

PLANT TAXONOMY

Chairman: THEODORE J. CROVELLO
University of Notre Dame, Notre Dame, Indiana 46556

Chairman-Elect: DONALD L. BURTON
Indiana University, Bloomington, Indiana 47401

Abstracts

The Identification and Evaluation of Indiana's Rare Vascular Plants: A Preliminary Report. JOHN A. BACONE, Indiana Department of Natural Resources, Division of Nature Preserves, 601 State Office Building, Indianapolis, Indiana 46204. Since Deam's *Flora of Indiana* was published in 1940, many significant changes have taken place with respect to Indiana's flora. The destruction of habitat due to increasing urbanization, industrialization, and agriculture has resulted in many native plant species becoming increasingly rare. At least six species have been extirpated from Indiana, eleven are possibly extirpated, and over thirty species are now known from only one site. It is necessary that these and other species of concern be identified, and their existence verified in the field. The Division of Nature Preserves of the Indiana Department of Natural Resources, and the Biological Survey Committee of the Indiana Academy of Science have been actively working toward this goal, and have prepared a preliminary list. On this list, species are listed as extirpated, possibly extirpated, endangered, threatened, vulnerable, or uncertain. Within the next year, it is hoped that the Division of Nature Preserves, the Biological Survey Committee, and the Indiana Heritage Program can finish herbaria searches, update the nomenclature, and consult the botanists and taxonomists familiar with Indiana's flora, to verify the continued existence of these plants and their abundance. A final list will then be published and periodically updated. The preliminary list will be available at the Indiana Academy of Sciences Fall 1978 meeting.

A Revision of Deam's Trees of Indiana. BARBARA J. HELLENTHAL* and THEODORE J. CROVELLO, Biology Department, University of Notre Dame, Notre Dame, Indiana 46556. A revision of information on the occurrence and distribution of Indiana trees is badly needed due to accelerated human induced environmental changes in the State. To satisfy this need for a reference work we are preparing a hard copy revision of Deam and Shaw's 1953 Trees of Indiana. But it also will have several additional features including a request for assistance by citizens around the State and information regarding procedures for their participation. Specifically, their help is needed to: reverify old county level records; help identify new ones; and provide more specific locality information. In our attempt to provide the most recent distribution information and accurate nomenclature for each species, problems have arisen. Many name changes have taken place since the earlier works. Dr. John Kartesz of the Biota North America Committee has thoroughly reviewed and corrected the tree list including

recombination of some varieties. Our keys will identify to the species level, including some species that are found only in cultivation. The text will also describe varieties, forms and hybrids. A map for each species will provide county distribution information as it is presently known. Use of a series of symbols for each county record will provide data on the source of information. In addition to the formal publication of an updated *Trees of Indiana*, a computerized I-TREES (Indiana Trees) data bank is being created at the University of Notre Dame to store current and future information as it is received. This will assure up-to-date information on tree species distributions between future hard copy revisions of *Indiana's Trees* as well as serve as a learning resource for students and other citizens.

Computer Data Bank for Storage of Floristic Data on Swamp Rose and Spicer Lake Nature Preserves. VICTOR L. RIEMENSCHNEIDER, Department of Biological Sciences, Indiana University at South Bend, South Bend, Indiana 46615._____Field and laboratory notes and measurements made during the past three years in completing a list of vascular plants of the Swamp Rose and Spicer Lake Nature Preserves are stored on computer tape. The data files, labeled SWROSE and SPLAKE, can be accessed by batch or terminal from any computer center in the Indiana University computer network. Each species entry in the files contains the specific location of the specimen, the soil type, habitat type and associated species. In addition, some species entries contain measurements and comments made in the field or in the laboratory while identifying the specimen. Some of the information is in coded form which is explained at the beginning of the file. Computer data banks are a more logical method of communicating massive amounts of information than is publication. They also provide the flexibility of making additions or corrections as new information becomes available. Information concerning file access can be obtained from the author.

The effect of data base choice in quantitative phytogeographic studies. CLIFTON KELLER, University of Notre Dame, Notre Dame, Indiana 46556 and Andrews University._____Numerical taxonomic studies have been shown robust to errors in homology, missing data, measures of similarity, and relatively so to the choice in the number of characters. Subsets of plant distribution records from Indiana were chosen and analyzed by quantitative techniques to determine the effect of this choice on the delimitation of phytogeographic regions. Results from these analyses were compared to the results obtained from an analysis using plant distribution records for all species having maps in Deam (1940) and to published vegetation maps for Indiana. Phytogeographic analyses are shown to be affected by subset selection. Large random subsets and data representing large diversified families provide rough ideas of the relationships among counties. Special results from smaller selected subsets provide additional dimensions into the distribution of particular habitat and community types. Differences among the various results are reasonable when phytogeographic regions are conceived without well defined boundaries.

Computer-Generated Summarization Graphics of the Brassicaceae of the Soviet Union. DOUGLAS C. MILLER* and THEODORE J. CROVELLO, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556._____Com-

puter-generated summarization graphics provided new insights into the phytogeography of the mustard family (*Brassicaceae*) of the Soviet Union. Plant distribution published in 1939 in Volume VIII of *The Flora Of The U.S.S.R.* was captured for computer retrieval and analysis. This consisted of data on 128 genera and 757 species. An integrated use of custom-written and commercially available programs, in both batch and time-sharing modes, made possible efficient graphic answers to interesting questions in systematics and phytogeography that were previously unanswerable. These methods have produced graphic summaries of the plant topography of geographically restricted species, and may prove of special value for the study of rare and endangered species.

Computerized Data Retrieval at the University of Kansas Herbarium. LARRY A. HAUSER, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556.——A computerized data retrieval system in use at the University of Kansas Herbarium allows the user quick and easy access to the latest Kansas vascular plant distribution information. It is a dynamic system, in that the data file may be modified and increased as additional systematic studies are completed and new distribution records discovered. The system fills the specific needs of the Herbarium and the closely associated State Biological Survey of Kansas. It is compatible with the Smithsonian-developed SELGEM system already in use at the University of Kansas Natural History Museum. Printouts help botanist in the field make the most efficient use of their time. The present data file includes vascular plant distributions for Kansas by county and also indicates the presence of a KANU voucher specimen. The file is created and edited using the SELGEM system and then most often retrieved by more specific programs. Types of printouts which may be obtained through the system include both county checklists and lists of plants which are not recorded for a particular county but occur in the surrounding area. Among other options available are the printing of dot maps and county summaries. The idea was not to invent yet another retrieval system, but to adapt an available widely used one. Consequently, specific local needs are met while maintaining compatibility with other SELGEM files.

Pollination in *Asarum canadense* and *Aristolochia serpentaria*. CHARLES B. HEISER, Indiana University, Bloomington, Indiana 47401.——Experiments at Bloomington demonstrate that bagged flowers of *Asarum canadense* will set seed thus confirming the observations made by Wildman (*Science* 111:551. 1950), presumably in West Virginia. No insects or other visitors on the flowers were observed during the height of the blooming season, suggesting that autogamy (or possibly apomixis) is the normal mode of seed production in this species. Additional observations should be made, however, for Vogel (*Flora* 167:329-366. 1978) has recently reported that fungus gnats are the pollinators of *Asarum caudatum*. Field experiments with *Aristolochia serpentaria* were unsuccessful. A single plant placed in the greenhouse, however, was observed to set seed in each of two years. It is unlikely that any pollinating agents were present in the greenhouse. Moreover, after the production of chasmogamous flowers, several cleistogamous flowers (see Pfeifer. *Ann. Mo. Bot. Gard.* 53:1-114. 1966) were produced which also set seed. Field studies are required before

concluding that autogamy (or apomixis) is the common method of reproduction in this species.

Phylogenetic significance of pollen morphology in Asiatic species of *Schefflera* (Araliaceae). JANE R. SHOUP* and CHARLES C. TSENG, Purdue University Calumet Campus.——Pollen morphology is used as an indication of phylogenetic relationships among 46 Asiatic species of *Schefflera*. On the basis of several palynological features seven pollen types are distinguished. These types correlate well with other characteristics, particularly number of carpels and geographical distribution of each species. On this basis evolutionary trends in sexine differentiation are postulated. Polymery of floral parts is assumed to be a primitive condition in Araliaceae. Pollen of multicarpellate species, found in New Guinea and the Solomon Islands, is designated *thaumasiantha* type. Pollen in these primitive species is spheroidal, having smooth, imperforate tecta and simple exine structure with no or indistinct bacula. Pollen of about half of the species studied is categorized as *leucescens* type. These species, distributed mainly in Sumatra, the Phillippines, and South China, are mainly pentacarpellate and possess very small pollen grains with relatively undifferentiated sexines similar to the ancestral group. The three Philippine species comprising the *digitata* pollen type have 8-12 carpels and pollen grains with uniformly semitectate sexines and distinct bacula. The pentacarpellate species of the *hoi* type occur in South China. The pollen has tectate-perforate sexines. Two 6-carpellate species from Borneo and Malaya belong to the *calyptata* pollen type; these grains have undulate-foveolate sexine patterns. The *longifrutescens* type is found in a single pentacarpellate Philippine species. This species has small grains with thin exines, short bacula, and suprategal spinules. Another single pentamerous species of New Caledonia is distinguished by the *golip* type pollen in which the sexine is significantly thickened at the poles, suggesting an advanced condition. Proposed phylogenetic relationships are presented. The palynological study of this genus has provided a basis for pollen phylogeny within and without the family Araliaceae.

Edward Lee Greene And His Botanical Collections. MAUREEN A. SAMPSON* and THEODORE J. CROVELLO, Department of Biology, University of Notre Dame, Notre Dame, Indiana 46556.——Edward Lee Green was a noted and controversial figure in plant taxonomy. As one of the earliest taxonomists in the western United States, he made significant contributions to the classifications of many new species. Greene named over 4500 species, including almost 3000 species new to science. Just before his death, Greene left his personal herbarium and library to the University of Notre Dame. The wealth of information stored here is now being studied further. In 1972, Crovello finished the capture for computer retrieval of specimen label data of the 65,000 specimens in Greene's collection. Computer searches are most valuable when they involve questions that are not taxon oriented, but framed primarily in terms of other characters such as geographic location, or individual collectors. Consequently, the computer searched the herbarium data bank for information recorded about Greene's specimens, arranged them chronologically, providing an itinerary for Greene. The information has also been sorted for the compilation of an annotated list of the type specimens in the collection. Statistical and graphic

analysis of these and other aspects of the collection provide insight into the life and works of E. L. Greene and of many contemporaries whose collections are represented in the Greene Herbarium.

Contribution of Seed Protein Studies to the Taxonomy of *Cannabis sativa* (Cannabaceae). CHARLES T. HAMMOND*, Department of Biology, St. Meinrad College, KATHRYN KAMO, and PAUL G. MAHLBERG, Department of Biology, Indiana University, Bloomington, Indiana 47401.——Soluble seed protein profiles of ungerminated achenes of *Cannabis sativa* (marihuana) were compared by SDS acrylamide gel electrophoresis. The achene samples consisted of 23 seed sources of worldwide distribution selected to encompass a range of known intoxicant, semi-intoxicant and nonintoxicant groups. Electrophoretic banding patterns compared visually and by densitometer tracings revealed a highly similar profile in terms of band number, band position, and band density among all seed sources regardless of country of origin or drug type. These data are interpreted to support the concept of a monotypic genus for *Cannabis*.

An analysis of chromatographic patterns of phenolic substances from the foliage of thirteen taxa of American alders (*Alnus*, *Betulaceae*). JOHN J. FURLOW, Department of Biology, Capital University, Columbus, Ohio.——Phenolic compounds were obtained from dried leaves collected from populations throughout the geographical ranges of 13 American taxa of *Alnus*. These substances were extracted in boiling water, ethyl ether, and normal butyl alcohol and separated by two-dimensional descending paper chromatography. Spots were identified on the basis of color reactions, their R_f values calculated, and the resulting patterns analyzed by means of cluster analysis and principal components analysis. A total of 91 compounds were identified in the butanol fractions, from 23 to 52 compounds appearing on the chromatograms of each taxon. At least one unique compound was present in all but four taxa, and all of the taxa were found to be distinguishable on the basis of the patterns observed. Numerical analyses of the results showed several pairs of taxa long considered to be closely related to possess very similar phenolic patterns. These include *Alnus crispa* and *A. sinuata*, *A. rugosa* and *A. tenuifolia*, *A. rugosa* and *A. serrulata*, and *A. arguta* and *A. glabrata*. It is suggested that at least some of these pairs may be conspecific. Close affinity is demonstrated by phenolic patterns but not by morphology between *Alnus rubra* and *A. tenuifolia* and between *A. maritima* and the Latin American species *A. arguta* and *A. jorullensis*. Additional study will be needed to determine the actual relationships among those taxa. Three major clusters of taxa appear in the analyses, these corresponding to subgenera or parts of subgenera. The most remote such cluster is made up of *Alnus crispa* and *A. sinuata* (subgenus *Alnobetula*). The others include *Alnus rugosa*, *A. tenuifolia*, *A. serrulata*, and *A. rubra* on the one hand, and the Latin American group, *A. arguta*, *A. glabrata*, and *A. jorullensis* on the other (each of these clusters representing a relatively distinct part of subgenus *Alnus*).

Techniques Utilized in the Preparation and Analysis of Oak Enzymes. JAMES J. TOBOLSKI, Indiana University-Purdue University at Fort Wayne, Fort Wayne, Indiana 46805.——Markers such as isozymes could be a useful tool in clarifying the taxonomy of the genus *Quercus*. However oak tissue is known to

contain numerous endogenous phenolic compounds and other inhibitors of enzyme activity. The purpose of this investigation was to develop an appropriate enzyme extraction medium and to determine which plant tissues provide suitable quantities of active enzymes. To overcome these endogenous inhibitors several homogenizing buffer systems were tested on bud, cotyledon, epicotyle and leaf tissues of red oak, white oak, swamp white oak and bur oak. The two following homogenizing mediums were found to be equally effective: (1) 0.1 M tris-citrate and lithium borate, pH 6.8; containing 0.2 M diethyldithiocarbamate and 0.1% B-mercaptoethanol, and (2) 0.1 M tris-HCl, pH 8.0 containing 6 mM ascorbate, 6 mM cysteine, 0.5 M sucrose and 1% v/v tween 80. From 0.8 to 1.5 grams of fresh tissue was ground by hand with 5 to 8 drops of homogenizing buffer and 0.8 to 1.5 grams of insoluble polyvinylpolypyrrolidone. The homogenate was centrifuged at 4°C for 10 minutes at 20,000 XG and the supernatant was utilized for enzyme analysis.

The enzymes alcohol dehydrogenase (ADH), leucine aminopeptidase (LAP) and glutamate-oxaloacetate transaminase (GOT) were resolved by starch gel electrophoresis. LAP and ADH isozyme bands were dark and well resolved from bud and cotyledon tissue, light-banded from epicotyle tissue and faint-banded or absent from foliar extracts. GOT was only partially resolved from bud, cotyledon and epicotyle tissues. No GOT bands were recovered from foliage. Isozyme differences between tissues of the same tree were minor. LAP and ADH exhibited a dark staining zone and a light staining zone each with one or two bands. Several species were found to have identical enzyme bands for one or more of the enzymes studied, reflecting their close phylogenetic relationship. However, some isozymes appear to be species specific and could be useful as genetic markers. Several other homogenizing buffers and enzymes are currently being investigated.