

■ HAROLD ROBINSON (1932–2020): THE BRYOLOGIST WHO REVAMPED COMPOSITAE TAXONOMY

Harold Ernest Robinson (Fig. 1) passed away on 17 December 2020 shortly after suffering a stroke. He was an expert on the Compositae (Asteraceae), the ultimate authority on the tribe Eupatorieae, and one of the most significant and at times controversial figures in 20th century synantherology (the study of Compositae). The magnitude of Harold's work in systematic botany (and entomology), with 966 publications (Fig. 2) during a scientific career spanning over 64 years, harkens back to the spheres of influence of 19th century botanical luminaries such as Bentham and Hooker. He published more than 4000 scientific names (Fig. 3), of which 3450 correspond to taxa belonging to the Compositae. Harold was a truly remarkable character with a brilliant mind. Our goal in this humble tribute is to honor him for his contributions to synantherology. Those interested in learning about other aspects of his biography and legacy can consult DeFilipps (2003), Nesom & Pruski (2011), and Krupnick (2021).

Harold was born in Syracuse, New York on 22 May 1932. He related some of his early childhood natural history interests in an oral

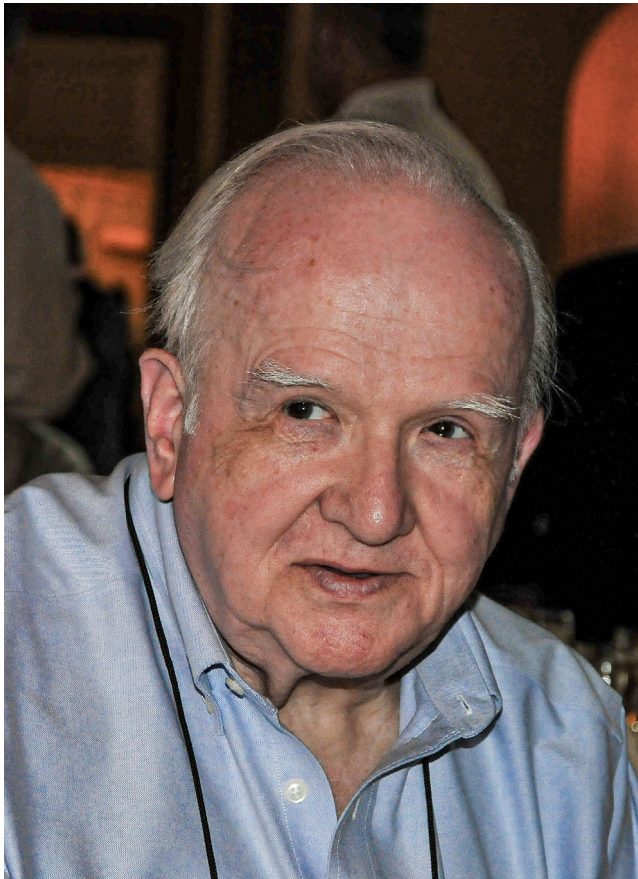


Fig. 1. Harold Ernest Robinson in 2010, at 78 years of age while attending the Botany 2010 meeting in Rhode Island, where he received the Asa Gray Award, the highest honor bestowed by the American Society of Plant Taxonomists (image by M. Bonifacino).

history interview (Robinson, 2016). His mother, a member of the Audubon Society, vainly tried to get him interested in birds, but he preferred plants because, according to his mother, they did not move. Harold reflected on his nine-month stay in Panama as a child (his father was there as an engineer for the U.S. Army Corps of Engineers), lamenting that at that time his interest in plants had waned in favor of insects, a rather unfortunate circumstance given that he was surrounded by lush tropical vegetation. Harold's interest in entomology started with butterflies and later shifted to flies, a group that would hold his attention throughout his career. Upon returning to the United States after the bombing of Pearl Harbor, his taste for plants returned and, in the absence of available books, he managed to look up the references from the few citations of ferns in a dictionary that was in the house. When Harold finally entered college, it was clear that he wanted to study plants and his first focus was ferns. The access to specialized literature opened a whole world to him and everything was more interesting thereafter. He then discovered mosses, which he found "disgustingly interesting", because he could not help being attracted to their intriguing biology and incredible diversity.

Given this background, it is unsurprising that Harold's training and early work were with bryophytes for which he received his Ph.D. in 1960 (Robinson, 1960) and flies (Diptera of the family Dolichopodidae). Along the way he also earned a M.S. for floristic work in Lamiales (Robinson, 1957) that provided experience with angiosperms. The study of small organisms impressed upon him the value of the compound microscope as his main tool for critical observations and Hoyer's solution as his favorite mounting medium, which had been championed by his Ph.D. advisor, Lewis E. Anderson (Anderson, 1954). This mode of data gathering and interpretation had a major effect on the way Harold would subsequently approach and study the diversity of the Compositae. In addition to the three disparate taxonomic groups that captured most of his attention, he also found time to publish on various other families of vascular plants including the Acanthaceae, Bromeliaceae, Cactaceae, Celastraceae, Orchidaceae, Gramineae, and Rubiaceae. Beyond Embryophytes, he even described new taxa of green algae. Although Harold collected plants in Australia, Dominica, Guyana, Mexico, and the U.S.A., he was not a very active field botanist. Instead, his encyclopedic knowledge was gained through herbarium specimens while curating one of the world's largest Compositae collections and identifying the many thousands of specimens sent to him from all over the world, especially from Latin America. He started at the Smithsonian's U.S. National Herbarium (US) in October 1962 as a taxonomist of "lower plants" (i.e., as a bryologist), but along with colleague Vicki A. Funk (1947–2019), who joined the Smithsonian 20 years later, he helped make US a destination for researchers and training in Compositae. Working in a large museum provided him the opportunity to pursue multiple interests and tackle complex groups that intimidated others.

Harold's transition in the mid-1960s from bryophytes to Compositae was spurred by a local synantherologist, Robert M. King (1930–2007), who was based at Catonsville Community College near Baltimore, Maryland and often visited US to use the herbarium and library (Turner, 2015). In the words of Harold, "One of my colleagues [King] showed up one day and said, 'You're used to working on the small things. Here is this small thing.' And it was a Compositae,

Harold Robinson's published record

1.25 papers every month throughout his 64 years of activity

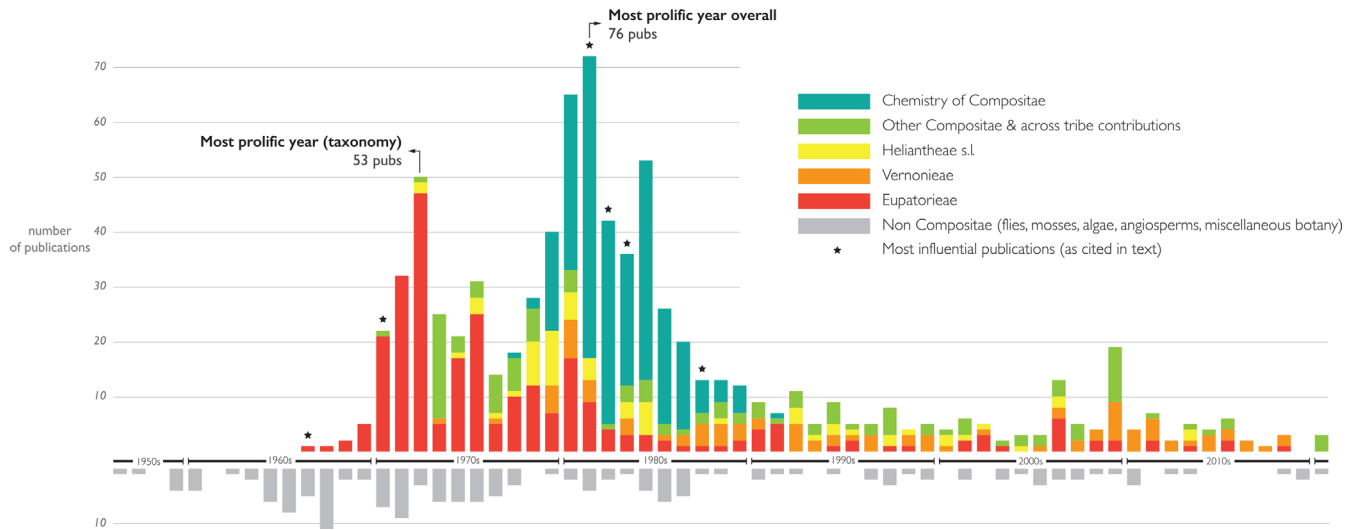


Fig. 2. Infographic summarizing the 966 publications of Harold Robinson. Notice the volume of Eupatorieae contributions, the pulse of chemistry papers (mostly on secondary metabolites of the same tribe), and the constant flux of non-Compositae papers (mostly on bryophytes and flies).

Harold Robinson: a nomenclatural machine

4052 organisms names have Harold Robinson as author

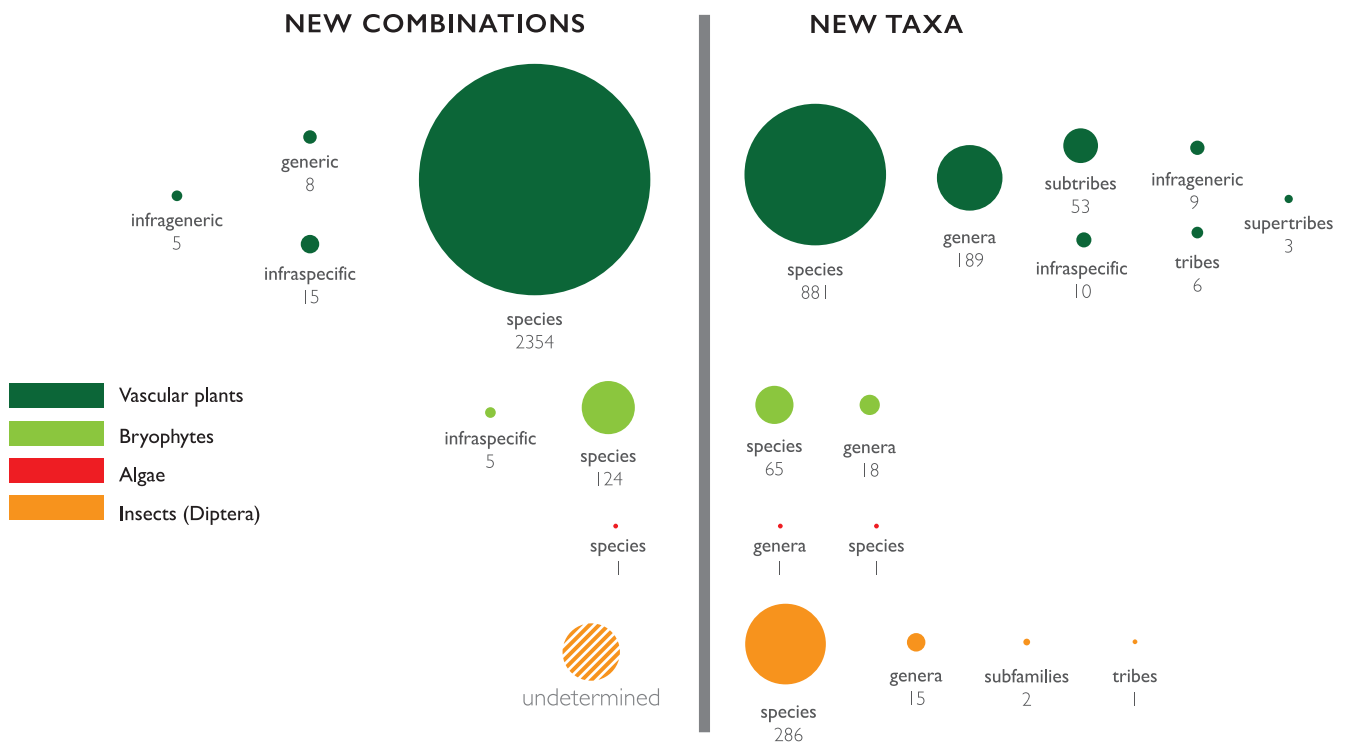


Fig. 3. Infographic summarizing the cornucopia of 4000+ organisms with Harold Robinson as taxonomic authority.

and so, I made a microscope slide of it and saw all kinds of characters, which had not ever been seen before. And he ended up describing the thing [see King, 1965] by the benefit of all those observations, but it was an interesting eye opener on the possibilities of using the microscope techniques on those plants. [...] And so, this event started us off with the breaking up of *Eupatorium* L., which had a thousand species in it, and when we got through it, [it] had about 30 [species]” (Robinson, 2016). The long collaboration with King eventually spanned 33 years and over 500 publications. Harold’s first work in Compositae and the start of this collaboration, was a review of the generic limits of the *Hofmeisteria* Walp. complex (King & Robinson, 1966). Here it is possible to see the mark that would define his taxonomic work: a deep dive into the study of morphology with an emphasis on micro- and a de-emphasis of macro-morphological characters for the diagnosis of genera. In the work on *Hofmeisteria*, various micromorphological characters are defined and illustrated, such as corolla pubescence, exothecium cell shape, connective appendage shape, cypsela pubescence, and carpodium shape and its constituent cells. King’s experience in Compositae and his introduction of Harold to the world of daisies appear to have influenced the order of authorship in all the “King & Robinson” publications that led to the atomization of *Eupatorium*. However, it is clear that Harold promoted these works from the beginning and contributed the academic weight in the use of microcharacters.

In their influential paper “The New Synantherology”, King & Robinson (1970) presented a strong criticism of the use of classical macroscopic characters, and put the focus on new microcharacters. Although their work lacked illustrations, the international venue provided by *Taxon* acted as an announcement of things to come: a blizzard of works applying these characters. In these studies, they meticulously segmented *Eupatorium*, then one of the largest genera of Compositae, into numerous small genera, which would mark them as some of the most prolific “splitters” in plant systematics. The New Synantherology received a cold welcome from another major figure in Compositae research, Billie L. Turner (1925–2020), who along with his graduate student Jerold Grashoff offered a short but scathing critique (Grashoff & Turner, 1970). An intellectual rivalry with Turner continued for many years but in time resolved amicably (Adams & al., 2020). Towards the end of this period, which produced more than 250 scientific papers, Harold compiled with Robert King the seminal book “The genera of the Eupatorieae” (King & Robinson, 1987). It is a formidable contribution for the family, where not only a tribal classification was unveiled, but, more importantly, all of the 180 genera are described and illustrated in detail, along with an extremely useful nomenclator of all the names published in the tribe. Microcharacters are clearly the main source of information on which Harold relied for the reorganization of the Eupatorieae, one of the five largest tribes of the Compositae (Fig. 4). Harold’s ongoing search for informative morphological characters led him to examine an overlooked character, namely the orientation of the style branches (Robinson, 1984). He built on pioneering work by Sherwin Carlquist on the nerves of the style branches and their prolongation on the surface of the cypsela (Carlquist, 1957), and provided practical indications on how best to observe this character and an initial review on its distribution across a broad spectrum of tribes. The value of this character for Compositae



Fig. 4. *Acanthostyles buniifolium* (Hook. & Arn.) R.M.King & H.Rob. The monotypic genus *Acanthostyles* was segregated from *Eupatorium* on the basis of microcharacters. The name (derived from Greek *Acantha*, “thorn” and *stylos*, “style”) refers to the rather unusual trait in Eupatorieae of long and sharp collector trichomes along the stylar branches, or according to King & Robinson, “the genus is named for its most distinctive feature, the flagelliform style appendage, which is laxly hirtellous with large acicular papillae” (image by M. Bonifacino).

systematics still needs further exploration but its potential utility, as outlined by Harold, is considerable.

Harold’s innovations in the field, through careful observation and embracing new types of data, also extended to the use of chemical characters derived from analysis of secondary metabolites. Through his association with German phytochemists, he provided the taxonomic input that led to the description of numerous compounds and their use for the chemotaxonomic characterization of many Compositae groups. Almost a quarter of his publications correspond to research of this nature, and were published mostly in the journal *Phytochemistry*. Some of his new insights in classification were initially based solely on chemistry. According to Harold, “I would have liked having DNA available to me when I started out but it was perhaps better to have the situations that did actually happen. For I produced some studies that differed with some of the established people in the field” (Robinson, 2016).

Harold’s work in the Compositae had taxonomic breadth, and beyond Eupatorieae, and there are few large tribes where he did not make a lasting impact in systematics. He described three new tribes, and circumscribed the showy Liabeae of the Neotropical cloud forests, where in his review of constitutive genera (Robinson, 1983) he offered insights into evolutionary relationships on the basis of microcharacters derived

from endothelial cells. Harold also contributed no less to the Vernoniae through the description of numerous genera and species, and postulation of hypotheses about their intratribal relationships based on characters derived from secondary metabolites. Also noteworthy is the attention he devoted to the Heliantheae s.l. through numerous works, among which his analysis of the constituent subtribes (many of them now recognized at the tribal level) stands out, with an emphasis on the characteristics derived from the pappus and cypselae (Robinson, 1981). He and his colleagues also made novel inferences about major trends in chromosome number evolution in Heliantheae s.l. (Robinson & al., 1981).

The passage of time has shown that many of the classificatory proposals made by Harold for the family, especially those within the Eupatorieae on the almost exclusive basis of micromorphological characters, were prescient and are now well supported by molecular phylogenetic studies. His classification system, once resisted in some corners of the world, is now broadly accepted. History records Cassini as the father of the Compositae, and it has definitely ascribed Harold Robinson as the unparalleled master of the Eupatorieae.

Harold shaped the exciting and pivotal modern era of Compositae research that was punctuated by major international Compositae conferences at Reading (U.K., 1975), Kew (U.K., 1994), and Barcelona (Spain, 2006). He was among the few scientists to take part in all three meetings and contributed significantly to the massive volume that came out of the last one (Funk & al., 2009). This era saw a new synthesis for the family, when ideas about the relationships within the Compositae started to be notably shaken and then reshaped by the advent of molecular data.

A special note needs to be made about the close collaboration that developed with Vicki Funk, his Smithsonian colleague who held the title of Curator of Compositae. Vicki brought emerging cladistic methods to her research and to Harold's attention. He embraced the new evolutionary perspective and its potential to test and refine his ideas of classification and character change. They published together from 1986 to 2020, with their collaboration cut short by the untimely passing of Vicki in 2019 (Wagner & Specht, 2020; Wen & Wagner, 2020). While the number of shared publications with Funk is considerably fewer than those produced with King, it is hard to overstate how synergistically they worked together and their influence on each other. In 2014, Harold and Vicki started an endowment that is now the Harold E. Robinson and Vicki A. Funk Award, which supports travel to visit US for Compositae research. More recently it was part of Harold's ritual to pay a visit to "Madame" Funk's office, where the two of them would discuss new and exciting findings about the Compositae, Vicki heralding molecular insights, and Harold providing support with his encyclopedic morphological knowledge of the family.

We end this review of Harold's most significant contributions to the world of Compositae with some thoughts about him as an individual. On the surface he was reserved, adverse to meetings and bureaucracy, and at first glance appeared introverted. However, behind that facade he could offer stimulating, wide-ranging conversation that was not necessarily limited to botany, often imbued with a deep sense of history, and one in which laughter was frequent. Harold's subtle sense of humor is evident for those who have doubts about its existence in the naming of *Dysaster* H. Rob. & V. A. Funk, a new genus of tribe Astereae, created to accommodate a seemingly impossible-to-place plant. In the publication's introduction, it was noted "There

is something very unsatisfying about a plant, sent for identification, that has no strikingly distinctive feature, but has a combination of characteristics that excludes it from any already known genus" (Robinson & Funk, 2014: 35). These sensibilities are also evident in, according to Gustavo Heiden from Brazil, his disdain of *Baccharis* L. and *Mikania* Willd. (two notoriously large and challenging genera) because he was not able to satisfactorily split them. Harold's world-class expertise in disparate groups of organisms could be hard for his peers to grasp, and sometimes led to confusion, such as the anecdote recalled by Fabián Michelangeli of when an entomologist in Costa Rica inquired about contact information and assumed the Smithsonian's fly and Compositae experts were two different people with the same name.

It was common to be working in the Smithsonian museum and sense steps approaching, generally at the end of the day, punctuated with Harold's classic question, "Well, what seems to be the progress in [whatever genus or group one was working on]?", and followed by inspiring and entertaining comments or jokes. Sometimes without saying a word he would withdraw as silently as he had arrived and then return, either later or the next day, with some relevant piece of literature or specimens. It was impossible not to learn something from those interactions, be it on plants, politics, or history. It saddens us that this beacon of Compositae wisdom and taxonomic innovation is gone. We find comfort knowing that his memory lives on in all the plants from around the world that bear his distinguished name, and how much light he shed on the never-ending path to a better understanding of the Compositae.

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Eponymy

Two genera and 13 species, mostly Compositae, commemorate Harold Robinson.

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