

OHIO'S HERBARIA: WHERE ARE WE AND WHERE ARE WE GOING?¹

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The preceding excellent contributions to the symposium have shown clearly the historical development, size, and importance of herbarium collections in Ohio. What hasn't been addressed yet is an overall assessment of where we stand in our efforts to document the flora of the state and of neighboring regions and to provide the kinds of services needed for active teaching, research, and public service that are responsibilities of our collections. It is the purpose of this paper to consider these aspects in a general way, first, by looking at the holdings that we now have, and second, by considering ways in which these holdings might be improved and cooperation developed among the institutions that house and maintain the collections.

WHERE DO WE STAND?

OHIO INSTITUTIONAL HOLDINGS. In total quantity there are 967,166 specimens contained in 36 herbaria in Ohio (Cusick and Snider 1982), or in effect, approximately 1,000,000 specimens. For ease of analysis of geographical holdings and distribution by taxonomic group, it will be useful to discuss the 10 largest herbaria of the state, which contain approximately 90% of all the material (table 1). Ohio State and Miami University are the largest institutions which together hold more than half of the specimens in Ohio. It is not surprising that the largest institutions contain the largest collections. The vascular plants in the top

TABLE 1
The 10 largest herbaria in Ohio.
Data from Cusick and Snider (1982).

Institution	Numbers of Specimens
1. Ohio State Univ.	352,300
2. Miami Univ.	204,070
3. Univ. of Cincinnati	86,800
4. Kent State Univ.	60,000
5. Ohio Univ.	37,300
6. Oberlin College	33,015
7. Cleveland Museum of Natural History	31,450
8. Youngstown State Univ.	26,582
9. Muskingum College	23,500
10. Bowling Green State Univ.	20,500
Totals	875,517

10 herbaria comprise 80.5% of the total holdings (699,150 specimens). The geographic distribution of these materials is interesting (table 2). Over half of the specimens are from Ohio (53.2%), which leaves 46.8% for material outside the state. The next major category of geographic distribution of holdings is North America, excluding Ohio and Mexico, with 39.7%. The eastern hemisphere has 3.9% and involves materials mainly from Europe; Latin America has 3.3%. The nonvascular plants (table 3) equal 171,751 in the top 10 collections and comprise 19.5% of the holdings. The taxonomic distributions (table 3) show that bryophytes (mosses and liverworts) are most in abundance with 37.8% of the total holdings within the top 10 institutions, with fungi at 30.2%, lichens at 20.5% and the algae at 11.5%. The institutions that have the major holdings are: for algae—Ohio State; fungi—Miami; lichens—Cincin-

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TABLE 2
Geographical representation of vascular plant specimens in the 10 largest herbaria of Ohio.
Data from Cusick and Snider (1982).

Area	Number of Specimens	Percentage of Total
Ohio	372,016	53.2
North America (excl. Ohio and Mexico)	277,687	39.7
Eastern Hemisphere	27,571	3.9
Latin America	21,876	3.3
Totals	699,150	100.1

TABLE 3
Taxonomic representation of non-vascular plant specimens in the 10 largest herbaria of Ohio.
Data from Cusick and Snider (1982).

Taxon	Number of Specimens	Percentage of Total
Bryophytes	64,878	37.8
Fungi	51,855	30.2
Lichens	35,281	20.5
Algae	19,737	11.5
Totals	171,751	100.0

nati, Miami, Ohio State, and bryophytes—Cincinnati and Miami.

The quantity of material contained in the various institutions in the state reflects a degree of quality as well. Obviously, since over half of the holdings relate to the Ohio flora, it is fair to say that this area is the best represented. Because the state has been sufficiently well collected (at least for vascular plants), it is doubtful that a major collecting program is needed at this time. However, there are areas that could be surveyed more carefully, particularly in southeastern Ohio. The out-of-state material is not as well represented, and is cause for some reflection. Very clearly, outside of North America the holdings contained within the state's institutions are minimal. To some this may seem an unnecessary or trivial problem, but in my opinion to fulfill clearly the responsibilities of service, teaching, and research, our institutions

should have better representation of the world's flora, at least at the generic level. Introduced exotics are often brought by police departments, interested citizens, and other units into our universities for proper identification. Without extensive holdings of the world's flora, it is impossible to do proper justice to these requests. This does not mean that we need to have every species represented, but that we need to have a good coverage of the families and genera contained within our institutions.

COMPARISON WITH NEIGHBORING STATES. To understand the regional position of our collections within Ohio (already discussed to some extent by Dr. Eshbaugh in this symposium), it is useful to look at the neighboring states of Indiana, Kentucky, Michigan, Pennsylvania, and West Virginia (table 4). Table 4 shows the total numbers of herbaria and the numbers of specimens in these other states as compiled from the recent edition of the *Index Herbariorum* (Holmgren et al. 1981). The total amount of material in these five states is 7,509,236 sheets. Ohio's share of the total is 13.2%. To have our full share, we would expect to have 16.17% or approximately 1,251,539, which means for

TABLE 4
Total numbers of herbaria and herbarium specimens in Indiana, Kentucky, Michigan, Ohio, Pennsylvania, and West Virginia. Data from Index Herbariorum (Holmgren et al. 1981).

State	Number of Herbaria	Number of Specimens	Percentage of Total Specimens
Pennsylvania	19	3,233,800	43.1
Michigan	25	2,118,604	28.2
Ohio	16*	993,035	13.2
Indiana	11	852,654	11.4
West Virginia	7	214,543	2.9
Kentucky	6	96,600	1.3
Totals	84	7,509,236	100.1

*The recent survey (Cusick and Snider 1982) shows 36 herbaria in Ohio, but because such a detailed analysis is unavailable for the surrounding states, the figures from the *Index Herbariorum* have been used here for comparisons.

absolute equal representation we should have about 250,000 more specimens. The largest holdings are found in Pennsylvania with 19 herbaria and over 3,000,000 specimens. Michigan has the largest number of herbaria (25) but with a reduced total of slightly more than 2,000,000 specimens. The University of Michigan alone has 1.4 million specimens. Kentucky has the smallest holdings with barely 100,000 specimens contained in six institutional herbaria. Basically, these figures indicate we are moderately successful in terms of quantity of material and numbers of collections within our state.

In terms of geography of material, the collections in Ohio do not rate well with those in neighboring states. Comparisons are difficult to make directly because of the existence in Pennsylvania of two very large general public institutions, the Carnegie Museum of Natural History (in Pittsburgh) and the Philadelphia Academy of Natural Sciences. The University of Michigan has an extremely large herbarium which is worldwide in scope. In general, however, it is clear that our collections within Ohio are not as extensive and representative of the world's flora as we would wish them to be in comparison with neighboring states. They are not far off the mark in total size, but they have an overwhelming representation of material of the flora of Ohio.

WHERE ARE WE GOING?

OBJECTIVES OF DIFFERENT HERBARIA IN THE STATE. Because we now have a good understanding of the total holdings of specimens within Ohio, it is appropriate to consider where we want to go in the maintenance and further development of our herbaria. To progress in a positive direction, it is necessary to know the objectives and priorities of our various collections. Unfortunately, we really do not have a good idea of what these are at the moment. Our herbaria have developed historically along lines of research interests of the directors and curators. This is often the way institutions do grow and enlarge, but

our separate objectives have not been clearly articulated and mutually communicated so that coordination could be achieved and duplication avoided. This seems especially true in our exchange programs. There seems to be a lack of policy on what kinds of collections are being acquired and what kinds are actively being solicited. Many of the smaller institutions grow through receipt of student collections derived from academic courses associated with the herbaria.

THE OHIO STATE UNIVERSITY HERBARIUM AS AN EXAMPLE. As I am more familiar with the operation of the OSU Herbarium, it might be instructive to indicate our priorities as an example of the kinds of things we are attempting for streamlining our operations and for providing a framework for future growth. We have just finished drafting a nine-year plan (Stuessy et al. 1982) which sets priorities on certain areas of acquisition. Many of the ideas expressed here come from that plan.

In guiding our understanding of the direction in which we hope to take the OSU Herbarium, we first looked at a comparison of our collection with those in the Big Ten universities, with which we are normally compared and are closely associated academically and in intercollegiate sports (table 5). This sobering picture reflects that although we are one of the largest herbaria in the state of Ohio, we rank only seventh in holdings in the Big Ten. In fact, of the institutions with smaller holdings, Northwestern University no longer has an herbarium (it was given to the Field Museum of Natural History in Chicago), Purdue University no longer has a botany program with an organismic focus, and Indiana University is the only institution still with a systematics program that has a smaller collection. Clearly, one of our goals for the future must be an increase in size of holdings to be more commensurate with our nationally recognized plant systematics program. In fact, it is our opinion that in terms of research productivity we would rank only second to the University of Michigan which has a very large in-

TABLE 5
*Year of founding and total numbers of herbarium specimens in Big Ten universities.
 Data from Index Herbariorum (Holmgren et al. 1981).*

University	Year of Founding	Number of Specimens	Percentage of Total Specimens
1. Michigan	1837	1,420,000	30.6
2. Wisconsin	1849	735,000	15.8
3. Minnesota	1890	725,000	15.6
4. Illinois	1869	465,000	10.0
5. Michigan State	1863	426,304	9.2
6. Iowa	1870	325,200	7.0
7. OHIO STATE	1891	260,000*	5.6
8. Purdue	1873	141,700	3.1
9. Indiana	1885	140,000	3.0
10. Northwestern		(all specimens given to Field Museum)	
Totals		4,638,204	99.9

*This figure is lower than the actual inventory of 350,000 specimens, but it is our older published value in comparison with these other institutions which also submitted older figures at that time for the *Index Herbariorum*.

stitutional collection of such national standing that it qualifies for federal support from the National Science Foundation (through the Biological Research Resources Program). The Ohio State University Herbarium contains only 5.6% of the total material held within Big Ten institutions. We believe that this situation must change. The holdings of the Big Ten collections are worldwide in scope with a strong emphasis on Latin America as well as on North America including Canada and Mexico.

To improve the posture of The Ohio State University Herbarium within the Big Ten and to make it more competitive in research and graduate instructional activities, we have formulated several objectives. First, we wish to maintain and increase our position of strength in holdings of Ohio materials because we are the designated State Herbarium and already have the largest collection of Ohio materials of any institution in the world. We do not anticipate aggressive collecting efforts in the Ohio flora, however, but rather the acquisition of existing collections and the adding of material through master's thesis research work done in our graduate pro-

gram. This material can be exchanged with other institutions within the state to further develop our Ohio holdings.

Second, we plan to obtain familial and generic representation of the world's vascular flora through both exploration and exchange, but primarily through the latter. We intend to specialize in Latin American holdings, because we already have a large collection in that area with approximately 12,000 specimens. Due to professional ties developed recently, we hope to specialize in southern South America, including Argentina, Bolivia, Chile, Paraguay, and Uruguay, with a secondary interest in the Andean regions including Colombia, Ecuador and Peru, the first two countries from which we have good holdings already. We have research programs and ongoing exchange programs with institutions from these regions at the present time. We intend to intensify this effort.

Third, we desire to improve our curation of existing materials. Recently we have been extremely fortunate to receive 50 new herbarium cases from the Office of Academic Affairs at OSU to house properly our existing collections. This has been a much needed step in the direction of pro-

recting our valuable specimens by being able to discard all the old non-insect-proof double-door cabinets. We are pushing hard to obtain a new poison-gas vacuum fumigator to allow for fast and sure elimination of insect pests of any materials coming into the collection. We have just purchased a microwave oven for the ability to eliminate immediately small spot insect infestations. Also, we are moving very hard to obtain new air-conditioned space which will allow further control of insect pests and provide a better environment for the long term durability of the materials.

NEED FOR AN ORGANIZATION OF HERBARIA IN OHIO. The activities associated with preparing for our symposium and its execution, plus the efforts involved with the survey (Cusick and Snider 1982), have made it clear that some type of association of herbaria within the state is needed. It has been suggested and generally agreed that the institutions which responded to the requests for information in the survey will together form the "Organization of Herbaria in Ohio" (OHIO). A newsletter is being developed that will be used as an informal means of communication among the institutions. Most importantly, we need to meet on a regular basis, perhaps once a year, to talk about priorities and needs and problems that we have in common. The same effort is going on regionally at the Missouri Botanical Garden, and the first meeting of this type was held in September of 1981 in association with the annual Systematics Symposium. We could profit by exchanging duplicate specimens from areas of interest to us. We could exchange equipment that we no longer need in a particular institution because of new equipment and the possibility of discarding old cabinets, tables, card files, etc. We could exchange library materials that are duplicated or no longer needed. We could give each other support in time of financial crisis by providing documentation of importance of herbarium functions, figures on space allocations in different institutions around the state, etc. We could

develop OHIO Expeditions, a statewide collecting consortium which could go each summer for 4-6 wk to different parts of North America but particularly to Canada and to Mexico. Several institutions participating in a statewide expedition might make it much easier for any curator in a particular institution to obtain funds as a part of this joint effort. Specimens would be divided up according to agreed-upon policy. This would be a useful opportunity for graduate students and promising undergraduates to develop training by contact with systematists at other institutions in the state. Further, through our newsletter we could mention other grant-supported expeditions from which materials might be forthcoming and on which students might be welcome as assistants from other institutions.

CONCLUSION

Our symposium has shown clearly that we have a richness of herbarium materials in Ohio that is an important part of our natural historical heritage. Although we have impressive holdings, we need to move ahead toward expanded collections in regions outside the state, particularly in other countries of the world. We can become more managerial in our acquisition policies and attempt to avoid duplication by keeping in closer contact with each other. We can develop new ways of funding expeditions by inter-university cooperation. In short, we have an excellent beginning for a coordinated and very active policy of herbarium development within Ohio. This symposium has set the initial stages for that important development.

LITERATURE CITED

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