A short description of the collections of The New York Botanical Garden Herbarium (NY)

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Holmgren, P. K., J. A. Kallunki, and B. M. Thiers (The New York Botanical Garden, Bronx, NY 10458-5126, U.S.A.). A short description of the collections of The New York Botanical Garden Herbarium (NY). Brittonia 48: 285–296. 1996.—An overview of the phanerogamic and cryptogamic collections accumulated by The New York Botanical Garden Herbarium (NY) since its foundation in 1891 is presented. Appended are a list of herbaria incorporated into NY, a list of collectors who have deposited their original herbaria or significant parts thereof at NY, a list of the taxonomic groups particularly well represented at NY, and a list of papers published since 1963 about the NY collections.

The herbaria of The New York Botanical Garden (NY); Muséum National d'Histoire Naturelle, Paris, France (P); Komarov Botanical Institute, St. Petersburg, Russia (LE); Royal Botanic Gardens, Kew, England (K); and Natural History Museum, London, England (BM) are the five largest in the world. The Garden's Herbarium, founded in 1891, is the youngest of these herbaria, the others having been established in 1635, 1823, 1841, and 1753, respectively.

From the year of its foundation, The New York Botanical Garden Herbarium became the depository of large, highly significant collections. The current extensive collections, numbering 5,800,000, have accumulated around the core of the Columbia College (now University) Herbarium of 600,000 specimens, including the private herbarium of John Torrey, deposited on permanent loan in 1895. During the early years, large historic collections, many of them private accumulations, were acquired. Subsequently, the herbaria of the College of Pharmacy of Columbia College (University), of Princeton University, and of Hunter College were added. Since the inception of the Herbarium, orphaned collections totalling 1,113,207 specimens, including thousands of types, from 23 herbaria have been incorporated into the Garden's Herbarium (see Appendix I).

The first director of the Garden, Nathaniel Lord Britton, and his associates inaugurated a program of botanical exploration that continues to this day and has brought to the Garden many of the scientifically significant Western Hemisphere collections since the time of Torrey. Since Per Axel Rydberg led the first expedition, to Montana in 1897, Garden scientists have undertaken more than 1000 expeditions to botanically unknown areas, mainly in the West Indies, the United States (the eastern part in the early years, the western part in more recent years), and South America (especially Brazil, Venezuela, the Guianas, and the Andes). The collection continues to grow by acquisition of exchange specimens and by the collecting activities of the current staff.

By these means the Garden's Herbarium has become extraordinarily rich. Its collection of more than 125,000 type specimens is the second largest in the Western Hemisphere. Appendix II comprises a partial list of historically important original herbaria, including types, of vascular and non-vascular plants on deposit at the Garden.

The geographical emphasis throughout the history of the Herbarium, both in orphaned herbarium acquisitions and in staff activity, has always been on the flora and mycota of the New World. However, all areas of the world are represented to some extent by historical and recent collections. From its inception, the Garden has recognized the importance of documenting all groups of plants and fungi, but the collection has a particularly broad representation of the plant groups studied by past and present staff members and of some obtained through the adoption

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of orphaned herbaria (see Appendix III). The collections of vascular plants, bryophytes, fungi, lichens, and algae are all among the largest in the Western Hemisphere. Publications about these collections are listed in Appendix IV. Each of these major divisions of the Herbarium is characterized separately below.

Vascular Plants (Excluding Pteridophytes)

The Garden contains vascular plants from most of the important early explorations of the United States. With the herbarium of John Torrey (obtained with the Columbia University Herbarium), the Garden received the specimens, including types for the new species described, from the expeditions of Major Stephen H. Long (1819–1820), from John Charles Frémont's several explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean (mid-1800s), from Howard Stansbury's expedition to Great Salt Lake (1849–1850), from Randolph Barnes Marcy's exploration of the Red River of Louisiana (1853), and from J. N. Nicollet's exploration of the Pacific Northwest (1844). Also included was the private herbarium of Alvan Wentworth Chapman, the basis of his *Flora of the Southern United States*. The herbarium of William Marriott Canby, obtained with the Columbia University's College of Pharmacy Herbarium, was considered to be the largest and most important ever held in private hands in North America. It was built by direct purchase of collections and through collections by individuals that he helped finance.

In this manner the Garden acquired a set of types and collections of the majority of collectors active in the United States from 1858 to 1888, a period that witnessed unequalled activity in plant exploration in the western United States.

The Garden houses important collections of South American specimens that predate its foundation. Such are the 3500 collections of Richard Spruce obtained in exchange from Cambridge University in 1931, the Thomas Morong collections made in Paraguay and Chile between 1888 and 1890 and obtained from Barnard College, Thaddaeus Haenke's collections from Chile, Peru, Ecuador, Panama, and Mexico dating back to the late 1700s, and Henry H. Rusby's early collections obtained with the College of Pharmacy Herbarium in 1945.

The private herbarium of Otto Kuntze was purchased by the Garden in 1907 with financial assistance from Andrew Carnegie. This large herbarium of about 32,000 specimens was amassed from all of the continents and contained most of the type specimens for the taxa described by Kuntze and for some taxa described by other botanists on the basis of Kuntze's collections.

The Garden's early international reputation as a center for research on vascular plants was won by preeminence in floristic investigation. Major floras produced by staff members N. L. Britton, P. A. Rydberg, and John Kunkel Small covered Montana, the northeastern United States and Canada, the Rocky Mountains and adjacent plains (two editions), the southeastern United States (two editions), Puerto Rico, the Virgin Islands, Bermuda, and the Bahamas. Recent major floras written by Garden staff members are *Vascular Plants of the Pacific Northwest* (Arthur Cronquist, five volumes and a companion field manual), *Intermountain Flora* (A. Cronquist, Noel H. Holmgren, and Patricia K. Holmgren, four volumes published, one in press, and one in progress), and *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* (Henry A. Gleason and A. Cronquist, two editions). Each of these projects contributed significant numbers of North American specimens to the Garden.

In 1944, staff member Bassett Maguire inaugurated his landmark exploration program in Venezuela and the Guianas, where he made extensive and excellent collections for the next 30 years. He also collected in various regions of Brazil and the Andes. At his instigation, Howard S. Irwin and William R. Anderson conducted an intensive botanical survey of the Brazilian Planalto from 1964 to 1975. In 1964, Ghillean T. Prance began the Garden's program in the Brazilian Amazon that continued until his departure from the Garden in 1988. As a consequence, the representation of the Guayanan and Brazilian floras at the Garden is unsurpassed. The strong program in floristic and monographic studies of the vascular plants of South America continues through efforts of current staff.

In addition to geographic strengths, the Garden's collection is strong in vascular plant families studied by past or present curators or acquired with orphaned herbaria (see Appendix III). Many of these are the best extant collec-

tions of New World representatives of these families.

Pteridophytes

The pteridophyte herbarium, containing over 200,000 specimens, is rich in collections from all parts of America (except southernmost South America), Europe, Philippines, China, and Hawaii. The Garden's first fern curator, Lucien M. Underwood (staff member, 1896–1907), attracted many collections as one of the world's outstanding fern authorities. His own collections from North America and the West Indies added substantially to the holdings. He added many types to the herbarium through his description of new species and also acquired fragments of thousands of types and other authentic material from European herbaria. The pteridophyte collection has continued to develop through the Garden's many expeditions in the Americas and exchange with other institutions. The current (and only the second) curator of ferns, John T. Mickel (staff member since 1969), has added to the strengths of the collection through his floristic work in Mexico, Costa Rica, Hispaniola, and Trinidad and through his monographic studies of *Anemia* and *Elaphoglossum*. (For further information, see the article by J. T. Mickel in this issue of *Brittonia*.)

Bryophytes

The bryophyte herbarium, the largest in the Western Hemisphere and probably the fourth largest in the world, consists of approximately 489,000 mosses and 114,000 hepatics. The collection attained almost instant preeminence in taxonomic and geographic breadth. With the Columbia University Herbarium came the moss herbarium of August Jaeger (ca. 12,500 specimens), which provided the foundation for the series of articles published between 1870 and 1878 by Jaeger (and later by Friedrich Wilhelm Sauerbeck) in which all known moss species were reviewed. In 1906, the Garden purchased the herbarium of William Mitten, which consisted of approximately 50,000 specimens (more than 1500 types) of mosses and hepatics from virtually all continents of the world. Mitten served unofficially as bryologist for the Royal Botanic Gardens, Kew, and had free access to the bryophyte collections from the many botanical expeditions sponsored by Kew or the British Government during the latter half of the nineteenth century.

The bryophyte flora of North America is more completely documented in the Garden's Herbarium than in any other in the world, due to collecting activities of staff members—e.g., Elizabeth Gertrude Britton (staff member, 1899–1934), Lucien M. Underwood (staff member, 1896–1907), Marshall Avery Howe (staff member, 1901–1936), Robert Stratham Williams (staff member, 1899–1936), William Campbell Steere (staff member, 1958–1989), Gary Smith Merrill (staff member, 1969–1977), William R. Buck (staff member, 1979–present), and Barbara M. Thiers (staff member, 1982–present)—and to the acquisition of other bryophyte herbaria, most notably those of the herbaria of Stanford University (DS), University of Kansas (KANU), Florida State University (FSU), Paul M. Patterson, and DePauw University (DPU). Because of Steere's research program in arctic America, Greenland, Iceland, and the Antarctic, the Garden has one of the world's most extensive collections of polar bryophytes. Early in Steere's career, as well as after his retirement, Steere focused on the bryophyte flora of Andean South America, making this another area of strong geographical specialization. The holdings of Andean mosses have been augmented substantially through Steven P. Churchill's effort to document the moss flora of Colombia. Research on the moss flora of the West Indies by Buck and collaborators, together with earlier collections of Mrs. Britton, make the Garden's holdings from this area the most significant in the world.

Moss groups particularly well represented are the Calymperaceae and Macromitriaceae, groups of interest to Steere; the Fontinalaceae, through the vouchers for Winona H. Welch's monograph of that family in 1960; the Polytrichaceae, through the work of Smith Merrill; and the Sematophyllaceae, through the ongoing monographic studies of Buck. In the hepatics, the Marchantiales (because of the work of Howe) and the Lejeuneaceae (because of the work of Thiers) are emphasized. (For further information, see the article by W. R. Buck in this issue of *Brittonia*.)

Fungi

The fungus herbarium, the third largest in the Western Hemisphere, comprises approximately

480,000 specimens. The foundation for this collection was laid when the Garden purchased the herbarium of Job Bicknell Ellis, a pioneer in North American mycology, who built his collection of more than 100,000 specimens over the course of 40 years. He not only collected extensively but also received material from all parts of the country and from many parts of Europe. All groups of fungi are represented in the Ellis herbarium, with the greatest emphasis placed on plant pathogens and micro-fungi in general. The collection includes the types of 4000 new species described by Ellis and collaborators.

The geographical strength of the mycological herbarium lies in collections from the Americas, both historical and contemporary. Staff members Fred J. Seaver (staff member, 1909–1948) and Clark T. Rogerson (staff member, 1958–1989, emeritus 1989–present) concentrated on North America. Rogerson has conducted intensive studies on the fungi of Utah for more than 30 years. Two recently acquired herbaria have greatly expanded the depth of North American holdings: the Carnegie Museum (CM) fungus herbarium is noteworthy for its extensive representation of the fungi of Pennsylvania and adjoining states, and the University of Massachusetts (MASS) fungus herbarium brought probably the most complete set of New England fungi to the Garden.

The preeminent representation in the Garden's Herbarium of the mycota of Latin America was established through the efforts of staff members. Franklin Sumner Earle, the Garden's first mycologist, collected primarily plant pathogens in Cuba and Puerto Rico as well as in the southeastern United States. William A. Murrill (staff member, 1904–1924) collected more than 70,000 specimens of polypores and agarics from the United States, Europe, Mexico, South America, and the West Indies. Kent P. Dumont (staff member, 1969–1981) carried out a very active collecting program in tropical America. He made more than 25,000 collections in Bolivia, Brazil, Colombia, Ecuador, Panama, and Venezuela. Gary J. Samuels (staff member, 1966–1973, 1984–1989) deposited thousands of his collections (primarily ascomycetes) from Brazil, Colombia, French Guiana, Guyana, New Zealand, Panama, and Venezuela. Roy Halling (staff member, 1983–present) has contributed specimens primarily of Agaricales from his research programs in Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, and Venezuela, as well as from his earlier studies in North America (primarily California and New England).

Certain groups of fungi are particularly well represented in the Garden's mycological herbarium. The combination of the myxomycete collections of Ellis, Robert Hagelstein, and William Codman Sturgis make the Garden's collection probably the largest in North America and one of the most important collections of myxomycetes in the world. The strong foundation in pyrenomycetes, established through the acquisition of the Ellis herbarium, has been supplemented through the research of staff members Rogerson and Samuels (Hypocreales) and the herbarium of Margaret E. Barr (from the University of Massachusetts). The discomycete collection is significant because it contains vouchers from the works on North American discomycetes by Seaver, worldwide studies by George E. Massee (whose herbarium was acquired in 1905 and 1910), and studies on the Sclerotiniaceae by Dumont. Especially significant collections in the basidiomycete herbarium include Hydnaceae (Underwood and Howard James Banker), boletes and polypores (Murrill), the agaric families Tricholomataceae (Howard E. Bigelow and Halling) and Russulaceae (Gertrude S. Burlingham), and gasteromycetes, especially hypogeous taxa (Sanford Myron Zeller). (For further information, see the article by C. T. Rogerson and G. J. Samuels in this issue of *Brittonia.*)

Lichens

The lichen herbarium, which totals about 110,000 specimens, is probably the fourth largest in the Western Hemisphere. About 4000 to 6000 specimens are being added annually.

The foundation of the lichen collection is based on the holdings of Columbia and Princeton Universities. However, it was during the Britton era at the Garden that the lichen collection began to grow. Of particular importance was the acquisition of a portion of the William Allport Leighton herbarium from Kew. It is not clear how it came to the Garden, but it included important early European collections and Richard Spruce's South American collections. Also during this early period, the Garden acquired Lucien M. Underwood's private collection. Underwood was best known for his work on pteridophytes and hepatics, but he held an interest

in lichens as well. Later, staff bryologist Robert Stratham Williams also had an interest in lichens and actively collected them in Alaska, Montana, the Philippines, and Bolivia. The duplicates from Williams's collections were critical in the early lichen exchange program that helped build the Herbarium. When Richard C. Harris arrived at the Garden in 1980, the lichen collection totalled about 55,000 specimens. Since then, he has been very active in identifying staff lichen collections. Also, important collections have been purchased or received as a gift in the last 15 years. The most important was the gift from Wellesley College (WELC), which housed the collections of Clara Eaton Cummings and Grace E. Howard and had the longest history of continuous lichenology in this country. The Garden also received significant numbers of lichens from DePauw University (DPU) and the University of Massachusetts (MASS). The Garden purchased the private herbarium of George T. Johnson, a specialist in the Trypetheliaceae, who had also done general collecting in Chile, Costa Rica, Panama, and Cuba. Most recently, a large set of Costa Rican foliicolous lichens from R. Lücking was purchased. In the 15 years that Harris has been at the Garden, the collection has grown from 55,000 to 110,000 and has gone from a seldom used, storage collection into a frequently consulted, active collection with one of the strongest holdings anywhere of eastern North American and neotropical lichens.

Algae

The algal herbarium—with ca. 140,000 specimens, among the five largest in the United States—was built primarily by Marshall Avery Howe, phycologist and Assistant Director of The New York Botanical Garden, whose years at the Garden spanned 1901 to 1936. Howe collected more than 35,000 specimens of algae in eastern North America, Panama, and the West Indies. Howe was instrumental in obtaining the herbaria of Timothy Field Allen and Frank Shipley Collins, the most important private algal herbaria of the day. Allen was the leading American student of the Charophyceae during the late 1800s, and he built a collection of approximately 4000 specimens from North and South America, Asia, and Europe. This herbarium was used extensively in the preparation of the monumental two-volume work, *A Revision of the Characeae*, by Richard D. Wood and K. Imahori. In 1978, the Garden received Wood's charophyte herbarium (ca. 7000 specimens), and together the Allen and Wood collections make the Garden's charophyte herbarium one of the finest in the world. Other areas of taxonomic emphasis are coralline algae, because of Howe's research, and diatoms, through the acquisition of the herbarium of microscopist Robert Hagelstein.

Appendix I

LIST OF HERBARIA INCORPORATED INTO THE NYBG HERBARIUM

	Date	Size	Groups	Contents
Columbia Univ.	1895	600,000	All groups	Herbaria of J. Torrey, C. F. Meisner
Barnard College	1901	18,000	All groups	
Columbia School of Pharmacy	1945		Vascular plants	Herbaria of A. Wood, W. M. Canby, and H. H. Rusby
Princeton Univ.	1945	48,000	Vascular plants & bryophytes	
Stanford Univ. (DS), in part	1968	4,580	Bryophytes	Arctic North America
Univ. Kansas (KANU), in part	1969	4,402	Bryophytes	North America
Florida State Univ. (FSU), in part	1973	8,158	Bryophytes	North America; R. S. Breen herbarium
Torrey Botanical Club	1973	100,000	Vascular plants	Primarily northeastern North America
Carnegie Museum (CM), in part	1981	41,000	Fungi	Western Pennsylvania and adjacent areas; 30 types
		905	Marine algae	Coastal North America
Univ. Utah (UT), in part	1982	6,479	Fungi	Utah and adjacent areas; 59 types
Wesleyan Univ. (WECO)	1982	10,700	Vascular plants	Eastern U.S., Europe; 54 types
Hobart & William Smith Colleges (DH), in part	1983	3,470	Vascular plants	U.S., Europe; 31 types
Hamilton College	1983	6,200	Vascular plants	H. P. Sartwell herbarium; 90 types
DePauw Univ. (DPU)	1987	75,801	Vascular plants	T. G. Yuncker herbarium; 1067 types
		45,403	Bryophytes	W. H. Welch herbarium; 701 types
		4,993	Fungi	147 types
		381	Lichens	
		541	Algae	
Wabash College (WAB)	1987	15,959	Vascular plants	317 types
		1,483	Bryophytes	4 types
Wellesley College (WELC), in part	1988	42,192	Vascular plants	365 types
		4,465	Mosses	
		564	Hepatics	
		9,653	Lichens	Herbaria of C. Cummings, G. Howard
		5,498	Fungi	
		1,092	Algae	
Univ. Massachusetts (MASS), in part	1989	30,632	Fungi	Herbaria of M. E. Barr, H. E. Bigelow; 302 types
Univ. Texas (TEX), in part	1990	1,116	Fungi	B. C. Tharp herbarium
Gettysburg College, in part	1993	555	Vascular plants	Historical collections
U.S.D.A., Texas A&M Univ.	1993	20,012	Vascular plants	P. A. Fryxell herbarium; 15,000 Malvaceae; 193 types
Univ. Rhode Island (KIRI), in part	1995	211	Fungi	Roger Goos herbarium; 4 types
Herb Society of America, New York Unit	1996	516	Vascular plants	Herbs
Mianus River Gorge Preserve	1996	246	Vascular plants	Northeastern U.S.
Total		1,113,207		

Appendix II

REPRESENTATIVE LIST OF COLLECTORS WHO HAVE DEPOSITED THEIR ORIGINAL HERBARIA OR SIGNIFICANT PARTS THEREOF IN THE NEW YORK BOTANICAL GARDEN HERBARIUM

	Groups	Size	Region
Alexander, E. J.	Vascular plants		Eastern U.S.
Allen, J. A. & O. D.	Bryophytes	3,000	U.S.
Allen, J. F.	Vascular plants		California
Allen, T. F.	Algae	4,000	Worldwide
Anderson, C. L.	Algae	4,000	California
Anderson, G.	Lichens		North America
Anderson, W. R.	Vascular plants	5,900	Brazilian Planalto
Austin, C. F.	Mosses, lichens		Primarily New Jersey
Averill, H.	Algae	2,500	Northeastern U.S.
Balick, M. J.	Vascular plants		Belize, Brazil
Banker, H. J.	Fungi	4,400	Eastern U.S.
Barneby, R. C.	Vascular plants		Western U.S.
Barnhart, J. H.	Vascular plants		U.S.
Barr, M. E.	Fungi	13,000	North America, especially New England
Barratt, J.	Vascular plants		Northeastern U.S.
Beals, A. T.	Bryophytes	2,000	Northeastern U.S.
Beatley, J. C.	Vascular plants		Nevada
Bechtel, A. R.	Vascular plants	4,100	North America
Beck, H. T.	Vascular plants		South America
Berger, A.	Vascular plants		
Best, G. N.	Mosses		North America
Bicknell, E. P.	Vascular plants		Eastern U.S.
Bigelow, H. E.	Fungi	20,000	North America, especially New England
Billings, J. S.	Fungi		Eastern U.S.
Boom, B. M.	Vascular plants		South America, West Indies
Brako, L.	Lichens		Brazil, Ecuador, Venezuela
Breen, R. S.	Mosses		Southeastern U.S.
Britton, E. G.	Bryophytes, lichens		North America, West Indies
Britton, N. L.	Vascular plants	135,000	North America, West Indies, Europe
Buck, W. R.	Bryophytes		South America, West Indies
Burgess, E. S.	Vascular plants		North America
Burlingham, G. S.	Fungi	10,000	North America
Calkins, W. W.	Lichens		Eastern U.S.
Camp, W. H.	Vascular plants		Ecuador, North America
Canby, W. M.	Vascular plants	150,000	North America
Chapman, A. W.	Vascular plants		Southern U.S.
Christ, J. H.	Vascular plants		Idaho
Churchill, S. P.	Mosses		Colombia
Clements, F. E.	Vascular plants		
Collins, F. S.	Algae	40,000	Worldwide
Coulter, J. M.	Vascular plants		Indiana
Cowan, R. S.	Vascular plants		Guayana
Cronquist, A.	Vascular plants	13,000	U.S., Mexico
Cummings, C. E.	Lichens		Jamaica, U.S., Europe
Curtiss, A. H.	Vascular plants		West Indies, U.S.
Daly, D. C.	Vascular plants		South America
Degener, O. & I.	Vascular plants		Hawaii, U.S.
Denslow, H. M.	Vascular plants		U.S.
Donaldson, A. B.	Vascular plants	40	Custer's Expedition
Dumont, K. P.	Fungi	30,000	South America
Earle, F. S.	Fungi		Southeastern U.S., West Indies
Ellis, J. B.	Fungi	80,000	North America, Europe, tropical America
Elmore, C. J.	Diatoms		Nebraska
Fairman, C. E.	Fungi		U.S.
Fink, B.	Lichens		Puerto Rico
Flowers, S.	Fungi		Western U.S.
Frémont, J. C.	Vascular plants		Western U.S.
Fryxell, P. A.	Vascular plants		Mexico
Garrett, A. O.	Fungi	6,500	North America
Gier, L. J.	Bryophytes	8,000	Eastern U.S.
Gleason, H. A.	Vascular plants		South America, Puerto Rico, U.S.
Hagelstein, R.	Diatoms	17,000	Mostly North America
	Myxomycetes	4,800	
Halling, R. E.	Fungi		North and South America
Haring, I.	Bryophytes	5,000	Mostly western North America

Appendix II

CONTINUED

	Groups	Size	Region
Harper, R. A.	Fungi		North America, Panama
Harris, R. C.	Lichens		North America, West Indies
Hasse, H. E.	Lichens, flowering plants		Predominantly California
Haynes, C. C.	Hepatics		
Heller, A. A.	Vascular plants		U.S.
Henderson, A.	Vascular plants		South America
Henry, L. K.	Fungi		Eastern U.S.
Holmgren, N. H. & P. K.	Vascular plants		Western U.S.
Howard, G. E.	Lichens		Western U.S.
Howe, M. A.	Hepatics, algae	32,000	New World
Irwin, H. S.	Vascular plants	32,200	Brazilian Planalto, Guyana
Jaeger, A.	Mosses		Worldwide
Jaeger, J. G.	Algae, fungi, bryophytes		
James, E.	Vascular plants		Major S. H. Long Expedition
Jenman, G. S.	Vascular plants		New World
Johnson, G. T.	Lichens	6,600	U.S., Cuba, Panama, Chile
Kallunki, J. A.	Vascular plants		Brazil
Killip, E. P.	Vascular plants, bryophytes		South America
Krukoff, B. A.	Vascular plants	13,000	Worldwide
Kuntze, C. E. O.	Vascular plants	32,000	Worldwide
Leggett, W. H.	Vascular plants		Eastern U.S.
LeRoy, P. V.	Vascular plants	15,000	North America
Lesquereux, C. L.	Vascular plants		North America, Europe
Liogier, A. H.	Vascular plants		West Indies
Lowe, J.	Lichens		New York
Lücking, R.	Lichens		Costa Rica
Luteyn, J. L.	Vascular plants		Andean South America
Mackenzie, K. K.	Vascular plants	43,000	North America
Maguire, B.	Vascular plants	60,000	South America, U.S., West Indies
Massee, G. E.	Fungi		
McClatchie, A. J.	Fungi	5,000	Mostly southern California
McGregor, R. L.	Bryophytes		Central U.S., primarily Kansas
Meisner, C. F.	Vascular plants		Worldwide
Merrill, E. D.	Vascular plants	23,000	Worldwide
Mickel, J. T.	Pteridophytes		Mexico
Mitten, W.	Bryophytes, lichens	50,000	Worldwide
Moldenke, H. N.	Vascular plants		Worldwide
Mori, S. A.	Vascular plants		French Guiana, Brazil
Morong, T.	Vascular plants	20,000	Paraguay, Chile, North America
Murrill, W. A.	Fungi	70,000	New World, Europe
Nash, G. V.	Vascular plants	11,000	Eastern U.S., Haiti
Nee, M.	Vascular plants		Bolivia
Ottley, A. M.	Vascular plants		U.S., South Africa
Patterson, P. M.	Bryophytes	8,000	Virginia
Perry, G. W.	Algae	1,400	North America
Pike, N.	Algae	3,000	North America, Portugal, Mauritius
Prance, G. T.	Vascular plants	29,500	Brazil
Pursell, R. A.	Lichens		Mexico, eastern U.S.
Rau, E. A.	Bryophytes	3,000	North America
Richards, H. M.	Algae		
Rogerson, C. T.	Fungi		U.S.
Rusby, H. H.	Vascular plants		South America
Rydberg, P. A.	Vascular plants	35,000	U.S.
Sartwell, H. P.	Vascular plants	1,670	North America, Europe
Schneider, A.	Lichens		U.S.
Schott, A. C. V.	Vascular plants		Mexican Boundary Survey
Schwarze, C. A.	Fungi		Eastern U.S.
Seaver, F. J.	Fungi		U.S., West Indies
Selby, A. D.	Fungi		Colorado
Shafer, J. A.	Vascular plants	25,000	West Indies, South America
Shurtleff, C. A.	Vascular plants		India, U.S., Mexico, West Indies
Small, J. K.	Vascular plants, lichens	70,000	U.S., West Indies
Smith, A. C.	Vascular plants		South America
Smith, G. L.	Mosses		New World
Smith, H. H.	Vascular plants		Colombia

Appendix II

CONTINUED

	Groups	Size	Region
Stansbury, H.	Vascular plants		Western U.S.
Steere, W. C.	Bryophytes		Arctic North America, South America
Stout, A. B.	Vascular plants		U.S.
Sturgis, W. C.	Fungi	3,200	
Sumstine, D. R.	Fungi		Eastern U.S.
Tate, G. H. H.	Vascular plants		Bolivia, Brazil, Ecuador, Venezuela
Tharp, B. C.	Fungi		Texas
Thiers, B. M.	Bryophytes		Australia, North and South America
Thomas, W. W.	Vascular plants		Brazil
Tiehm, A.	Vascular plants		Western U.S.
Torrey, J.	Vascular plants		North America
Torrey, R. H.	Lichens		Eastern U.S.
Tuckerman, E.	Lichens		New England
Uggla, W.	Bryophytes	13,000	Mostly Europe
Underwood, L. M.	All groups		U.S., West Indies, Mexico
Vail, A. M.	Vascular plants	5,600	North America
Van Brunt, C. G.	Diatoms	2,000	North America
Vigener, A.	Vascular plants, bryophytes, lichens	20,000	Central Europe
Watson, S.	Vascular plants		Clarence King Expedition
Welch, W. H.	Bryophytes	20,000	Mostly North America, especially Indiana
Williams, R. S.	Vascular plants, mosses	20,000	Bolivia, Philippines, Panama, North America
Wilson, P.	Vascular plants	16,000	Bahamas, Cuba, Honduras, Puerto Rico, U.S.
Wood, A.	Vascular plants		U.S.
Wood, R. D.	Algae	7,000	Worldwide
Wurdack, J. J.	Vascular plants		Guayana
Yuncker, T. G.	Vascular plants	19,000	West Indies, Central America, South Pacific, North America
Zanoni, T. A.	Vascular plants, bryophytes		West Indies
Zeller, S. M.	Fungi	3,500	Worldwide
Zundel, G. L.	Fungi		Western U.S.

Appendix III

REPRESENTATIVE LIST OF THE TAXONOMIC GROUPS THAT ARE PARTICULARLY WELL REPRESENTED IN THE NYBG HERBARIUM BECAUSE OF THE WORK OF PAST AND PRESENT STAFF SPECIALISTS AND BECAUSE OF THE ACQUISITION OF OTHER HERBARIA WITH SPECIAL STRENGTHS.

Flowering Plants

Anacardiaceae: J. Mitchell (neotropics), D. C. Daly (neotropics).
Asteraceae: A. Cronquist (North America), D. D. Keck (North America), E. S. Burgess (North American *Aster*).
Burseraceae: D. C. Daly (neotropics).
Cactaceae: N. L. Britton (Americas), A. Areces (Americas).
Caesalpiniaceae: R. C. Barneby, H. S. Irwin (American Cassiinae).
Campanulaceae: J. L. Luteyn (neotropics).
Caryophyllaceae: B. Maguire (North America).
Chrysobalanaceae: G. T. Prance (neotropics).
Clusiaceae: B. Maguire (neotropics).
Connaraceae: E. Forero (neotropics).
Cucurbitaceae: M. Nee (Americas).
Cuscutaceae: T. G. Yuncker (worldwide).
Cyperaceae: N. L. Britton (West Indies), T. M. Koyama (worldwide), W. W. Thomas (neotropics), K. K. Mackenzie (North American *Carex*).
Dichapetalaceae: G. T. Prance (neotropics).
Ericaceae: A. C. Smith (Americas), W. H. Camp (Americas), J. L. Luteyn (neotropics).
Eriocaulaceae: H. N. Moldenke (worldwide).
Euphorbiaceae: E. Jablonski (Americas).
Fabaceae: R. S. Cowan (neotropics), B. A. Krukoff (*Erythrina*), R. C. Barneby (*Astragalus*, Daleae).
Lauraceae: C. K. Allen (neotropics).
Lecythidaceae: G. T. Prance (neotropics), S. A. Mori (neotropics).
Loganiaceae: B. A. Krukoff (*Strychnos*).
Malpighiaceae: W. R. Anderson (neotropics).
Malvaceae: P. A. Fryxell (worldwide).
Melastomataceae: J. J. Wurdack (neotropics), H. A. Gleason (neotropics).
Menispermaceae: B. A. Krukoff, R. C. Barneby (neotropics).
Mimosaceae: N. L. Britton (neotropics), R. C. Barneby (neotropics).
Palmae: M. J. Balick (neotropics), A. Henderson (neotropics).
Piperaceae: T. G. Yuncker (worldwide).
Poaceae: G. V. Nash (North America, West Indies).
Polygonaceae: J. K. Small (North America, especially *Polygonum*).
Rapateaceae: B. Maguire (neotropics).
Rosaceae: P. A. Rydberg (North America).
Rutaceae: R. S. Cowan (neotropics), J. A. Kallunki (Brazil).
Salicaceae: J. Barratt (North America).
Sapotaceae: B. A. Krukoff (neotropics), A. Cronquist (neotropics).
Scrophulariaceae: F. W. Pennell (North America, West Indies), D. D. Keck (*Penstemon*), N. H. Holmgren (Americas, especially *Castilleja* and *Penstemon*).

Simaroubaceae: A. Cronquist (neotropics), W. W. Thomas (neotropics).
Solanaceae: M. Nee (neotropics).
Verbenaceae: H. N. Moldenke (worldwide).
Vochysiaceae: S. A. Mori (neotropics).

Gymnosperms

Pinales: T. A. Zanoni (Americas).
Cycadales: D. W. Stevenson.

Pteridophytes

L. M. Underwood, J. T. Mickel, J. M. Beitel (Americas).
Equisetaceae: R. L. Hauke.

Bryophytes

Calymperaceae, Orthotrichaceae: W. C. Steere.
Fontinalaceae: W. H. Welch (worldwide).
Sematophyllaceae: W. R. Buck.
Ricciaceae: L. M. Underwood (North America).
Lejeuneaceae: B. M. Thiers (Australia, Americas).
Porellaceae: M. A. Howe (North America).

Fungi

Myxomycetes: R. Hagelstein (North America, West Indies), W. C. Sturgis (Colorado).
Deuteromycetes: J. B. Ellis, R. D. Goos.
Pyrenomycetes: J. B. Ellis (North America), G. E. Massee (Peronosporaceae, Erysiphaceae), C. T. Rogerson (Hypocreales), M. E. Barr (Dothidiales, Diaporthaceae, Loculoascomycetes).
Discomycetes: G. E. Massee (Geoglossaceae), F. J. Seaver (North American inoperculate taxa), K. P. Dumont (Sclerotiniaceae).
Uredinales: J. B. Ellis (North American Uredinieae).
Aphyllophorales: L. M. Underwood (North America).
Hydnaceae: H. J. Banker (North America).
Polyporaceae: W. A. Murrill (North America, Philippines, neotropics).
Boletaceae: W. A. Murrill (North America), R. E. Halling (North and South America, Australia).
Tricholomataceae: W. A. Murrill (North America), H. E. Bigelow (North American *Clitocybe, Omphalina*), R. E. Halling (North and South American *Collybia*).
Russulaceae: G. S. Burlingham (North American *Russula* and *Lactarius*).
Gasteromycetes: G. E. Massee (*Calostoma*), S. M. Zeller (Pacific Northwest).
Sphaeriales: J. S. Billings (worldwide).

Lichens

Trypetheliaceae: G. T. Johnson, R. C. Harris (worldwide).

Algae

Diatoms: R. Hagelstein (West Indies).
Charophyceae: T. F. Allen, R. D. Wood (worldwide).
Coralline algae (Rhodophyceae): M. A. Howe (West Indies).

Appendix IV

PUBLICATIONS SINCE 1963 ABOUT THE COLLECTIONS IN THE NEW YORK BOTANICAL GARDEN HERBARIUM

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Balslev, H. & E. Joyal. 1980. Plant collectors in Ecuador: Camp, Prieto, Jørgensen and Giler. Brittonia 32: 437–451.

Barneby, R. C. 1963. Treasures of the Garden's herbarium: Reliquiae Haenkeanae. Gard. J. New York Bot. Gard. 13: 139–140, 142.

———. 1963. Treasures of the Garden's herbarium II. The collection of Karl Friedrich Meissner. Gard. J. New York Bot. Gard. 13: 182–183.

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——— **& M. E. Fleming.** 1964. Treasures of the Garden's herbarium III. The bryophytes of William Mitten. Gard. J. New York Bot. Gard. 14: 146–148.

Barr, M. E., S. M. Huhndorf & C. T. Rogerson. In press. The pyrenomycetes described by J. B. Ellis. Mem. New York Bot. Gard.

Becker H. F. 1968. Plant fossils. Gard. J. New York Bot. Gard. 18: 118–120.

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Callejas, R. & D. M. Johnson. 1989. Piperaceae types from the T. G. Yuncker Herbarium (DPU) now filed in The New York Botanical Garden Herbarium (NY). Brittonia 41: 297–324.

Cholewa, A. F. & D. F. Austin. 1987. Checklist of species described by J. K. Small. Contr. New York Bot. Gard. 18: 9–82.

——— **& M. A. Wetter.** 1988. The Henry Parker Sartwell herbarium of Hamilton College. Brittonia 40: 66–75.

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Goodman, G. J. & C. A. Lawson. 1995. Retracing Major Stephen H. Long's 1820 expedition. The itinerary and botany. Univ. Oklahoma Press, Norman, Oklahoma.

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Harris, R. C. 1988. The lichen collection of DePauw University assembled by Winona Welch, complete cryptogamist. Brittonia 40: 172–179.

Holden, C., editor. 1993. Custer's last botanical stand. Science 259: 32.

Holmgren, P. K. 1977. Uses of The New York Botanical Garden's systematic collections for solution of problems of human health, food resources, environmental quality, and location and utilization of natural resources. Bull. Amer. Assoc. Bot. Gard. 11: 2–13.

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Kallunki, J. A. 1980. Cuban plant collections of J. A. Shafer, N. L. Britton, and P. Wilson. Brittonia 32: 397–420.

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Koonz, B. 1992. Botanist finds Custer's plant specimens. Review Press-Reporter, Bronxville, New York. 17 December, page 1.

Leonardi, L. & B. M. Thiers. 1987. Bryophytes of The New York Botanical Garden Forest: yesterday and today. Garden Magazine 11: 33–34.

Masson V. J. 1994. Brief history of and collector's index to the Wabash College Herbarium (WAB), now deposited at The New York Botanical Garden (NY). Brittonia 46: 211–224.

Meurer-Grimes, B. 1989. Bibliography of Truman G. Yuncker. Brittonia 41: 221–224.

———. 1989. Index to collectors of the Piperaceae represented in the T. G. Yuncker Herbarium of DePauw University. Brittonia 41: 285–296.

———. 1989. Itinerary of Truman G. Yuncker's expeditions. Brittonia 41: 225–235.

———. 1991 [1992]. Notable collections represented in the Truman G. Yuncker Herbarium (DPU), now deposited at The New York Botanical Garden (NY). Brittonia 43: 269–276.

——— & **C.-S. Chang.** 1991. Type specimens of vascular plants in the T. G. Yuncker Herbarium of DePauw University (DPU), now deposited at The New York Botanical Garden (NY). Brittonia 43: 57–64.

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New York Botanical Garden Staff. 1988. Winona H. Welch Festschrift. Brittonia 40: 113–187.

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O'Neil, T. 1993. A Custer find in the Bronx. Newsletter of the Little Big Horn Association 27: 5.

Park, C.-w. 1987. Type specimens of *Polygonum* (Polygonaceae) in the Meisner herbarium at The New York Botanical Garden. Brittonia 39: 96–105.

Prince, C. R. 1977. Lichen herbarium of William Mitten (1819–1906). Bryologist 80: 231–232.

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Rodrigues, K. 1989. Index to J. B. Ellis's types of pyrenomycetes with amyloid ascal rings. Mycotaxon 34: 577–599.

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BOOK REVIEW

Monocotyledons: Systematics and Evolution. 2 vols. Edited by Paula Rudall, Phillip Cribb, David Cutler & Christopher Humphries. Royal Botanic Gardens, Kew, England. ISBN 0-947643-85-0 (paper). 1995. 750 pages. Price not given.

This two-volume, paperback set contains the papers presented at the international symposium Monocotyledons: Systematics and Evolution. The symposium was held at Kew Gardens in England in July 1993. The papers from the symposium have been speedily published and the editors are to be congratulated for this. This set is dedicated to Rolf Dahlgren, whose life ended tragically in 1986, and whose own 1985 book, *The Families of the Monocotyledons* (co-authored with H. Clifford and P. Yeo), forms the departure point of many of the papers here. Comparison of the two books will soon show how much progress has been made in monocot research in the intervening decade. The most revolutionary development has been, of course, the cladistic analysis of molecular data.

The two volumes comprise 31 papers, most of them studies at the family level or above or reviews of various kinds of data. The scene is set by the first paper by Herendeen and Crane, who review the fossil record of the monocots. Other authors review morphological data (Endress on flowers, Ronse and Smets on the androecium, Tillich on seedlings, Danilova and colleagues on seed structure), cytological data (Greilhuber), vascular organization (Tomlinson), chloroplast DNA (Hahn and colleagues), and flavonoids (Harborne and Williams). There are four papers on particular families (Amyrillidaceae, Orchidaceae, Palmae, and Pandanaceae), nine on orders (Nympheales, Dioscoreales, Asparagales, Liliales and Melianthales, Burmanniales and Orchidales, Arales, Pontederiales, Cyperales, and Poales), four on supra-ordinal taxa (Ariflorae, Triuridiflorae, Zingiberanae, Lilianae), one on a subclass (Alismatidae), and a clade (commelinid). Four papers analyze monocots as a whole: Bharathan and Zimmer use molecules, as does Chase; Stevenson and Leconte use morphology; and Chase and Stevenson analyze a combined data set.

There is too much here to review in detail. The only paper I read with more than passing attention was that on the prince of monocot families, the palms. Uhl and colleagues supply the first family-level cladistic study based on morphology and restriction-site DNA data. The coryphoid palms are disproportionately sampled—in fact, the paper is really an analysis of this group. Some characters from the morphological data set are somewhat dubious; character 13 does not exist (there is no morphological difference between hapaxanthic and pleonanthic palms but a life-history one, and even the life histories of the three hapaxanthic groups are different from one another); character 21 is incorrectly scored for *Itaya*, and probably not homologous in coryphoid, nypoid, and phytelephantoid palms; and character 6 (praemorseness) is certainly not homologous in the different groups where it occurs (and *Manicaria* is not praemorse). It would be interesting to know what differences these changes would make to the results, especially concerning the tenuous connection between the caryotoids and iriarteoids. This paper is, however, the first higher-level attempt at cladistics in palms, and certainly shows the way forward. No doubt the morphological data set will continue to be refined and expanded in the future.

The papers in these two volumes are, in general, excellent. I expect the books will sell very well, and any botanist interested in monocot phylogeny will want to buy them. One of the clear lessons of this symposium, in my view, is the continued importance of understanding morphological characters and their underlying development, as well as (and combined with) molecular data.—ANDREW HENDERSON, The New York Botanical Garden, Bronx, NY 10458, U.S.A.