

# Phycological Trailblazer

## No. 11

### Chin-Cih Jao

(originally printed in the Phycological newsletter. 1997.  
Vol. 34 No. 2)

Chin-Chih Jao epitomizes the all-round phycologist, whose very long and productive career in phycology truly spans the 20th Century. His broad interests in the algae ranged from marine to fresh-water. He covered a lot of mileage over the decades both in China and in North America in quest of algae, and he discovered and described many interesting algal species. In North America, he managed to spend time working at two phycological meccas, Woods Hole on the east coast and Friday Harbor on the west coast as well as being a graduate student in the middle of the country, in Michigan. Born in 1900, Jao remains a vital presence in China, a revered figure in a land where longevity, symbolized by the peach is especially treasured. For a seven-year period (from 1928 up through early 1934) prior to his traveling to America to embark on his graduate studies, Jao carried out extensive field work in Szechwan [= Sichuan] Province of southwestern China. This province was then made up of numerous rice farms and Jao found himself in an ideal situation to carry out collecting of freshwater algae. In fact, he made nearly 2,000 collections in the various seasons. His doctoral research, working under the guidance of Prof.



C.-C. Jao as a student in Ann Arbor

W.R. Taylor at the University of Michigan in Ann Arbor. involved working up his many collections of Zygnemataceae (Jao, 1935a). He carried out most of his collecting during winter and early spring from rice farms and water-storage pools after the rice harvest and before the fields had been plowed. He found that this period was most favorable for algal growth because after plowing as well as during the luxuriant growth of rice in the summer months, the algae, in particular filamentous green algae, were in poor condition for study. Frost is exceedingly rare in this region; occasionally a very thin layer of ice would appear during the night in winter. Winters were characterized by infrequent sunshine and

by banks of mist hanging over the land and preventing surface evaporation. These conditions resulted in very damp soil and much standing water, in other words, very favorable conditions for algal growth. More than half of the species of Zygnemataceae he described (Jao, 1935a, 1936d) were regarded as new: *Zygnema*, 11 species, including four new; *Zygogonium*, one new species; *Zygnemopsis*, one new species; *Mougeotia*, 10 species, including four new; *Spirogyra*, 51 species, including 31 new; *Sirogonium*, one species with one new variety. Jao spent the summers of 1934 and 1935 at the Marine Biological Laboratory on Cape Cod, carrying out much collecting with Hannah Croasdale. In reading over his

papers (Jao, 1934a, 1935b, 1936a, b) and being somewhat familiar with the geography of the Cape, I can see that Jao and Croasdale covered a lot of territory by land and by sea: Nobska Point in Woods Hole, Cuttyhunk, Grassy, and Pine Islands, Sheep Pen Harbor on Nonamesset Island

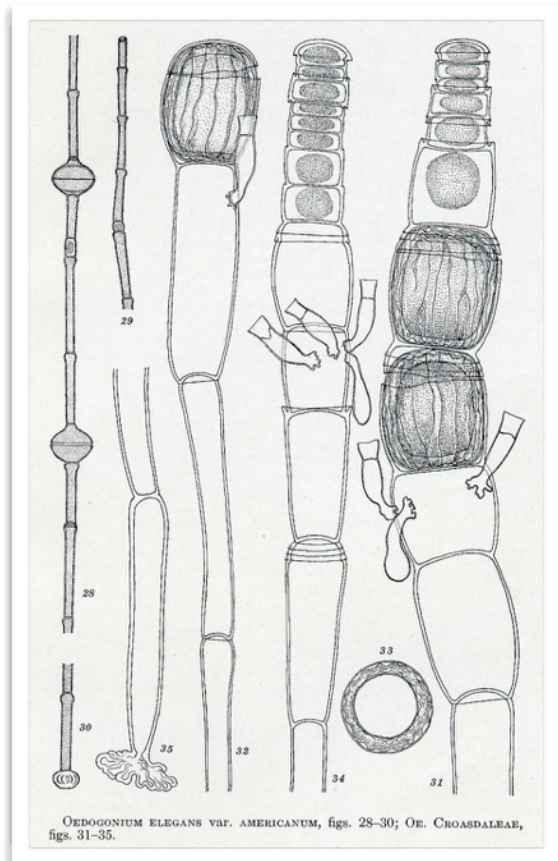


Fig. 1. *Oedogonium elegans* var. *americanum* Jao (figs 28-30); *Oe. croasdaleae* Jao (figs 31-35) In Jao (1934a).



Fig 2. *Acrochaetium intermedium* Jao (figs 1-4); *A. subseriatum* Jao nom. illeg. (figs 5-7). In Jao (1936a).

in the Elizabeth Island chain, across Vineyard Sound to North Point and Gay Head out on Martha's Vineyard and across Buzzards Bay to Black Rock near New Bedford. Freshwater habitats were also being sampled during these excursions as well as many other places on the Cape such as Harper, Wall, Salt, and Iron ponds. Thanks to such concentrated collecting, Jao reported on seven new taxa of Zygnemataceae from Woods Hole and environs (Jao, 1935b), including *Spirogyra taylorii* from Whitman Road, where the Taylors' cottage was located, and a total of 47 taxa (species and vars.) of *Oedogonium*, including *Oe. croasdaleae* (Jao, 1934a) to honor his fellow-collector (Fig.1).

From August to Dec., 1935, Jao had the opportunity of working at Friday Harbor Laboratories (of the Univ. of Washington, Seattle) on San Juan Island. He spent a four-

month period of intensive field work there, obtaining samples from as many different localities and habitats as possible: San Juan, Brown, Tum, McConnell, Canoe, Bell, and Shaw Islands. He discovered some new species of marine red, brown, and green algae and made some new records for the Washington coast (Jao, 1937a). He brought his samples back to China to complete the work of identification. He had largely completed the task of making identifications some months after the Japanese invasion into North China in July, 1937. But owing to the difficulties (impossibility) of printing during war time, he was not able to publish on this work until 1948 (Jao, 1948a).

Over the years and in spite of the difficult and turbulent times of war Jao managed to turn out a steady flow of papers on algae. This often involved arduous collecting trips. In the period 1936-1941 he made collections from various

localities of China, which contributed to a paper (1941b) on freshwater red algae. Even though he modestly used "a preliminary account" in the title, Jao made observations on eight genera, listing 21 species and three varieties. Eleven of these species (in *Audouinella*, *Batrachospermum*, *Lemanea*, *Sirodotia*, and *Compsopogon*) and two varieties were described as new. The Chialing River, where his new var. *angusta* of *Caloglossa leprieurii* occurred, had flooded, filling up a rocky cave. Jao used the water-filled cave as a natural culture chamber to follow the form of this alga for almost 11 months.

He and his family moved from Shanghai to Wuchang in 1954. Their home was situated on the shore of Lake Tunghu, very close to the Institute, and he was pleased to be living in such a beautiful place. He and his wife had four children. Their only son became an instructor at the Wuhan Industrial College. The eldest and youngest daughters became high school teachers, while the middle daughter became a doctor and instructor at the Bethune Medical University.

While as a student in the U. S., Jao's artistic talents had been put to good use by Randolph Taylor in putting together the first edition of his algal flora of the northeast coast of North America. Taylor (1937) acknowledged that Jao executed most of the drawings used in this book, and Jao received "second billing" as the artist on the book's title page. After Taylor sent a copy of his 1957 revised flora, Jao wrote an appreciative letter back to Taylor the same year, saying that the book was the first item that he had received sent directly from the U.S. to China since 1950. He was indeed delighted. Jao went on to explain that he had worked in the Institute of Botany, Academia Sinica, in Shanghai until the liberation of China in 1949. Since then he was transferred to the Institute of Hydrobiology, still affiliated with the Academic Sinica, in Wuchang, as a "research fellow of the 1st rank." This meant that he had about 30 workers in his laboratory along with several guest investigators from various universities. The theme of their research was not merely systematics of freshwater algae

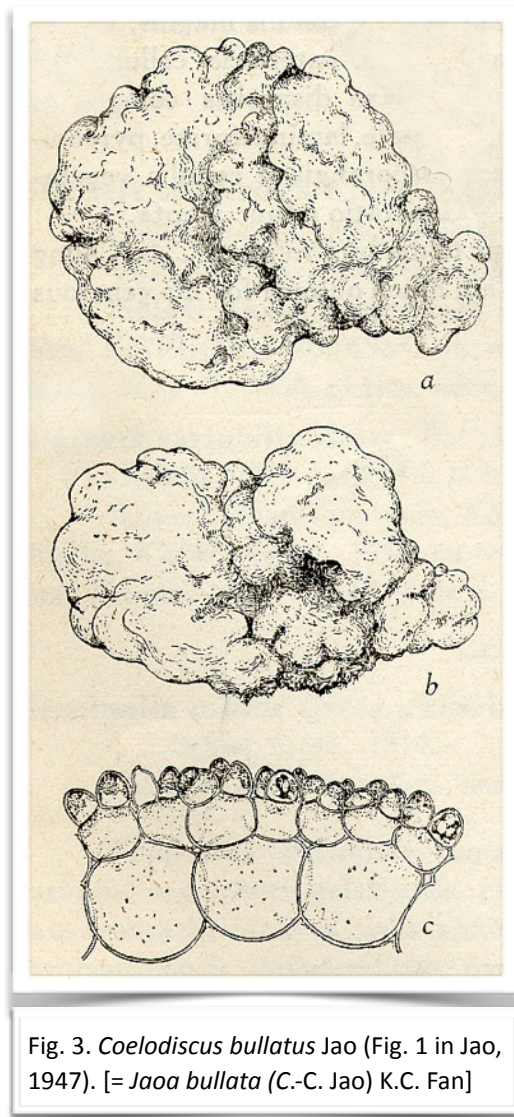
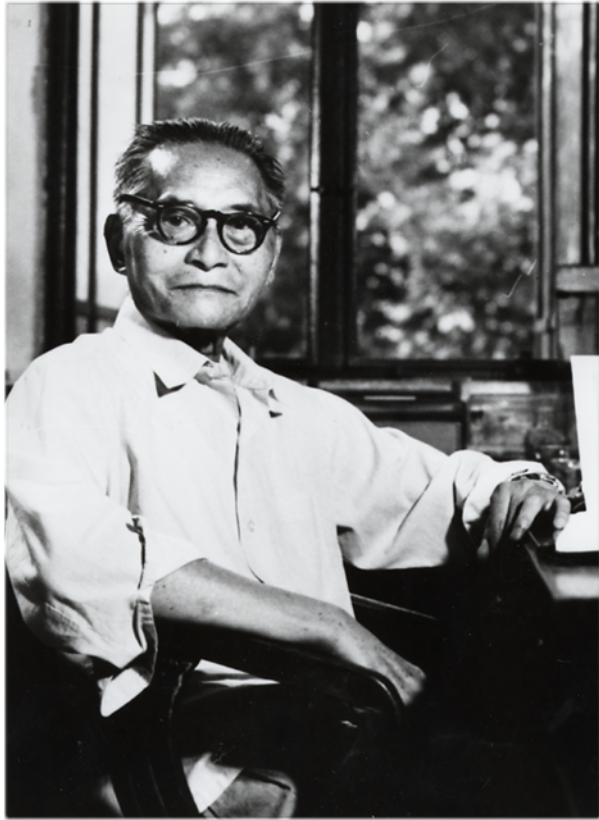


Fig. 3. *Coelodiscus bullatus* Jao (Fig. 1 in Jao, 1947). [= *Jaoa bullata* (C.-C. Jao) K.C. Fan]

but also had a strongly applied aspect. They were interested in expanding fish farming in the shallow lakes in China and making rational use of natural food by the fish (Wu & Jao, 1958). Fish farming flourished after the People's Republic of China was established. It was in this period that he collaborated with others in producing books both on methodology for studying lakes (Jao et al., 1956) and on freshwater fish farming (Li et al., 1961). Jao felt that it was an opportune time for the development of phycology in China. He spent much of his time supervising workers on the various algal groups they were studying, and a series of articles was published treating all of the known planktonic algae occurring in the inland waters of China. In 1956 he traveled to Helsinki to attend the 8th International



On his 80th birthday (1980).

Limnological Congress, where he met R. C. Starr and got caught up on news of colleagues in the U.S.

In retrospect, Jao's primary specialization was on the green algal orders Oedogoniales and Zygnematales (1988). Yet over the years he showed a broad interest in various groups of algae, including *Vaucheria* (1936c), Cyanobacteria (1939b, 1944b, 1948a), Chlorophyceae (1941a, 1942, 1947a, b, c), freshwater brown algae (1941 b, 1943), freshwater red algae (1941 c), diatoms (1964), charophytes (Jao & Lee, 1974), and chloromonads (1978). Jao was the author of several new genera, e.g., *Leptosiropsis* (1940), *Oncosaccus* (1947a), *Westellopsis* (1959a) [non *Westelliopsis* Janet, 1941], *Sphaerodictyon* (1978), *Echinocoleum* (Jao & Lee, 1947), and *Dicloster* (Jao, Wei, & Hu, 1976). His publications also concerned river algal assemblages (1944a) and limnological surveys (Jao, 1962). One of the

most impressive of Jao's publications was his monograph of the Oedogoniales of China (1979). This work, written in Chinese, was reviewed by Taylor (1981), who admitted that it may appear "rash" for him to report on a book most of which he could not read. But he was able to grasp the general scope of the book, to read the Latin descriptions of the many new taxa, and to appreciate again Jao's truly beautiful illustrations. This book included 346 taxa in *Oedogonium* and 55 in *Bulbochaete*, of which 122 (eighty at the species level) were described as new. In terms of eponymy, *Jaoa* was used by K. C. Fan (1964) to replace Jao's (1941d) *Coelodiscus* (Fig. 3), which was a later homonym. Skvortzov (1961) described *Jaoniella planktonica* of the Isochrysidales. Now at the age of 97 years, Jao lives in contented retirement in Wuhan, Hubei Province. He remains associated with the Institute of Hydrobiology of the Chinese Academy of Sciences.

#### Note added in postscript:

Professor Jao passed away on 28 March 1998 at the age of 98, about one month after the publication of this essay. See Bi & Hu (1998).

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