

## A CENTURY OF BOTANY IN INDIANA.

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The opening of the century we are celebrating was remarkable in the history of American botany. During the two preceding centuries American botany had been developing under European influence. It began to develop under home influence approximately in 1815. About this date a number of American publications appeared dealing chiefly with local floras, and marking the beginning of American botanical publication by American botanists. A mention of these publications will illustrate the fact that what seemed to be the psychological moment for the beginning of American botany expressed itself in several almost simultaneous publications; and it will also serve to introduce us to the beginnings of botany in Indiana.

In 1813, Muhlenberg, a Lutheran minister of Philadelphia, published the first catalogue of North American plants, which of course was a very meager representation of a great continental flora. In 1814, Bigelow, a physician of Boston, published a flora of Boston and vicinity. In 1815, Barton, Professor of Botany in the University of Pennsylvania, published a flora of Philadelphia. In 1817, Rafinesque, a man of hybrid origin and a wanderer, published his "Flora of Louisiana." Louisiana had been admitted as a state five years before, as a part of the much more extensive "Louisiana Purchase." In this *Flora*, Rafinesque mentioned certain plants as extending up the Mississippi and its tributaries, some of which he had observed in Indiana. The year 1817, is so near the beginning of our century that botany in Indiana has been said to be, in a general way, contemporaneous with Indiana as a state.

Since Rafinesque may be regarded as the pioneer Indiana botanist, a brief mention of this singular man will be appropriate. When Jordan began his study of fresh water fishes, he encountered the pioneer work of Rafinesque, and proceeded to uncover the facts of his life. Finally, in 1895, the Filson Club of Louisville published an elaborate memoir by R. E. Call, in which all available information in reference to Rafinesque was brought together. This restless and unique naturalist came to the United States for the second time in 1815, and began his wanderings of twenty-five years, which extended as far west as the Mississippi. He followed down the Ohio river, exploring for the first time the flora of Ohio, Kentucky, Indiana, and Illinois, settling for a time in that famous community at New Harmony on the Wabash. Jordan calls attention to the fact that in that day New Harmony was a center of American science. The first scientific contact with Indiana plants, therefore, was along the Ohio, and especially at the falls of the Ohio, and in the vicinity of New Harmony.

Rafinesque's vivid description of his experiences in traveling through the forests of our nascent state is worth preserving. He traveled always on foot

because, as he said, horses were never made for botanists, and his impression of his travel through the primeval Indiana forest is as follows:

“Mosquitoes and fleas will often annoy you or suck your blood if you stop or leave a hurried step. Gnats dance before your eyes, and often fall in unless you shut them; insects creep on you and into your ears. Ants crawl on you whenever you rest on the ground; wasps will assail you like furies if you touch their nests. But ticks, the worst of all, are unavoidable when you go among bushes, and stick to you in crowds, filling your skin with pimples and sores. Spiders, gallineps, horse-flies, and other obnoxious insects, will often beset you or sorely hurt you.”

Rafinesque was not only a pioneer in the study of Indiana plants, but also a pioneer in the use of the laboratory method in teaching science. He was the first teacher of natural history west of the Alleghenies, his one academic position being that of Professor of Natural History and the Modern Languages in Transylvania University at Lexington, Kentucky. He thought that his students should be introduced to the actual things studied; and so he brought plants into the class-room. This was such an innovation in the method of the time that the faculty could not stand for it. They voted that such unseemly conduct must be discontinued, and the action as taken reads as follows, according to the documents referred to. “This practice must be discontinued, since it breaks up the discipline of the class-room, diverts the attention of students from more serious things, and is more entertaining than instructive.”

Other botanists touched Indiana casually during the general period of Rafinesque, and for that reason may be associated with him as forming a pioneer group. It seems that Michaux, a conspicuous name in the early history of American botany, visited Indiana in 1795, spending a part of August in journeying from Clark's Hill to Vincennes. He recorded about 20 plants as having been discovered in Indiana.

In the summer of 1816, contemporaneous with Rafinesque, David Thomas made his way along the Ohio from the eastern part of Indiana, and finally reached Vincennes, and records the names of 95 plants.

In 1818, shortly after Rafinesque had entered Indiana, Nuttall, the predecessor of Asa Gray at Harvard, journeyed down the Ohio, his recorded stops being at Lawrenceburg, Rising Sun, Vevay, Troy and some place near Newburg.

Such was the beginning of botany in Indiana. It was the phase of botany that naturally precedes every other phase in an unexplored country, and a century ago all the world needed exploration so far as plants were concerned. For the next 65 years, approximately, botany in Indiana developed as it was developing everywhere in the United States. A botanist was necessarily a taxonomist; not only that, but his taxonomy was restricted to vascular plants, and chiefly to flowering plants. A few of the earlier publications including Indiana plants will indicate the various methods of attack.

In 1835, Riddell, one of our western botanical explorers, published a synopsis of the flora of the western states, including an area represented by ten or twelve states now, extending from Ohio on the east, and including the Northwest Territories on the west. The synopsis includes lichens, liverworts and mosses, in addition to the vascular plants, and still the list enumerates only 1,802 species, among which were all the known Indiana plants; but it set the pace, and subsequent explorers filled in the gaps.

Shortly after this, Prince Alexander Philip Maximilian visited New Harmony, and in 1839 published a list of sixty trees growing in the vicinity of that scientific center. This is the first published list of Indiana trees, so far as I know, and it is no wonder that the forest of the lower Wabash should have attracted Prince Maximilian's attention, for it represents the culmination of our Indiana tree vegetation.

Another interesting early publication is that of Lapham, a botanist identified with Wisconsin rather than with Indiana, but who published in 1853 a list of the grasses of the states bordering on the great lakes. First the trees and then the grasses of Indiana were selected for special consideration.

During the next twenty-five years, this kind of work continued as the only phase of botany in Indiana, or anywhere else in the United States. An increasing number of naturalists, as all botanists of that time could be called, collected and recorded the vascular plants of their neighborhoods. County lists multiplied, occasional state lists appeared, and now and then particular families were singled out for presentation. It may be of interest to know that the bibliography to which I have had access includes 132 titles dealing with the taxonomy of the vascular plants of Indiana, representing 45 authors. As a result of all this work, the vascular flora of Indiana became gradually known, and finally what may be called the first stage of botanical development ceased to be the dominant phase, and gave place to a second.

This does not mean that such work has been completed even yet, but it does mean that it is now only local and occasional, rather than general and universal.

One who searches among the titles of this taxonomic period, as it may be called, can obtain occasional glimpses of other phases of botany in the nascent stage. A taxonomist occasionally was interested not only in the classification of his collections, but also in habitats and distribution, and was thus the forerunner of the ecologist. Now and then a botanist can be detected who watched the development of some plant from its seedling stage to its maturity, and was thus the forerunner of the morphologists of today, who study the ontogeny of plants. But morphology was gross, and ecology was "without form and void."

It was approximately in 1880 that the change came. Ever since 1850, European botany had been feeling the stimulus of Hofmeister, and had been developing what is known as modern morphology, the morphology of minute structures. The laboratory with its microscopes and re-agents and sections

was replacing field exploration. There are perhaps at least three reasons why modern morphology did not reach the United States for thirty years after its birth in Europe. One is that our flora was still new and intensely interesting. A second is that in the person of Asa Gray, through his *Manual* and texts, there was a dominating influence in the field of botany, such as would be impossible now. The third reason is perhaps the best one, and that is that our botanists had not begun the habit of going to Europe to study. In fact, botany was not as yet a full fledged profession; it was only an incident. Botanists were chiefly amateurs, and in addition there were a few teachers of the subject, who taught many other things besides.

At last some botanists went to Europe, and as a result, in 1880, Bessey introduced us to an American presentation of modern morphology as developed by Sachs. Then it was that botanical laboratories began to appear in this state, with microscopes and laboratory guides. In Wabash, in Purdue, and a little later in Indiana, the work began, presently extending to all the colleges, and finally invading the high schools. Not only did instruction in modern morphology begin, but also research, and morphological papers began to issue from several of our laboratories.

We should appreciate this phase of morphology in passing. Just as in the case of taxonomy, many morphologists have moved on, but there is always an old guard that never moves on. Perhaps the most significant change introduced by the new morphology was that its material was the whole of the plant kingdom. No longer were the vascular plants the sole representatives of botany; but there was a curious rigidity about the morphology of these earlier days. The mature structures only were studied and pigeon-holed. Definitions were rigid and facts were observed as facts, with no thought of their inter-relationships. You will all recall those days as the period of "types," when a few types were selected to represent the whole plant kingdom. The theory was that it was better to discover all the facts about a single plant, than to discover the important facts about plants in general. In other words, there was as yet no conception as to the relative values of facts. And still this was the beginning of botany as a distinct profession in Indiana, and chairs of botany began to be differentiated from chairs of natural history or biology. This is bound to be the case when collecting is replaced by technique. Almost any one with the instinct of a naturalist can collect, but to section and interpret needs special training.

It was approximately in 1890 that a further refinement of morphology entered the field. Strasburger was dominating botany in Europe, and many American students worked in his laboratory. As a result, from 1890 cytology began to be represented in our laboratories. It represented the further development of technique; it led to the development of ontogeny, so that the study of mature structures gave way to the study of developing structures; and finally comparative ontogeny led to the development of evolutionary sequences. As a consequence, much of our old morphology was relegated



to an anatomical rubbish heap, and facts were selected that were significant in an evolutionary scheme. Other phases of botany have been added since in schemes of instruction, but so far as I can judge from bibliography, the current production of Indiana botany deals chiefly with taxonomy and the various phases of morphology, in both of which field there have been notable contributions.

Concurrent with the development of morphology in Indiana, which began approximately in 1880, and sharing in its later development from 1890 to the present time, interest in the lower plant groups began to appear. Thanks to morphology this interest did not express itself merely in collecting and naming these forms, but in studying them, in many cases uncovering complicated life histories. As a result, the list of titles is much shorter than in the taxonomic period, but the contributions represent a very different type of work. I have discovered fifteen such titles, but they all represent time and technique. These titles run from mosses down to Myxomycetes, and notable among them are contributions to our knowledge of the parasitic fungi.

It would be out of place for me to mention the names of all who have shared in making the history of Indiana botany. If this sketch is ever published, there should be appended a full bibliography of the work of Indiana botanists. Furthermore, it would be invidious to select a few names for special mention, for we have all shared in making this history. You know the men who have worked and those who are still working in this state.

There is one further fact connected with the botanical history of Indiana that seems worthy of mention. It is not personal because it belongs to all of us. In 1875, before we had emerged from our purely taxonomic stage, an insignificant-looking botanical journal began to appear each month. Its home was on the banks of the Ohio, but its stimulus was Asa Gray at Harvard, who month by month rebuked, advised and contributed. For nearly twenty years that journal had its home in Indiana, and naturally it contains much Indiana botany, as well as botany in general. As the years went on it grew in size and influence, always in the editorial care of Indiana botanists, until now it is a fair representative of American botany, and has had no small share in the development of American botany. This journal is distinctly a Hoosier by birth, but its influence has reached wherever the science of botany is cultivated.

Now that the days are over when botany was represented exclusively by local lists of species, botany knows no state boundaries. Botany in Indiana is no longer Indiana botany. Your contributions are not for a particular locality, but for the science of botany in general. The men who for a time worked in Indiana and are now working elsewhere are in a sense still Indiana botanists. They are colonists that you have sent into other fields to continue the work they began here; but Indiana is the mother country where the first inspiration came.

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