

# Phycological Trailblazer

## No. 35

### Francis Wolle

(Originally printed in the Phycological Newsletter.  
2011. Vol. 47 No. 2)

The Rev. Francis Wolle (1817-1893) was an early American phycologist and microscopist who deserves our attention because of his numerous contributions and detailed observations that were made under modest circumstances. He was responsible for literally hundreds of first reports of algal taxa belonging to all categories of the freshwater flora of North America. He also described numerous new species and varieties and a pair of new genera.

Francis Wolle was born on 17 December, 1817, in Jacobsburg, Northampton County in eastern Pennsylvania, and for his entire life he was closely associated with the Moravian Church. His first job was as a clerk in his father's store. Later, in 1839, he became a teacher, first at Nazareth Hall, a Moravian preparatory school, and subsequently in Bethlehem, Pennsylvania. In 1857, Wolle became a vice-principal of the Moravian Seminary for Young Ladies. By 1861, he was elevated to principal and was also ordained as deacon in the Moravian church. With an innate ability and a fierce determination, Wolle saw the school make it through the years of the Civil War followed by the difficult post-War circumstances of high inflation and related problems. He continued with the Moravian seminary until 1881, when



Rev. Francis Wolle. (from Harshberger, 1899,  
photograph by E. A. Rau.)

the infirmities of age had taken their toll and caused him to retire to a less demanding schedule.

Wolle had a restless, inquisitive nature, and both his younger years and his later years were occupied with his love for things botanical. In and around the countryside of Bethlehem, he had ample access to the beauties of nature. He had a passion both for botany and entomology. Northampton County is located in the Lehigh Valley, extending from the Pocono Mountains as its northern border to the Delaware River, which separates Pennsylvania from New Jersey. It was an ideal region to pursue natural history on weekends. He gradually immersed himself in bringing home his collections of botanical specimens, including plankton samples, and in using a monocular microscope to make observations, eventually compiling hundreds of sketches of his observations. A steady stream of Notes began appearing in the Bulletin of the

Torrey Botanical Club starting in 1876. Eventually, ten such notes were published up through 1884.

The background of research on freshwater algae of the U.S. was then very limited. Dr. Jacob Bailey of West Point [Phycological Trailblazer No. 18 (Wynne, 2003)] had published a couple of papers on desmids. Another important milestone in North American freshwater phycology had been

the publication by Horatio C. Wood (1872), who was profiled as Phycological Trailblazer No. 15 (Wynne, 2001). Wood brought together previous records and observations that had been made up to that time for the entire country, which included 160 species of desmids, many depicted in his colored plates.



Rev. Francis Wolle at his monocular microscope.

In Wolle's (1876) first "Notes", he described many new species of the desmid genera *Cosmarium*, *Micrasterias*, and *Staurastrum*, all within a 20-mile "circuit" around Bethlehem, Pennsylvania, thus, not far from home. Wolle (1877a) presented a lengthy list of those species that were thought to be entirely new discoveries for the United States. He followed the nomenclature of Dr. G. L. Rabenhorst and "others of the German school", while accepting the then-current names of Thuret & Bornet (1875) for members of the "Nostochinées".

Wolle's (1877b) Notes III listed 150 "forms" new to the United States, a list that included 24 entirely new species and a pair of new genera. The new genus *Kalodictyon* (based on *K. margaritatum* sp. nov. and assigned to the "Chlorophyllophyceae") was found on *Potamegeton* in slow river waters in Bethlehem, Pennsylvania. Wolle's *Kalodictyon* is not to be confused with two other algal names. *Calidictyon* of Greville (in Lindley, 1836) or *Callidictyon* of Norris and Abbott (in Norris et al., 1995).

A second new genus, *Poterophora* (based on *P. donnellii* sp. nov. and assigned to the "Zygnemaceae"), was collected from the bark of trees in Florida by Capt. J. Donnell Smith of Baltimore, Maryland. But Austin (1879) later discounted Wolle's *Poterophora*, saying that it was merely "the prothallus of some dioecious fern or filicoid." Wolle was greatly helped by

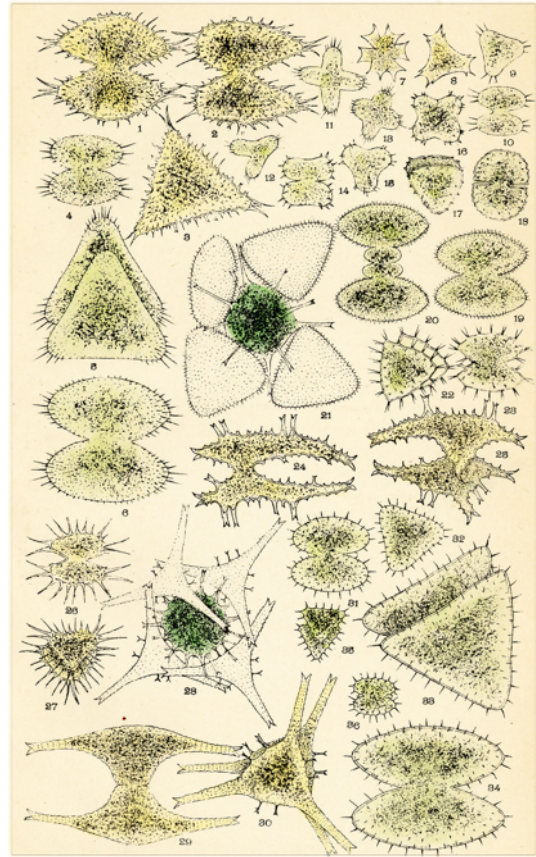


Fig. 1. Various species of *Staurastrum* (pl. 45, Wolle, 1884b)

Capt. Smith, who made extensive collections of freshwater algae in Florida in the 1870s, sending his gatherings to Wolle. Mr. C.F. Austin of Closter, New Jersey, was also a great help in making collections. Wolle had an eye for freshwater Rhodophyceae, describing *Entothrix grandis* Wolle (1877b) [later *Tuomeya grandis* (Wolle) Wolle (1887a) and more recently *Paralemanea grandis* (Wolle) Kumano (2002)] from shallow rivers near Bethlehem. He described *Chantransia beardleei* from Painesville, Ohio (Wolle, 1879), which was later transferred to *Audouinella* by Ott (2009). He also observed reproduction in *Chantransia violacea* [= *Audouinella hermannii* (Roth) Duby] (Wolle, 1880c). Wolle (1885b) described a freshwater species of *Ectocarpus*, *E. rivularis*, from a few inland sites in northeastern Florida. He had made his own collection of it from an inland site near Green Cove Springs (Clay County), whereas Rev. H.D. Kitchel had

collected it from Blue Springs on the St. John's River (Orange County), and Capt. Smith had collected it a few years earlier from an unstated site. This species has not been re-collected.

Because there was essentially no one at that time in America to offer Wolle encouragement in his field of study, he turned to European experts to receive the necessary advice. In the Preface of his impressive "Desmids of the United States" (Wolle, 1884b), he acknowledged that help from several foreign workers. That volume contained 53 lithographed color plates (Fig. 1). Many new species of *Cosmarium*, *Docidium*, *Euastrum*, *Micrasterias*, *Staurastrum*, and *Xanthidium* were described. He dedicated the desmid volume to Dr. Otto Nordstedt of the University of Lund, saying that Nordstedt kindly determined the identities of certain of his American desmid species found by Wolle with those already known in Europe and pointing out those taxa that then appeared to be restricted to the United States. Wolle also acknowledged the help of Dr. L. Rabenhorst of Meissen, Germany. He had sent to Rabenhorst many sets of his mounted specimens, which Rabenhorst then included in the distribution of his *Algae exsiccatae*. Wolle also contributed to Wittrock & Nordstedt's *Algae aquae dulcis* (Stafleu & Cowan, 1988). Wolle received many valuable communications from Alexander Braun of Berlin. A "new and enlarged edition" of this work on desmids appeared in 1892. According to Stafleu & Cowan (1988), Wolle's herbarium and types were deposited in PH (the Academy of Natural Sciences, Philadelphia), with residual collections also in several other herbaria. Sayre (1975), however, claimed that the bulk of his herbarium is now in F (the Field Museum of Natural History in Chicago) and that various herbaria have material that he distributed with the printed title "FRESH WATER ALGAE OF THE UNITED STATES".

A second volume on "Fresh-Water Algae" by Wolle (1887a) complemented the earlier volume on the desmids but excluded the diatoms. This "Volume II" contained 157 colored plates, with 2,300 figures, and depicted Cyanobacteria (Fig. 2), green algae (other than

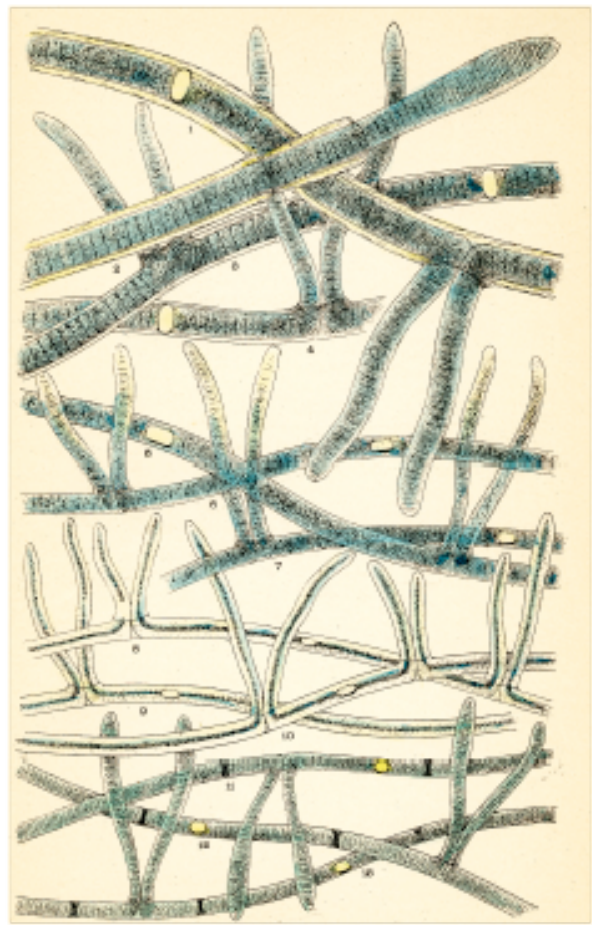


Fig. 2. Various species of *Scytonema* (pl. 183, Wolle, 1887a).

desmids), and freshwater red algae. A remarkable number of the figures depicted reproductive stages as in *Coleochaete*, *Oedogonium*, *Bulbochaete*, *Spirogyra*, *Volvox*, and others. Drouet (1939) published an account of Wolle's filamentous Myxophyceae, offering some clarifications and transfers. Bornet & Flahault (1888) remembered Wolle with the honorific name *Wollea* of the Nostocaceae.

Wolle's (1890) "Diatomaceae of North America" was a remarkable synthesis in that it compiled 2,300 of "the author's drawings", presented on 112 plates. From the scattered and often difficult to obtain literature, Wolle "collected the cream of what has already been written on the subject, as well as the figures of all known North American species". Most of the figures were redrawn, and the original sources of the figures were duly cited. Wolle admitted that

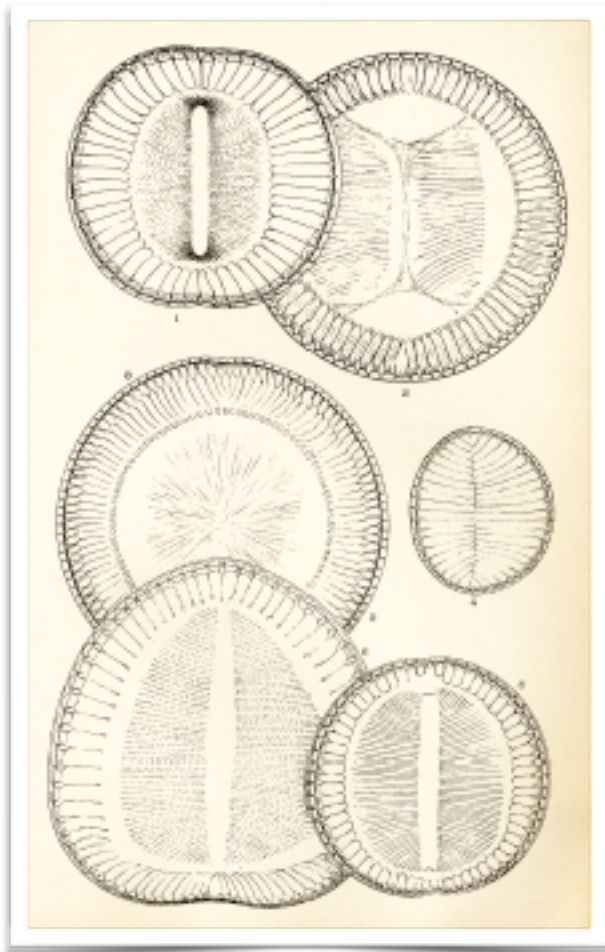


Fig. 3. Various species of *Campylodiscus*  
(pl. 72, Wolle, 1890)

he was following the example of Dr. Adolph Schmidt (1874-1890), in letting the figures suffice for the descriptions of the species. He followed the most current classification scheme of the day, namely, the “conspectus of the families and genera of the Diatomaceae” of Dr. H.L. Smith of Hobart College, Geneva, New York (Smith, 1872). Wolle dedicated his treatise on North American diatoms to Dr. Smith. Wolle’s work included 125 genera of pennate and centric diatoms (Fig. 3).

It is worth noting that another of Wolle’s accomplishments, thanks to his inventive nature, was designing various mechanical devices. An example of one of his inventions was the machinery for making paper bags. The goal was simply to allow customers to hold items more easily. Wolle’s patent, taken out by him in 1852, seems to have been the first such granted in the

U.S. and possibly in the entire world. His patent was later taken out in England and in France. With his brother Sylvester Wolle and other investors, he co-founded the Union Paper Bag Machine Company in 1881. In 1936 this company opened a \$4 million plant, employing 500 workers, in Savannah, Georgia. The plant still is in operation today, although now owned by the International Paper Company (from on-line data).

Anonymous. 1894. Rev. Francis Wolle [Necrology].  
Proc. Amer. Microscop. Soc. 15( 4) : 245-246.

Austin, C. F. 1879. Notes on Hepaticology. Bull. Torrey Bot. Club 6: 301- 306.

Bornet, É., & C. Flahault. 1888. Revision des Nostocacées hétérocystacées contenues principaux dans les herbiers de France. Ann. Sc. Nat., Bot., sér. 7, 7: 177- 262.

Drouet, F. 1939. Francis Wolle’s filamentous Myxophyceae. Botanical Series, Field Museum of Natural History, 20( 2) : 17-64.

Kumano, S. 2002. *Freshwater Red Algae of the World*. Biopress, Bristol, U.K. xi + 375 pp.

Lindley, J. 1836. A natural system of botany.... Second edit. Xxvi + 526 pp. Longman, Rees, Orme, Brown, Green & Longman, London.

Norris, J. N., I. A. Abbott & C. R. Agegian. 1995. *Callidictyon abyssorum*, gen. et sp. nov. (Rhodophyta) , a new deep- water net-forming alga from Hawai’i. Pacific Science 49: 192- 201.

Ott, F. D. 2009. *Handbook of the taxonomic names associated with the non- marine Rhodophycophyta*. Gebr. Borntraeger, Stuttgart. xxiv + 969 –[ 971] pp.

Sayre, G. 1975. Cryptogamae Exsiccatae-- an annotated bibliography of exsiccatae of Algae, Lichenes, Hepaticae, and Musci. V. Unpublished Exsiccata. I. Collectors. Mem. N. Y. Bot. Gard. 19: 277- 423.

Schmidt, A. 1874- 1890. *Atlas der Diatomaceen-Kunde*. Ascherleben, Leipzig.

Smith, H. L. 1872. Conspectus of the families and genera of the Diatomaceae. Lens 1: 1- 19, 72- 93, 154- 157.

Stafleu, F. A. & R. S. Cowan. 1988. Taxonomic literature, II. Volume VII: W- Z. Bohn,

- Scheltema & Holkema, Utrecht & Antwerp.
- Thuret, G., & É. Bornet 1875. Essai de classification des Nostochinées. Ann. Sci. Nat., Bot., sér. 6, 1: 372- 382.
- Wolle, F. 1876. Fresh water algae.— Collected during the past three years, mostly within a circuit of about twenty miles around Bethlehem, Penn. Bull. Torrey Bot. Club 6: 121- 123.
- \_\_\_\_\_. 1877a. Fresh water algae. II. Bull. Torrey Bot. Club 6: 137- 141.
- \_\_\_\_\_. 1877b. Fresh water algae. III. Bull. Torrey Bot. Club 6: 181- 189.
- \_\_\_\_\_. 1878. A *Nostoc* the matrix of *Scytonema*. Bull. Torrey Bot. Club 6: 217- 218.
- \_\_\_\_\_. 1879. Fresh water algae. Synopsis of discoveries and researches in 1878. Bull. Torrey Bot. Club 6: 281- 288.
- \_\_\_\_\_. 1880a. Fresh- water algae. IV. Bull. Torrey Bot. Club 7: 43- 48.
- \_\_\_\_\_. 1880b. New American desmids. Bull. Torrey Bot. Club 7: 91, pl. V.
- \_\_\_\_\_. 1880c. Cell- multiplication in *Chantransia violacea* Kg. Am. Mo. Mic. J. 1: 43- 45.
- \_\_\_\_\_. 1881a. American fresh- water algae. Bull. Torrey Bot. Club 8: 1- 4, pl. VI.
- \_\_\_\_\_. 1881b. Fresh- water algae. V. Bull. Torrey Bot. Club 8: 37- 40.
- \_\_\_\_\_. 1882. Fresh- water algae. VI. Bull. Torrey Bot. Club 9: 25- 30, pl. XIII.
- \_\_\_\_\_. 1883. Fresh- water algae. VII. Bull. Torrey Bot. Club 10: 13- 21, pl. XXVII.
- \_\_\_\_\_. 1884a. Fresh- water algae. VIII. Bull. Torrey Bot. Club 11: 13- 17, pl. LXIV.
- \_\_\_\_\_. 1884b. Desmids of the United States and list of American Pediastrums with eleven hundred illustrations on fifty- three colored plates. Moravian Publications Office, Bethlehem, Pennsylvania. xiv + 182 pp., 64 pls.
- \_\_\_\_\_. 1885a. Fresh-water algae. IX. Bull. Torrey Bot. Club 12: 1- 6, pl. XLVII.
- \_\_\_\_\_. 1885b. Fresh-water algae. X. Bull. Torrey Bot. Club 12: 125- 129, pl. LI.
- \_\_\_\_\_. 1886. Turner's "New Desmids of the United States." Bull. Torrey Bot. Club 13: 56- 60.
- \_\_\_\_\_. 1887a. Fresh- water Algae of the United States; ( exclusive of the Diatomaceae) complementary to Desmids of the United States ... One hundred and fifty one plates ... including nine additional plates of desmids. The Comenius Press, Bethlehem, Pennsylvania. [ i] – xix – [ 21] – 364 pp.
- \_\_\_\_\_. 1887b. Desmids of the Pacific coast. Bull. Calif. Acad. Sci. 2: 432- 437.
- \_\_\_\_\_. 1888. Desmids of the Pacific coast. Proc. Calif. Acad. Sci., ser. II, 1: 79, 80.
- \_\_\_\_\_. 1890. Diatomaceae of North America, illustrated with twenty- three hundred figures from the Author's drawings on one hundred and twelve plates. The Comenius Press; Bethlehem, Pennsylvania, U.S.A. 112 pl.
- \_\_\_\_\_. 1892. Desmids of the United States and list of American Pediastrums with eleven hundred illustrations on fifty- three colored plates. "New and enlarged edition." Moravian Publications Office, Bethlehem, Pennsylvania. i- xiv + 15- 182 pp., 64 pls.
- Wood, H. C. 1872. A Contribution to the History of the Fresh-water Algae of North America. Smithsonian Contributions to Knowledge 19 (3) : i- viii, 1- 262, with 19 colored and 2 uncolored plates from 360 original microscopic drawings.
- Wynne, M. J. 2001. Phycological Trailblazer No. 15. Horatio C. Wood. Phycological Newsletter 37( 2) 4- 5
- \_\_\_\_\_. 2003. Phycological Trailblazer No. 18. Jacob W. Bailey. Phycological Newsletter 39 (1) : 23- 5.

**Michael J. Wynne**  
**University of Michigan, Ann Arbor**