

IN MEMORY OF PROFESSOR YAN-CHENG TANG—A BRIEF BIOGRAPHY AND ACADEMIC CONTRIBUTIONS

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Abstract. Professor Yan-Cheng Tang, also known as Yen-Cheng Tang, (汤彦承, given name Yan-Cheng, surname Tang; abbreviated Y. C. Tang), passed away on August 6, 2016, in Beijing at the age of 90. He was a highly respected plant taxonomist for his massive contributions to plant taxonomy in China and for the number of botanists he influenced. A brief biography and a summary of his importance in the development of plant taxonomy in China during the latter half of the 20th century is presented.

摘要. 中国科学院植物研究所汤彦承教授 (简称Y.C.Tang) 于2016年8月6日在北京去世, 享年90岁。他是一位倍受尊敬的植物分类学家, 为中国植物分类学做出了重要贡献, 影响深远。本文简要记述了汤先生的学术生平及他对20世纪下半叶中国植物分类学发展的贡献。

Keywords: Yan-Cheng Tang, plant taxonomy, Institute of Botany, Chinese Academy of Sciences, Beijing

Professor Yan-Cheng Tang (汤彦承; surname Tang, given names Yan-Cheng or Yen-Cheng, abbreviated Y. C. Tang) (Fig. 1), was born in Xiaoshan, Zhejiang Province, China, on 7 July 1926; he passed away on 6 August 2016 in Beijing at the age of 90. From 1942 to 1945 he attended the private Suzhou Taowu Middle School in Shanghai. He was influenced by one of his Chinese teachers, Bin-Liu Wang, who advocated the ideals of the “Seven Wise Men in the Bamboo Forest,” a group of Chinese scholars, writers, and artisans of the third century CE who followed Daoism, which essentially promoted living in harmony with nature. In 1945, he entered the College of Agriculture at St. John’s University in Shanghai, a private university for undergraduate study, but transferred to the Advanced Class at Shanghai Temporary University in October 1946. From there, he was recommended and admitted to Tsinghua University in Beijing. During his time at Tsinghua University (Fig. 2), as the only student majoring in botany in the Department of Biology, he studied plant taxonomy under the supervision of Zheng-Yi Wu (吴征镒; Cheng-Yih Wu [C. Y. Wu]) (1916–2014) and also benefited greatly from the rigorous teaching of plant morphology and systematics by Professor Jing-Yue Zhang (张景钺; Chin-Yueh Chang [C. Y. Chang]) (1895–1975), a student of the American botanist Professor Charles J. Chamberlain (1863–1943).

In August 1950, Tang was hired by the Institute of Plant Taxonomy (now the Institute of Botany), Academia Sinica (whose name was changed to Chinese Academy of Sciences [CAS] later), where he remained for the rest of his life. From October 1958 to October 1960, Tang was a visiting scholar at the Komarov Botanical Institute (Fig. 3) in Saint Petersburg (at that time, Leningrad), in the former Soviet Union. From 1972 to 1981, he was director of the Department of Plant Taxonomy and Phytogeography at the Institute of Botany, CAS. Although he officially retired in 1987, he continued to work actively throughout his life.

His initial taxonomic interests were in Poaceae. In 1954, Tang was selected to lead a group of young researchers to the East China Workstation of the Institute of Botany (now the Jiangsu Institute of Botany) for training by Prof. Yi-Li Keng (Y. L. Keng; 1897–1975), an expert on Poaceae, and to organize and direct the research and writing of the *Flora Illustralis Plantarum Primarum Sinicarum—Gramineae*. After about two and a half years of work, the team accomplished their objective in August 1956 and the book was published in April 1959 (Keng, 1959). The book, a landmark for research on the Poaceae of China, was welcomed by plant taxonomists; it was reprinted in 1965. During this project, Tang trained a team of Chinese taxonomists in agrostology and also gained experience and expertise for the subsequent compilation and editing of the series *Iconographia Cormophytorum Sinicorum* (ICS; Institute of Botany, Chinese Academy of Sciences, 1972–1976). As one of the key organizers of the national projects ICS, 中国植物志 (*Flora Reipublicae Popularis Sinicae* [FRPS]; Editorial Committee, 1959–2004), and *Flora Xizangica* (Comprehensive Expedition to Qinghai-Tibet Plateau, Chinese Academy of Sciences; Wu, 1983–1987), he not only contributed to and edited several volumes in these three important projects but also devoted much of his time to leading and coordinating them.

During the 1970s, Tang actively organized a team of taxonomists and plant illustrators in his department and at other institutions throughout China to promote the compilation of ICS, which aimed to serve as a reference for the identification of common Chinese plants. Tang assigned plant groups to the authors and oversaw the progress on each group. He, along with Wen-Tsai Wang (王文采; W. T. Wang; b. 1926) and others, reviewed and revised the manuscripts. In addition to his management duties, he also undertook the task of compiling the treatments of Araceae, Caprifoliaceae (s. l.), Acanthaceae, Nyctaginaceae, and Polygalaceae

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FIGURES 1–3. **1**, Yan-Cheng Tang in the Shennongjia Forest District, Hubei Province, China, 1980. Photograph courtesy of David E. Boufford; **2**, Yan-Cheng Tang as a student at Tsinghua University, 1948. Photograph courtesy of Yan Tang; **3**, Yan-Cheng Tang at the Komarov Botanical Institute in the former Soviet Union, 1958–1960. Photograph courtesy of Yan Tang.

for ICS. The resulting five volumes were successful in providing an important tool for identifying Chinese plants; it has been reprinted seven times by Science Press. The ICS series and the companion volume, *中国高等植物科属检索表* (*Claves Familiarum Generumque Cormophytorum Sinicorum* [*Keys to Families and Genera of Higher Plants of China*]; Institute of Botany, Chinese Academy of Sciences, 1979), received China's National Natural Science First Prize Award in 1987. Although Professor Tang and others were intimately involved in these publications, their names do not appear on the title page, nor elsewhere in the books, which was customary during the years of the Great Proletarian Cultural Revolution in China (1966–1976) and in the years immediately following. At the time, it was the workers' group that was credited, not the individual(s) who carried out the work.

During the 1970s and 1980s, Tang was involved in the compilation of the *Flora Reipublicae Popularis Sinicae* (FRPS). In 1973, he served as a member of the Editorial Committee and made great efforts to speed up progress on the project. As the director of the Department of Plant Taxonomy and Phytogeography at the Institute of Botany, where the Office of the Editorial Committee was located, Tang allowed taxonomists to work on plant families that he knew well, while he himself selected families that he had not previously studied. He shared his academic notes and accumulated manuscripts without reservation with colleagues who were interested in groups that had been the focus of his research. This material included important data collected during his visit to the Soviet Union, information compiled on type specimens, and drafts of his taxonomic treatments. In collaboration with his colleagues, he published treatments of Ulmaceae, Liliaceae, and Cyperaceae (*Carex*)

in three volumes of FRPS (Tang, 1978, 1998, 2000a). His treatment of *Polygonatum* in FRPS received high praise from Charles Jeffrey, a well-known taxonomist from the Royal Botanic Gardens, Kew, UK (Jeffrey, 1980), who also had an interest in the genus. To improve the quality of FRPS, Tang encouraged his colleagues to study and translate articles representing the latest progress in taxonomy. He took the lead in those efforts, resulting in the compilation and publication of the Translated Series on Plant Taxonomy in Chinese (published internally). In the early 1980s, Tang organized a series of lectures on the principles of plant taxonomy, which were later published by the Chinese Botanical Society in mimeographed form. He contributed a booklet entitled "Introduction to the Two Schools in Taxonomy—Cladistics and Evolutionary Systematics" (Tang, 1984a). Around 1990, he was invited to serve as an advisor to the Editorial Committee of FRPS to answer questions posed by authors on the treatments of various plant families.

The compilation of *Flora Xizangica* (vols. 1–5) in the 1970s was an important achievement based on the first Qinghai-Tibet scientific expedition sponsored by the CAS. Compilation of the five volumes began in late 1976. The Institute of Botany was the leading institution and Tang was one of the key organizers. Tang assisted Professor Zheng-Yi Wu, the editor-in-chief, in organizing two review meetings and contributed the treatments of Oxalidaceae, Tropaeolaceae, Linaceae, Zygophyllaceae, Tamaricaceae, Flacourtiaceae, Lythraceae, Punicaceae, Droseraceae, and part of the Asteraceae (Tang, 1985b, c, d; 1986).

During the 1970s and 1980s, Tang expanded the traditional approach of using only morphology (Fu et al., 1979; Tang and Liang, 1984; Tang and Xiang, 1989b) to

incorporate experimental data from karyotype analyses (Tang et al., 1984; Tang and Xiang, 1987) and palynology (Tang et al., 1983; Tang and Zhang, 1985). In the early 1970s, Tang introduced the concepts and methods of biosystematics and cladistics to taxonomists in China. He kept abreast of new developments in taxonomy and systematics and advocated for obtaining as much taxonomic evidence as possible through experimental approaches of morphology, anatomy, embryology, palynology, and cell biology. He was the first to introduce the principles and methods of Hennig's cladistical approach to Chinese plant taxonomists (Tang, 1984a). He emphasized dividing taxonomic characters into plesiomorphies, autapomorphies, and synapomorphies and carefully analyzing all characters to infer phylogenetic relationships. In the 1970s, when the compilation of treatments for FRPS was nearing completion, he worked with colleagues to establish laboratories for gathering data from morphology, cytology, anatomy, and palynology using experimental techniques. He employed experimental approaches in his own collaborative research with colleagues and students on Stachyuraceae (Tang et al., 1983; Zhu et al., 2006), Triplostegiaceae of Dipsacales (Zhang et al., 2001, 2003), Lardizabalaceae and Convallariaceae (Liliaceae) (Tang and Zhang, 1985), and *Carex* (Tang and Xiang, 1989a; Li and Tang, 1990). In 1984, he supervised graduate student Haining Qin on a systematics study of the Lardizabalaceae. Through analyses of the micromorphology of carpels, ovules, fruits, seeds, pollen, and karyology, they inferred the evolutionary relationships within the family and assessed the phylogenetic position of the family within a larger framework (Qin, 1987). Those studies were regarded as leading research in China at that time. In 1985, when Tang was nearly 60 years old, he attended courses in molecular biology at Peking University so that he could gain an understanding of molecular systematics. In the 1990s, nucleotide sequences of the plastid *rbcL* gene and ribosomal DNA ITS regions were already widely used in plant systematics, but in China molecular systematics was still in its infancy. There were debates on the value of molecular data to solve systematic problems due to fear of losing ground in traditional taxonomy and to a lack of understanding of the principles of molecular systematics. Tang firmly supported molecular systematics. He not only encouraged the young scholars and graduate students at the Institute to read the literature and use molecular methods in their research, but he also set an example by gathering with them to study the most recent literature (Xiang et al., 1998). Through those efforts, he nurtured a fertile academic environment that led to the rapid and prosperous development of molecular systematics in China under the leadership of Prof. De-Yuan Hong and Prof. An-Min Lu from Institute of Botany, Chinese Academy of Sciences.

The species concept is the key to research in taxonomic biology. Two main groups are frequently referred to in practice, namely the "splitters" and the "lumpers." As the director of the Department of Taxonomy and Phytogeography, he advocated for a national discussion on the species concept among the taxonomists of China

(Tang, 1982) and encouraged young taxonomists to study the monographs prepared by world-renowned botanists, such as G. Ledyard Stebbins. He also advocated applying a population-based species concept in taxonomic practice. He had a preference for the methods employed by such taxonomists as Vernon H. Heywood in the treatment of species. In his work, he was especially concerned about morphological patterns of variation and was not constrained by characters previously employed by others. When a sufficient number of specimens were available, he proposed using a statistical approach to analyze character variation and synthesize morphological and geographic evidence in taxonomic revisions. His revisions of *Tofieldia* (Tang, 1975) and *Clematoclethra* with Qiu-Yun Xiang (Tang and Xiang, 1989b) represented new advances in plant taxonomy in China at that time.

Prof. Tang retired in 1987 but continued to work at the frontiers of plant systematics and biogeography (Fig. 4). He participated in the National Natural Science Foundation's major project, "Studies on the Seed Plant Flora of China," under the auspices of academician Zheng-Yi Wu and published important research papers on the historical elements and the Tertiary origins of the East Asian angiosperm flora based on his studies of Staphyleaceae, Morinaceae, and Caprifoliaceae sensu lato. He proposed that the eastern Asian flora had a Tertiary origin and that the Miocene could be considered to be the boundary between paleo- and neo-endemic genera in China (Tang and Li, 1994, 1996). This hypothesis was supported by several recent studies (e.g., Chen et al., 2018; Lu et al., 2018). After 20 years, they are still important historical references for understanding and studying the flora of eastern Asia. In 2000, he published *The Floristic Relationship of the Chinese Flora with Other Regional Floras and the Status and Role of the Chinese Flora in Flora of the World* (Tang, 2000b). Tang and his colleagues proposed that there were 60 "primitive" angiosperm families (Tang et al., 2002). By comparing them with the 32 basal families defined by molecular-systematic methods, they concluded that the eastern Asian flora was unique. It had a close relationship with the eastern and western North American floras but was much closer to the flora of Indochina. They considered that the four circum-Pacific districts (eastern Asia; eastern and western North America; part of tropical Asia, eastern Australia, and the southwestern Pacific islands; and tropical South America) are the areas of greatest concentration of primitive angiosperm families. This distribution pattern obviously relates to the birthplace and dispersal routes of angiosperms and the history of the Pacific Ocean. In his later years, Tang made further attempts to study the floristic range and division of the Tangut endemic flora using historical evidence (Tang and Wang, 2015).

From 1995 to 2005, Prof. Tang participated in the National Natural Science Foundation's key project, "The Structure, Differentiation, and Systematic Relationships of Primitive Angiosperms," organized by Professor An-Min Lu., Prof. Tang and his colleagues proposed a new classification for angiosperms, called the "Eight-Class System"



FIGURES 4–9. **4**, Yan-Cheng Tang at the Kunming Botanical Garden, Chinese Academy of Sciences, Kunming, Yunnan, China, 2007. Photograph courtesy of Jin-Xiu Wang; **5**, Left to right: Yan-Cheng Tang, Prof. An-Min Lu, and Prof. Zheng-Yi Wu at the Beijing Friendship Hotel when Wu won the National Preeminent Science and Technology Award, January 2008. Photograph courtesy of Jin-Xiu Wang; **6**, Left to right: Yan-Cheng Tang, Bruce Bartholomew, and Zong-Zhi Ran during the joint Sino-American Botanical Expedition to the Shennongjia Forest District, Hubei Province, China, 1980. Photograph courtesy of Yan Tang; **7**, American members of the joint Sino-American Botanical Expedition at the Institute of Botany, Beijing, prior to departure for fieldwork in western Hubei Province, China, August 1980. Left to right: David Boufford, Stephen Spongberg, Theodore Dudley, Bruce Bartholomew, James Luteyn, and Yan-Cheng Tang. Photograph courtesy of D. E. Boufford; **8**, Yan-Cheng Tang celebrating his 80th birthday with his students, Beijing, 2006. Left to right: Yu-Ping Zhu, Hai-Ning Qin, Yan-Cheng Tang, and Jin-Xiu Wang. Photograph courtesy of Jin-Xiu Wang; **9**, Qiu-Yun (Jenny) Xiang visiting Yan-Cheng Tang, Beijing, 2013. Left to right: Qiu-Yun (Jenny) Xiang, Prof. Pei-Yu Yu (wife of Prof. Tang and a famous entomologist), Yan-Cheng Tang, and Yan Tang (their daughter). Photograph courtesy of Qiu-Yun (Jenny) Xiang.

(Wu et al., 1998, 2002) (Fig. 5). This was the first system of classification for angiosperms proposed by Chinese botanists since the system proposed by Hu Hsen-Hsu (1950). Two important books later published were *The Families and Genera of Angiosperms in China: A Comprehensive Analysis* (Wu et al., 2003) and *The Origin and Evolution of Primitive Angiosperms* (Lu and Tang, 2020).

Prof. Tang actively promoted the advancement and prominence of plant taxonomy, plant systematics, and phytogeography in China. He was a versatile and knowledgeable scholar and an excellent mentor and friend in the Chinese plant taxonomy community. He excelled in his knowledge of classic literature, botanical nomenclature, and botanical Latin. Those endeavors had a significant impact on the development of modern plant taxonomy/systematics in China. To ensure the highest quality of the treatments in FRPS, Prof. Tang emphasized adherence to the International Code of Botanical Nomenclature (ICBN). He translated the ICBN (Montreal edition) published in 1959 into Chinese in the early 1960s, although his name does not appear in the translated version. In 1982, he taught the ICBN to young taxonomists at the Northwestern Institute of Botany (Shaanxi Province). Prof. Tang's lecture notes were mimeographed and distributed to the authors and editors of FRPS to be used as an important reference. On the basis of the lecture notes, Prof. Tang subsequently published a series of papers on nomenclature (1983a, b; 1984b–f; 1985a; Tang and Zheng, 1985). They became important references for Chinese plant taxonomists in the 1980s and 1990s. In addition to his publications on the ICBN, he also proposed a reasonable nomenclature for Chinese plant names (Wang and Tang, 2005, 2007). In addition to English, Prof. Tang also knew Latin, German, French, and Russian, which allowed him to make full use of the diverse botanical literature. He compiled an extensive index-card file on botanical literature, which resulted in the booklet "A Brief Introduction to One Hundred Kinds of Plant Taxonomy Literature" in mimeograph in 1986 to use in the training of young taxonomists. Inspired by *A Bibliography of Eastern Asiatic Botany* by E. D. Merrill and E. H. Walker (1938), he proposed a similar compilation of Chinese systematic botanical literature to the Chinese Botanical Society and generously donated his index-card file toward its production. His advocacy resulted in the publication of the *Bibliography of Chinese Botany* (vols. 1–4) (Chinese Botanical Society, 1983–1995).

Prof. Tang undertook management of many scientific research programs, especially during his 10-year tenure as director of the Department of Plant Taxonomy and Phytogeography of the Institute of Botany, CAS. Chief among them was organizing and promoting the completion of FRPS and ICS. Following his leadership, the department developed four major areas of research: phylogeny, experimental taxonomy (biosystematics), floristics and phytogeography, and monographic revisions. In the area of phylogenetics, he emphasized research at three levels, global phylogeny, class/order phylogeny, and family/genus phylogeny, referred to in China as "big system—medium system—small system." He selected young leaders for the

research teams, entrusted them with important tasks, and sent them to study abroad. He proposed hiring Ke-Xue Xu, a mathematician, in the early 1980s to undertake research on numerical taxonomy and to create a database of images of Chinese plants. At the end of the 1970s, he led the committee to design the present herbarium building of the Institute of Botany (herbarium acronym PE). The design included space for laboratories of anatomy, cytology, palynology, and chemistry and extra space for future expansion of the herbarium and additional laboratories.

Prof. Tang was particularly concerned with the long interruption in academic exchanges with foreign colleagues during the tumultuous years of the 1960s. To remedy the situation, he met with Dr. Shiu-Ying Hu, a botanist from Harvard University who was visiting China at the Beijing Hotel in August of 1975. He arranged for Dr. Hu to visit the Institute of Botany, CAS. His efforts led to the reestablishment of Sino-U.S. botanical exchanges after the end of the Cultural Revolution. In 1980, from August 15 to October 15, he led a joint Sino-American botanical expedition to the Shennongjia Forest District and to Lichuan Xian (the type locality of *Metasequoia glyptostroboides* Hu and W. C. Cheng) in western Hubei (Bartholomew et al., 1983; Fig. 6–7). He also made arrangements and acted as guide for the American members of the team on visits to the leading botanical institutions in China, where they met with potential collaborators. Reciprocating the visit of the five American botanists to China, five Chinese botanists spent a year at botanical institutions in the United States. It was most unfortunate that Prof. Tang's poor health at the time prevented him from participating. He arranged for other researchers in his department to study in the United States, carried out cooperative research, and opened the way for Chinese plant taxonomists to study abroad. His vision for the future and scientific planning for the department laid a solid foundation for subsequent interdisciplinary development that led to the transformation of the department into the Laboratory of Systematic and Evolutionary Botany, CAS (now the State Key Laboratory of Systematic and Evolutionary Botany, CAS), in 1987.

Prof. Tang served as a member of the editorial committee and standing member of the editorial boards, deputy editor, and editor-in-chief of *Acta Phytotaxonomica Sinica* (now *Journal of Systematics and Evolution*) for more than 30 years, from the 1970s until 2014. He reviewed and revised many manuscripts. He was also a permanent member of the Chinese Botanical Society and the director of the Plant Taxonomy Professional Committee, where he put forward important suggestions for the development of Chinese botany.

Although Prof. Tang trained few Ph.D. students (Fig. 8), he mentored many young scientists in the department going back to the 1950s. In the 1980s he mentored Qiu-Yun Xiang (Jenny Xiang) in cytotaxonomic and quantitative taxonomic research, using a population-based species concept. His guidance provided the impetus for Xiang, now a professor at North Carolina State University, to choose a career in plant systematics. She obtained further training



FIGURE 10. Yan-Cheng Tang with his colleagues and students, Beijing, 2010. Left to right: Song Ge, De-Zhu Li, Hong Wang, De-Yuan Hong, Xiao-Guo Xiang, Zhi-Duan Chen, Yan-Cheng Tang, Jun-Sheng Ying, and An-Min Lu. Photograph courtesy of Xiao-Guo Xiang.

under Douglas E. and Pamela S. Soltis for her Ph.D. degree (Fig. 9). Numerous young scholars, especially graduate students in the CAS systematics and evolutionary laboratory, were influenced by Tang's thinking and benefited from his advice (Fig. 10).

Tang admired Wen-Lan Fan's (1891–1969) work ethic: I rather be totally ignored than pen a single meaningless word for attention (板凳要坐十年冷, 文章不写半句空). Although he did not publish as many papers as his peers, most of his work was carefully thought through and was novel and pioneering in China. In his later years, he

continued his research, working until the last moments of his life. Prof. Tang was knowledgeable, modest, and tolerant. He was selfless and dedicated to plant taxonomy. He was a humble person who worked tirelessly and quietly to enhance the development of plant taxonomy in China. He never sought honors or attention for himself but instead always tried to help and promote others. His outstanding attitude and contributions to plant taxonomy and scientific research, and his moral character, will continue to inspire not only those of us who were privileged to have known him but future generations in China as well.

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