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History of Classification

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Butler University
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Edited by

J. E. Potzger

The *Butler University Botanical Studies* journal was published by the Botany Department of Butler University, Indianapolis, Indiana, from 1929 to 1964. The scientific journal featured original papers primarily on plant ecology, taxonomy, and microbiology. The papers contain valuable historical studies, especially floristic surveys that document Indiana's vegetation in past decades. Authors were Butler faculty, current and former master's degree students and undergraduates, and other Indiana botanists. The journal was started by Stanley Cain, noted conservation biologist, and edited through most of its years of production by Ray C. Friesner, Butler's first botanist and founder of the department in 1919. The journal was distributed to learned societies and libraries through exchange.

During the years of the journal's publication, the Butler University Botany Department had an active program of research and student training. 201 bachelor's degrees and 75 master's degrees in Botany were conferred during this period. Thirty-five of these graduates went on to earn doctorates at other institutions.

The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner, included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daudenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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to the author if we presumed to comprehend fully a description without seeing the original specimen also. We have concluded that names of species with only descriptions and illustrations for types cannot be employed as names for taxa of algae in nature.

HISTORY OF CLASSIFICATION

If botanists prior to 1777 encountered species of coccoid Myxophyceae, they probably referred them to the Linnaean genera *Byssus*, *Tremella*, or *Ulva*. J. Lightfoot in his *Flora Scotica* (1777) named a conspicuous gelatinous alga from wet places on the Isle of Skye *Ulva montana* [*Anacystis montana* of this paper]. K. Sprengel in *Flora Halensis, Mantissa* (1807) described green globules floating in a lake near Halle as *Coccochloris stagnina*. During the period 1790—1850, numerous genera and species were published by J. B. Bory de St. Vincent, C. A. Agardh, H. C. Lyngbye, J. P. Vaucher, C. Sommerfelt, S. F. Gray, H. F. Link, C. G. Ehrenberg, A. J. C. Corda, R. K. Greville, E. Fries, P. J. Turpin, B. Biasoletto, F. G. F. Meyen, B. Gaillon, M. J. Berkeley, A. de Brébisson, A. Braun, V. Trevisan, A. H. Hassall, J. J. Roemer, F. C. Mertens, A. G. Roth, and others to accommodate species of coccoid algae. In the 1830's, G. Meneghini and G. Zanardini in Italy, F. T. Kützing and L. Rabenhorst in Germany, W. H. Harvey in England, J. G. Agardh in Sweden, and C. Montagne in France began the careful description and classification of all algae, revising at the same time the work done by colleagues and by past authors. Without separating the Myxophycean forms as a group, they created classifications which would account for a large proportion of the unornamented coccoid algae which we know today.

Carl Nägeli, studying collections of microscopic algae principally from Switzerland, wrote a short paper in 1849 entitled *Gattungen Einzelliger Algen*. He separated the family *Chroococcaceae* from the more obviously green and red algae and divided the species in it among genera characterized by planes of cell division and the resultant distribution of the cells within the gelatinous matrix. The limitations which he set to the variability of the gelatinous matrix have remained with us as an incontrovertible orthodoxy. His classification, an expression of philosophical commitment to his theory of the cell as the unit of structure and function in plants, his descriptions, and his illustrations were so logically and mechanically executed that their material bases have remained almost completely unquestioned until now.

In his *Flora Europaea Algarum* (1864—68), L. Rabenhorst attempted to resolve the classifications of coccoid algae by Kützing, Meneghini, Nägeli, and others, chiefly along Nägelian lines. With this publication as

a basis, and encouraged by the indefatigable Rabenhorst personally and through the media of his journals and published sets of exsiccatae, numerous workers throughout Europe and on other continents devoted themselves to the study of the microscopic algae. Many new genera and species of coccoid Myxophyceae were described, and considerable research in morphology, physiology and geographic distribution was done by J. E. Areschoug, E. Askenasy, J. W. Bailey, G. de Beck, E. Bornet, A. Borzi, A. Braun, C. G. Brügger, V. Cesati, F. Cohn, F. S. Collins, C. Cramer, P. L. and H. M. Crouan, A. de Bary, G. B. de Toni, E. de Wildeman, G. Dickie, W. G. Farlow, C. Flahault, J. Flotow, M. Foslie, C. Gobi, M. Gomont, A. Grunow, R. Gurwinski, A. Hansgirg, C. A. Hantzsch, P. Hariot, F. Hauck, G. Hieronymus, L. Hilse, L. Heufler, F. Hy, H. Itzigsohn, O. Kirchner, L. K. Rosenvinge, G. Lagerheim, A. Le Jolis, E. Lemmermann, P. Magnus, G. Martens, W. Migula, M. Möbius, A. Mougeot, O. Nordstedt, G. de Notaris, M. Perty, M. Raciborski, J. Reinke, P. Richter, J. Rostafinski, J. Schröter, W. A. Setchell, E. Stizenberger, W. F. R. Suringar, G. Thuret, J. E. Tilden, F. Unger, E. Wartmann, A. A. Weber-van Bosse, W. West, N. Wille, V. B. Wittrock, F. Wolle, and others. Thuret and Bornet, as their herbarium indicates, made an abortive attempt to revise the coccoid Myxophyceae; they contributed materially to our understanding of the life histories of numerous species. Itzigsohn and Hansgirg developed theories that among microscopic algae the species are polymorphic and thus not comparable with those of larger plants. This is an inversion of the more common assumption that all morphological variations and transformations through which an organism passes must necessarily be proper to a single species.

Since the early 1890's, many phycologists have occupied themselves with the ecology, cytology, and physiology of the microscopic algae. Historical taxonomy as a field of scientific investigation passed generally out of vogue in the universities toward 1900. At the same time, however, the describing of new taxa was very much accelerated. Until this period, the practice of preserving specimens permanently as indispensable records had been scrupulously observed by students of algae. Now, freed from a tradition of re-examining the material bases for descriptions of these microscopic plants, phycologists evolved an authoritarian taxonomic "science" about algae represented by idealized proxies in manuscript and published descriptions and illustrations, not about real algae. If original specimens were preserved at all, they were stored in liquid, usually in inadequately labeled containers. Some authors described taxa from living material, which was forthwith discarded after camera-lucida drawings had been made. Since 1900 the amount of literature in descriptive taxonomy has become immense, and the tradition has established itself that historical taxonomy in microscopic algae is inconceivable. According to this tradition, the validity of a

species and the application of its name can be judged only from the literary excellence of its description and the artistic excellence of its illustration, not from the plants which the author studied.

A list of the active researchers on the coccoid Myxophyceae since 1890, in addition to those mentioned above, would be too long for inclusion here. Some of the more notable have been G. S. West, A. Forti, N. L. Gardner, O. Jaag, L. Geitler, H. Skuja, A. A. Elenkin, P. Frémy, M. M. Hollerbach, A. Ercegovic, Giuseppe de Toni, and Y. Bharadwaja.

General treatments of the classification of the coccoid Myxophyceae along Nägelian lines, with minor innovations, were made by O. Kirchner in Engler & Prantl, *Natürl. Pflanzenfam.*, vol. 1 (1a) (1900), by A. Forti in de Toni, *Sylloge Algarum*, vol. 5 (1907), by J. Tilden in *Minnesota Algae*, vol. 1 (1910), and by others. In 1923, A. A. Elenkin in *Not. Syst. Inst. Crypt. Hort. Bot. Petropol.* 2 (5) introduced a classification of the Chroococcaceae which proceeded much farther than Nägeli's did to enhance the generic and suprageneric value of the gelatinous matrix. This system was elaborated in his *Monographia Algarum Cyanophycearum, Pars Specialis*, Fasc. 1 (1938).

Geitler in *Beih. z. Bot. Centralbl.*, II., 41: 163—294 (1925) summarized the Nägelian classification of the Chroococcaceae with its attritions during seventy-five years and created a new series of families and genera in the groups treated in the present paper as Chamaesiphonaceae and Clastidiaceae. This classification has been further refined in his larger works in *Rabenh. Kryptogamen-Fl.*, ed. 2, vol. 14 (1932) and in Engler & Prantl, *Natürl. Pflanzenfam.*, ed. 2, vol. 1b (1942).

In 1939 we (in *Field Mus. Bot. Ser.* 20: 67—83) published the results of a tentative inquiry into the life histories and nomenclature of species of *Microcystis*. Daily, using a similar procedure, treated the Chroococcaceae of Ohio, Kentucky, and Indiana in *Amer. Midl. Nat.* 27: 636—661 (1942). In *Manual of Phycology* (G. M. Smith, ed.), p. 159 ff. (1951), Drouet briefly summarized the morphology of the three families included in the present paper. We later published a synopsis of the present classification, with keys, and formally introduced the new family *Clastidiaceae* in *Butler Univ. Bor. Stud.* 10: 220—223 (1952).

MORPHOLOGY

THE PLANT.—This term is employed here to indicate a single free cell or a group of cells joined together, usually in a gelatinous matrix. A specimen or single collection may contain many plants of one or few cells