the stock type at landings on the scale's ramp when organs that are improved by repeated use or weakened by disuse, "are preserved by reproduction to the new individuals which arise." Thus most organisms at any time will be found on landings at some far

remove from the generalized type which can evolve up the evolutionary scale. Happenstances that lead to the appearance of forms do not necessarily repeat. Specialized creatures cannot advance to higher levels. Individuals, their group, and groups to which they belong, can prosper and change or dwindle and die on the landings upon which they wander. Their death implies extinction no more than does the die off of a colony of people imply the extinction of humankind. Their like, in terms of their specializations, may never appear again, however.

The long neck of the giraffe was explained by Lamarck, without the picture book illustration (an embellishment made by others to poke fun (***Figure e7.2***) and which since, ludicrously, has become an icon), as acquired by quadruped animals that in their lives stretch their necks to browse as high as they can strain. Giraffe offspring, continuing this feeding strategy, begin with the habitually elongated neck of their parents as an inherited advantage.

In 1815, Lamarck described his primary-linear force that propels life's evolution from simple to complex as operating in two separate series. The one sequence begins with single celled animals (*infunsorians*), the other with internal worms (*vers*). The series that begins with internal worms requires that the appropriate environment (*l'influence des circonstances*) is there that allows for the spontaneous generation of these.[6] Thus, Lamarck does not see his opportunistic-lateral force as operating to divide the flow of evolution into two branches. In this new description of the organization of life, the quest to discern the influencing circumstances takes precedence, in Lamarck's mind, over the supposed de facto, and so less interesting, force that propels evolution in each. The interest is there because, while the influencing circumstances that determine series and subseries are not predictable from simple theory, they are discoverable. Lamarck was therefore unfazed to learn that "*Dens sa production des differents animaux, la nature n'a pas executé une série unique et simple*. (In its production of the different animals, nature has not fashioned a single and simple series.)" Thenceforward, *l'influence des circonstances* was seen for its additional role to provide at different levels the fertile ground for ramifications. Microscopic life, as illustrated for maturing fleas and lice by Hooke in his *Micrographia*, 1665, does not originate by spontaneous generation but from an egg and *epigenesis* (the addition and growth of functioning organs one after another)—contradicting *preformation* (the unfolding and growth of features present in the egg at the outset). Thereby did microscopy begin the process of laying to rest the Aristotelian notion that flies, worms, and other small animals originate spontaneously from putrefying matter, and Baptista van Helmont's (1577-1644?) fanciful claim that he had seen rats "originate" in bran and old rags. Two thousand years of Aristotelian orthodoxy was that insects have no internal organs. That ended when pioneer microscopist Jan Swammerdam (1637-1680) exclaimed "How then can we avoid crying out, O God of miracles!" upon discovering evidence of ovaries which meant insects grow from eggs laid by a female of the same species.[7] A thousand times smaller than fleas are animacules first seen by Leeuwenhoek in a drop of canal water (beginning October 9, 1678, he reported his observations to the Royal Society of London for Improving Natural Knowledge, founded in 1660).[8] As a draper who used a low-power magnifying glass to inspect the quality of cloth, he had thought to devised a microscope with a single lens that he hand-ground from a glass globule. The best lenses he made had a linear magnifying power of 500 and a resolving power of one-millionth of a meter. To his amazement this had brought into view otherwise invisible "living creatures," as spermatozoa and bacteria that he saw occur in multitudes of fully formed individuals, each species with distinguishing organs needed for its life. He could find no reason to doubt that each reproduced after its kind and was the offspring of a living predecessor. In 1692, Nicolaas Hartsoeker drew what he erroneously saw through his microscope: a human sperm containing in its head a homunculus [9] (a perfectly formed little person), which image, a hundred years later, allowed Rabbi Pinhas Elijah's ejaculation: "Male masturbation is wrong as it destroys little persons!"—a thought leavened by Talula Bankhead's reason for naming her pet parrot *Onan*: "He doth spilleth his seed upon the ground."

So spontaneous generation, Lamarck heterodoxly proposed, must occur at many *sub*microscopic levels where the situation is right for it. Life, an organizing and invigorating fluid, is distributed everywhere throughout Earth. The evolved organic levels, locked in, have become timeless. In the act of fertilization, life's vapor penetrates the not yet alive embryo. "If the small mass in question is

gelatinous, it will be animal life [***Footnote e7.1***] that is established in it; but if it is simply mucilaginous, then vegetable life only will be able to exist in it." Just so.

We would be wrong to read Lamarck's classification chart of animal groups (***Figure e7.3***), as merely indicating branching evolution of animals through time. He didn't.

Ramifications in the primary series are subseries ladders. The footing of these are where spontaneous creation can continually bring into being the type organism. For each, co-evolving life and environment provide the circumstance. By the influence of a changing, or changed environment, or habit, and "thereafter by that of habit on the state of the parts and even on organization, the structure and organization of any animal may undergo modifications, possibly very great, and capable of accounting for the actual condition in which all animals are found." The *thereafter* is the principle difference between Lamarck's conceptual scheme and the one that Darwin would later come to describe for essentially the same data. Lamarck's ramifications of series are *not* the simple branches of a Darwinian evolutionary bush. ❑

Footnote e7.1 In 1820, Lamarck included in a treatise on psychology a chapter on the classification of animals. In this, he proposes that all animals stem from a yet to be found, continuously being generated, submicroscopic, common ancestor that he called a *monad*.

Figure e7.1 [10] Jean-Baptiste-Pierre-Antoine de Monet, chevalier (citoyen after 1800) de **Lamarck** (1744-1829). The originality of Lamarck's early work was recognized by Buffon who first employed Lamarck to tutor and travel with his son and later secured him a starting position in 1781 as an assistant in the botanical department of (what is now) the Muséum national d'Histoire naturelle in Paris.

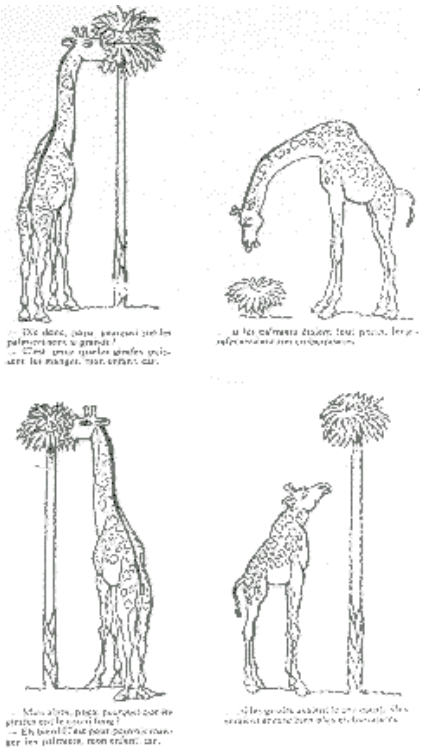
> It is quite enough to believe that man possesses an immortal soul; there is no occasion for us to study the seat and limits of this soul in the individual body, nor its connection with the phenomena of organization: all that we can ever say on this subject is baseless and purely imaginary. [*C'est magnifique, mais ce n'est pas de la science*.]
>
> If we are studying nature she alone should occupy our attention; and we should confine ourselves exclusively to the examination of the facts which she presents, in our endeavour to discover the physical laws which control the production of these facts; lastly, we ought never to introduce into our theories any subjects that are outside nature, and about which we shall never be able to know anything.
>
> —*Lamarck* (translated from the original French by Hugh Elliot in 1914).[11]

Lamarck's "theory" that functional attributes acquired by ancestors can be passed on to descendants, has found no proof.

Lamarck's only reference to giraffes is in his *Zoological Philosophy*, 1809. The full text, (translated by Hugh Elliot), is:

> It is interesting to observe the result of habit in the peculiar shape and size of the giraffe (*Uamelo-pardalis*): this animal, the largest of, the mammals, is known to live in the interior of Africa in places where, the soil is nearly always arid and barren [not true], so that it is obliged to browse, on the leaves of trees and to make constant efforts to reach them. From this habit long maintained in all its race, it has resulted that, the animal's forelegs have become longer [in fact, they are shorter, the shoulder hump is muscle] than its hindlegs, and that, its neck is lengthened to such a degree that the giraffe, without standing, up on its hindlegs, attains a height of six metres (nearly 20 feet).

Figure e7.2 A caricature by Caran d'Ache (pseudonym of Emmanuel Poiré, 1858-1909).[12]



— Dis donc, papa, pourque les palmiers sont si grands?
— C'est pour queles girafes puissent les manger, mon enfant, car.

. . . si les palmiers étaient tout petits, girafes seraient tres embarrassces.

—Say, dad, why are the palms so tall?
—It is so that the giraffes can eat them, my child, for if.

. . . the palm branched low, the giraffes would be very put out.

— Mais alors, papa, pourquoi que les girafes ont le cou si long
— Eh bien! C'est pour pouvoir manger les palmiers, mon enfant, car.

. . . si les girafes avaient le cou court, elles seraient encore bien plus embarrassces.

—But then, dad, why do giraffes have such a long neck?
—Eh well! It is in order to eat the palms, my child, for if.

. . . the giraffes had a short neck, they would again be most put out.

Figure e7.3 Lamarck's 1815 schemata showing ramifications of life in its descent from continually emerging simple forms and which he reasoned is ongoing.

In Lamarck's scheme, species originate continuously by spontaneous generation from inanimate matter and then move gradually to ever greater perfection "up" (down in the diagram) the two chains of being from a) worms to ungulculate (clawed or nail bearing) mammals and b) from infunsorians (protozoa) to radians (echinoderms).

The idea of species extinctions has no meaning, as gaps in the scale of being simply fill up from below. However, adapted-forms of a species may and have (as the fossil record shows) become discontinued.[13]

The bifurcations are due to the influence of alternative environments.