From understanding to action - the consequences of how we label nature

A recent popular science book on the history of taxonomy (Naming Nature: The Clash Between Instinct and Science *by Carol Kaesuk Yoon) portrays modern evolutionary biology as the enemy of natural history.*

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Trusting our umwelts?

In *Naming Nature*, the author expresses a sentiment that conservationists will share and applaud: that there is an urgent need to engage more people with nature. However, she lays the responsibility for any lack of engagement squarely at the door of science. What could have been a lively account of the history of naming nature is re-packaged as a call to reject scientific taxonomy. The narrative is well-crafted and entertaining but the message potentially damaging for biodiversity conservation. Taxonomy is the science of grouping and naming organism. Scientific naming or nomenclature has to follow which ever taxonomy is used and does not exist independently. Conversely, common or vernacular names are independent of scientific taxonomies.

Yoon, the author, maintains that:

- Scientism means we leave grouping and naming nature to scientists; "we don't remember that there is any valid way, other than science, to determine what a living thing is or is not."

- Science is not necessarily the best or only way to order nature as "there is so much more to ordering life than science."

- We have the innate ability to order nature ourselves – our 'umwelt' (what ethologists describe as how organisms perceive the world around them) – as demonstrated by studies of brain-damaged patients who have lost this ability.

- Science battles against our umwelts because science is objective and our umwelts are subjective.

- Taxonomy by the 1950s "was entirely the territory, the sole property, of the professional taxonomists". Today it is only done by scientists in genetics laboratories and excludes amateurs - in contrast to the 19th century hey day of natural history.

Therefore, she concludes, science is undermining our engagement with nature because ordinary people's umwelts are ignored and they cannot take part in grouping and naming plants and animals. Or as Yoon with rhetorical flourish puts it, scientists have killed fish, common sense tells us there are fish, so we should demand them back.

This is a reference to the hotly contested late 1970s and 1980s debate between groups of taxonomists, known as cladists (favouring grouping by common ancestry), pheneticists (grouping by physical similarities, often visual i.e. morphological but also chemical, anatomical, ecological etc; 'phenetic = 'appearance' in Greek), and traditionalists (who tried to balance both methods). All three methods use morphological, molecular, chemical, cytological (e.g. chromosome number) and other characters. It is not a case of DNA taxonomy against the rest.

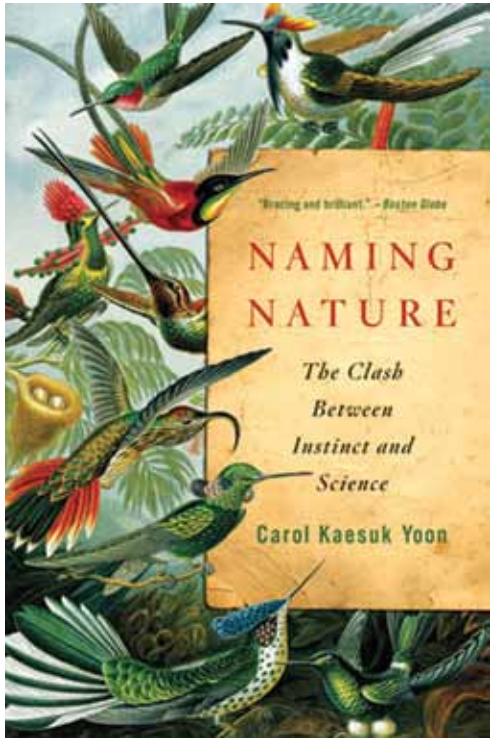
Phenetic similarity and recency of common ancestry (or branching order) do not always coincide, i.e. similar-looking organisms are not necessarily closely related. This happens because lineages evolve at different rates. 'Fish' as a natural group does not exist, where a natural group means a group whose members are closer cousins to one another than they are to non-members of the group. The natural group to which humans and cows belong includes lungfish but not sharks or tuna. This isn't to say that humans are descended from lungfish; we share a common ancestor. Yoon argues that common sense recognises 'fish', including lungfish, sharks and other aquatic vertebrates because they all look like fish.

The traditionalists are championed by Yoon, their umwelts explaining their resistance to the more objective numerical and cladistic (now called phylogenetic) methods. However, there is no account of the reasons provided by these biologists themselves for their resistance; so no first-hand evidence is provided supporting Yoon's umwelt theory. It does look rather like Yoon imposed her umwelt concept on historical events to satisfy her present-day ontological pre-judgement.

Folk taxonomies and common names – the pros and cons

This book's solution for engaging people with nature is getting fish back by re-claiming our folk taxonomies and common names and, presumably, therefore also either rejecting scientific taxonomies and nomenclature or relegating these to the 'experts only' side-lines. There are several problems with this argument, as discussed below.

As fascinating, and as culturally valuable folk taxonomies are, is Yoon seriously saying that Rondelet's 1555 classification of fish into "flat and compressed fishes"; "those that dwell among the rocks"; "little fishes"; and "fishes that are almost round" is preferable to having no 'fish' because lungfish are not fish? People use groupings that they can relate to in their time and place, but these still need to be based on sound theories of knowledge or will lead us wildly astray. They both reflect and direct our thinking. Scientific taxonomy underpins all biodiversity conservation effort because scientific names go with taxonomies and provide the order we need to then describe what we have got, where it is and what threats it faces. Ordering is a prerequisite to protecting.



We may have a sense of innate order in nature but this is to suit *our* purposes. Most folk taxonomies are about the use of plants or animals by humans. Modern phylogenetic groups are liberating as they value nature *on its own terms*. Our common sense grouping of lungfish with fish is nostalgia for a more anthropomorphic-centred view of life.

Folk taxonomies and common names co-exist with scientific groupings. Lungfish are both 'fish' in the popular sense, 'not-fish' in the scientific taxonomic sense, and may well become something else if future research displaces our present understanding. In the meantime, there is no need for one system to replace the other as this books advocates and it is essential that scientific ordering is recognised, used and valued by the general public.

Many of my students comment to me that they are fascinated by counter-intuitive relationships such as lungfish and mammals sharing a common ancestor and these facts engage them to want to learn more about nature, not less! As Dennett (1995) put it "how can increased understanding [of organism relationships] diminish their value in our eyes?"

Yoon stresses at the start of her book that as a PhD biologist she could be expected to be biased in favour of science; and implies therefore that her views contra scientific taxonomy are more credible. This is naïve because her own conception of science – as an objective, exclusive laboratory club – still influences her arguments heavily, creating a false dichotomy between science and natural history.

Scientists are part of the process of doing science, so it cannot be free of some level of subjectivity. Phylogenetics involves subjective decisions, such as scoring peaks by eye in DNA sequence data. Taxonomies are not objective pigeon holes but developing hypotheses. Conversely, naturalists aim at objectivity in their meticulous empirical observations and would not recognise Yoon's vague sensual view of doing natural history. Her description of the meditative moth man identifying specimens as if by black magic betrays her outsider's perspective – a taxonomist would know how much systematic thinking and scientific rigour was going on as he examines

a specimen. It may appear subjective and mystical but it is most definitely not. Her account of Darwin's barnacle work leaves the impression that she believes species are too variable to recognise so groups are always arbitrary, when the basic skill of a taxonomist and scientist like Darwin is to distinguish informative diagnostic characters from the rest.

Science and society – going deeper to see the relationships

Science is not as objective, nor natural history as subjective, as this book portrays. A polarised distinction, of course, supports the author's central umwelt-v-science thesis, and again it looks like this bias has dictated the presentation of the story.

The late 19th century naturalists heyday and twentieth century decline is also misleading. As Farber (2000)[1] stresses, a fashion for fern cabinets and museum visits did not equate to serious amateur taxonomy or any concern for nature and its protection.

If you look at the actual numbers, for example using Botanical Society of the British Isles (BSBI) membership as a proxy for *serious* naturalist participation, people actually identifying plants and writing floras, this hey day myth is revealed: BSBI (originally the Botanical Society of London then the Botanical Exchange Club) was founded in 1836 and had less than 100 members (mostly male, schoolmasters, GPs and vicars[2]) throughout the 19th century; by the 1990s, it had over 3000 members from a range of social backgrounds. More botanical recording goes on now than ever before. The heyday of opportunities for *everyone* to engage with nature is the 21st century. Keeble-Martin's flora sold over one million copies in the late 1960s; by the 2000s public participation projects like the Woodland Trust's Phenology Project and the Open University's OPAL Project were engaging thousands of new nature lovers, particularly by using website fora. Any scientist in our few remaining universities doing taxonomic research would weep to have access to the £12m funding that OPAL enjoys! There has always been, and still is, taxonomy going on outside of labs and professionals have long worked in successful partnership with amateurs.[3] There is still a role for amateurs doing detailed morphological, anatomical and ecological work. Whether people choose to take up these opportunities to do taxonomy is another issue. The decline since the 1950s has been of specialist expert taxonomists (both amateur and professional) not in public participation in natural history. Public participation projects, while great for many reasons, are unlikely to produce dedicated experts.[4] By contrast a taxonomy training apprenticeship like the *Natural Talent* scheme run by BTCV and partners in Scotland will hopefully produce some future experts – but much depends on whether those involved are able to devote the time required. 39% of amateur naturalist society members are over 65 and 70% are male (as found by a recent Natural History Museum survey) probably because it takes so much time (and obsession) to do natural history seriously. Perhaps younger people are not so bothered about knowing the names of things, but names are still a fundamental reference point to describe features of an organism's biology, ecology, and cultural associations. Names are the basic starting point for knowledge. So those who *only* appreciate nature in an aesthetic sense, and who do not want to know more, are not naturalists in the sense I am writing about here.

The author's status as a scientist, and the *New Scientist's* award of 'best book of the year' means that readers are likely to rely on the book's arguments as authoritative and, even, as one journalist reviewer announced, "revolutionary". This is worrying because although the author dismisses creationism, paradoxically, her book provides an argument for creationists to claim that evolutionary biology is damaging biodiversity conservation – a point raised by several other reviewers.[5]

This book is a missed opportunity to produce an accessible account of the history of taxonomy. The umwelt story is interesting but unhelpfully polarises science and society. Above all, this book is misleading about scientific taxonomy at a time when it needs more public recognition, not less, if plants and animals are to be conserved worldwide.

References and notes

1. Farber P.L. (2000) *Finding Order in Nature. The Naturalist Tradition from Linnaeus to E.O. Wilson*. John Hopkins Introductory Studies in the History of Science. John Hopkins University Press, Baltimore.
2. Allen D.E. (1986) *The Botanists. A History of the Botanical Society of the British Isles through 150 Years.* St Pauls Bibliographies, London.
3. This was highlighted as a particular reason for the success of British natural history and taxonomy in the twentieth century by Allen D.E. (1976) *The Naturalist in Britain. A Social History.* Penguin Books, London.
4. For the natural history society survey see http://www.opalexplorenature.org/sites/default/files/7/file/Can%20the%20female%20of%20the%20species%20save%20nature%20groups.pdf
5. A staggering 44% of Americans deny evolution (Gallup survey figures for 2008 cited in Dawkins (2009) *The Greatest Show on Earth*. Black Swan Transworld Publishers, London). A review by a leading American taxonomist also makes this point – see http://www.the-scientist.com/news/display/55880/

- Yoon, K.Y (2009) *Naming Nature.The Clash Between Instinct and Science*, W.W. Norton

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