



**Acta Botanica  
Mexicana**

## Book review/Reseña de libro

# The Advent of PhyloCode: The Continuing Evolution of Biological Nomenclature

Aixa O. Rivero-Guerra<sup>1,2</sup> 

### Editorial sheet

Title: The Advent of PhyloCode: The Continuing Evolution of Biological Nomenclature.

Autor: Michel Laurin.

Publication: 3 August 2023.

Editorial: CRC Press (Boca Raton, FL).

Number of pages: xv + 209.

Number de figures: 32.

Number of species treated: Not applicable

New species for science: 0.

ISBN: 978-0-367-55288-6 (hbk)

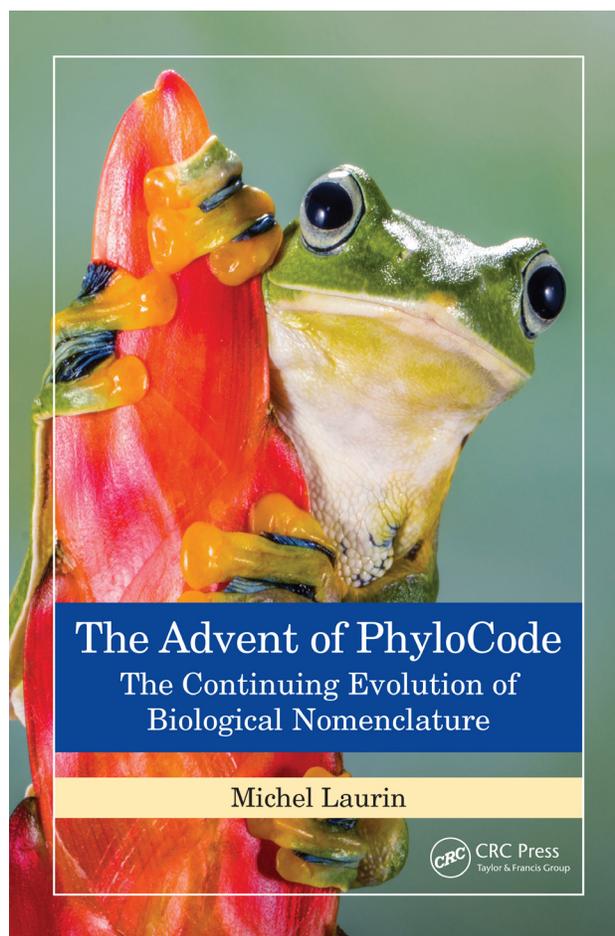
ISBN: 978-0-367-55210-7 (pbk)

ISBN: 978-1-003-09282-7 (ebk)

Costo: \$US 102

More information:

<https://www.taylorfrancis.com/books/mono/10.1201/9781003092827/advent-phylocode-michel-laurin>



<sup>1</sup>Universidad Estatal Amazónica, Programa de Ecosistemas, Biodiversidad y Conservación de Especies, Paso Lateral km 2 ½, v. Puyo-Tena, EC-160150 Puyo, Ecuador.

<sup>2</sup>Author for correspondence: [rivero-guerra@hotmail.com](mailto:rivero-guerra@hotmail.com); [arivero@uea.edu.ec](mailto:arivero@uea.edu.ec)

Received: March 10, 2025.

Reviewed: March 20, 2025.

Accepted by Marie-Stéphanie Samain: March 25, 2025.

Published Online first: April 23, 2025.

Published: Acta Botanica Mexicana 132 (2025).

To cite as: Rivero-Guerra, A. 2025. Book review "The Advent of PhyloCode: The Continuing Evolution of Biological Nomenclature". Acta Botanica Mexicana 132: e2448. DOI: <https://doi.org/10.21829/abm132.2025.2448>



This is an open access article under the Creative Commons 4.0 Attribution-Non commercial Licence (CC BY-NC 4.0 International)

e-ISSN: 2448-7589

The last phase of the Darwinian revolution is arguably underway. After many scientists accepted the idea of evolution in the 19<sup>th</sup> century, phylogenetics underwent its revolution in the second half of the 20<sup>th</sup> century, with the rise of phenetics, cladistics (parsimony), model-based phylogenetics (using maximum likelihood and Bayesian methods), and molecular systematics. Extension of the Darwinian revolution to the field of nomenclature occurred later still. It started slowly with some of the first basic principles proposed by Hennig (1969), and more detailed proposals at the end of the 1980s and early 1990s (e.g., De Queiroz, 1987). These were subsequently formalized into a code, called the *PhyloCode*, that was first posted on the internet in 2000, but that took effect only in 2020 (Cantino and de Queiroz, 2020).

The book *The Advent of PhyloCode: The Continuing Evolution of Biological Nomenclature*, written by Michel Laurin, the President-elect and former Secretary of the International Society for Phylogenetic Nomenclature (ISPN for brevity; see Cantino and de Queiroz, 2020) tells this story, placed in a deeper historical perspective that starts with pre-literate nomenclatural practices as evidenced by various folk taxonomies and nomenclatures. It is structured into seven chapters and answers the question of how we have named plants and animals from prehistory to the present, although it concentrates on the last three centuries. Throughout the book, the taxa are considered individuals; the text explains the historical transformation of nomenclature, systematics and biological taxonomy, mainly with the application of phylogenetic analytical methods that reveal evolutionary patterns and that favored the publication of the *PhyloCode* (Cantino and de Queiroz, 2020). The book shows how the Darwinian revolution that started with the publication of *The Origin of Species* in 1859 and subsequent developments in phylogenetics logically paved the way for the development of phylogenetic nomenclature.

In the first chapter, the author addresses in depth the historical bases of the development of biological nomenclature used in folk taxonomy, as well as scientific (western) taxonomy that follows a hierarchical system of classification. The development of formal rules of biological nomenclature was driven by the need to deal with the explosion of knowledge about the diversity of plants and animals that naturalists strove to describe and name. Soon, the need

for lists of synonyms, in addition to regulation (which culminated in the adoption of nomenclatural codes) became obvious because many species were described with more than one name by different authors. Therefore, the challenges faced by systematists prior to the 20<sup>th</sup> century were complex. The book relates the progressive appearance of the nomenclatural categories, with the significant contributions of Magnol (1689), who introduced for the first time the rank of family, which was subsequently reinforced by Adanson (1763) and Latreille (1797). In addition, Tournefort (1694) was the first to recognize four ranks in his taxonomies: those of classes, sections, genera and species. Linnaeus (1735) recognized the categories kingdom, class, order, genus and species. The idea of adopting short names, consisting of only two words to designate species (binomial system) in western systematics (it was often but inconsistently used in folk nomenclature, as explained in chapter 1) comes from Gaspar Bauhin (Bauhin, 1623), but he did not apply it consistently to all the species in his work. Linnaeus (1753) generalized the use of the binomial system in his work *Species Plantarum* and emphasized the genus as the primary category. The contributions of Leibniz, Adanson, Augustin Pyramus de Candolle and particularly Lamarck, as the founder of the theory of evolution, are evoked. Darwin (1859) was the first to illustrate an evolutionary tree; Darwin and Wallace (1858) argued that natural selection is the main mechanism driving the evolution of species, which rests on the postulate of the heritability of characters that was subsequently clarified by Mendel in 1866. All this paved the way for the development of phylogenetic nomenclature, but only after a long delay.

The second chapter is devoted to the rank-based codes and it explains the rules and principles used to promote the stability of nomenclature regulated by these codes, the first being that of Strickland, published in 1843. It inspired the five main rank-based codes, which are (year of publication of the first version in parenthesis): (1) *International Code of Botanical Nomenclature* (De Candolle, 1867), (2) *International Code of Zoological Nomenclature* (ICZN, 1905), (3) *International Code of Nomenclature for Cultivated Plants* (Stearn, 1953), (4) *International Code of Nomenclature of Prokaryotes* (International Committee on Bacteriological Nomenclature, 1958), although the initial proposal



was introduced in 1936), and (4) *International Code of Classification and Nomenclature of Viruses* (Tournier and Lwoff, 1966). This chapter also summarizes the modifications made to each code from its first edition to the present. In addition, it exposes the mishaps of the *BioCode* initiative.

Chapter three focuses on progress in phylogenetics starting in the mid-20<sup>th</sup> century (phenetics, parsimony and model-based inference are covered) and how these pushed several systematists to seek ways to transform nomenclature to take biological evolution into consideration. Indeed, the rank-based codes rely on artificial absolute ranks (the so-called Linnaean categories) that are arbitrary, which in turn generates instability. This new perspective triggered substantial changes that aim at delimiting taxa in an objective, stable and precise way. In addition, the chapter explains how progress in evolutionary theory and phylogenetics highlights the artificial nature of Linnaean categories, and surveys various approaches that could be (or have been) taken to make them more objective, and why ultimately such approaches are doomed.

Chapter four shows the advances in phylogenetic nomenclature from Hennig, through the publication of the *PhyloCode*, and the few years that elapsed since then. It details the methods that have been developed to provide a precise and stable delimitation to each validly published taxon, and emphasizes that the purpose of the *PhyloCode* is to stabilize the content of these named taxa, rather than renaming them. The names applied to clades are based on phylogenetic relationships rather than on taxonomic ranks. The book also covers nomenclatural controversies among proponents of the *PhyloCode* on how to define popular clade names, such as *Tetrapoda*, *Mammalia* or *Aves*. This controversy centers mostly on the decision to adopt definitions that stabilize the definition on taxonomic content that reflects either the paleontological literature or the neontological literature. The former often links the delimitation to an apomorphy; for example, *Tetrapoda* is then linked with the origin of the limb with digits. The latter arguably reflects crown groups (the smallest clades that include all extant members of a given taxon; in that case, *Tetrapoda* (to use the same example) delimits a smaller, more recent clade that excludes the oldest known (Devonian and Carboniferous) limbed vertebrates.

Chapter five compares the nomenclatures of different sciences, starting with the similarities and differences between stratigraphic (and more generally, geochronological) nomenclatures with those of rank-based and phylogenetic nomenclature of taxa. This section discusses the biogeographic units and the *International Code of Area Nomenclature*. The nomenclature of geopolitical entities is also covered. These nomenclatures share with rank-based nomenclature of taxa the use of ranks, but they are more similar with phylogenetic nomenclature in attempting to define and delimit entities as precisely as possible.

Chapter six discusses controversies in biological nomenclature and their implications, emphasizing the advantages of adopting a phylogenetic nomenclature. The following questions are answered: What are the implications of horizontal gene transfer between taxa? What are the mechanisms through which genetic and phenotypic cohesion operate in space and time? Which problems do we face when delimiting species? How many concepts of species currently coexist in the literature, and what are their advantages and limitations? Will we be able to achieve a universal concept of species?

The seventh and final chapter outlines the future of biological nomenclature; it argues that phylogenetic nomenclature is a logical successor to rank-based nomenclature, given the spectacular progress in evolutionary biology in the last two centuries. I allow myself to transcribe from the book the following paragraph containing a prediction written by Alphonse de Candolle in 1867 (in the English translation provided in the book), and which shows that great pioneers of rank-based nomenclature realized early that one day, a great nomenclatural revolution would be required.

*"However, a time will come when the current plant forms having all been described, herbaria offering certain types, botanists having made, undone, sometimes remade, raised or lowered, and above all modified several hundred thousand groups, from classes to simple varieties of species, the number of synonyms having become infinitely more considerable than that of the valid taxa, science will need some great renovation in its principles. This nomenclature, which we are trying to improve, will then appear like an old scaffolding, formed of parts painfully renewed,*



*one by one, and surrounded by debris made up of all the rejected parts which will form a more or less embarrassing clutter. The edifice of science will have been built, but it will not be sufficiently free from all that has served to raise it. Then, perhaps, there will arise something completely different from Linnaean nomenclature, something which will be imagined to give stable names to definitive groups."*

Finally, I emphasize that we always keep learning, and as a biologist, I appreciate the great effort that the author has made to summarize a great amount of literature into a very readable account. In each chapter, he sets out with absolute mastery and coherence all the topics in depth, without leaving loose ends. The book is addictive and highly educational, essential for botanists, zoologists, bacteriologists, paleontologists and students of biology and related fields, encouraging the reader to reflect, investigate and innovate.

## Literature cited

- Adanson, M. 1763. Familles des plantes. 1ère partie. Vincent, France. Cccxxv + 189 pp. DOI: <https://doi.org/10.5962/bhl.title.271>
- Bauhin, G. 1623. Pinax theatri botanici. Basileae Helvet. Sumptibus & typis Ludovici Regis. Basilea, Switzerland. Pp. 570.
- Cantino, P. D. and K. de Queiroz. 2000. PhyloCode: a phylogenetic code of biological nomenclature. Version 1. <https://www.ohio.edu/phylocode/>.
- Cantino, P. D. and K. de Queiroz. 2020. International Code of Phylogenetic Nomenclature (PhyloCode): A Phylogenetic Code of Biological Nomenclature. CRC Press, Boca Raton, USA. XI + 149 pp.
- ICZN. 1905. Règles internationales de la nomenclature zoologique adoptées par les congrès internationaux de zoologie. International rules of zoological nomenclature. Commission Internationale de Nomenclature Zoologique. Internationale Regeln der Zoologischen Nomenklatur. FR de Rudeval. Paris, France. Pp. 57.
- Darwin, C. 1859. On the origin of species by means of natural selection or the preservation of favoured races in the struggle for life. John Murray. London, England. Pp. 502. DOI: <https://doi.org/10.5962/bhl.title.82303>
- Darwin, C. and A. Wallace. 1858. On the tendency of species to form varieties; and on the perpetuation of varieties and species by natural means of selection. Proceedings of the Linnean Society of London 3 (9):45-62. DOI: <https://doi.org/10.1111/j.1096-3642.1858.tb02500.x>
- De Candolle, A. 1867. Lois de la nomenclature botanique adoptées par le Congrès international de botanique tenu à Paris en août 1867: suivies d'une 2e édition de l'introduction historique et du commentaire qui accompagnaient la rédaction préparatoire présentée au Congrès. H. Georg. Genève. Switzerland. Pp. 64.
- De Queiroz, K. 1987. Phylogenetics systematics of iguanine lizards: a comparative osteological study. University of California Press. Berkeley, USA. Pp. 203. DOI: <https://doi.org/10.5962/bhl.title.4857>
- Hennig, W. 1969. Die Stammesgeschichte der Insekten. Kramer. Frankfurt am Main, Germany. Pp. 436.
- International Committee on Bacteriological Nomenclature. 1958. International Code of Nomenclature of Bacteria and Viruses. Bacteriological Code. Iowa State College Press, Ames, Iowa, USA. Pp. 186.
- Latreille, P. A. 1797. Précis des caractères génériques des insectes disposés dans un ordre naturel. Prévôt. Paris, France, xiii + 201 pp. DOI: <https://doi.org/10.5962/bhl.title.58411>
- Linnaeus, C. 1735. Systema naturae. Theodorum Haak. Leiden, Netherlands. Pp. 14.
- Linnaeus, C. 1753. Species plantarum. Salvi, Stockholm, Sweden. Pp. 1200.
- Magnol, P. 1689. Prodromus historiae generalis plantarum in quo familiae plantarum per tabulas disponuntur. Pech, France. Pp. 79.
- Mendel, G. 1866. Versuche über Pflanzen-Hybriden. Verhandlungen des naturforschenden Vereines in Brünn 4: 3-47.
- Stearn, W. T. 1953. International code of nomenclature for cultivated plants. Royal Horticultural Society London. London, UK. Pp. 28.
- Tournefort, J. P. de. 1694. Elemens de botanique ou methode pour connoitre les plantes. L'Imprimerie Royale, Paris. Paris, France. Pp. 379.
- Tournier, P., and A. Lwoff. 1966. Systematics and nomenclature of viruses. The PCNV proposals. Pp. 417-422. Ninth International Congress for Microbiology. Pergamon press. Moscow, Russia.

