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THE MEANING OF NATURAL HISTORY IN OUR TIME

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The Origin of a Peculiar Term

In the voluminous writings about plants and animals by western peoples as far back as Aristotle (-384 to -322), there is much that seems strikingly familiar. This arises from the tendency to treat the lives of non-human organisms as interesting and important in their own right. Once we get beyond the old style of expression, we find that Aristotle speaks to us today because he wants to know the kinds of things that want to know. A serious pleasure in the contemplation of nature is probably universal in humans, but a literature rooted in confirmable facts has very definite, restricted cultural roots. Nothing comparable is found outside of the western tradition until quite recent times. This tendency, plainly present in classical antiquity and revived with the european Renaissance, is known as natural history.

It is an odd term. In classical Greek and Latin, a *history* was an orderly discourse on any learned subject of the real world. Aristotle's *History of Animals*, for example, is the core of his zoological writings, in which he described the various animals that he knew and how they lived. In time, "history" came to be restricted to the meaning we know today, a treatise on the human past, while other areas of inquiry took on terms of their own. Outside of its core modern meaning, "history" now exists in our vocabulary only in the centuries-old term *natural history*, a practitioner of which is a *naturalist*.

Even so, the realm of natural history has not remained constant throughout its many centuries. In the beginning it covered almost everything outside of civilized humanity and its works, including such things as the motion of the seas, the formation of rocks, the medicinal uses of plants, and the lifeways of "savage" peoples. In his *Natural and Social History of the Indies*, first published in 1590, the early Spanish chronicler José de Acosta aimed for a comprehensive treatment of all that was known of the New World at that time in both the natural and human realms. Francis Bacon, writing in the early 17th century, conceived of natural history in a similarly all-encompassing way. As a fair approximation, its scope then was that of the natural sciences today.

However, by the time of the first major treatise on the subject in English, Gilbert White's *The Natural History and Antiquities of Selborne* of 1789, we already find a narrowing of concept. It bears mention that part of the great charm of White's book -- it continues in print today in several editions -- derives from his treatment of Selborne in the manner of a foreign traveler, so that his approach to his native village was not very different from Acosta's in treating the exotic localities of Central America.

The High Tide of Natural History

White was writing at the interface between two eras, the Enlightenment and the Romantic period, in which natural history enjoyed considerable prestige. It was a fashionable activity for educated people, and many saw it as the key to understanding the deeper mysteries of the world. It is no exaggeration that during this time natural history contributed very substantially to a radical re-organization of ideas about the form and workings of the non-human world. Its fashion and impact are seen in its penetration of art and literature, for which it was a source of powerful images. The Romantic poet Samuel Taylor Coleridge, for one, showed a keen interest in science and made frequent allusions to new findings in his verse. Whitaker (1995) speaks of a "culture of curiosity" that prevailed especially in Britain at the time, in which a truly accomplished person was expected to turn his mind to "the rare, novel, surprising, and outstanding in all spheres of life."

It was a time when the Georges Louis Buffon (1750-1804) and his immediate successors could compile a massive, 44-volume encyclopedia of nature that was not just economically viable but regarded as required reading for educated Europeans.

This high tide came in part through two kinds of discoveries that greatly expanded the subject and invested it with new excitement. The period of european exploration brought great numbers of strange new species into view, especially from the New World. The prestige of natural history was such that it became almost standard on English and French surveying voyages to include a naturalist, whose business it was to bring back large quantities of data and specimens. And such naturalists were by no means unheard of on board the vessels of other European nations. The development of national museums grew alongside the practice of exploration. These mutually reïnforcing tendencies are nicely illustrated in the life of Joseph Banks (1743-1820), the naturalist on James Cook's first Pacific voyage who went on to become director of the Royal Botanic Gardens at Kew.

Another new world was that of the minute, exposed to view through the microscope in the 17th century. In addition, the expanding study of fossils opened the distant past to scholarly contemplation for the first time.

Together, these new dimensions proffered the possibility of limitless new discoveries to those with the leisure to pursue them. Because natural history was at that time conceived in large part as a religious activity -- the understanding of God through his works -- it gained strength from the tacit belief that the facts of where and how organisms live could not possibly be trivial or irrelevant.

Although studies of rocks and soils have never formally lost their membership, they have become increasingly marginalized from the core of natural history, so that today the term is used almost entirely with reference to the living world.

The Transformation of Natural History

Just who were these naturalists of the 17th, 18th and 19th centuries? With a very few outstanding exceptions, the more influential of them were men. But not just any men – gentlemen. Unlike today, when this term is applied loosely to any man who dresses acceptably, is kind to small animals and is never unintentionally rude in public, a gentleman in earlier times had visible means of support, yet did not work with his hands or engage in trade. While few naturalists were as high-born, connected and rich as Banks, they were educated and removed from unseemly labour. For example, R.A.F. de Réaumur (1683-1754), like Banks, was a landed aristocrat; Gilbert White (1720-1793) was a country parson; Jean-Baptiste de Lamarck (1744-1829) was a museum curator; Charles Darwin (1809-1882) was wealthy by inheritance and investments; Jean-Henri Fabre (1823-1915) was a school teacher.

Even as its scientific reputation flourished, natural history was seen as accessible and egalitarian, a relatively democratic branch of science (Drouin & Bensaude-Vincent 1995). It was only to be expected, then, that as literacy became more widespread in the 19th century, the number of active naturalists increased, and the social strata from which they were drawn became more varied. This strengthened and enriched amateur natural history, especially in Britain, as evidenced by the appearance of a great many naturalists' societies. Some of these had only a fleeting existence, while others -- including the Trinidad & Tobago Field Naturalists' Club, a direct manifestation of the British amateur natural-history tradition -- have persisted for a century or more. This tradition was (and is) strongest in England and Scotland, with France in a strong second place, and a respectable presence in the rest of northern Europe and in North America.

The professionalization of the life sciences during the second half of the 19th century and the broadening of approaches throughout the 20th century brought further changes to the meaning of our peculiar term. When the term *biology* was introduced around the start of the 19th century, it was hardly

distinct from natural history, but this did not remain so. The close, microscopic examination of body form and the analysis of function gave rise to new disciplines within biology, associated with a shift from unconstrained observation to a more experimental approach. These were less and less conceived as part of natural history, which was seen in relation to the whole, living organism in a more or less natural state.

However, subsequent shifts in the scope and perspective of biology introduced a sharp change in natural history's roles in the scientific enterprise. Biology expanded in new directions that proved extremely successful. Ecology became much more mathematized and gave rise to the ecosystems approach, which left little room for focus on single organisms or even single species, the mainstay of natural history. In about the same period, genetics became a mature discipline with strong predictive powers. And, together with biochemistry, genetics gave rise to molecular biology, the biology of DNA.

Biochemistry and molecular biology are firmly in the reductionist tendency, born of the belief that the best way to understand any system is to investigate its components at the next lower level. The great confidence of the reductionist approach is seen in Erwin Schrödinger's *What is Life?*. This noted physicist believed he could contribute very substantially to this most fundamental puzzle through his background in the study of the most fundamental matter. The general verdict of a later generation is that the attempt was largely unsuccessful, but Schrödinger's optimism remains rather thrilling, and the book continues in print.

None of these 20th-century developments had much effect on the makeup of natural history, but they did strongly affect its place and prestige within science. The very power of the new disciplines called into question the relevance of the naturalist approach to problems of interest and brought on a marked crisis of confidence. With molecular biology going from success to striking success almost daily in the 1960s (a time of great excitement in this field), for example, could one really take seriously the patient observation of where a particular animal lives, its breeding season, how it makes its nest, and what it eats? Increasingly, natural history was regarded with scant respect, and already by 1950 "naturalist" had become synonymous to many with "dabbler" or "dilettante" (Bates 1950), one who appreciated nature without rigour.

From about the 1970s, we have seen a laudable reaction against this tendency to regard natural history as a trivial pursuit, with some of our time's leading scientists openly proclaiming their belief in its continued relevance and importance. Most strikingly, Edward O. Wilson titled his autobiography simply *Naturalist* as a deliberate point of propaganda.

In Our Time

A measure of natural history's disrepute during much of the 20th century is seen in the frequency with which biologists justified their study of this or that species as a suitable "model organism" or even "model system" for some general problem. This represents a very different way of looking at organisms from the older, naturalist view, and there is much to be said for it. As an example, *Drosophila melanogaster*, first put to work in Thomas Hunt Morgan's lab in 1908, was the workhorse for a generation of geneticists who were little interested in the fly itself. Rather, it was a good species to study because it could be bred in large numbers in the lab, had a short generation time, and its genome was reliably reflected in the phenotype. They did not especially care to visit *Drosophila* at home, meet its husband and kids, and learn about its daily life, and they may not even have wondered what it ate or whether it ever slept. Much the same could be said of the bacterium *Escherichia coli*, the mainstay of a later generation of geneticists.

This attitude, so starkly at variance with that of the naturalist, quickly came to be taken for granted in the realms of biochemistry and molecular biology. Who among you can tell me, for example, whose DNA was used in working out the general structure of the molecule in 1953? It must be on record (e.g. Watson 1968), but I confess that I have never bothered to take note of it. The universal assumption all along was that any species would do.

Still, the model organism/system way of looking at plants and animals -- and, now, microörganisms -- often has a distinctly shame-faced aspect to it. I have heard it explicitly expressed hundreds of times, mostly by young scientists eager to show their modernity. In some cases such a rationale is perfectly reasonable and sincere, as noted above, but I have learned to be on my guard when a special point is made of it. To come to the point, I am convinced that a great many claims to be studying a model organism/system are nothing but a shield against any accusation of amateurism, of an interest in the organism for itself.

The success of the model approach is closely tied with scientific reductionism, the power of which is long since beyond doubt. Still, it is not and cannot be the whole of biology.

The bedrock of natural history at all times has been an unapologetic interest in wild organisms in themselves. Wilson (1984) has set forth the thesis that humans have a natural affinity for other kinds of organisms, especially animals, a tendency that he calls *biophilia*. Wilson's thesis will certainly resonate strongly with regular readers of this journal, most of whom may consider it self-evident. What bears emphasis is that it is the fuel that runs most of biology, not just that practised by scientists who are happy to be known as naturalists.

Let me note an argument for the relevance of natural history that seems to me quite misplaced. It is illustrated in the statements by Arnold (2003) that "Natural history today lives in the bustling enterprises of its descendant disciplines" and Jaksic (1999) that "Natural history, the source of ecology, evolutionary biology, ethology and biogeography, among others, has become fragmented in a process that is at once irrevocable and full of promise." In this view, natural history can never die as long as at least some of its descendants remain active, and Jaksic goes on to conclude that conservation biology is the present-day discipline that most faithfully preserves the spirit of natural history. It is a respectable argument, but not one that I share. Any discipline that is altered beyond recognition is no longer with us, and we should not pretend otherwise.

The Coming Period

It is time to address directly the title question of this essay. What, if any, is the place of mainstream, even frankly old-fashioned natural history in today's science? Clearly, it no longer occupies the central position it once did. This should not cause either nostalgia or anguish. While natural history is no longer adequate in itself for the understanding of grand questions, we can readily reject any suggestion that it has fallen to a pointless contemplation.

The first and only grand unifying theory of life, evolution by natural selection -- which continues to form the foundation of all of modern biology -- was very much a part of natural history. One reason for its early success was that it made very good sense to experienced naturalists. In the succeeding 140-some years the situation has not changed nearly as much as some would have us believe.

Now and for the foreseeable future, a close, personal understanding of organisms in nature forms the basis for the more fashionable hypothesis-testing biology at the whole-organism and population levels, and for good reason. As plainly seen in the title of Nobel laureate Nikolaas Tinbergen's *Curious Naturalists*, a striking feature of the best biologists at these levels is an inexhaustible curiosity about the lives of organisms. The application of this curiosity gives rise to a huge fund of knowledge, which in turn forms the basis for conjectures, hypotheses, and good judgement.

The core subject matter of natural history today is what it was in antiquity: Adaptation, or questions of survival and reproduction at the whole-organism level. It is terribly impressive how organisms are so well fitted in form and function to their environments, and the switch from divine design to natural selection as the general causal explanation of this fit does not lessen our admiration. Biology is the struggle to

understand adaptation at all levels. It is this, along with the biophilic tendency, that accounts for the robust continuity of natural history.

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