A BRIEF HISTORY
OF
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IN
NORTH AMERICA
augmented edition
Prepared for the 50th anniversary of
the Mycological Society of America

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The history of mycology in North America must begin with prehistory. The Spaniards who came to Mexico with Cortez in 1519, and after, found among the Aztecs an astonishing mushroom cult which still survives. The earliest instance of the cult that they noted comes from nearly a century before the European conquest; the earliest mscr. dates from about 1543; the most extensive reports are those of the Franciscan Bernardino de Sahagún, who was in Mexico for sixty years from 1529. What was recorded is that in central and southern Mexico a number of kinds of mushrooms, distinguished under local names, were regarded as sacred and divine—teonanácatl: food of the gods. They were gathered and consumed with religious rites, brought about inebriation and the seeing of visions, and were employed for divination. Sixteenth-century representations of the mushrooms exist, the work of both Mexican and Spanish draughtsmen; mushrooms certainly, but pictographs rather than identifiable portraits. Furthermore, the mushroom cult—or at least a mushroom cult—had already existed for thousands of years. What are interpreted as mushrooms form a part of central Mexican frescoes from 300-600 A.D. depicting Mexican deities. And numerous stone effigies representing mushrooms, or mushrooms whose stipes are replaced or modified by human or animal figures, have been found in Guatemala, and rarely also in Mexico, San Salvador, and even Bolivia, the relics of a culture going back to 1500 B.C. and continuing through later phases to perhaps 900 A.D. The latest Spanish work mentioning the ritual use of mushrooms comes from the middle of the 17th century. By that time the cult, suppressed by the Spaniards with every means in their power, apparently had disappeared. In 1915, in fact, W. E. Safford, a botanist concerned with ethnology, discovered and proclaimed that it had never existed: the Spanish chroniclers had mistaken for mushrooms the so-called mescal buttons, dried slices of the cactus Lophophora or peyote, employed in religious ceremonies by the native tribes of northern Mexico and the southwestern United States. So much for early American ethnomycology.

Safford’s assurance was transferred to most ethnologists but not all. In the later 1930’s B. P. Reko, V. A. Reko, R. J. Weitlaner,
and R. E. Schultes rediscovered the mushroom cult in the state of Oaxaca in southern Mexico near Guatemala and secured specimens of the mushrooms; and J. B. Johnson and his party attended a celebration of the rite. Their work and that of others is summarized by Valentina P. and R. G. Wasson, whose studies and experiences brought the sacred mushrooms to the attention of most mycologists. In mountain villages of southern Mexico, culturally isolated, and often speaking only local dialects, Indians of several linguistic groups still recognize, use, and revere the sacred mushrooms. The ceremonies include gestures, attitudes, and implements that appear to have been adapted from the Christian mass, but they retain the essentials reported in the 16th century. The mushrooms are gathered and treated ceremoniously and reverently. They are handled and consumed—and sometimes administered to other participants—by an officiant, the curandera or curandero, recognized as an adept. They induce extraordinary visions and an exalted mental state. And the ceremony and the consumption of mushrooms are not for entertainment, inebriation, nor even the cure of illness, but for divination. The mushroom speaks, to bring news of an absent person or locate a lost object, to indicate the prognosis or the manner of treatment of an illness. This and a good deal more was learned by the Wassons in their visits to the Mexican mountains in the 1930's. They brought back specimens of the mushrooms employed, and submitted them to R. Heim, who later visited the area with them. From his studies the identity of the mushrooms first became known: a number of species of Psilocybe, one Stropharia, one Psathyrella, one Conocybe, two species of Panaeolus. These are all physiologically active (psychotropic); used with them may be other fungi apparently valued although not known to be active: Cordyceps and its host Elaphomyces, Dictyophora, a Clavaria, a Cantharellus. As a result of more recent studies by others, significant extensions of range of some of these species have been established, as well as the existence of other species (especially of *Psilocybe*) with similar physiological properties, occurring as far away as the northwestern United States and southwestern Canada. Since no ancient mushroom cult is known from any area north of the Valley of Mexico, it is apparent that in this matter as in others the utilization of fungi depended upon the culture and not upon the availability of appropriate species.

Little has been recorded concerning the knowledge and uses of fungi among aboriginal Americans from farther north. In the famous *New Englands Rarities Discovered* of 1672 Josselyn indicates, "For the Gout, or any Ach. Spunck, an excrescence growing
out of black Birch [*Fomes igniarius?], the Indians use it for Touchwood, and therewith they help the *Sciatica*, or Gout of the Hip, or any great Ach, burning the patient with it in two or three places upon the Thigh, and upon certain Veins." No one appears to have corroborated this report, and the employment of Spunck probably will never achieve the currency of the "recreational use" of *Psilocybe*. The next American fungus whose use attracted the attention of European explorers is the tuckahoe, or Indian bread. This may be the growth referred to under the name Okeepenauk by Thomas Harriot in 1588. It was reported in 1743 by Gronovius from Clayton's Virginian collections under the name *Tubera Terrae maxima*, and is the subject of a considerable number of accounts, studies, and conjectures published almost to our own times. In 1762 Gronovius misapplied to it the name *Lycoperdon solidum* L.; Schweinitz described it in 1822 as *Sclerotium Cocos*; ostensibly in the same year Fries established for it the genus *Pachyma*; at the same time John Torrey studied it chemically; and in the present century F. A. Wolf and G. F. Weber have discovered that its fructification is assignable to the genus *Poria*. The tuckahoe is a very large subterranean tuber-like sclerotium, parasitic or saprobic on the roots of pine and other vascular plants; it was baked, or dried and ground, by the Indians and used as food; Schweinitz reports that they used it medicinally. The word tuckahoe (variously spelled and, apparently, pronounced) was employed beyond the range of *Poria Cocos*, and even in the Southeast seems to have been used also for the edible rhizomes or corms of a number of angiosperms. The Virginia tuckahoe of Capt. John Smith (1632) and Robert Beverly (1705) was a marsh plant. In addition, Gußow found in the prairie provinces of Canada a different subterranean sclerotium on poplar roots that gives rise to stipitate pore-bearing basidiocarps, and described it as *Grifola Tuckahoe*; but there is no report that the name tuckahoe was used for the fungus by the Indians, who employed it for poulting as "médecine de terre."

Except for teonanácatl and the tuckahoe, fungi either were rarely used by pre-Columbian Americans or, more likely, escaped the attention of earlier European settlers—who, the Wassons hold, were all mycophobic anyway. What else we are told of American ethnomycology is little and uncertain, and recorded only in the late 19th and earlier 20th centuries. Species of *Lycoperdon* were gathered in large quantities in the southwestern United States and eaten fresh, or else dried for winter use. Some wood-inhabiting species of polypores, especially one on poplar which may have been a *Tyromyces*, were baked or boiled and esteemed a delicacy. An un-
named *Fomes* is also reported to have been used by the Indians for food; but the taxonomic competence of the reporter has not been established. Various unnamed mushrooms were eaten by the plains Indians, and one Southwest tribe is said to have eaten all mushrooms, edible or poisonous; but perhaps the Indians knew more than the palefaces. The chlorophyll-less yellow, fragrant witches' broom of subalpine *Abies* infected with the rust *Melampsorella elatina*, a sort of American golden bough, was used for ceremonial purification. A northwestern polypore was grated to a powder and used as a perfume or deodorant. A puffball, *Geastrum* or *Lycoperdon*, was employed in the Southeast as a prophylactic and possibly hemostatic substance. The spores of *Ustilago maydis*, the American corn smut, were drunk in water as a medicinal draught, and the immature galls of this fungus are eaten at present in Mexico as a choice food and may well have been eaten by the original cultivators of maize. And whereas in eastern North America the red pigment used by the native peoples for personal adornment was commonly iron oxide, in the Northwest it consisted of powdered sporophores of that strange tooth-fungus *Echinodontium tinctorium*, the Indian paint conk. It is plain, alas, that there are few accurately identified fungi in these notes. When we come upon a reference to "*Polyporus officinalis*, a fungus which yields a reddish coloring matter... much used by Indians to paint their faces," the lack of more such identifications seems a slighter loss; experts who do not distinguish a brick-red tooth fungus from a chalky-white pore fungus, or a cactus from a mushroom, are not qualified to supply a great deal of mycological wisdom.

Most of the classics of early American exploration omit the fungi completely from their accounts of the natural wonders of the New World. This is an example of the fallacy of *majus ergo melius*, or the bigger the better. It has persisted to recent times and is shown in the unphilosophical remark of a botanist who some years ago completed a difficult and hazardous crossing of the Colombian Andes: "For days I cut my way through a forest with undescribed tree species a hundred feet high, and you want to know what Myxomycetes I collected." Of course, Sloane's report in his *Voyage to the Islands* (1707) is perhaps a fair sample: "The number of Mushrooms I observed in Jamaica were very few, two of the ground kind, one whereof was edible, the other poisonous, and as many of the Trees, one exactly resembling Jews Bars, growing after the same manner on the Trunks of Trees; and the other coming out of the ends of the roots of them." From the slightly more particular notes in his *Catalogus plantarum in insula Jamaica sponte*
nascentium, 3 ed., these could be Agaricus campestris, a white Amanita, and an Auricularia.

In addition to the "spunck" Josselyn noted, in 1672, "Fuss-balls, very large" (presumably Calvatia), and "mushrooms, ... none like our great mushrooms in England," a negative observation that leaves plenty of room for conjecture. A more useful account of American fungi is the work of "America's first resident naturalist," the young Anglican clergyman John Banister. For thirteen or fourteen years from 1678 to 1692, when he was accidentally shot dead while botanizing, Banister labored not only in the church but at a contemplated Natural History of Virginia, collecting specimens, compiling lucid notes, preparing brilliant drawings, and sending specimens, seeds, and reports to his bishop and other devotees of natural history in England. His notes include characterizations of twelve fungi, nearly all of which can be identified today with some assurance—Pilobolus, Calostoma, Mutinus, Lycogala or some other aethalial slime mold, Clavaria, Morchella, Ozonium, Cyathus, Polyporus, Astraeus, and Lycoperdon or Calvatia. His notes and drawings were used and quoted (with or without attribution) by a number of successors; eleven of Banister's fungi were published by J. Petiver in 1707, and in the last years of the 17th century Plukenet listed a nidulariaceous species from the West Indies which, as Peziza lentifera, is the only American fungus noted in Linnaeus's Species plantarum; this is derived from Banister. In 1739 Gronovius reported from Virginia what was probably Mitrula paludosa, and in his second volume on Clay's plants, in 1743, two species of "Agaricus" (perhaps Polyporus Schweinitzii and Auricularia auricula), a Boletus that we should call Morchella, a species of Phallus, Clavaria militaris, etc. (Mitrula), a Peziza that would now be accounted Cyathus or Crucibulum, and the tuckahoe. In his second edition (1762) twenty species of fungi are reported, including several under the genus Fungus (Agaricaceae); with a little faith one can recognize Agaricus campestris, Coprinus micaceus, Hygrocybos minoratus, Amanita caesarea, and Polyporus squamosus.

Kalm, a student of Linnaeus's, noted many things in his Travels into North America (1753-61), but his mycological observations were scarcely notable: Truffles abundant in New Jersey and very common in Carolina, and a yellow Agaricus in the middle Hudson valley, useful for tinder. The Franciscan J. Torrubia in 1754 reported the occurrence five years earlier in the neighborhood of Havana of certain dead but intact wasps from whose belly emerged a little tree, called Gia; he published an illustration and a poem
concerning the phenomenon. Ten years later G. Edwards illustrated, quite accurately, and described from Dominica insects with a kind of fungus growing out of the head; he also presented a copy of Torrubia's drawing, and the suspicion that it showed a similar occurrence. Whether little trees or vegetable worms or fungi or "an insect plant found at Natchitoches" (Louisiana) and reported in 1809 by B. Lafon, Cordycps and its insecticolous kin attracted attention and encouraged exuberant comment wherever found. In the first American materia medica (1787) J. D. Schoepl listed a polypore ("puck"), the tuckahoe, and a Calvatia. Schoepl was a Hessian, during the Revolutionary War one of the occupying troops in New York; afterward he traveled as far south as Florida in search of medicinal plants, receiving (but failing to acknowledge) assistance from Muhlenberg in his botanizing. In 1788 Olof Swartz, another of Linnaeus's students, described eighteen species of fungi from the West Indies, mostly from Jamaica; in 1791 he added four names and a detailed diagnosis of Boletus (i.e., Polyporus) sanguineus. In 1806 he published full descriptions of nineteen fungi, including eight species of Thelephora; one of these was surely the basidiolichen Cora and another the blood-red lichen Chiodecton. In 1788 also Walter reported from the Carolinas twenty fungi explicitly placed in Linnaean genera; most of them are with fair probability assignable to recognized species; the twenty-first appears under Walter's notorious generic designation Anonymos.

In 1793 Henry Muhlenberg included in his first Index of the Pennsylvania flora 23 binomials of fungi ("et permulti aliis," unnamed), presumably from Linnaeus, but without description, reference, or author. Muhlenberg (1753-1815), the son of "the patriarch of the Lutheran Church in the United States," who had come to Pennsylvania from Lusatia in 1782, was born at New Providence, Pennsylvania, and educated there and at Halle (1763-70), and was pastor of a Lutheran congregation at Lancaster for 35 years. In his Supplementum of 1799 most of the 113 names of fungi are followed by references to illustrations in Schaeffer, Hoffmann, Batsch, Tode, Hedwig, or Withering. His Catalogus of 1813 was further expanded: 51 genera and 288 species, "secundum Persoon" (who in 1809 published a note on some of Muhlenberg's material). The second (posthumous) edition (1818) listed 333 species, nearly all after Persoon, but a few attributed to Sprengel. Oddly enough, Muhlenberg's most valued mycological treasure does not appear among the fungi; Lichen stellare, later Glonium stellare, that bizarre and (to a mycologist) fascinating member of the Hysterialae, was retained, as a name merely, among the lichens, until other workers
got possession of specimens. Sprengel and G. Kunze examined Muhlenberg material, and Schweinitz studied his own collections and published *Glonium* Muhlenb. ex Sch.=Muhlenberg is said to have prepared descriptions of his plants, although he published only their names, and to have had a better knowledge of American botany than his lists can show. He is the first American to have contributed to mycology.

What is perhaps the most remarkable item in the history of American mycology in the 18th century makes no mention of a fungus. In 1755 the Governor, Council, and House of Representatives of the Province of Massachusetts enacted "that whoever, whether community or private person, hath any Barberry Bushes, standing or growing in his or their land,...he or they shall cause the same to be extirpated or destroyed..." A devotee of ESP must surely regard this as precognition; the U. S. Department of Agriculture began the eradication of barberries in 1918.

From the beginning of the 19th century many contributions to American mycology—but not, of course, all—were the work of resident botanists. Shecut's *Flora carolinensis!* of 1806 described eleven species of *Agaricus*, four of *Boletus* (=Polyporaceae), and eight of *Clavaria*; his work was alphabetically arranged and, since it remained incomplete, only the earlier genera appeared. After several years of travels through the Gulf states and the West Indies C. C. Robin reported in 1807 the occurrence of four fungi. During the years 1808 to 1820 the ineffable Rafinesque published at least six works dealing in some measure with fungi; one of these is a prospectus of a "natural history of the funguses, or mushroom-tribe of America," with 19 briefly characterized, but effectively published, new generic names. Too many able botanists have wasted time and effort attempting to apply Rafinesque's names to existing forms. E. D. Merrill's *Index Rafinesquierianus* will summarize the problem (77 generic names of fungi) and the results. Elias Fries stated it more briefly in 1825: "For the rest, the many genera proposed by Rafinesque are known only by name." Finally, for any who may still hope to fix the application of these names, there is the observation of W. R. Gerard (1885) that tentative assignments of Rafinesque's fungus genera according to his descriptions are wholly contradicted by a unique set of his surviving illustrations. Bosc's 1811 *Mémoire*, describing fourteen species and a genus of fungi from South Carolina, stands at the other end of the scale: descriptions as vivid and clear as one could hope for, and admirable illustrations; most can be recognized today. The 1814 *Synopsis* of O. O. Rich includes brief
diagnoses of 18 genera from Linnaeus, Bulliard, and Persoon. In 1818 appeared under the pseudonym Senex an "Essay on smut in wheat"; the author held the cause of the disease to be unknown; he proposed twelve rules for prevention, many of which might be effective, and recommended Tillet's steeping of seed-grain in lime- or wood-ash-water. The article is to a considerable extent derivative, but is notable as an early essay on fungus disease. In the same year James Macbride published in the Transactions of the Linnean Society an account, dispatched from Charleston the year before, of that perennial puzzle the tuckahoe, "Lycoperdon solidum," which he reported to be parasitic on living roots. In 1817 appeared (without the author's name) the first edition of Amos Eaton's Manual of Botany for the Northern and Middle States; the second edition (1818) treated 22 genera of fungi, mostly of Linnaeus, but including one curious nomen novum, and more than 90 species, some from Muhlenberg. The third edition appeared in 1822 (certainly before April 23rd and possibly before March 23rd), and is of course later than the starting-point for fungus names; most of the genera and species are Persoon's; only three new names, but 58 genera and over 300 species are characterized. In 1819 the New York Lyceum of Natural History published A Catalogue of Plants Growing Spontaneously Within Thirty Miles of New-York, ostensibly prepared by a committee of three who signed the "Advertisement," but actually the sole work of John Torrey. The list includes 27 genera and 62 species of fungi "according to Persoon." In the next year Torrey tried his hand at the tuckahoe, which, in agreement with Macbride, he found to be a fungus; he called it Sclerotium giganteum. In the same year and the same journal W. Tully considered "The ergot of rye"; he treated it as Sclerotium clavus DC., and listed eleven reasons for believing "that the Clavus is a parasitic Fungus, like the different sorts of blight, smut, etc." M. Field made another essay at the same problem in 1825. In 1820 Ehrenberg reported the first fungi from northwest America—seven species from Alaska and two from St. Lawrence Island and St. Lawrence Bay.

The paper that is the real foundation of American mycology, Schweinitz's Synopsis fungorum Carolinæ superioris, was completed and delivered to Schwaegrichen at Leipzig in 1818. Schweinitz is rightly considered the first American mycologist and one of the fathers of the science. He was the son of the early head of the Moravian Church in the United States, born in Bethlehem, Pennsylvania, and educated there and at Niesky, in Saxony; himself the administrative head of his church first in Salem, North Carolina, and later in Bethlehem. In many respects his career parallels that of
the earlier Muhlenberg, even to the family origins in Lusatia. The *Syn. Fung. Car.* was published in the latter half of the year 1822; in it were catalogued 76 genera and 1373 species of fungi, of which two genera and about 320 species were described as new. Before going to Salem in 1812 Schweinitz was already co-author of the excellent *Conspicuus fungorum* of 1805 and possessed more experience and knowledge of fungi than any other worker except Persoon; his American paper was at once recognized as dependable and authoritative. In 1825 he brought out a short paper on species of *Sphaeria*, and in 1832 his *Synopsis* of North American fungi, which includes 246 genera and nearly 3100 species, over 1200 first discovered by Schweinitz. So much has already been written concerning Schweinitz that it appears unnecessary here to discuss his work at length. Its quality can best be appreciated from a comparison with that of contemporaries: Rafinesque with his unidentifiable new names, Muhlenberg with his bare names from European works, and C. P. von Martius with his *Decas plantarum mycetoidarum* described and illustrated from Brazil in 1821, not one of which, apparently, has ever been detected by anyone else anywhere. The knowledge of American fungi in Europe before Schweinitz is fairly indicated by the first volume of Fries's *Systema mycologicum* (1821). It included 45 species of fungi said to occur in America, attributed to or by implication reported by Bosc, Meyer, Swartz, Torrey, Muhlenberg, and Ehrenberg; of these six are known only from South America. Obviously more than 39 North American species were known to Fries by specimens or published reports; *S. M. I.* includes scarcely any groups except Hymenomycetes. But the number is still quite meager. The 1828 supplement to the same volume of Fries, volume one of the *Elenchus*, lists about 93 species from North America and the West Indies; of these 79 are from Schweinitz.

Probably the most elaborate description in Schweinitz's Carolina *Synopsis* is that of *Calostoma* (under the name *Mitremyces lutescens* Schw.). An even finer description of the other American species of *Calostoma* appears in a remarkable anatomical and developmental study of *"Gyropodium coccineum"* (a Schweinitz herbarium name) published in 1825 by Edward Hitchcock of Amherst, Massachusetts. In 1829 Hitchcock's *Catalogue of the Plants... in the Vicinity of Amherst College* was published, like the first edition of Eaton's *Manual*, by his students; it lists some 170 species of fungi. W. J. Hooker identified 19 fungi among the plants reported by Richardson in 1823 from Franklin's expedition to the "shores of the Polar Sea," a second list from the Arctic.
From the earliest times to our own day it has been noticeable that the greater part of the most erudite and admired contributors to the knowledge of the fungi have been learned in other phases of botany also. Persoon with his Synopsis plantarum, Schweinitz with his monograph of hepatic mosses and his studies and herbarium of vascular plants, and Fries with his works on lichenology and his floristic contributions all exemplify this breadth. It has less often been true or noticeable that botanists best known for work with vascular plants have also been competent mycologists; and yet there are many known as "taxonomists"—meaning students of phanerogams—who surprisingly made some of their early contributions to mycology. In a minor degree John Torrey is one of these, and even more oddly, Thomas Nuttall, who in his "Collections towards a flora of the Territory of Arkansas" (1837) noted three species of Fuligo and three of Trichia. A number of others appear later in the century.

Undoubtedly the most extensive contributions from abroad to the knowledge of American fungi were the work of M. J. Berkeley. From the year 1839 he was author, alone or with one or another of a series of collaborators, of a continuing stream of descriptions of fungi from the Americas. Among these are papers on Cuban fungi, the "Centuries of North American fungi," and two papers on the Schweinitzian herbarium, all with Curtis, the "Notices of North American fungi," and a Catalogue of Ohio fungi from Lea. C. G. Lloyd has raised the question—and settled it to his own satisfaction—whether the botanists who shared authorship with Berkeley ought to be accounted collaborators or merely persons who supplied unnamed collections to Berkeley. Undoubtedly Berkeley wrote the papers as they stand in print. In 1868, in the introduction to the "Fungi cubenses," appears a reference to "enormous quantities of fungi of the United States, especially the more Southern, amounting to above 6470 numbers. The latter, in many cases, were accompanied by copious notes or detailed descriptions, aided by excellent figures." That can be taken as Berkeley's assessment of his American collaborators, especially Curtis. He continues, "Dr. Montagne, it should be observed, had also a few notes to guide him; or characters of the Guiana species could not have been drawn up satisfactorily"—an implied justification for such joint authorship, as indicated by "B. & C.," and depreciation of Montagne's usual neglect of his collaborator. In his later years Berkeley may have attempted to deal with more fungi than he had time for, and his notes are not infrequently perfunctory rather than diagnostic; fortunately the descriptions are supported by specimens, and can be extended as re-
quired. M. A. Curtis, a New England Yankee residing as an Anglican clergyman in North (and for a time South) Carolina, furnished most of the American fungi described in the Berkeley and Curtis, and Curtis and Berkeley, papers. His earliest mycological work appeared in 1848; during the Civil War his knowledge of fleshy fungi made a contribution to the feeding of the people of his adoptive state. The msr. and illustrations for a book to this end were never published in their entirety, although some of the substance undoubtedly appeared in his article "On the esculent fungi of America" published in England in 1869 and 1870, and parts were included in a medical encyclopedia in 1886. His papers on the plants of North Carolina were for many years the standard flora, and he was considered by Asa Gray (who was not a mycologist) to be the botanist best acquainted with the vegetation of the southern Appalachians. But as he wrote in 1851, "I have...exhausted the field around me, so far as Phanerogams are concerned...and so I must needs look to Cryptogams for novelty...and have at last settled down upon Fungi upon which I have been engaged for five years." T. G. Lea's *Catalogue of Plants...Collected in the Vicinity of Cincinnati, Ohio*, published posthumously in 1849, included 310 fungi, with notes on occurrence, of which one genus and 54 species were carefully described as new, identified by Berkeley. C. J. Sprague's "Contributions to New England mycology" (1859) similarly reported the identifications of Curtis or Berkeley, and the new species are attributed to "B. & C."

J. F. C. Montagne was, like Berkeley, a distinguished European contributor to the knowledge of American fungi; his "Century of cellular plants" of 1842 and especially his *Sylloge* of 1856 must be consulted, chiefly for tropical, but to a lesser degree for temperate species. J. H. Léveillé, beginning in 1844, included American species among his "Champignons exotiques." M. C. Cooke, who can compete with Berkeley in the number of his publications on fungi, entered American mycology in 1869 with his "Decades of Maine fungi," a paper on Uredinales not only from Maine as we understand it but also from New York and Chicago. Later, he contributed extensively, by himself and in collaboration with Berkeley, Ellis, Harkness, and Peck, to the knowledge of New-World fungi. One of the great students of fungi who, alas, missed making such a contribution was the Czech A. C. J. Corda. Having completed five volumes of his magnificent *Icones* and the compendious *Anleitung*, Corda came to America and for some months collected and studied in Texas. The ship that carried him and his specimens left New Orleans August 25, 1849, and Corda was never again heard of. One account
states that the ship was found afloat but unmanned, and another that the ship disappeared with passengers and crew.

George Engelmann, another notable vascular-plant taxonomist, was publishing notes on parasitic fungi in St. Louis as early as 1861. Beginning in 1850 and continuing to the 1880's, Joseph Leidy cultivated one of the most esoteric of mycological studies, that of what he called Entophyta (that is, Trichomycetes) in healthy arthropods. Curtis's nearest mycological neighbor, H. W. Ravenel, as early as 1851 published careful and informative notes on South Carolina fungi, and later collected in Texas, to learn whether fungi contributed to diseases of cattle; he also supplied specimens and notes to Berkeley, and issued five centuries of the Fungi Caroliniani Exsiccati, a very useful set and the first American fungi exsiccati. He also collected or assembled the material for eight centuries of Fungi Americani Exsiccati, the sets being made up and distributed by M. C. Cooke. In 1865 D. A. P. Watt published "A provisional catalogue of Canadian cryptogams," with nearly 150 species listed by binomials only, part identified by Berkeley, part by Curtis.

After the death of Schweinitz in 1834 there were few workers with American fungi. Torrey found that vascular plants occupied what time he had to devote to botany; Asa Gray scarcely ventured beyond the phanerogamic herbarium; most botanists were content with what mycology had been recorded by others. Berkeley and Curtis studied most of the collections and described most of the novelties. It was 35 years before another American mycologist as active as Schweinitz appeared on the scene.

In 1867 C. H. Peck was appointed—temporarily—botanist of the State of New York, and commenced the rearrangement and increase of the collections at Albany. During his second year he was able to begin work on the fungi; and the 22nd Museum report for that year, published in 1869, is the first of the series, of which the 66th is the last, in which he set down his discoveries and observations. Although Peck identified and described fungi (and, for that matter, plants) of all groups, his greatest contribution was to the knowledge of macrofungi, and most notably of agarics and boletes—families that Schweinitz had examined and recorded, but had described only infrequently. These are fungi that are most effectively studied during the short time when they are fresh and discharging spores, and a great deal of Peck's material he gathered himself and examined in the field. But there is often someone to whom others send casual or puzzling collections, and for many years Peck was
such a one; by no means all of his work deals with his own New York specimens. For some years he shared this work with Cooke, and later with Ellis. His descriptions, and especially his monographic treatments of subgenera or genera, for the most part are far more informative than those of many predecessors.

In Brattleboro, Vermont, not far from Albany, worked a contemporary and colleague, C. C. Frost, whose work was fully equal to Peck's most careful descriptions. Frost's first mycological paper, entitled a "Further enumeration of New England fungi," appeared in the same year, 1869, as Peck's. He concerned himself with fleshy fungi in general, but especially with the Boletaceae, and many of the eastern American boletes were discovered and described by him. Frost's "Catalogue of Boleti of New England" (1874) includes 46 species, nearly half his own. He contributed the fungi (as well as the Bryophytes and Characeae) to the Catalogue of Plants Growing ... Within Thirty Miles of Amherst College, which he published in 1875 jointly with E. Tuckerman. Most early American botanists were either clergymen or physicians; Frost was a shoemaker, who first purchased Fries's Systema and then taught himself Latin in order to read it. From the day when he left the common school, at the age of 15, in revolt against an unjust beating, his devotion to learning persisted throughout his life. He is the first in this hemisphere who mastered that beautiful and exasperating family the Boletaceae.

Beginning in 1869 E. V. Riley published a series of notes on entomogenous fungi. His interest appears to have been in the host rather than the parasite; but as early records the papers are a part of mycological history. W. R. Gerard, a native and resident of the Hudson valley, began in 1873 a series of papers on varied phases of mycology. Some of the titles are such as to invite study: "Spurious fungi" (insect galls mistaken for Rhytisma), "A truffle new to North America" (the first reliable report of an American truffle, all earlier ones being dubious or certainly mistaken), "Correlation between the odor of phalloids and their relative frequency"—not earth-shaking, but informing and accurate.

In 1874 first appeared mycological work from the hand of J. B. Ellis. During his early years Ellis was a school teacher in his native state, New York. After graduation from Union College he continued as a teacher—of classics—and school principal. In 1853 he went to South Carolina with the intention of settling and teaching there; but being informed by a local professor that his origin
in New York made it unlikely that he would succeed, he returned home. During the Civil War he served in the U. S. Navy and afterward settled in Newfield, New Jersey, which therefore became a sort of mycological capital of North America. For thirty years from 1857 he corresponded with Ravenel, who may have awakened his interest in fungi. At any event, his first paper on “New Species of Fungi found at Newfield, New Jersey” was followed by some 200 others, and throughout his life the Newfield area, and nearby Pennsylvania, continued to furnish endless series of specimens for study and distribution. Early in the 1880’s Ellis became acquainted with B. M. Everhart, a merchant of Chester Co., Pennsylvania, and in 1883 they published their first paper. In January of 1885, with W. A. Kellerman, then at Kansas State College, they began the publication of The Journal of Mycology, preceded by only one other mycological periodical, the Revue Mycologique (1879). And alone or with Everhart, Ellis issued three works of fungi exsiccata: Fungi Nova-Cassareensae [1] (1 century, 1877), North American Fungi (36 centuries, 1878-1898), and Fungi Columbiani (14 centuries, 1893-1899). Subsequent centuries were the work of C. L. Shear (Cent. 15) and E. Bartholomew (Cent. 16-51). Although Ellis studied, described, and included in the exsiccata fungi of all groups, his greatest interest was in what are sometimes called microfungi—such pyreno- and coelomycetes as are pathogenic to vascular plants. Besides journal articles in a number of periodicals Ellis and Everhart published in 1892 the North American Pyrenomycetes, for many mycologists the only introduction to a vast and difficult group. Like his contemporary C.H. Peck, Ellis was an able and generous provider of information to botanists, professional and amateur, throughout North America; to his local collections were added incredible numbers of specimens and species from elsewhere, for description and distribution. He is reported to have been a retiring and even timid man, charming and hospitable to visitors, but disinclined to travel far from Newfield or to attend meetings. He probably did more than any man of his time to nourish and encourage American mycology, though few who depended on him and his works ever met him.

In 1874 also T. J. Burrill published his first mycological paper, on “Aggressive parasitism of fungi.” Or perhaps the paper should be characterized as phytopathological; the time was still far off when pathologists would be content with ignorance of the fungi or mycologists scorn the pathogenic activities of their charges. In an address published as early as 1869, Burrill had called attention to “a new field of labor,... that of the vegetable diseases. Perhaps
nothing pertaining to plants is so little understood.... Parasitic fungi... materially influence both [disease and decay], after causing great loss and alarming destruction.” Burrill was a Yankee—that is, a native of New England—transplanted to Illinois, botanist of the first Powell expedition to Colorado, assistant professor of natural history, professor of botany and horticulture and later of botany alone, dean, vice-president, and twice acting president of the university. He initiated a survey of the parasitic fungi of the state, produced treatments of Illinois rusts, smuts, and powdery mildews and a monograph of the latter group for Ellis and Everhart’s North American Pyrenomycetes, and departed so far from mycology as to become the first (1877-80) to demonstrate that bacteria, as well as fungi, cause disease in plants. At a time when the most widely used textbook, Asa Gray’s Lessons in Botany, gave two-thirds of a page to cryptogams (1866) or two pages to fungi (1868), and when botany was a lecture course, Burrill introduced in his courses in 1868 laboratory study of botany and plant pathology, using M. C. Cooke’s Rust, Smut, Mildew, & Mould (1865) for a text, and “The use of the microscope,” with a real live microscope, as a laboratory topic. These appear to be the first class laboratory in botany and the first use of the microscope for class instruction in botany, anywhere. A number of his students came to occupy useful places in American mycology.

W. G. Farlow published his first mycological paper—which, like many of its successors, was phytopathological—in 1875, on “The potato rot.” Farlow’s training was medical—not from professional interest, but as insurance against the paucity of botanical employment. Immediately after receiving his degree he was appointed assistant in cryptogamic botany under Asa Gray, who was quite aware that American academic botany could not forever ignore nonvascular plants. Two years later Farlow went for two years to France and Germany, where for most of the time he worked under de Bary (and alongside Rostafinski); he also visited other botanical laboratories and collections. In 1874 he was assistant professor of botany at the Bussey Institution of Harvard University, where the application of mycology to pathology was especially appropriate, and in 1879 became professor of cryptogamic botany at Harvard College. Here he continued work on both fungi and algae (as well as their synthesis, lichens), built up a notable library and herbarium of cryptogamic botany, established invaluable bibliographic indices for the fungi, and contributed directly to the education of many of the next generation’s mycologists and plant pathologists and, as “the foremost cryptogamic botanist of America,” indirectly to the
development of his subject throughout the hemisphere. The Farlow Library and Herbarium, which he bequeathed to his university, is a great and unique institution for the cultivation of cryptogamic botany. Farlow's published papers contain sound mycology—including early essays in forest pathology and medical mycology—but his greatest contribution was made through his example, his students, and his institution. In the early 1870's, noting the prevalence in Strassburg of one of the ephemeral botanical fads, he wrote to Gray that "at the rate the Germans are going on, in twenty years there won't be a botanist in Germany who knows anything about the flora of the country," and Farlow did all in his power to avert a similar fate for American cryptogamic botany.

H. W. Harkness was a native of Massachusetts, and received a medical degree in that state in 1847. Having seen one relative after another succumb to tuberculosis, he decided to seek health and fortune in California. He traveled overland from Rock Island, Illinois, and reached the coast in the historic year 1849. For twenty years he practiced medicine in Sacramento, and then retired to San Francisco, to take up the study of the fungi. His first mycological paper, on Peridermium, was summarized in the minutes of the San Francisco Microscopical Society in 1876. Thereafter he continued to collect, identify, and describe. Collections sent to W. H. Phillips in England were reported and described by the latter from 1876, and by Phillips and Harkness in 1884; others sent to J. E. Vize, by Vize beginning in 1877; and others jointly by M. C. Cooke and Harkness from 1880, J. B. Ellis and Harkness from 1881, and C. B. Plowright and Harkness in 1884. A Catalogue of Pacific Coast Fungi was prepared by Harkness and J. P. Moore and published by the California Academy of Sciences in 1880. Among Harkness's early discoveries were sporocarps of Tuberales and subterranean gastromycetes; systematic study of American truffles and false truffles can be said to begin with Harkness and his paper on "Californian hypogaeous fungi" published in 1899. He seems to have prospered in his adoptive state; when the last rail in the transcontinental railroad was laid in Utah, Harkness presented the golden spike on behalf of the State of California. When he died in 1901 at the age of 80 his extensive mycological collections were left to the California Academy—in time to be lost, except for some types that were rescued, in the San Francisco earthquake of 1906; but many duplicates and most of the hypogai exist in other herbaria. Harkness was the first mycologist on the west coast of America and the founder of what may be called American mycology.
B. D. Halsted published his first mycological note in 1876, while still a student of Farlow's. He was another native of New York state; his earlier studies were carried on at Michigan State; later he was professor of botany at Iowa State, and for nearly thirty years at Rutgers University. Almost all of his many papers dealt with pathogenic fungi. He is reported to have been a successful and greatly admired teacher. —Mary Elizabeth Banning, a native of Maryland, published a number of papers on the larger fungi of that state and Virginia, beginning in the year 1877. As seems inevitable, one of them had as subject the tuckahoe. Peck wrote with admiration of a set of 175 colored drawings of fungi, with manuscript descriptions, that she presented to the New York State Museum. It had been her hope to provide an American counterpart to Mrs. Hussey's *Illustrations of British Mycology*; unfortunately, her larger work was never published. —A. P. Morgan was an Ohioan and teacher in Ohio primary schools and later of mathematics in Dayton High School. He went into the army, during the Civil War, with a copy of Gray's *Manual* in his knapsack. A severe attack of typhoid fever prevented for a time his return to teaching; and during a visit to his wife's home in Vermont he met Frost and Tuckerman (and possibly Peck in Albany); thence began his special devotion to fungi. For several years he served as principal of a school district in Dayton, but later retired—if that is the word—to a farm in southwestern Ohio. He imported a copy of Fries's *Hymenomycetes europaei* in 1876; his first mycological paper, on "The study of fungi," appeared the next year. His studies embraced several groups, but the agarics, the gasteromycetes, the slime molds, poly pores, and that taxonomic nightmare the resupinate pore fungi came in for special treatment. One who knew him wrote that "the work that he has done from first to last is his own," and one who used it many years after publication can testify to its excellence. —C. E. Bessey, another Ohioan, is rarely thought of as a mycologist, but rather as one of the great teachers in American botany and as the author of a widely accepted approach to a natural classification of Angiosperms. In 1877, at the time of publication of his first mycological paper, "On injurious fungi.—The blights, (Erysipheii.)," he was professor of botany, zoology, and entomology at Iowa State, and the same volume includes a taxonomic paper from his hand on Orthoptera. During the fifteen years spent at Ames he continued to work on mycological problems as well as others implied by his position; in 1884 he went to the University of Nebraska as professor of botany, and there developed one of the outstanding departments in the United States. He accepted and vigorously championed the hypothesis of Sachs and others that fungi are algae on relief, and many
of his students—including Clements and Shear and E. A. Bessey—carried that throughout their lives as unchallengeable dogma. Bessey may have been the greatest teacher of botany of his time; he certainly was one of the most influential in America, in mycology as well as other matters.

In a number of places in America the study of fungi was begun at about this period. —A. E. Johnson reported on "The mycological flora of Minnesota" from 1877. —J. Fowler noted 55 fungi in his "List of New Brunswick plants" in 1879. —E. W. D. Holway began his accounts of the fungi of northeastern Iowa with a paper on those of *Anemone nemorosa* in 1880, and other notes followed, including those on the "Sound of discharging ascospores" ("something like the noise of soda-water") in 1883. Decorah, Iowa, proved a prolific nursery of new fungi, but another passion, that for mountaineering, diverted a part of Holway's attention to the Canadian Rockies. And for a change of climate Holway and his wife collected rusts extensively and expertly in Central and South America. His *North American Uredinae* (1905-1924) was illustrated by his own excellent photomicrographs. Neither the mountain-climbing nor the knowledge of the rusts are what would be expected of one who was prevented by frail health from progressing beyond the local schools, and whose profession was that of banker. But Mt. Holway and a river are evidence of his accomplishment in the one direction; his own papers, and a number of studies by J. C. Arthur and by H. S. Jackson on his later collections, testify to his standing as a mycologist. The seven centuries of the *Reliquiae Holwayanae* were made up from his collections. —J. Somers reported "Nova Scotia fungi" in 1882, and additions four years later. —W. F. Bundy in 1883 published "A partial list of the fungi of Wisconsin," binomials and authors, arranged in families but without further information except for descriptions of three new species.

J. C. Arthur, a native of New York state, but like Holway brought up in Iowa, was one of the first students enrolled in what is now Iowa State University at Ames. There he received his first degree, and in 1877 his master's, and there he taught for a time; later he was instructor at Wisconsin, then Minnesota, and then botanist at the Geneva, N. Y., experiment station. In 1886 he took a D.Sc. at Cornell, and the next year went as professor to Purdue, where he remained for the rest of his life. His first paper, published in 1883, dealt with "The interpretation of Schweinitzian and other early descriptions"—and, as might be expected, with rusts. The Uredinales remained his chief concern for sixty years. A great deal
of his field work was devoted to experimental inoculation, aimed at elucidation of the life cycles of heteroecious rusts. With the collaboration of as distinguished a group of assistants as ever worked together in a mycology laboratory Arthur built up the enormous rust herbarium at Purdue, which the University named in his honor, and brought out the treatment of Uredinales in *North American Flora*, the *Manual*, and the biological studies in *The Plant Rusts*. The classification in *North American Flora*, rigidly determined by the sequence of sori exhibited, had later to be abandoned; the scheme of the *Manual* is generally accepted, and what was for many years the standard terminology of sorus types (and still might well be) was also Arthur’s work.

A. B. Seymour also published his first paper in 1883 on a rust, *Puccinia heterospora*. For some time, with F. S. Earle, he assisted Burrell in a survey of fungus diseases in Illinois. For a year he taught botany at Wisconsin, but otherwise the remainder of his life was devoted to the elaborate and complete bibliographic and host indices that Farlow had initiated at Harvard. The *Host Index of the Fungi of North America*, published in 1929, contains some of the information he assembled; the larger part remains in the files of the Farlow Library. While Seymour was working at Illinois and Arthur at Iowa State two mycologists were undertaking similar studies in Kansas. —W. A. Kellerman’s first mycological paper appeared in 1885 with Ellis as joint author, on “New species of American fungi”; in the same year he published “A partial list of Kansas parasitic fungi,” which was more than a list, since it included careful designation of authors and hosts, and diagnosis of new species. In that year Kellerman began, with Ellis and Everhart, the *Journal of Mycology*; he was its last editor, and the journal came to an end soon after his death in 1907. Kellerman was an Ohioan, a Cornell graduate, a student at Zurich (Ph.D.), and a teacher in Wisconsin and professor at Lexington, Kentucky, at Kansas State College, and from 1891 at Ohio State. He issued the *Mycological Bulletin*, 200 numbers of the exsiccata set *Ohio Fungi*, many papers on fungi, and (at an estimate) quite as many on other phases of botany, notably the Ohio flora; and he was regarded as an inspiring teacher. He died of a tropical fever, or quite possibly simple overexertion, on his fourth scientific expedition to Guatemala. —F. W. Cragin, at Washburn College in Topeka, was a Kansas contemporary; where Kellerman’s chief interest was in plant parasites, Cragin wrote in 1884 and 1885 mostly on hymeno- and gasteromycetes.

William Trelease, who is generally known as a student of the taxonomy of vascular plants, beginning in 1884 published a num-
ber of careful and detailed papers on fungi, notably a "Preliminary list of Wisconsin parasitic fungi." — F. S. Earle began his mycological work with Seymour on the Illinois parasitic fungi, writing (1884) on Podosphaera and later with Burrill on powdery mildews in general. After a year at the Mississippi Agricultural Experiment Station and the publication, with S. M. Tracy, of "Mississippi Fungi" he was put in charge of the mycological herbarium of the U. S. Department of Agriculture. From there he went as professor of biology to the Alabama Polytechnic Institute (Auburn University), where he published "A preliminary list of Alabama fungi" with L. M. Underwood (1897), and over a hundred pages on the fungi of the state in Mohr's Plant Life of Alabama (1901). He was preceded in the collecting of Alabama fungi by T. W. Peters, who sent material to Curtis and Ravenel. In 1902 Earle went to the New York Botanical Garden, where he prepared a critical paper, published in 1909, on "The genera of North American gill fungi." In 1906 he moved to Cuba, and there continued in agronomic work.

— J. Macoun in 1885 reported 26 species of fungi collected in Labrador (determined by Ellis), and later in that year published notes on "Edible and poisonous fungi." For many years he contributed to other phases of Canadian natural history, but his work with fungi appears to be largely that of collector; he is known for his specimens studied by later authors. — W. W. Calkins brought out the first of his "Notes on Florida fungi" in 1886. He was an Illinois lawyer and historian, who wrote also on other phases of natural history. All his mycological papers appeared in the Journal of Mycology, and many of his collections were distributed in Ellis and Everhart's exsiccati. He later deserted mycology for its stepchild lichenology.

— G. Martin of Pennsylvania made large collections of Florida fungi at the same time; several of his papers appeared in early volumes of the Journal of Mycology, but most of his fungi were studied by Ellis. — A. B. Langlois, a priest of southern Louisiana, published his first mycological note in the Journal of Mycology in 1887 and in the same year brought out in France his Catalogue provisoire des plantes phanérogames et cryptogames de la Basse-Louisiane, which includes a list of almost 650 fungi whose identification is attributed to Ellis. He continued to collect fungi, and found some very fine things, described by Ellis or later mycologists.

To those mycologists who are acquainted with the work of R. Thaxter—and this should mean all mycologists—the title of his first paper on fungi is nearly incredible: "On certain cultures of Gymnosporangium, with notes on their Roesteliac," printed in 1887. Thaxter is known to many as the botanist who, on being asked by a
journalist "What is the economic importance of your studies?", replied "None, thank God." Nevertheless, he wrote a number of papers with a strong phytopathological bent. He was a native of Massachusetts, a student of Farlow's, and, after four years at the Connecticut Experiment Station, his associate at Harvard. He studied insects—and produced six papers on them—before his first publication on fungi, and therefore had some preparation for the monographing of the Entomophthoraceae, the subject of his thesis, and the study of other entomophagous fungi and of the group that will always be his own, the Laboulbeniales. His studies of the Endogonaceae and of a number of the more bizarre zygo- and oomycetes are only less extensive. Although Laboulbeniales and some other favorites can really be seen only in the laboratory, Thaxter was an extraordinary field botanist; from Nova Scotia, New England, and the Great Smoky Mountains to Punta Arenas and the Chilean coast he collected not merely the local species, but significant, mycologically exciting ones. The Farlow Herbarium was endowed or burdened with hundreds of fungi deserving detailed study and filed away for his successors. Thaxter's drawings, executed under a reading glass, and one (perfect) dot at a time, may be rivaled only by C. Tulasne's. He was interested in most small fungi; in fact, he made important collections of Tuberales and hypogeous gastromycetes—which although not small are obscure enough to challenge the collector.

J. H. Faull, a native of Michigan, earned his B.A. at Toronto in 1898. After teaching mathematics at Albert College for two years he returned to Toronto to study with E. C. Jeffrey. In 1901 he went to study with Thaxter at Harvard; his thesis was written on ascus cytology; his doctorate was conferred in 1904. In 1903 he became lecturer at Toronto, where he continued until 1928, having become professor and head of botany in 1918. One year's study abroad was spent mostly at Munich with Hartig. In these years he collected quantities of fungi and pathological specimens. At the request of the Canadian government he established a field laboratory at Timagami for forest pathology. In 1928 he went to Harvard as professor of forest pathology, working at the Arnold Arboretum. Much of his later work in both Canada and the United States dealt with forest pathology; probably the best known papers are his monographs of the fern-conifer rusts *Milesina* and *Uredinopsis*.

Soon after Thaxter's death D. H. Linder became curator of the Farlow Herbarium. Linder was a native of Massachusetts and a graduate of Harvard College; his postgraduate studies had been con-
ducted under the guidance of W. H. Weston and R. Thaxter, and had been interrupted or enriched by tropical collecting in Guiana, the West Indies, and Liberia. For a number of years he served as mycologist at the Missouri Botanical Garden and on the faculty of the Henry Shaw School of Botany, Washington University, St. Louis. He was an able speaker at mycological meetings, and a fine teacher so long as he could work with students one at a time or informally, but detested lecturing. At the Farlow, with inconsiderable financial resources and little support from the university, he not only increased the collections and library but made them available as they never had been to those elsewhere engaged in mycological studies. In “occasional scattered moments” he produced distinguished papers, illustrated in the Thaxter tradition, on helicosporous imperfects, Oidium, Kickxellaceae, Tremellales, gasteromycetes, oomycetes, marine fungi—most groups except the slime molds. His death at the age of 47 was felt as a serious loss to the science. —W. L. White, a later director of the Farlow Herbarium—to pursue the Harvard connection briefly — was a Pennsylvanian, whose undergraduate studies were pursued at Pennsylvania State. His first interest in mycology lay with the Thelephoraceae and related basidiomycetes; but receiving no encouragement to continue with that group he went to Cornell, Whetzel, and the discomycetes. For a time he was bibliographer at the Farlow; then, beginning in 1943, and for five years, he worked on tropical deterioration for the War Department. When he returned to Cambridge in 1948 he continued work for the Quartermaster Corps, and reduced the botanical activities of his institution to what the university would support. He died at 44 in an automobile accident. —J. R. Raper, a native of North Carolina, worked for a time on the induction of gametangia in Achlya. At the University of Chicago and later at Harvard his attention was devoted to the discovering of additional complexities among the unreasonably multiplied mating types of Schizophyllum.

Among Massachusetts students of fungi, one whose achievements have had profound and wide influence was A. F. Blakeslee. Working under Thaxter, Blakeslee undertook as a student to learn why black molds sometimes failed to form zygospores. His investigation embraced careful cultural studies of many Mucorales; the solution to the problem was the discovery in 1904—and not only discovery, but careful analysis—of homo- and heterothallism. His methods and concepts proved to be the key to many behavioral peculiarities of other phycymycetes, of myxo-, asco-, and basidiomycetes, and of algae and protozoa. What is more, puzzles that these concepts have failed to solve have sometimes owed their difficulty
to failure to follow Blakeslee's clear definitions and examples. Part of the fault may have been his; Blakeslee sought to equate heterothallism with sexual differentiation; after twenty years' failure in that endeavor he moved to another area, angiosperm genetics. —L. M. Ames was born in the state of Washington and grew up in Michigan and Illinois; he graduated from Michigan State under E. A. Bessey and for a year worked at the experiment station in Wooster, Ohio, and then went to Harvard to write his thesis, on reproduction in Pleurage, under W. H. Weston (1934). For ten years he worked out of the Arnold Arboretum as pathologist with the U. S. quarantine service on rust diseases and Berberis; later he became research mycologist with the Army Corps of Engineers, and then scientific officer in research and development. Here, in Virginia, he wrote and published his Monograph of the Chaetomiaceae (1961). He worked on fungus allergies also. Washington? Massachusetts? Virginia? He would be claimed by friends anywhere.

G. P. Clinton was born in the Rock River country of northwestern Illinois, as his biographer says, a "land of flowers and trees and smut." He selected botany as his major when he came to the University of Illinois in 1886, and as an undergraduate assisted Burrill, the only botanist on the faculty, with his research; after earning bachelor's and master's degrees he continued as assistant in botany and in the experiment station. His first paper "Observations and experiments on Saprolegna infesting fish" (1894) resulted from the difficulties of the U. S. Fish Commission exhibit at the Chicago world's fair. His inclination to specialize in the slime molds appearing irrelevant to experiment-station work, he gave special attention to the Ustilaginales, writing on "Broom corn smut" in 1897. He also completed at Illinois a careful study of the apple scab fungus (published in 1901), only to learn that his main conclusion had been anticipated by Aderhold in 1897. In 1900 he went to Cambridge to work with Farlow and Thaxter, receiving his Ph.D. in 1902 for a thesis on "North American Ustilagineae." In that year he was appointed botanist at the Connecticut Agricultural Experiment Station, where he studied not only smuts but almost any problem that presented itself. In 1910, for example, he found and described oospores of Phytophthora infestans—which nobody knows, since the fungus is heterothallic and until recent times no one in Europe or temperate North America ever saw the requisite pair of strains. His treatment of the smuts in the North American Flora is still a very usable classic; how he did it is another mystery, since before 1930 all other authors in N. A. F. were compelled to follow the American Code. In later years Clinton held appointments, without
relinquishing his work as "botanist" at the experiment station, at Yale University, where he taught botany, forest pathology, and plant pathology.

G. F. Atkinson, a native of Michigan, began his studies at Olivet College in that state, but later graduated from Cornell University. In 1885 he was assistant professor of entomology and zoology at the University of North Carolina; in 1888, professor of botany and zoology at the University of South Carolina; and in 1892 professor of biology at Alabama Polytechnic Institute. It is not surprising that his first publication dealt with insects and a later one with the birds of North Carolina. Several early papers treated plant diseases. In 1896 he became head of botany at Cornell in the college of liberal arts. In 1897 appeared his first article on agarics, and this group become his chosen object of study. A series of papers dealt with the structure and development of the basidiocarps of various genera, and his book Mushrooms Edible, Poisonous, etc. (1900) was an introduction to popular mycology. He was collecting in Washington for an illustrated work on fleshy fungi of North America when he died of influenza in 1918. He was the teacher of a number of the most active mycologists of the next generation.

H. H. Whetzel, like a number of Cornell mycologists and phytopathologists, was a native of Indiana and a student of M. B. Thomas's at Wabash College. Thomas secured an assistantship for him, and Whetzel began study with Atkinson in 1902. Although Atkinson was botanist in the experiment station as well as head of the botany department, he passed a good deal of his experiment station work along to his assistants, and Whetzel did his share. In 1904 he was given the responsibility for most of the plant disease investigations, and in 1906, when he had almost completed the requirements for his graduate degree, he was made assistant professor and head of another botany department, that in the college of agriculture. The next year at his request the titles were changed to plant pathology, and Whetzel is in consequence the founder of the first department of plant pathology in America. Unfortunately, since he had accepted a professorship he could no longer receive a degree from the university, and to the end of his days carried the affectionate title of Prof. Whetzel. He was one of the organizers of the American Phytopathological Society in 1909 and one of its first editors, and later a prime mover in the organization of the Mycological Society of America. He was equally innovative in his teaching: a system of few lectures and continually available material for study, with a conference with the instructor at the conclusion of
each problem—vastly different from most lecture-laboratory arrangements—and it works, at least for as fine a teacher as Whetzel. He also invented a new system of herbarium arrangement, with specimens filed according to date of accession rather than with related forms on herbarium sheets. It is still the rule in Whetzel’s old department and a few other institutions, and there are those who are sure that it doesn’t work. Whetzel’s studies were concerned with many problems and fungi, but his favorites were the inoperculate discomycetes that he finally brought together in his family Sclerotiniaceae. It was an inspiring sight, Prof. Whetzel crawling over the surface of a boggy woods and sifting over the bits of vegetation for sclerotia. He was convinced that the structures usually studied—apothecia, asci, spores—were insufficient to establish the classification of the group; one must take into account sclerotia and imperfect fructifications. And he convinced others.

H. M. Fitzpatrick, another Hoosier (which is to say, a native of Indiana), and another of Thomas’s boys from Wabash College, went to Cornell in 1908 to assist Atkinson, and later to assist Whetzel in teaching a course called “Etiology of plant diseases,” a sort of pathogenic mycology plus. In 1913 he received his Ph.D. and appointment as assistant professor of plant pathology, and from that time had charge of all instruction in mycology. He expanded the course to cover two full years of work on phycomycetes and higher fungi, with an additional semester for the myxomycetes and bacterial pathogens. Later still the bacteria were dropped and the slime molds included in a further enlarged two-year course. There is no doubt that no such introduction to mycology was offered elsewhere in America. The material of the section on phycomycetes was published in the book The Lower Fungi—Phycomycetes in 1930. The section on ascomycetes, even more useful, was given to Fitzpatrick’s students and mycological friends in the form of mimeographed sheets; the author had determined not to publish another book, and so it was never published. His published papers dealt with many aspects of mycology. His thesis, on the development of three hypogaeous genera of gasteromycetes, is a classic; so are his papers on that incredible semi-rust Eocronartium. The groups that are his own (as the Sclerotiniaceae are Whetzel’s) are the obscure ascomycete families Coryneliaceae and Nitschkiaceae. He also did careful work on mycological bibliography; as first secretary and lifelong historian of the Mycological Society he often wrote on mycological history.

W. A. Murrill, a Virginian and a graduate of Randolph-Macon College and Cornell University, after a number of years teaching in
high schools came to the New York Botanical Garden in 1904. His early duties were with the fungi, but others soon attached themselves to him. In 1908 he became assistant director; in 1909 he founded *Mycologia*, to take the place of the *Journal of Mycology*, and edited the first sixteen volumes. Besides extensive collecting trips in all parts of the United States and several areas of the American tropics he made a number of extensive visits to foreign herbaria, carrying with him and leaving abroad specimens of American fungi and returning with permitted fragments of foreign collections; thus he increased enormously the value of the reference collections in his charge. He is best known for his studies of the Polyporaceae and Agaricales, where his taxonomy was far in advance of what was generally held, his nomenclature objective and honest (in accordance with the American Code); for both reasons he was admired and derided. The hymenomycetes were not his only subject; among others he described and named the chestnut blight fungus. He retired in 1924; a few years later, appearing in Gainesville, Florida, he settled there and with the assistance of friends in the university took up his studies of fungi and vascular plants. His designation of himself was "the naturalist"; some of his friends and opponents called him "the first gentleman of American mycology." Mutrill was succeeded at the Garden by F. J. Seaver, an Iowan and a graduate of Morningside College and the University of Iowa. Before coming to New York he had taught at Iowa Wesleyan and at the University of North Dakota. He was director of laboratories at the N. Y. B. G. from 1908, received his degree from Iowa in 1912, and became curator in that year and head curator in 1943. He was editor of *Mycologia* from 1925, editor-in-chief 1933-1945, and managing editor 1933-1947, and the solvency of the journal was for many years the result of his watchfulness. He worked with and wrote on many groups of fungi, but his special interest was in discomycetes (*The North American Cup-fungi — Operculates*, and — *Inoperculates*) and the Hypocreales. His early collecting, for papers on the Iowa discomycetes, was remarkably thorough; later he pursued field studies in New York, the Rocky Mountains, and the Caribbean.

B. O. Dodge was born and grew up on a Wisconsin farm. By his twentieth year he completed the work of the local high school, and then taught school for a time. In 1895 he enrolled in the University of Wisconsin, but from lack of money had to drop out before the end of the year. Later, alternately teaching and studying, he graduated from the Milwaukee Normal School in 1901. In 1909, after five summer sessions and a year at Madison, he earned the degree of bachelor of philosophy at the age of 37. Receiving an as-
sistantship at Columbia, he came to New York; his Ph.D. was awarded in 1912 and he continued as instructor until 1920. In that year he was appointed plant pathologist in the Bureau of Plant Industry, and was in Washington until 1928, when he became plant pathologist at the New York Botanical Garden. Dodge's mycological accomplishments are many. Very early he completed a study of Wisconsin discomycetes. His beautiful paper on *Ascobolus* included the first demonstration of heterothallism in an ascomycete. Other careful studies on orange rusts of *Rubus* and on *Gymnosporangium* added much to knowledge of those genera. He worked hard at his job of pathologist, investigating diseases both in the plantations of the Garden and as presented for diagnosis from outside; a book on *Diseases of Ornamental Plants* resulted. His discovery and demonstration of the splash-cup mechanism in the bird's nest fungi was the solution of a problem presented at the Garden. While he was in Washington with C. L. Shear he collaborated in a study of the basidiomycete *Pilacre* (i.e., *Phleogena*) and another in which the new genus *Neurospora* was characterized. Many papers by Dodge followed on *Neurospora*; his studies made of it an organism perfectly adapted for the elucidation of generical knowledge not readily derivable from the usual fruit flies, peas, and corn. Haploid genetics, and genetic ratios derived from observation rather than inference, can be said to originate with Dodge and his *Neurospora* work. It is regrettable that the honors later conferred for work in *Neurospora* genetics came only to his successors. In New York he interested himself in medical mycology also; for ten years he was consultant on mycology and lecturer in dermatology at Presbyterian Hospital. In his last years he often expressed one wish: for forty years more, to follow up some of the fascinating but incomplete studies he had initiated—discomycete taxonomy, life cycles of the *Rubus* rusts.

R. A. Harper, an Iowan, after graduation from Oberlin College was for two years a teacher of Latin and Greek at Gates College, and then instructor in science at Lake Forest Academy. In 1891 he earned an M.A. at Oberlin, returning to Lake Forest College as professor of botany and geology. After further study of botany at Johns Hopkins and Bonn he received his Ph.D. from the latter in 1896. Thence he went to the University of Wisconsin, where he was professor of botany for thirteen years; in 1911 he moved on to Columbia, and remained until his retirement. His best known papers are cytological—the studies of ascomycete life-cycles that appeared to support the assertion that karyogamy takes place in the ascogonium, and those that seemed to show ascospore de-
limitation by rays of the achromatic figure; a number of papers pre-
pared by his very able students were also cytological. But in the re-
gion of New York City he was quite as devoted to field botany.
—Rhoda W. Benham was a native of New York state and an un-
dergraduate student at Barnard College. While working on her
doctoral thesis on metal nutrition of *Aspergillus niger* she was, at
the urging of Dodge, co-opted for work on fungus pathogens in the
College of Physicians and Surgeons of Columbia University. There
she completed a new thesis, on “Certain monilias parasitic on man,”
in which she employed both morphology and agglutination in sort-
ing out the so-called monilias, and a cornmeal agar for laboratory
identification. Workers who speak blithely of *Candida albicans* may
not be able to imagine the confusion that preceded Benham’s paper.
Similar treatments of other groups followed, both yeast-like and
mycelial pathogens of man; much of her work was taxonomic—and
how it was needed!—but she continued to investigate the nutrition
of these fungi. In 1935 she organized a postgraduate course in the
College of Physicians and Surgeons, the first course in medical my-
cology in the country; a number of its graduates carried the work
to other laboratories, and its reputation attracted many students.
—Gertrude S. Burlingham, another New-York-stater, was a teacher
of biology in Brooklyn. Her doctoral thesis, prepared at Columbia
(1908), dealt with the twin genera *Russula* and *Lactarius* (or, as
required by the American Code, *Lactaria*). She prepared a number
of smaller papers on these genera and the inclusive ones for *North
American Flora*. She collected widely, in later years around a win-
ter home in Florida and a summer home in the hills of Vermont,
on the Pacific coast, and in Scandinavia with those who knew the
Friesian species in their original habitats.

L. O. Overholts was a native of Ohio, and a student of Fink’s
at Miami University, where his first paper, on “The known Polyporaceae of Ohio,” was published while he was an undergraduate.
His graduate studies, at Washington University, St. Louis, with E.
A. Burt, were also of polypores; and although he willingly collected
and studied other hymenomycetes, and even fungi outside the bas-
idiomycetes, the pore fungi remained his specialty. He went to Penn-
sylvania State in 1915 and remained there for the rest of his life.
The manuscript of his magnum opus *The Polyporaceae of the United
States, Alaska and Canada*, incomplete at his death, was seen through
was a native of Utah and a graduate of Utah State Agricultural Col-
lege. After two years of teaching he came to Cornell for graduate
study; he completed work for his master’s degree in 1915. He was
appointed by the Bureau of Plant Industry to work on smut control at Pullman, Washington; he finally went to the graduate school of Yale University for work under Clinton; and there he assisted in the preparation of Clinton's treatment of smuts for *North American Flora* and wrote his own dissertation on the *Ustilaginales of the World*. In 1928 he came to Pennsylvania State as assistant professor of plant pathology. Most of his published work deals with the smuts.

—F. D. Kern, for many years head of the botany department at Penn. State, was an Iowan and a graduate of the University of Iowa. From 1904 to 1910 he was a collaborator with the U. S. Department of Agriculture and associate botanist at the Purdue experiment station, working there with Arthur; he received his M.S. degree from Purdue in 1907. For short periods he was a research scholar at the New York Botanical Garden and in 1910 a fellow at Columbia; his thesis presented to that university was a study of *Gymnosporangium*. This was far from the usual taxonomic monograph of a rust genus; as much attention was devoted to biology as to morphology, and to the imperfect as to the telial stages, and with it one can satisfactorily recognize a *Gymnosporangium* in any state, acacial or telial; a remarkably thorough and satisfactory work. Many of Kern's papers were concerned with other groups of rusts—a number on the species of various areas in tropical America—but he did not limit himself to uredinology. While serving as head of botany and dean of the graduate school he taught a graduate course in his own subject, supervised graduate work, and taught 51 semesters of elementary courses. In his ninetieth year the university press brought out his complete revision and bringing-up-to-date of his 1911 thesis.

—Another Pennsylvania mycologist was D. R. Sumstine. A native of the state, a graduate of Thiel College, with an M.S. from the University of Pittsburgh, he was an ordained minister of the Lutheran Church, and from 1891 to 1926 a teacher or principal in the public schools; thereafter until 1939 he had a research appointment in the Pittsburgh schools. Mycology was his avocation; from 1900 he collected specimens for the Carnegie Museum, where he was honorary associate and honorary curator. His earlier papers described fleshy fungi, later ones mostly hyphomycetes. He died in 1965, at the age of 95.

As the site of the national capital, and more particularly the approximate site of the Department of Agriculture, the District of Columbia, and neighboring communities, e.g., Beltsville, Maryland, has had its full share of outstanding mycologists of the United States. One of them was certainly C. I. Shear, perhaps the leading student for many years of the vast and difficult tangle of the pyre-
nomycetes. Shear was born on a farm in upstate New York, not far from Albany. At the age of 23 he graduated from the Albany State Normal School, where one of his instructors was E. A. Burt; he also met and collected with Peck and for many years corresponded with him. For a number of years he taught grammar school, collecting fungi wherever he went, and distributing some of them in the three centuries of *New York Fungi*, whose sale contributed substantially to the support of his family. Many of these were assembled while he taught at Alcove, N. Y. In 1894 he went to Osborne, Kansas, to another teaching position and for further profitable collecting. C. E. Bessey offered him a fellowship at Nebraska, and he moved to Lincoln to earn a college degree; during the summers he had an appointment for the field study of grasses. In 1897 he graduated with a bachelor's degree, and in the next year received a master's, working in Bessey’s laboratory and with E. A. Bessey, F. E. Clements, R. Pound, and other notable botanists. He went to Washington as assistant agrostologist, carrying on mycological studies outside of office hours. In 1901 he was given an appointment in vegetable pathology, which meant applied mycology, and could work with fungi on the government’s time as well as his own. His special duties at first brought him to the study of cranberry troubles, but later to all small-fruit diseases. His account of cranberry diseases was used for his Ph.D. thesis at George Washington University in 1906. An early notable paper straightened out the tangles of *Glomerella*, a genus in which species had been multiplied according to the plant afflicted; another was an exhaustive study of *Endothia*, which settled once and for all the origin of the chestnut blight; a third he shared with Dodge, the first *Neurospora* paper. There were careful nomenclatural studies, and studies of various phases of the history of American mycology, often with N. E. Stevens. *The Genera of Fungi* (1931) was quite certainly more Clements than Shear; it seems likely that the combining of Sphaeriales and Hypocreales was Shear’s. He was not entirely happy with the book, and set to work at once accumulating corrections for another edition, a formidable task that was never completed. His contributions to the knowledge of many groups of fungi are notable, but most are concerned with the pyrenomycetes. Shear was another of the giants.

Charles Thom was a native of central Illinois; after high school he attended Lake Forest Academy and Lake Forest College, where he received bachelor’s and master’s degrees, in both academy and college having worked with R. A. Harper. His was the first Ph.D. conferred by the University of Missouri (1899), his thesis dealing with fertilization in ferns. He collected plants in the Ozarks of
southwest Missouri and the swamps of the southeast part of the state. In 1902 he went to Cornell as assistant to Atkinson, in company with Duggar and Whetzel. In 1904 he moved to the Connecticut Experiment Station at Storrs, as a dairy mycologist to work on ripening of cheeses, a project that neither he nor anyone else knew much about. Finding that there were no recognizable descriptions of the blue molds of cheese, he isolated a small group of penicillia for comparison and then described P. roqueforti and P. camemberti. This set him on his long series of papers on Penicillium and later Aspergillus, and the classical and indispensable manuals on those genera. His study of morphology was complete and perceptive; what placed his work in a class quite beyond existing treatments was the use of uniform media and the description of the molds from such cultures. Besides describing the fungi Thom was able to specify the methods of producing the cheeses that they adorned, a matter of some importance to the state. In 1913 he went to Washington as mycologist in charge of the microbiological laboratory, U.S.D.A. Bureau of Chemistry, where the enforcement of the Pure Food and Drug Act was an important function. He maintained that processing methods should go beyond the avoidance of actual toxicity, and that "sight, taste, and smell were given to man to keep him from eating rotten food"; and what is more, he was supported by the courts. Later he was mycologist in charge of the Division of Soil Microbiology; it was here that the manual The Penicillia was prepared. Wherever he went the growing culture collection accompanied him. When the real identity of Fleming's "Penicillium rubrum" and better strains for the production of penicillin were required, Thom identified the fungus as P. notatum; his system of sections within the genus, and the culture collection, by then maintained at Peoria, were available for the wartime emergency. Other studies resulted in the commercial production of citric acid through the use of Aspergillus niger, the Chaetomium test for textile protectants, and an effective biological control for Texas root rot (Phymatotrichum). Applied mycology, pure mycology, all kinds of mycology, well done, well presented, useful, significant.

Flora W. Patterson belonged to the Division of Vegetable Pathology and Physiology from 1896, before the development of the Bureau of Plant Industry. She was a native of Ohio and graduated from Antioch College in 1860; later she attended Wesleyan College, Cincinnati (A.M., 1883) and the University of Iowa (A.M., 1895). Widowed by a steamboat explosion, for three years she took courses in botany at Radcliffe College and worked as assistant in the Gray Herbarium at Harvard. In 1896 she became as-
sistant pathologist in the Department of Agriculture, and later mycologist in charge of mycological and pathological collections. She published papers on fungi of various groups, but her most detailed studies were of the Exoascaceae (Taphrinaceae).

Vera K. Charles was a native of western Pennsylvania, a student at Mt. Holyoke College, and a graduate of Cornell, where she also did postgraduate work under Atkinson. In 1903 she came to the Bureau of Plant Industry to work in the mycological collections; for many years she dealt especially with agarics, and was the one in government service responsible for identification of edible and poisonous mushrooms; with Flora W. Patterson she was author of the widely used bulletin on the subject. (In the days when the Boy Scout Handbook was a dependable source of information on natural history, she wrote the article on fungi.) For a time she carried on a large part of the pathological inspection of important plants. And later her papers frequently dealt with entomogenous fungi. Two of her studies discussed dermatophytes. —Anna E. Jenkins, a native of New York state, also studied at Cornell, with Whetzel, Fitzpatrick, and Massey, receiving her B.S. in 1911 and Ph.D. in 1927, and at George Washington University. From Cornell she came in 1912 to the Bureau of Plant Industry, doing inspection work and, later, studies on a number of specific plant diseases. After 1952 she worked for considerable periods in Brazil. Much of her later research dealt with Sphaceloma and the perfect state Elsinoë, and the diseases of important economic plants caused by these fungi. With A. A. Bicancourt of Brazil, Jenkins edited the 500 numbers of the Myriangiales selecti exsiccati.

Of the mushroom paintings of L. C. C. Krieger, Lloyd wrote, "Such perfection of illustration has never been reached by anyone else in this country and in Europe only by Boudier. There may never be another as competent as he." Krieger was born and received his early education in Baltimore; there he entered art school at the age of thirteen. At 18 he was appointed artist assistant in one of the divisions of the Department of Agriculture and set to illustrating, among other things, mushrooms. Four years later he spent a year in Munich at the Academy of Fine Arts, returning to Baltimore as instructor where he had been a student. In 1912 he went to Cambridge (and Chocorua) to work as artist for Farlow. Several hundred plates in the collections of the Farlow Herbarium are his work (as artist) and Farlow's (as authority for the identification), and 24 of these are published in the Icones Farlowianae, with descriptions by Burt; oddly and unfortunately, that noble volume nowhere
names the artists whose work it displays. After another stint in the Department of Agriculture he worked with H. A. Kelly of Baltimore on fungi; those paintings are at the University of Michigan. He then illustrated cane diseases in Cuba, and returned to the United States to become mycologist in the New York State Museum at Albany, where he prepared a popular guide to mushrooms; this has twice been reprinted commercially. He is the author of a number of papers on various fungi, mycological illustrations, and bibliography, a delightful fantasy, The millenium of systematic mycology, the beautifully illustrated article on mushrooms in the National Geographic Magazine of 1920, and a nomenclatural disaster concerning Physalacria.

W. C. Coker must be seen as the successor, and a worthy successor, of Schweinitz, Curtis, and Ravenel. Born and educated in South Carolina, he received his introduction to natural history from his father, a businessman and leader in education, who had spent a year with Asa Gray and Louis Agassiz. After graduation from the University of South Carolina he worked in North Carolina for two or three years as a banker, and, deciding to do graduate work in botany, went to Johns Hopkins, where in 1897 he earned his Ph.D., with a dissertation “On the gametophytes and embryo of Taxodium.” For a number of years he worked chiefly on gametophyte, embryo, and seed development. In 1902 Coker came to the University of North Carolina as associate professor of botany; there he remained until his retirement in 1945. Except by reproducing his bibliography it is impossible to suggest the breadth of his studies. He followed Curtis in concern with the woody plants of North Carolina, and applied his knowledge to landscaping of school grounds throughout the state and to the campus at Chapel Hill. He kept going simultaneously folders of manuscript on various groups of fungi, publishing papers and books as the material was satisfactorily rounded up. His first mycological paper (1907) was on Achlya, and his first book on The Saprolegniaceae (1923). He never published a book on the lower basidiomycetes but his extensive 1920 paper is a classic. Books were produced on Clavaria, the gasteromycetes (with his successor J. N. Couch), the Boletaceae, and the Hydnaceae (with Alma H. Beers), the last just before his eightieth year. Many genera of mushrooms, the Thelephoraceae, and some Polyporaceae were dealt with in useful papers but never in books. Some appreciation of Coker’s contributions to the knowledge of American fungi can be gained by laying out for a class in mycology, as the term progresses, the important literature, group after group.
F. A. Wolf, a native of Nebraska, earned bachelor’s and master’s degrees from the University of Nebraska, studied at the University of Texas, and received his doctorate in 1911 under Atkinson. He was plant pathologist at Auburn (Alabama Polytech.), at North Carolina State, and with the Bureau of Plant Industry at Orlando, Florida; in 1927 he was appointed professor of botany at Duke. As a pathologist he specialized in diseases of tobacco; many of his other studies dealt with ascomycetes, especially plant parasites; and his work finally placed that ancient puzzle the tuckahoe in the genus *Poria*. The two-volume text-book *The Fungi*, published with his son F. T. Wolf in 1947, included many important subjects never before—or since—brought together in a single work. The book is still a useful one for students of mycology and mycologists seeking an introduction to less traditional phases of the science.

V. M. Cutter, a New Englander in everything except nativity, was born in Guatemala, his father being an official of the United Fruit Company. He graduated from Dartmouth and in 1941 earned his Ph.D. at Cornell with a thesis on zygospore germination in the Mucorales. He was a member of the staff there for six years, spent a year as lecturer in botany at Minnesota, and then went to Yale as assistant, later associate, professor of microbiology. Much of the work at Yale was biochemical and only incidentally mycological; but there he carried out his very difficult, significant, and to an extent equivocal work with *Gymnosporangium*, which he cultivated first in two-member culture with callus tissue of *Juniperus* and then, at least apparently, in pure culture. At the time of his death he was working to clear up anomalies in his results, and it is the greatest of pities that he was not spared to do so. From Yale he went to the Women's College, University of North Carolina, at Greensboro, where he worked as vigorously, as innovatively, and as successfully in instruction as ever in research. He died at the age of 45.

J. H. Miller, born in Washington, D.C., grew up in Georgia, and spent nearly all of his life there. His bachelor’s and master’s degrees were from the University of Georgia; he received his Ph.D. from Cornell in 1928. At the time of his retirement he was head of the department of plant pathology at Georgia. His purely mycological publications were concerned with pyrenomycetes; for many mycologists concerned with other groups his address as president of the Mycological Society of America was an introduction to recent work on pyrenomycete morphology (1949). His *World Monograph of Hypoxylon* was to be followed by similar treatments of other genera, which plans were terminated by his death.
C. H. Kauffman was the founder and developer of the varied and extensive mycological work at the University of Michigan (Ann Arbor). A native of Pennsylvania, he took an A.B. at Harvard after studies that included one course in botany. For a number of years he taught in the schools of Pennsylvania, Indiana, and Illinois. In 1901 he went to Wisconsin for more work in the sciences, and met R. A. Harper, who interested him in the Saprolegniaceae. The next two years, at Cornell, as assistant to Atkinson, introduced him to the Agaricaceae. In 1904 he went to Michigan (Ann Arbor) as instructor in botany, and in 1907 that university conferred his Ph.D. for a thesis on the physiology of the Saprolegniaceae. By 1920 he had become professor; meanwhile he worked for the development of cryptogamic botany, teaching courses in all of its phases and in general and forest pathology, and making opportunities to enlarge the herbarium and library. His book *Agaricaceae of Michigan* (1918) is still the nearest approach to a comprehensive manual of American agarics; he wrote besides a number of generic monographs and studies of notable fungi of the Rockies and Pacific northwest and of the southern Appalachians. He was not given time to complete some of his projected studies; he died in 1937 at the age of 62.

E. A. Bessey was born in Iowa and brought up in Nebraska, as his father C. E. Bessey held appointments in one school or the other. After bachelor's and master's degrees from Nebraska he went to Halle to study under Klebs, and received his Ph.D. from that university in 1904. He held appointments with the Department of Agriculture successively in Washington and Florida, was professor of botany at Louisiana State from 1908 to 1910, and then went to Michigan State (East Lansing), where he was professor of botany and mycology, botanist at the experiment station, department head, acting dean of applied science, and dean of the graduate school. His mycological writings were concerned with various aspects of the science, with phylogeny probably his chief interest. In 1950 he published the *Textbook of Mycology*, the first in America, and a most useful one, even for those who could not adopt Besseyan phylogeny. Not long after its publication, and again just before bringing out its successor, he asked correspondents to point out to him any errors of fact appearing in the book; one at least who had read it through repeatedly and taught with it for years was unable to find one. What amounted to an enlarged second edition, the *Morphology and Taxonomy of Fungi*, appeared in 1950; its author asserted that it did contain errors of fact—but what they were is not apparent. His work embodied minute and rigorous factual accuracy and freely expounded but not dogmatic interpretation.
E. B. Mains, a native of Michigan, began his undergraduate education at East Lansing, but received his bachelor’s degree from the University of Michigan and continued there with Kauffman for his Ph.D. (1916). For many years his principal research was with the Uredinales. At Purdue he studied the genetics of wheat resistance to leaf rust, but also made major contributions to the rust treatment in *North American Flora* and Arthur’s *Manual*. Following the death of Kauffman he was appointed, in 1936, professor of botany at Michigan, and the next year director of the herbarium, which was greatly enlarged through his efforts. Some further rust work was undertaken at Michigan, but his most consulted studies from those years are of *Corynebacterium* and its associated conidial states and the Geoglossaceae.

L. E. Wehmeyer, a native of Illinois, received his bachelor’s degree from Michigan in 1921 and Ph.D. in 1925. For three years he was National Research Council fellow at Harvard. Returning to Michigan as instructor in botany, he moved through the academic ranks to professor, 1947-67. He carried out extensive and detailed studies of *Pleospora* and related genera, *Diaporthe* and its segregates, and *Melanconis* and related genera, studies summarized in three taxonomic manuals. He also made large general collections in eastern Canada and in Wyoming, and published one of the few American “fungus floras” on his results, *The Fungi of New Brunswick, Nova Scotia, and Prince Edward Island*.

C. G. Lloyd was born in Kentucky and received his only formal education in the country schools. He came to Cincinnati and, as his biographer says, “obtained employment” (more likely he found a job) as bottle-washer and apprentice in a drug store. At the age of 25 (1884) he formed with his two older brothers the pharmaceutical firm of Lloyd Brothers; apparently he had learned the business. In 1905 he arranged with his partners to have his work performed by a substitute, and retired to study mycology. He seems to have chosen this brand of botany, having long been interested in plants in general, through his acquaintance with Morgan, whose farm was near Cincinnati. Lloyd had made enough money from his business to support private publication, a growing library, and unlimited travel for study of authentic specimens. His *Mycological notes* and other papers assembled as *Mycological writings* began in 1898, at first mostly on agarics; but Lloyd preferred fungi that could be preserved for future comparative study in his museum, and soon came to work chiefly on gasteromycetes, polypores, the larger pyrenomycetes, Thelephoraceae, and Tremellales. He solicited speci-
mens from all parts of the world, and sent back identifications to the collector. The price of a subscription to the publications was interest in fungi. It is probable that Lloyd knew more than anyone of his time about gasteromycetes, and his knowledge of other groups was great if not unique. Lloyd was as noted for his style and opinions as for his knowledge. He believed that the system of "self-advertising"—the appending of authors' names to names of fungi—was a chief cause of careless work, meaningless splitting, and what he called name-juggling; except in his earliest work he refused to attach the name Lloyd to a binomial, and satirized those whose names appeared too frequently after those of fungi. Mycologists whom he greatly respected, such as Murrill, were the targets of the same sort of ribbing as those whom he considered incompetent; and the result still enlivens the literature of taxonomic mycology. His masterpiece in this field is the pamphlet on The myths of mycology, an important part of mycological history. His satirical feats were often uttered through the mouth of one Professor McGinty. Some Europeans are said to have believed in the existence of the Professor; one at least went so far in the other direction as to consider all McGinty name-changes as invalid because not proceeding from serious motives. Lloyd was of course as serious in publishing the McGinty names as were ever the authors satirized, and (to the enrichment of mycology) the McGinty names stand. Sharp as he often was in taking issue with statements he considered incorrect, Lloyd was the first to confess his own errors; at least one of Lloyd's juniors (Zeller) was given generous access to whatever he needed in Lloyd's museum as a result of having demonstrated, on a specimen, that Lloyd's criticism of his work was unjustified. It is a question which was of more service to mycology, Lloyd's published accounts of fungi, his bringing together of an important collection and library, or his scourging of unworthy publication. It is a temptation to assert that another Lloyd would confer more benefits on his chosen science than would ten years of research grants.

B. Fink, best known as a student of lichens, was perhaps the first to treat lichenology as a special phase of mycology (1911, 1913), carrying over Schwendener into taxonomy: "Growing with Thelocarpon was another ascomycete"; "Transforming the algal-host colonies into foliose bodies"—these are characterizations not of the association, but of the fungus. "The lichen is the fungus of the association"; if this gnomic sentence is emended by italicizing is, Fink's concept of the lichen is unmistakable. He was born in Blackberry, Illinois, and received his bachelor's and master's degrees from the University of Illinois under Burrill (1887, 1894). In 1896
he received another M.A. at Harvard after work with Farlow. For five years he was principal of a high school in South Dakota; from 1892-1903, professor of botany at Upper Iowa University; from 1903-1906 he held a similar appointment at Grinnell; and in 1906 he went to Miami University in Ohio, where he continued until his death. His doctorate was conferred in 1899 by the University of Minnesota, where he had spent his summers with the natural history survey, for a morphological study of Rumex. In 1896 he published his first paper on lichens; and although his interest in several other phases of botany resulted in publication, his chief interest became lichenological, with the ascomycetes taking second place. For many years his *Lichens of Minnesota* (1910) was the standard treatment of lichens for most of temperate North America; at his death the *Lichen Flora of the United States* remained short of completion, and was brought to publication in 1935 by his associate Joyce Hedrick. Fink was noted wherever he went as a teacher of botany, and Miami, like a number of small colleges blessed with inspiring teachers, sent many more graduates to advanced work and positions of responsibility in botany than the size of the institution would have suggested.

H. J. Banker was born in upstate New York, graduated from Syracuse University, and for three years taught in a Vermont academy. For three years from 1895 he was pastor of a Methodist church in Vermont. In 1901 he received his A.M., and in 1906 the Ph.D., from Columbia. He taught mathematics in Dickinson Seminary and then biology at Southwestern State Normal School, both in Pennsylvania, and then went to DePauw as professor of biology, where he remained until 1914. It was during these fourteen years that most of his mycological work was published, although two brief papers appeared in the late 20's. Banker took the family Hydnaceae as his subject, and his was the only general consideration of this group in America for many years. He left DePauw to join the staff of the Carnegie Institution and its Eugenics Records Office in 1914, and thereby all but left the fungi.

B. M. Duggar, though he probably would not declare himself to be a mycologist, worked with fungi during much of his long career and made important contributions to knowledge of the fungi. He was born in Alabama and attended the University of Alabama, Mississippi Agricultural and Mechanical College (B.S., 1891), and Alabama Polytechnic Institute (Auburn; M.S., 1893 under Atkinson) and had an experiment station appointment in Alabama the next year. He then studied two years under Farlow and finally, in
1898 received his Ph.D. from Cornell for work again under Atkinson. There were two years of postdoctoral study in Europe, as was at that time considered desirable. A succession of appointments followed, at the Illinois State Laboratory of Natural History, at Cornell, and at the Bureau of Plant Industry. At the last laboratory Duggar carried out the pioneer studies on which American mushroom culture is based. He was professor at Missouri, Cornell, Washington University (St. Louis), and finally at Wisconsin (professor of plant physiology and economic botany, 1927-1943). After retirement (a word here used loosely) he was consultant at the Lederle Laboratories, Pearl River, New York. He was the author of the first American text on plant pathology, *Fungal Diseases of Plants* (1909), and of many studies of separate diseases, notably Texas root rot, whose causal fungus he determined to be *Phymatotrichum*, and *Rbizoctonia* diseases; he monographed the latter genus. In 1911 he published what was long a standard textbook of plant physiology. A number of his students, especially at Washington University, wrote their theses on phases of the physiology of the fungi. After retirement he entered the developing field of antibiotics, and aureomycin was the result. He held and said strongly that actinomycetes were fungi, and so in Duggar's mind even this last discovery was a coup in applied mycology.

H. C. Greene was a native of Indiana and for two years a student at Wabash College; moving to Seattle, he received his bachelor's and master's degrees from the University of Washington, his master's thesis being concerned with slime molds; in 1933 he was awarded the Ph.D. by Wisconsin, where he spent the rest of his life. For a time he worked with molds and mold fermentation; in 1937 he received an appointment in the department of botany, and in 1941 became curator of the cryptogamic herbarium. Here he continued the studies on parasites and greatly enlarged the collections of J. J. Davis; and most of his papers are entitled "Notes on Wisconsin parasitic fungi." With such species, and with their hosts, he was well acquainted; nonparasitic fungi, even such biologically significant ones as truffles, came in for less attention. He became interested also in ecological studies and labored — successfully — to transform a large tract of farm land adjacent to the university arboretum into a typical prairie. Although his curatorship did not imply responsibility for classes, he devoted much time and attention to assisting groups of students with their problems in his several areas of competence.

F. L. Stevens was born and brought up on a farm in central New York, where he assembled botanical and geological collections
and taught himself enough chemistry to pass high school and college examinations without formal instruction. He graduated from Hobart College, and at the suggestion of D. G. Fairchild went on to study fungi and plant diseases with B. D. Halsted at Rutgers, where he received a B.S. degree in 1893. During a year of teaching in Racine College he met J. J. Davis, then a practicing physician, but already becoming interested in parasitic fungi. The next year while a teacher in Columbus, Ohio, Stevens found a collection showing all stages in the development of *Albugo* oospores; he went with his material back to Rutgers, where he received an M.S. in 1897; from Chicago he earned a Ph.D. in 1900. Other papers on the cytology and development of *Albugo* followed. For a year he studied abroad, under Strasburger, Klebs, and others, and then returned to become professor of botany and plant pathology at North Carolina College. Here he wrote, with J. G. Hall, *Diseases of Economic Plants*, the first manual of plant diseases (in contrast to Duggar's plant pathology textbook) in America; he also brought out studies of various problems in plant pathology. In 1912 he became dean of agriculture in the University of Puerto Rico, and while in the American tropics made many of the collections of tropical fungi that were described in his later papers and those of his students. He also completed the very useful manual *The Fungi Which Cause Plant Disease* (1913). In 1914 he became professor of plant pathology in the University of Illinois—and more and more turned from pathology to mycology. At various times he collected in South America, Panama, Hawaii, and the Philippines; his paper on Hawaiian fungi (1925), together with Burr's on the Stevens basidiomycetes, is the foundation of Hawaiian mycology. His papers on Dothideales, Meliolales, and similar epiphyllous fungi are his principal contribution to taxonomic mycology.

N. E. Stevens was a native of Maine and a graduate of Bates College. In 1911 he received his Ph.D. from Yale, studying with the hepaticologist A. W. Evans and presenting a thesis on heterostyly. After teaching a year at Kansas State he went to the Bureau of Plant Industry to work on chestnut blight, and there became associated with Shear. In 1915 he was transferred to fruit-disease investigations, to study strawberry diseases and, for many years, those of cranberries. Most of his mycological papers were on plant pathogens—the genus *Endothia* with Shear and Ruby Tiller, and *Botryosphaeria* and *Physalospora* and their pycnidial states. With Shear he, like F. L. Stevens, collected fungi in the Hawaiian Islands, but the study of the collections was not completed. In 1936 he became professor of botany at the University of Illinois. In addition to his pa-
pers on mycology and plant pathology a number of his obiter dicta are worth reading and rereading: "The excessive meekness of American botanists," for example, and "Scientific research by unfashionable techniques," in which he pays his respects to the fetish of quantification. A number of his publications (with Shear) are studies of mycologists and mycological collections, and a joint history of mycology was proposed—a work for which the authors were uniquely prepared. Stevens did not live to write it.

L. R. Tehon was born in South Dakota and received his common-school education in that state, Nebraska, and Wyoming. He attended colleges in Nebraska and Illinois and in 1916 received a B.A. at the University of Wyoming, where he worked under Aven Nelson. With intervals of high-school teaching and military service he studied and held appointments at the University of Illinois until 1921, when he joined the staff of the Illinois Natural History Survey; his master's and doctoral degrees were conferred by the university, for work under F. L. Stevens. In 1947 he received also appointment as research professor in plant pathology, to teach a course on tree diseases and supervise graduate research. His papers were concerned with various pathogenic fungi and especially the ascomycetes causing needle casts of conifers.

E. J. Durand was a native of the Finger Lakes district of New York, and inevitably attended Cornell University, where he received his bachelor's and D.Sc. degrees. As fellow, assistant, and instructor in botany he was at Ithaca from 1893 to 1910. From that year until 1918 he was a member of the botany faculty at the University of Missouri, and from 1918 professor of botany at Minnesota. His published papers cover a variety of subjects—bryology, plant pathology, botanical literature and nomenclature—but the majority are mycological, and much of his attention was devoted to the discomycetes. His monograph of the Geoglossaceae, brought out in 1908 while he was at Cornell, is the work most regularly consulted.

T. H. Machride was a native of Tennessee, brought up there and in Iowa, and recipient of B.A. and M.A. degrees from Monmouth College. He was professor of mathematics and languages at Lenox College in Iowa from 1870 to 1878, when he went to the University of Iowa as assistant professor of natural history, sharing the settee of natural history (botany, bacteriology, zoology, geology) with his friend S. Calvin. Some of his early specialization was in plant histology and bacteriology; with Calvin he collected and
studied some of the rich beds of fossil cycads of the plains area, and as early as 1885 was publishing notes on fungi. A number, bearing titles similar to "Notes on Iowa saprophytes," dealt especially with gasteromycetes; several described C. L. Smith's Central American collections; and from 1892 the myxomycetes came in for special attention. The North American Slime-Molds appeared in 1899, with a second edition in 1922 and The Myxomycetes, revised and broadened in collaboration with G. W. Martin, in 1934. Macbride was founder and head of the department of botany, founder of the university's field station, the Iowa Lakeside Laboratory, and later president of the university. He continued work on the Myxomycetes until shortly before his death at the age of 86.

J. C. Gilman, a native of Nebraska, grew up in the state of Wisconsin, where he earned his bachelor's and master's degrees and worked as assistant in plant pathology. In 1915 he completed his doctoral work at Washington University, St. Louis, with a thesis on Fusarium wilt of cabbage. For the next three years he was professor of biology at Ripon College, and there developed his interest in and philosophy of teaching. In 1918 he went to Iowa State, where he remained for the rest of his life, first as plant pathologist with the experiment station, but after three years, in instruction as well as research, in mycology, pathology, and general botany. Much of his publication dealt with parasitic fungi, and much with soil fungi; his Manual of the Soil Fungi went to a second edition. For eight years he served as editor of the Iowa State Journal of Science. After retirement he taught mycology and plant pathology for a year at Southern Illinois University. During his tenure a happy (and not inevitable) relation of friendship and cooperation existed between the two major universities of the state, at least so far as mycology was concerned; the work at Ames (Iowa State) and Iowa City (the State University of Iowa) was complementary, and the personnel on the friendliest terms.

G. W. Martin was born and spent his early years in Brooklyn, N. Y.; he progressed as far as the second year in high school there, when an eminent educator, the principal, suspended him for an infraction of rules of which he was not guilty, promising reinstatement on confession and repentance. That was the end of school; he worked as a Wall Street messenger and on occasion as a spear carrier at the Metropolitan Opera, and later as a bookkeeper; meanwhile he carried on the studies that he missed in high school and in 1908 passed the entrance examinations and was admitted to Rutgers University. His degree (1912) was in literature, but he had classes under B.
D. Halsted, and during 1913-1915 was assistant in plant pathology at the New Jersey experiment station. In September, 1915, he entered on graduate work at Chicago; in the year 1916-17 he was instructor in botany at Massachusetts College (Amherst); in 1917-19 he was in the army, saw service in France, and was discharged in 1919. After the armistice he was able to do some mycological collecting in Germany and to study briefly at Beaune and Paris. For a time he was assistant professor at Rutgers and carried out investigations of the food of the oyster for the New Jersey fisheries commission; in 1922 he received his Ph.D. from Chicago for a thesis on this subject. In 1923 he went to the University of Iowa as associate professor of botany. There his mycological work covered a considerable part of the fungi. He early interested himself in the agarics; not much later, in the Tremellales; and from the beginning, in the myxomycetes, since it had been agreed that he was to revise Macbride's second edition. Phylogeny seemed to him a necessity to the understanding of the fungi; he strongly defended both the hypothesis of the fungi as an evolutionary line independent of the algae and the interpretations of basidial morphology proposed by Patouillard and Neuhoff. During the second world war he worked at the Jeffersonville Quartermaster Depot on problems of fungal deterioration; the work did not trouble him, but the status did: "In the first war I was a lieutenant of infantry; now I'm just another '(censored) civilian in the Quartermaster Corps'"—the latter being a quoted description of a despised form of life. After retirement Martin spent a year as professor at the University of Illinois. On his return to Iowa City he was co-opted for a new tutorial program that required a scholar, scientific acumen being a bonus if available. For many years he edited the University of Iowa Studies in Natural History, for five years Mycologia, and for a time the publication of the Iowa Academy. He was the unquestioned master of the Tremellales and Myxomycetes, and his classification of the fungi, revised annually for his mycology classes and for each of five editions of Ainsworth and Bisby's Dictionary, was the nearest thing to a generally accepted classification that existed.

No biographical information is at hand concerning another Iowa mycologist, Kathryn A. Gilmore, who in a master's thesis entitled "Culture studies of Psilocybe coprophila" (1927), indicated the functional difference, often glossed over or ignored, between dicaryotic and diploid cells. Gilmore apparently did nothing further with mycology, but her single contribution has a place in the development of the science.
H. S. Conard, a Pennsylvanian, a graduate of Haverford College and Ph.D. from the University of Pennsylvania (1901) taught at that university for five years. After a year's scholarship at Johns Hopkins he became professor of botany at Grinnell College in 1906. He appears to have made a principle of versatility; in his last years he was best known as dean of American bryologists. But during a year as exchange professor at Harvard, having been informed by Thaxter that the laboratory was not interested in macrofungi, he produced a study of "The structure and development of Scotium agaricoideus" (1915), interpreting this prairie puffball as a paedo-
genic Agaricus; this interpretation, since applied to many other Se-
cotiaceae, may well furnish the clue to the interrelations of the higher basidiomycetes and to the origin of the several diverse groups within the gasteromycetes. He had earlier published a developmen-
tal study of Simblum.

E. A. Burt, a native of Pennsylvania, received three degrees at Harvard, the Ph.D. in 1895, during the joint regime of Farlow and Thaxter. He taught at Albany Academy and the New York State Normal School (also at Albany), and at Middlebury College as Professor of Natural History from 1895 to 1913. The title seems to be accurate; students at Middlebury remember him as constantly accompanied by a vasculum, which was generally believed to enclose an embalmed cat—the other half of his professional responsi-
bility. His earlier papers dealt with the basidiomycetes of Vermont. In 1913 he went to the Missouri Botanical Garden as mycologist and librarian; there he published a number of papers on basidiomy-
cetes, including one on F. L. Stevens' Hawaiian collections and one on various Tremellales. His magnum opus was the Theliphoraceae of North America, the first comprehensive treatment of a large and difficult group. —W. E. Maneval, a Pennsylvanian, received his bachelor's degree from Bucknell and his Ph.D. from Johns Hopkins in 1912. From 1907 to 1910 he taught at Roanoke College, from 1912 to 1914 at Randolph-Macon, and the next year at the University of Virginia. In 1915 he came to the University of Missouri. At one time or another he taught, it is said, most of the courses in the botany department; he interested himself in working out and applying odd and brilliant staining techniques for fungi, and his papers on the fungi of Missouri are extensive, informative, and dependable.

Besides C. E. and E. A. Bessey and Shear, the University of Nebraska had at the one time at least two other contributors to mycology. F. E. Clements, a native of the state, all of whose degrees were earned at the university, later wrote on Minnesota fungi. He
issued, with Mrs. Clements, six centuries of *Cryptogamae formationum coloradensium* (with Latin indications of habitat that have been mistaken for diagnoses) and two editions of *The Genera of Fungi*, the second with Shear. Much of this text is frankly translation and compilation; the most original part is found in the introduction, in the application to mycology of the Clementsian code of nomenclature, and in the idiosyncratic designation of type species. H. S. Conard’s copy was inscribed *Bewundert viel und viel geschol- ten*, a motto taken from Goethe’s *Faust*. But however much accursed, the work is indispensable for a worker in general taxonomic mycology. —Another Nebraskan who fell by the wayside is R. Pound, who revised the Mucoraceae in 1894 and, with Clements, the hyphomycetes in 1896 and 1897. He strayed so far as to become dean of the Harvard law school.

Leva B. Walker, a native of western Oregon, received her bachelor’s degree at Pacific College, her master’s at Nebraska (1908), and her Ph.D. from Cornell. For five years she taught in the schools of Washington state; from 1908 until her retirement she held appointments at Nebraska, where for many years she taught both general botany and mycology. Her papers are few, careful, and choice—on such subjects as out-of-the-way gasteromycetes, *Endogone*, *Ascoidea*, and occasionally fungal physiology.

E. Bartholomew was born in Pennsylvania and taken by his parents to Ohio and then to a farm in Illinois, where he completed his formal education in the district school and grew up. Desiring to obtain an Illinois teacher’s certificate, which required some knowledge of botany, he bought Gray’s *Lessons in Botany* and passed his examinations. At the end of his year of teaching (1874) he moved on to northwest Kansas, took up a homestead, and farmed it for 55 years; he is said to have developed the garden spot of that part of Kansas, and he conducted various experiments in plant pathology in his fields for the Department of Agriculture. By 1885 he had collected for his herbarium every phanerogamic species growing in the area. On a visit in that year Kellerman asked him, “Bartholomew, why don’t you study something that is really interesting?”, showing him *Albugo* on *Amaranthus*; and his future was determined. His mycological herbarium at his death consisted of 38,000 specimens; he issued 36 centuries of the *Fungi Columbiani* and 35 centuries of the *North American Uredinales*, collected fungi in all of the (then) 48 States, Canada, and Mexico, and published papers on “The plant rusts of Kansas” and, in 1927, “The fungus flora of Kansas,” with over 1800 species. In 1929 he left his farm to be-
come curator of the mycological herbarium at Kansas State College,
Fort Hays, where he continued until his death at 82.

A. J. Mix was born in western New York and earned degrees
from Hamilton College and Cornell University (Ph.D. 1916),
where he worked under Reddick and Whetzel. In 1916 he went to
the University of Kansas as instructor in plant pathology; by 1924
he was professor of botany, and in 1931 he became chairman of the
department. At various times he held temporary appointments else-
where, and several periods were spent studying at the larger her-
baria or collecting abroad; but from his graduation Kansas was his
home. The genus Taphrina—or, for that matter, the order Taph-
rinales—was his study and as wholly his property as a fungus group
can be anyone’s. He collected Taphrina in most of the places where
it grows, cultured it (having learned that hot weather is bad for
the genus), and published the classical monograph. An experienced
botanist used to say that with a moderate amount of knowledge
anyone could write a scientific paper, but it took a scholar and an
expert to make a children’s story from the material. Mix, as expert
in languages as in laboratory techniques, did almost that, in “My
life with Taphrina,” written for a nonmycological audience.

E. Bethel, an Ohioan, and a graduate of Scio College and East
Tennessee Wesleyan University, migrated to Colorado in 1890.
From 1917 he worked in the Office of Forest Pathology of the De-
partment of Agriculture. He published little but was a devoted and
keen-eyed collector, and a good many of the earlier records of rusts
and slime molds from Colorado are founded on his specimens.
—W. C. Sturgis, a Bostonian, and holder of three degrees from
Harvard University, was for a time pathologist at the Connecticut
experiment station and lecturer at the Yale school of forestry. In
1904 he went to Colorado College, where later he was dean of
forestry. He worked while in Colorado on various fungi and diseases,
but his principal contribution was the study of the myxomycetes of
the state, in which he benefited from Bethel’s astute collecting.

W. H. Long spent most of his life in the Southwest. A native
of Texas, he received his bachelor’s degree from Baylor University
in 1888, and served there as professor of natural sciences for four
years, followed by a similar post at Burleson College, also in Texas.
In 1899 he went to the University of Texas for graduate work,
earning his A.M. in 1900; in that year he published his first myco-
logical paper on fungi of the vicinity of Austin. For the next nine
years he was professor of botany at North Texas State Normal Col-
le. During this time he carried out studies of the rusts, publishing a monograph on *Ravenelio*; he also began his lifelong investigation of gasteromycetes. Long spent several summers with Atkinson at Cornell, and finally completed a dissertation for which he was awarded his doctoral degree by Texas in 1917. In 1910 he commenced work on the *Experiment Station Record* in Washington, but finding pencil-pushing not to his taste transferred to the Office of Forest Pathology. Before long he was assigned to Albuquerque to head up southwestern work in forest pathology, and there he remained. Most of his published work can be summarized under three heads—rusts, wood rots, and gasteromycetes; his contributions under each are numerous and important. His eighteen “Studies in the gasteromycetes” are for the dry Southwest about what “Coker and Couch” are for the rainy Southeast. To mycological bibliographers Long is remembered also for one bewildering choice of place of publication: “Three undescribed species of polypores” appeared in the *Papers of the New Mexico Chapter of Phi Kappa Phi*, volume one, number one, in 1917.

R. Sprague was a native of Alaska, but before he was a year old his family returned to the lower 48, and he grew up in eastern Washington and in Arizona. His bachelor’s and master’s degrees were earned at Washington State (1924, 1925), and after further graduate work at the universities of Washington, Wisconsin, and Cincinnati he received his Ph.D. from the latter. In 1929 he was appointed to a post in the Division of Cereal Crops and Diseases of the Bureau of Plant Industry, being stationed first at Oregon State and after eleven years at Mandan, North Dakota. In 1947 he returned to Washington State as associate professor of plant pathology at Pullman, and later transferred to Wenatchee. Some of his papers dealt with tree fruit diseases, but most with diseases of cultivated and wild grasses; his book *Diseases of Cereals and Grasses in North America* (1950) brings together much of his work; it is in fact a contribution to mycology, regardless of the title.

S. M. Zeller, a native of Michigan, received his B.S. degree from Greenville College in Illinois in 1909. At the University of Washington (Seattle), where he was instructor in botany, he earned a B.A. and M.A.; and in 1917 he received his Ph.D. from Washington University, St. Louis. In 1919 he came to Oregon State (Corvallis) as assistant pathologist on the staff of the experiment station, where he remained; at the time of his death he was plant pathologist and professor of plant pathological research. Because of the nature of his appointment Zeller did not take classes—a loss
to the students—but did supervise the research of young plant pathologists and give friendly assistance to at least one new instructor in mycology. Except as it affected problems in pathology, mycology was no part of his duties, and the majority of the long list of purely mycological contributions from his hand must be accounted works of supererogation. He wrote of many things—Boletaceae, agarics, wood decay, forest-tree diseases, fungi of Ericaceae—as well as the diseases of small fruits that were his special province. Without doubt his greatest contribution to mycology is the series of papers on gastrocytobolaea, some in collaboration with C. W. Dodge, some under his sole authorship, and the general classification of these fungi that was the summing-up of his work. From the occasion during his early days at Seattle when Zeller found his first Rhizopogon, hypogaeous gastrocytobolaeae were a source of pleasure and object of study and, as Harkness first called attention to them, Zeller is to be considered the one who established the knowledge of these fungi in America.

Helen Margaret Gilkey was in all respects a botanist of the Northwest. She was born in Washington, came to Corvallis with her family at the age of seventeen, and except for a brief residence in Colorado and excursions to California, Massachusetts, and New York for study was an Oregonian for the rest of her life. Her bachelor's and master's degrees were earned at Oregon State, the master's in 1911 with a thesis on fleshy fungi. She went to the University of California for her doctorate, under W. A. Sneath, her thesis (1915) being The Tuberales of California, published the next year. Both at Corvallis and at Berkeley her artistic ability led to her appointment as illustrator; at Berkeley she worked with W. J. Jepson, drawing plants for his manual. The figures for her Tuberales papers are, in a more delicate and economical style, as brilliant portrayals as C. Tulasne's of the same group. In 1918 she returned to Oregon State as curator of the herbarium and later as professor of botany. Her duties were considerably broader than the curatorship; half time for the herbarium, which meant collecting, curating, identifying and extension work (naming bundles of plants for county agents and others who wanted expert identifications); half time for instruction, twenty or more hours a week with classes in elementary botany, plant taxonomy, or agrostology, and the supervision of the studies of advanced students. Research was not, at least for years, a part of her duties; the beautifully illustrated and critical papers on various Oregon vascular plants, the successive editions of the northwest flora, the papers on Tuberales, were left for her recreational hours. When she could steal time to work in the field she
exercised an almost clairvoyant faculty for discovering truffles—and also, of course, some of Zeller's gasteromycetes. Her three major papers on Tuberales—of California, of North America, and in North American Flora—are classics of American mycology.

Ruth E. Allen, a native of Wisconsin, was awarded three degrees by the University of Wisconsin, the Ph.D. in 1909. She was assistant at Wisconsin, for four years instructor at Michigan State, for four more years instructor and assistant professor at Wellesley, and then, in 1918, went to the Bureau of Plant Industry, as associate pathologist and later pathologist. While stationed at the University of California she carried out a series of cytological studies on rusts that are of fundamental importance in interpreting the reproductive process of those fungi. In Puccinia graminis she observed and figured the fusion of pycniospores with other pycniospores as well as with pycnial hyphae (1930); in P. triticina and P. coronata, fusion with various types of emergent haploid mycelia; in Melampsora lini, fusion to form so-called 2-legged cells; in P. sorghi, anastomosis of complementary haploid mycelia within the leaf; and germination of pycniospores by a mycelium capable of growing into the leaf; and in P. malvacearum, anastomosis (pycnia being absent) of adjacent monosporidal infections. All of this casts doubt on the completeness of the often accepted "spermatium and receptive hypha" description and might well have earned for her, if it had been in existence during her lifetime, the Ruth Allen Award "for outstanding contributions to the science of plant pathology"—and, in this case, mycology.

R. M. Page, a native of California, graduated in biology from Harvard, where he had the pleasure of studying with W. H. Weston, served in the army during the war years, and returned to Cambridge to earn his Ph.D. with a thesis (1948) on the metabolism of keratin by pathogenic fungi. His special interest and competence in mycology was clearly physiological, but not the physiology of data tables and equations; Page's physiology served to explain, define, and render more delectable the life of the fungus. From his arrival at Stanford in 1948 as assistant professor he worked with Pilobolus, for centuries one of the most fascinating of fungi, but more so with each of his studies. Near the end of his life he had begun similar work with Conidiobolus. Page is reported to have been a devoted and a born teacher, and his biographers have characterized him as a blithe spirit. His work was terminated in his 49th year.

H. A. C. Jackson was a native of Montreal and lived there most of his life. His formal education ended while he was still in
his teens; he found employment with a lithographing firm, continuing night classes during the same period. He became an expert lithographer and an authority on the methods employed. He also developed an interest in and a considerable knowledge of natural history. Dr. Irene Mounce and I. L. Conners encouraged him in his painting of fungi, and after the foray of 1935 he and W. H. Snell corresponded and exchanged portraits of mushrooms. R. Pomerleau was another mycological friend and collaborator, and Jackson’s drawings beautifully illustrate Pomerleau’s book on mushrooms. His work is both beautiful and accurate; by no means as elaborate as Krieger’s, but quite as successful as portraiture.

J. Dearness was born at Hamilton, Ontario, in 1852. For ten years he attended a rural school in that province and did farm labor at the same time. In 1871 he completed a short course at Toronto Normal School, winning a special certificate in “Natural History, Botany, and Agricultural Chemistry.” At the age of 19 he became principal of a village school, and at 21 of another. His class refused promotion to the high school without Dearness, and so he became a high school teacher. In a few months he left, having been appointed (at 20) district inspector. Here he remained for 25 years, becoming, from 1888 to 1914, also professor of biology in the medical school at London, Ontario. In 1892 he began publishing jointly with Ellis on Canadian fungi. In 1899 he was appointed vice-principal of the London Normal School; in 1902 he earned by extramural study the B.A., and in 1903 M.A., from Western University. He continued to receive appointments to educational bodies—including the senate of the University of Western Ontario, long after his retirement in 1922—and to publish; his latest mycological paper appeared in 1941, but his biography of Holway in 1946. He was well into his 103rd year when he died. Many of his papers had to do with microfungi; edible and poisonous mushrooms were always of interest to him, and were often his subjects. His standing as a mycologist does not derive merely from his longevity; he was an able mycologist of Ellis’s generation, and of the generation to which we (at least, some of us) belong.

W. L. Gordon, a native of Quebec, earned his bachelor’s and M.Sc. degrees at McGill (1922, 1924). He became a plant disease investigator with the Canada Department of Agriculture in 1922 and continued until his death in 1963. His Ph.D., earned at Wisconsin in 1932, dealt with oat rust; but in that year he was asked to undertake work on the taxonomy of Fusarium. Those who have attempted to identify fusaria with the publications of either of the
two extreme schools of *Fusarium* taxonomy may have an idea of the size of his problem. Gordon correlated many field data on this terrible genus with studies of pure lines maintained through repeated single-spore selection and with the results of new ways of inducing development of the perfect state. The phytopathological implications of this work are as great as the mycological; only the occasional oligomycologist can afford to be ignorant of Gordon's work.

H. S. Jackson, a native of New York state, received his A.B. from Cornell, where he worked under Atkinson. For three years, 1905-08, he held an appointment as instructor at the University of Delaware and the Delaware experiment station. During the next year he studied at Harvard with Thaxter. From 1909 to 1915 he was professor of botany and plant pathology at Oregon State. Wherever he went he collected, studied, and published papers on the rusts and smuts. In 1915 he moved to Purdue as successor to Arthur; while there he brought out a series of papers on Holway's South American rusts, and worked with the preparation of the rust volume of the *North American Flora*. In 1929 he received his Ph.D. from Wisconsin, went as professor of mycology to the University of Toronto, and for ten years from 1941 until his death was head of the botany department. After further work on rusts he turned to the study of the other fungi of Ontario, built up a very large cryptogamic herbarium, and published a number of carefully worked out papers on those other "lower" basidiomycetes the Thelephoraceae and Tremellales. In his twenty-one years at Toronto he was adviser to a remarkable group of Ph.D. candidates who later made a place for themselves in American—which of course means Western Hemisphere, not United States—mycology. Whether treating Uredinales or wood-inhabiting hymenomycetes, his papers were of the highest excellence. For mycology in general his two carefully reasoned and fully documented studies of tendencies in the phylogeny of rusts and higher fungi remain of greatest importance—in spite of, or perhaps because of, his decision on some points to present evidence rather than insist on conclusions. Few achieve such restraint, and few have so much to hold back.

J. W. Groves, a native of Ontario, attended normal school in preparation for a teaching career, and for two years, 1926 to 1928, taught public school. He then enrolled in Queen's University, graduating in 1930 with majors in biology and chemistry. The summer before, and during three later summers, he worked as a field investigator for the Canada Department of Agriculture, and this work
appears to have been the influence that made him choose for his profession, out of all the kinds of natural history in which he was interested, the science of mycology. He received his M.A. and in 1935 his Ph.D. from Toronto, pursuing special mycological studies the following year with Jackson; he also enjoyed summer field work a number of seasons at Timagami, a locus classicus for mycological studies in America. In 1936 he received an appointment with the Department of Agriculture, in which he continued until his death at 63. Much of his work was with the discomycetes, especially Dermataceae and Sclerotiniaceae. During the second world war he brought out an important and needed study of seed-borne diseases. Discovering that people in general, especially medical ones, expect a mycologist to be able to identify fleshy fungi and furnish authentic information about edible and poisonous species, he began field work on "mushrooms" and brought out a popular book on the subject—which, incidentally, contains pure mycology that deserves the attention of the professional. For a number of years he was in charge of the national collections of fungi, and developed them, and the staff, to a point where both were notable sources of information concerning mycological problems.

G. A. Ledingham was born in Ontario but from an early age grew up in Saskatchewan. By persistence in attending normal school, teaching and farming he obtained his B.Sc. in biology from the University of Saskatchewan at the age of 24. During summers he worked with W. P. Fraser on rusts and T. C. Vanterpool on root rots of cereals, and during the rest of the year instructed and completed the requirements for the M.Sc., awarded in 1928. In 1932 he received his Ph.D. in plant pathology under D. L. Bailey at Toronto, with a thesis on "The life-history, morphology, and cytology of Polymyxa graminis." The next year he spent at Harvard with W. H. Weston. Several more studies of flagellated-celled parasites followed, and then, during the war years, work on fungus deterioration and on byproduct utilization at Ottawa. In 1947 he became director of the Prairie Regional Laboratory, and most of his subsequent work, brought out with colleagues, had to do with chemical activities of fungi. His mycological dream was the achieving of pure culture of Puccinia graminis, but he died, at 57, before realizing it.

W. P. Fraser, a native of Nova Scotia, attended country school there and finally, at the age of 29, found the opportunity to complete his secondary schooling. He taught school for three years, studied two years at Dalhousie University, and spent another two years in high school teaching. In 1906 he received a B.A. from Cor-
nell, where he had gone for further instruction in botany under Atkinson. He returned to Pictou Academy as instructor, and there published on “The Erysiphaceae of Nova Scotia” (1909) and “The rusts of Nova Scotia” (1913); he received his M.A. from Dalhousie University in 1910. He continued mycological work, but found it desirable to combine it with problems in pathology. In 1912 he went to Montreal as lecturer in biology at Macdonald College, McGill University, where he was responsible for mycology and plant pathology. One summer was spent studying apple diseases in Nova Scotia and two with wheat rusts in western Canada. In 1919 he was put in charge of the new Dominion laboratory in Saskatoon, and in 1925 became professor of biology at the University of Saskatchewan. Here studies were conducted on varietal resistance and physiological races of the black stem rust and a number of other wheat diseases. He had much to do with barberry eradication and early proposed—unfortunately, unsuccessfully—the eradication of the buckthorn, which stands in a similar relation to oats. On his retirement he worked to build up an excellent Provincial herbarium of vascular plants.

A. H. R. Buller was born in Birmingham, England. He attended Mason College in his native city and then the London University (B.Sc. 1896), Leipzig, under Pfeffer (Ph.D.), Munich, where he worked with Hartig, and the Marine Biological Station, Naples. He returned to teach at Mason College; in 1904 he was appointed professor of botany at the University of Manitoba, and commenced his long series of twice-a-year Atlantic crossings. For a time he taught geology as well as botany, and retained an interest in both; at an informal display of “remarkable objects” on New Year’s eve, 1940, he brought out first a piece of sandalwood (from the burning ghat of Benares) and next “the oldest thing in the world,” a sample of the sedimentary matrix of the ancient pegmatites of the Karelian isthmus. At Winnipeg he began the Researches on Fungi enshrined in the seven volumes of his magnum opus. The basidiocarp, and then the basidiospores of Coprinus, and then of other basidiomycetes; the functional structure of hyphae, Pholobolus—all sorts of ingenious, patient, and enlightening studies, mostly of fungus physiology, came from his laboratory. In some he was probably more successful than in others; the autodeliquescence of Coprinus, the delicate adjustment of sterigma, basidiospore, apiculus, and water drop in spore discharge, are perhaps better observed than some matters of ascus orientation, and nuclear migration than the cause of clamp-formation. His physiology without biochemistry is superb, and comparative morphology not always his forte. But Bul-
ler's influence on mycology is very great and his monument as legible as when it was erected, and probably as lasting as any. He had a hand, too, in rendering another monument legible to many; the beautiful translation into English by W. B. Grove of the Tulasnes' Selecta fungorum carpologia and its magnificent publication were undertaken on his motion. The last mycological work he saw into print was a discussion of "The diploid cell and the diploidization process..."—in part a defense of the interpretation that dicaryotic equals diploid.

G. R. Bisby, a native of South Dakota, worked as hospital orderly and later laboratory assistant to put himself through college; he received his bachelor's degree from South Dakota State in 1912. For a time he studied potato diseases with the Bureau of Plant Industry and for the American Potato Corporation in Maine; Columbia conferred his master's degree in 1915. In that year he was assistant at the Indiana experiment station at Lafayette, and the next four years assistant professor of plant pathology at Minnesota, with E. C. Stakman; there he received his Ph.D. in 1920, and thence went to the University of Manitoba as professor of plant pathology. There he performed the usual duties of a provincial plant pathologist as well as those of a professor. One of those, as he conceived it, was to know the fungi of the province, and he collected, with Buller, the species of the Winnipeg area, with frequent excursions farther afield. The first result was the Fungi of Manitoba, with Buller and Dearness as co-authors, and the second the Fungi of Manitoba and Saskatchewan, with Fraser and R. C. Russell as additional authors. A considerable number of regional lists of fungi have been published in America, but, oddly enough, only three sufficiently complete and detailed to stand as approximations of a "fungus flora"—those of Manitoba and Saskatchewan and Wehmeyer's of Nova Scotia. In 1937 Bisby left the prairies to join the staff of the Imperial (now Commonwealth) Mycological Institute at Kew, and had his part in the Ainsworth and Bisby Dictionary of the Fungi; he also wrote on nomenclature, and brought out a useful Introduction to the Taxonomy and Nomenclature of Fungi. Other publications of immediate interest this side of the Atlantic are his papers on Hysteriaceae and several genera of Hyphomycetes. Americans (sensu lato) are glad enough to make daily use of his English publications, but some are regretful of the distance that deprived them of the chance to consult Bisby face-to-face.

Margaret Newton was born at Montreal. She received her B.S.A. and M.Sc. at McGill; while working there as a graduate stu-
dent with Fraser in 1917-1918 she independently discovered the existence of physiological strains of stem rust of wheat, thereby confirming Stakman's slightly earlier discovery. In 1922 she received her Ph.D. from Minnesota, the center of the study of such rust strains. For the next three years she was associate professor at the University of Saskatchewan; in 1925 she joined the newly formed Dominion Rust Laboratory at Winnipeg, as senior plant pathologist, and remained for twenty years. With her assistants she studied physiological races in various rusts of small grains—among them stem rust, leaf rust, and stripe rust—and flax. One study of great significance demonstrated the occurrence of hybridization among strains on the aerial host of *Puccinia graminis* and the origin there of previously unknown strains; this not only confirms what was suspected about rust life cycles, but constitutes an additional benefit from barberry eradication.

J. H. Craigie was born in Nova Scotia, served in the Canadian army from 1915 to 1918, and received his A.B. at Harvard, his M.S. at Minnesota, and his Ph.D. at Manitoba with Buller in 1930. It is Craigie who solved the long-standing problem of the function of pycnia. On a warm day in spring, cultures of *Puccinia graminis* on barberry in the Winnipeg greenhouses were given an airing through opened ventilators; flies entered from out-of-doors, settled on the leaves, and began lapping up the pycnial exudate—and behold the answer! Subsequent experiments with caged plants and controlled transfers of pycniospores confirmed what the flies had suggested, and the symbol O came to stand for the organ of plasmodogamy rather than functionless male gametes. Craigie was for a year an agent of the U.S. Department of Agriculture, for two years pathologist at the Winnipeg rust laboratory (1925-27), for a year senior pathologist, officer-in-charge, chief of the Division of Botany and Plant Pathology (1945-52) and finally principal plant pathologist, 1952-58.

Irene Mounce, a native of British Columbia, received her B.A. and M.A. degrees from the University of British Columbia, the latter in 1920; working with Buller at Winnipeg, she earned an M.S. from the University of Manitoba in 1922. In 1924 she joined the Ottawa laboratory as assistant plant pathologist, carrying on the work initiated by Clara W. Fritz on the identification of wood-destroying fungi of forest trees; her Ph.D. thesis (Toronto, 1929) was a study of *Fomes pinicola*. A number of important papers on mating types in hymenomycetes resulted from Dr. Mounce's studies. In 1938 she went to the laboratory at Saanichton, B.C., for studies of western seed-borne fungi, where she continued until 1945.
Much of the mycological exploration of the Caribbean and Central American area has been carried on by mycologists from the United States or Great Britain. A very notable exception is provided by C. E. Chardon. He was born in Puerto Rico in 1897, and enrolled in the College of Agriculture, Mayaguez, in 1915. When in 1918 the work of that campus was brought to a stop by a severe earthquake, his dean recommended him to Cornell University; and there he met Whetzel. He took a bachelor's degree in 1919 and a master's in 1921. Returning to the island, he was appointed plant pathologist at the experiment station, Rio Piedras; from 1923 to 1930 he was commissioner of agriculture, and from 1931 to 1936 chancellor of the University of Puerto Rico. One of his problems was diseases of sugar cane; he published a paper on transmission of cane mosaic. His mycological papers dealt with rusts, smuts, and especially pyrenomycetes; with collaborators, especially his countryman R. A. Toro, he brought out extensive treatments of the fungi (American, but outside the scope of this history) of Colombia, Venezuela, and Brazil, as well as those of Puerto Rico and Hispaniola. His projected work on Los Naturalistas en la America Latina was completed through volume 3 but only vol. 1 has been published. In his later years important administrative posts in the Puerto Rican government consumed time that, selfishly, we should like to have seen spent on tropical-American fungi.

R. P. Duss was born in Switzerland, completed the studies of the Gymnasium at Lucerne, spent a year at Freiburg learning the French language, and became a member of a religious community in Paris. He was sent in 1865 as missionary and professor to Martinique, in 1875 to Saint-Pierre, and in 1890 to the college at Basse-Terre in Guadeloupe. In these and other islands that he visited he made botanical and conchyllogical collections. In 1903 in his Flore Cryptogamique des Antilles Françaises he reported ninety-odd pages of fungi, all determined by Patouillard; in 1899 and 1900 Patouillard published two papers on Fr. Duss's material. —R. Ciferri, a native of Italy, saw military service on the Italian front; returning, he took a degree in agricultural science at Bologna in 1920. For four years he carried on studies of mycology and plant pathology in Italy, and then, from 1925 to 1932, worked in tropical America—Cuba and the Dominican Republic—on the fungi of the islands and diseases of important tropical crops. Returning to Italy, for four years he studied human pathogenic fungi at Pavia; for six years as professor at Florence he continued with both phyto- and anthropopathology, and brought out a volume on Italian smuts.
Supplement

The day of the devoted amateur who contributed notably to American mycology did not end with Schweinitz, Curtis, or Ellis, but continues well into our own times. One of the most careful and accurate, as well as one of the kindest, of that breed was H. C. Beardslee. A native of the Western Reserve of northern Ohio, he attended Oberlin College and Western Reserve University, graduating from the latter in 1889; in 1892 he received its A.M. For twelve years he taught in high schools in Ohio; in 1901 he became senior master of the Ashville School for Boys in North Carolina. He collected fungi in Ohio, North Carolina, Florida, and Sweden, in the last with Lars Romell and over Fries's collecting grounds, to assist in the evaluation of American species. His special studies of Russula and Lactarius included careful notes on the color of fresh spore-deposits and on patterns of spore sculpturing, at a time when these critical characters were not generally utilized. His notes on scaly Hydnaceae were founded on field observations of marked basidiocarps at two- or three-day intervals throughout their life span, and showed that what had been regarded as quite distinct species were only developmental phases—a kind of study greatly needed for other hydnums and other macrofungi. Beardslee's wide knowledge of higher fungi was shared in the most useful and least assertive manner possible. For such an investigator designation as amateur or professional has no meaning; he was quite simply one of the more expert American mycologists. He died in 1948 at the age of eighty-two.

In 1888 the Providence Franklin Society published J.L. Bennett's Plants of Rhode Island, in which are listed, by name and author only, 583 species of fungi. The arrangement followed is that of M. C. Cooke; revision by Ellis and Peck is acknowledged; “The Fungi were all named by the late Rev. Dr. M. A. Curtis, or by him in connection with Dr. Berkely [!]”; and the importance of the mycological treatment lies in its foundation, the series of specimens, now at Brown University, identified by these authors. Bennett was born in Providence in 1832; prepared for study at Brown but was unable to undertake it; a manufacturing jeweler, he took botany as a hobby, and brought together a large herbarium. This with the earlier S. T. Olney collection and a set acquired from Curtis in 1872 constituted the foundation of the university's herbarium, of which Bennett was for a time curator. Brown conferred on him an honorary B. A.
G. D. Darker was born in Streetsville, Ontario, in 1898, and received his bachelor's and master's degrees from the University of Toronto; his Ph.D., still under Faull, was earned at Harvard in 1931. At the Farlow Library, with the title of research associate, he continued from 1933-1940 Seymour's work with the indices—bibliographic, taxonomic, and host—of North American fungi, and his own mycological studies. The next year he taught at Washington University, St. Louis, and from 1943-1959 was mycologist at the Ben Venue Laboratories, Cleveland, dealing with problems in the production of antibiotics. He returned to Canada and the Department of Agriculture at Ottawa in 1960. His knowledge of the fungi was broad, but his most used publications are monographic studies of the needle-cast fungi, the Hypodermataceae.

W. W. Diehl was born near Logansport, Indiana; with his family he soon moved to Ohio, where he received his schooling. He graduated from Miami University, which is in Ohio, after work with Bruce Fink, and in the same year (1914) went to Iowa State. There he studied under I. E. Mellhus and R. E. Buchanan, published his first mycological paper, on Rhizoctonia crocorum, and earned his M.S. At Ames he worked for a time with the Bureau of Plant Industry on cereal rusts, and in 1916-17 taught botany and plant pathology at Clemson College. He returned to the B.P.I. in Washington, but in December of 1917 enlisted in the U.S. Army. In February 1919 he again came to Washington as scientific assistant in the B.P.I., later becoming associate pathologist; from 1927 he was also lecturer in botany at George Washington University. During the same period he met with C.G. Lloyd, and took part in negotiations for the ultimate transfer of Lloyd's extensive mycological collections to the Bureau of Plant Industry. In 1930 he was assigned to studies of Balanisia at Harvard, with Weston, for which in 1932 he received his Ph.D. He continued work with the herbaria that became the National Fungus Collections, and, as adjunct professor, his instruction at George Washington University. Balanisia and related genera and the Xylariaceae were his special mycological subjects, but Diehl had a wide knowledge of fungi and, apparently, an extraordinary acquaintance with both specimens and literature, and a photographic memory; it used to be said that if a fungus turned up that no one else could identify, Diehl was the one who would know it; if he didn't, no one would. He retired from teaching in 1956 and from the U.S.D.A. in 1958, and died in 1978.
Notable and elegant contributions to the understanding of flagellated aquatic fungi resulted from the work of R. Emerson. A native of New York City, Emerson received his B.S., M.A., and Ph.D. from Harvard University, where he worked in Weston's laboratory. The beautiful and fascinating genus *Allomyces* was his mycological first love, and the fact that its taxonomy, life cycles, morphology, biology, and pretty much everything else are available to all mycologists is the fruit of his investigations. After his Ph.D. he spent two more years at Cambridge University and another at Harvard, and in 1940 went to the University of California as instructor in botany; in 1953 he became professor. During the second world war he worked on the fungi associated with the retting of guayule; this was the beginning of an interest in thermophilic fungi. At Berkeley he taught a course in introductory botany as well as more advanced work and ultimately a course in Phyco- and Ascomycetes. A good deal of manipulation is required to persuade the several water-molds to perform when and as planned in a teaching laboratory, and his notes on their peculiarities were brought together in a paper on “Mycological Organization,” where they are of the greatest use to others. Emerson combined to a rare degree mastery of his special area of mycology with ability to convey to his students his knowledge and enthusiasm; he must be accounted one of the most erudite and eloquent mycologists of his generation.

Dorothy I. Fennell is to be regarded, with C. Thom and K. B. Raper, as one of the important and minuscule group of mycologists who have known *Aspergillus* and *Penicillium*. A native of Middletown, Illinois, she graduated in 1938 from the University of Illinois with a B.A. in bacteriology, and, after three years of teaching elementary schools near the Illinois River, came to the Northern Regional Research Center of the U.S. Department of Agriculture in 1942. Here she was assigned various parts in the penicillin project, leading to mass production of the antibiotic. Thereafter, she prepared illustrations for the Thom and Raper manuals of the two genera; in 1965 she was joint author with Raper of *The Genus Aspergillus*. For fourteen years she worked with several of the great culture collections and the Quartermaster Research Center on culture maintenance and fungal deterioration of military equipment, and in 1969 returned to the Peoria laboratory (NRRC) as curator of its collection of *Aspergillus* and *Penicillium* strains; there she was concerned with cereal mycology and mycotoxins as well as continued contributions to the two critical genera and their relatives. She died in 1977 in her sixtieth year.
R. Hagelstein, a native of New York City, retired early from a business career to pursue his microscopical and botanical hobbies, the study first of diatoms and later of the Myxomycetes. Through extended field work he built up a large collection of these fungi; and his papers and ultimately *The Mycetozoa of North America* embodied the results of his intimate knowledge of Myxomycetes in nature. The book is closely modeled on the Lister monograph, but benefits from the field studies and the new discoveries of the author. Hagelstein died in 1945 at the age of 75.

Elizabeth Lee Hazen worked during much of her life at the New York City Branch Laboratory of the State Department of Health, where she established a service for the detection and identification of infective fungi in suspected specimens; with the assistance of Dr. Rhoda Benham’s laboratory at Columbia she built up a large reference collection, the foundation of three editions of a work on *Laboratory Identification of Pathogenic Fungi*. Later she described the synergistic effect of a bacillus in the sporulation of *Microsporum audouini*, and still later, without interrupting her identification service, dedicated herself to the discovery of an anti-fungal antibiotic. With the collaboration of Dr. Rachel Brown, a biochemist, she cultivated actinomycetes and screened them for activity against *Candida albicans* and *Cryptococcus neoformans*. In 1948 she collected in Virginia what became *Streptomyces noursei*, which yielded nystatin (named for New York State), the first antifungal antibiotic, since employed not only in medicine but in animal husbandry, plant pathology, and the arts. The co-discoverers licensed the substance through the Research Corporation, with a provision that half the royalties (exceeding $13 million) should be expended in grants for biological, mostly medical-mycological, research. Dr. Hazen was born in Lula, Mississippi, and after the death of her parents was brought up by relatives. She was educated in the local public schools; at the age of twenty-five she earned a B.S. from the Mississippi State College for Women. For six years she taught in a high school in Jackson, and then came to Columbia University for an M.S. and Ph.D. in bacteriology (1927), the latter delayed by work in an army diagnostic laboratory during the first world war. At Columbia she taught for four years in the College of Physicians and Surgeons, and then joined the state laboratory, where she continued until shortly before her death at the age of ninety.
The distinguished French mycologist R. Heim, whose contributions to the knowledge of fungi are taxonomically broader, more catholic in respect to the aspects of the science dealt with, and geographically wider than in this era seems possible for one scientist, has a special place in the history of American mycology. In the early days of the Wassons' ethnomycological investigations he was a source of information and in later years a collaborator in the study of Mexican hallucinogenic mushrooms; the taxonomic phase of the joint investigations and much of the subsequent laboratory study are his. His lifelong study of tropical fungi took him to a greater number of productive areas than any other mycologist has ever seen, and led to immense knowledge and many papers. Among his fields of special interest were the derivation of Gasteromycetes, fungi associated with termites, Russula and its kin, toxic and hallucinogenic fungi, lower Basidiomycetes, the mushrooms of Europe, and the conservation of natural areas. Heim was born in Paris in the year 1900, of a family established for generations in that city. Educated at first as an engineer, he chose botany for the work of his life, and was early at the Institut Pasteur and later at the Muséum National d'Histoire Naturelle, where he became professor of cryptogamy and for fifteen years director; he received his doctoral degree in 1931. During the second world war he was active in the French resistance; in consequence he was deported to the extermination camp of Buchenwald, from which he was freed by American troops in May 1945. He has justly been characterized as "A scientist steeped in the humanities who writes with style"; his formal lectures and informal conversation were likewise marked by a singular clarity and grace. He died in 1979.

L. R. Hesler was born in 1888 on a farm near Veedersburg, Indiana, and went from the local schools to Wabash College, intending to transfer to Purdue in civil engineering. But at Wabash he became another of M. B. Thomas's boys, continued in botany, and went for graduate work to Cornell and with Whetzel. At Cornell he advanced from a fellowship (1911) to an assistant professorship (1919); in that year he was appointed Professor of Botany at the University of Tennessee. In 1934 he was made dean of the College of Liberal Arts; in 1958 he became dean and professor emeritus. He died at Knoxville in his ninetieth year. At one time or another he held brief appointments at Woods Hole, Mayagüez, Washington, and Wooster. His career resembled Zeller's in that his job was pretty much plant pathology, and mycology his avocation (or better, true vocation). With Whetzel he published a Manual of Fruit Diseases (1917), and with
Wherzel and others two editions of *Laboratory Outlines in Plant Pathology*. His first publication on a purely mycological subject dealt with Tennessee Polyporaceae (1929); the next year appeared his first paper on agarics; and from that time nearly all of his very numerous papers, and eight books, were concerned with the fungi of the southern Appalachians or monographic studies of Agaricales. Five of the books were written in collaboration with A. H. Smith. During his years as dean Hesler collected fungi whenever possible, locally before the beginning of the day's required work, in the mountains whenever a week-end permitted, and during the summers; his specimens were spore-printed and described in careful notes, looking to the day when, as he said, he could be done with deaning and back at mycology. In his eightieth year an international symposium on Basidiomycetes was held in his honor at Knoxville, and he attended both the scientific sessions and the collecting trips that followed in the Great Smoky Mountains. Some six weeks before his death, in 1977, he wrote, "They tell me that this has been the best mushroom year in decades—*and I missed it.*" One of the giants.

A valuable contribution to the terminology, and thence to the understanding, of mycological phenomena appeared in G.K.K. Link’s 1929 paper on “Reproduction in Thallophytes, with Special Reference to Fungi.” The essence of the rather difficult discussion is that the terms sex and sexuality have been indiscriminately applied to different classes of phenomena, with resulting confusion; that “sex” implies distinction, and originally referred to “differentiation of somas”—i.e., male and female—and was legitimately “extended... to the products of these differentiated somas.” Instead of “sexual reproduction” he proposed “caryallagic reproduction”: a cycle with change of nuclear condition; the opposite is “acaryallagic”; and there is among fungi no actual or logical association between sexual or asexual and caryallagic or acaryallagic. The paper proposes a long series of further terms derived from Greek, and may have been often neglected because of these inessential complexities. But the logical and terminological distinction is a valuable one. Link was born in 1888 in Mt. Clemens, Michigan, and received a bachelor’s degree from Chicago, a master’s from Nebraska, and his Ph.D. (in physiology) from Chicago. He taught one year at Kansas Agricultural College and 1911-1919 at Nebraska; for a number of years was with the U.S. Department of Agriculture as specialist in market pathology, and from 1924-1953 was associate professor and then professor of plant pathology at the University of Chicago.
W. J. Robbins was born at North Platte, Nebraska, in 1890. His bachelor's degree was earned at Lehigh University, and his Ph.D. at Cornell in 1915. He was instructor in biology for a year at Lehigh and for four years in plant physiology at Cornell; at Alabama Polytech he was for a year professor of botany. For a short time he was soil biochemist in Washington, and from 1919 to 1937 professor of botany at the University of Missouri; part of that time he was also dean of the graduate faculty. From 1931-1937 he was chairman of the biological science fellowship board of the National Science Foundation; in interviewing nominees for those greatly desired fellowships he employed a combination of knowledge, acute penetration, and fairness rarely present in one person. From Missouri he went as director to the New York Botanical Garden, where he continued until his retirement in 1958; afterward he worked at Rockefeller University. His research was physiological—on nutrition, with tissue cultures of vascular plants and mycelial cultures of fungi; on antibiotics; on plant tumors. Cultures of a very large number of basidiomycete species were screened for antibiotic production; the most active proved to be toxic to mammals as well as to bacteria or fungi. Growth factors were identified and reported for various fungi. In both areas of study he had a number of able collaborators, of whom Annette Hervey (b. 1920, d. 1980) was an associate for the longest period. Along with such work, largely biochemical, Robbins possessed and employed noteworthy competence in such esoteric areas as taxonomy, bibliography, and horticulture.

W. H. Snell, born in West Bridgewater, Massachusetts, received his A.B. from Brown in 1913; his major field of study was romance languages, but he earned election to Sigma Xi as well as Phi Beta Kappa. Because of his interest in trees and tree diseases he went to Wisconsin for graduate work, receiving his Ph.D. in 1920. In 1918-1920, as forest pathologist with the Bureau of Plant Industry, he worked in the big woods of the Pacific Northwest. In 1920 he returned to Brown as assistant professor of botany; in 1942 he became Olney Professor of Natural History, at various times teaching general botany, mycology, forest pathology, and dendrology. During a long series of summers he served in the Adirondacks as forest pathologist for the New York State Conservation Commission. One of the results was conclusive evidence that it is the European black currant, not the red and white, that brings about significant infection of the white pines by Cronartium ribicola; since federal agents had been ruthlessly eradicating red currants for years, it proved difficult to get that evi-
vidence into print. In Providence he worked with the New England textile mills, troubled by fungus infestation not only of the mill timbers but of fabrics; his studies with a home-made high-humidity test cabinet and standard test cultures long anticipated the investigations of government laboratories during the second world war. He also made observations on a fungus that suppressed decay-producing organisms in wood, but his insistence on conclusive evidence prevented publication concerning a pre-Fleming antibiotic. Forty years of studying the Boletaceae were brought together in the very beautiful Boleti of Northeastern North America in 1970. Verbal descriptions of boletes are useful, and in fact essential, but accurate illustrations in color are the only satisfactory means of recording or conveying their characteristics. Snell’s boletes remained alive in his water-color drawings, made from fresh specimens at the end of the day’s collecting. His 3000 Mycological Terms, and the much larger Glossary of Mycology, were composed with the same painstaking precision as his studies of fungi: carefully circumscribed definitions, citation of sources, derivations. In the later of these, as in the later studies of Boletaceae, Snell’s collaborator was Esther A. Dick of the Brown department of botany, now Mrs. Snell. His linguistic and scientific accomplishments were matched by those in a quite different area. As an undergraduate Snell won four varsity letters in baseball and others in football and basketball, was signed by Connie Mack for the Phillies, and played a season with the Red Sox. In 1913 he was all-American collegiate catcher; he successfully dumped Jim Thorpe on a muddy football field; and in his first time at bat in the majors he hit a drive safely past Napoleon Lajoie. Perfection, versatility, patience. He died in 1980 at the age of 91.

W. G. Solheim, who must always be the first mycologist of the Rocky Mountains, in all his origins was a man of the middle west. He was born in Wisconsin, received his first degree from Iowa State Teachers College, and was an A.M. and Ph.D. (1928) of the University of Illinois. There he studied with F. L. Stevens and published his first mycological work, on Cercospora and related genera. In 1929 he accepted a year’s appointment to the University of Wyoming, where he continued to the end of his days. He collected widely in the mountains, wrote on fungi of various groups, accumulated an herbarium of some 50,000 specimens, and assembled and distributed the 13 centa (4 with G. B. Cummins) of the Mycoflora Saximontanensis Excittata. A few days before his death, at the age of 80, Wyoming conferred upon him an honorary LL.D.
F. K. Sparrow was a member of the notable constellation of mycologists situated at the University of Michigan during this century and one of the brilliant students of the aquatic Phycomycetes working in the United States in the same period. He was born in Washington, D. C., in 1903 and earned his bachelor's degree at Michigan in 1925. Thence he went to Harvard for his A.M. and Ph.D. studies, under Weston, and there published his first paper, on Pythium. From 1929 to 1931 he was assistant professor of biology at Dartmouth; a year of research at Cornell followed, and a year at the universities of Cambridge and Copenhagen. In 1934 he reported the completion of the life-cycle of Physoderma zeae-maydis, and the genus continued to be the subject of later contributions. In 1936 Sparrow became assistant professor of botany at Michigan, and in 1949, professor. At Ann Arbor, and at the university's field biological station, he taught courses not only in aquatic fungi, but in fresh-water algae and aquatic flowering plants; over the years he lectured and studied at a number of other institutions. His Aquatic Phycomycetes was published in 1943 and an enlarged second edition in 1960; in 1969, with T. W. Johnson, Fungi in Oceans and Estuaries. A lasting result of his later work was the recognition among aquatic Phycomycetes of four lines of descent characterized by zoospore structure; this classification has been widely adopted. Sparrow's work is presented in admirable language and with a seasoning of relevant levity that is an adornment rather than a diversion. He died in 1977, only a few weeks after presiding at the Second International Mycological Congress.

J. A. Stevenson's life work was the mycological collections of the Bureau of Plant Industry, later designated and separated under the aegis of the Smithsonian Institution as the National Fungus Collections. He was born in Woonsocket, South Dakota in 1890, and later lived in Wisconsin and Iowa; he received his B.S. in forestry from the University of Minnesota in 1912. After a year at Minnesota as assistant in botany he went to Puerto Rico in 1913 to be assistant pathologist in the Sugar Planters Experiment Station. He continued there for some years in various assignments. As pathological inspector he returned to Washington in 1918 and became botanist in charge of explorations for plant introduction. From 1927 he was mycologist in charge of the B.P.I. collections, and after his formal retirement carried on as curator and research associate under the Smithsonian. In Puerto Rico he became enamored of that aggregation of mycological jewelry the Meliaceae, and continued their study at Beltsville. Under his care the National Fungus Collections expanded greatly.
and continually, as it became evident that critical and fundamental collections would there be both preserved and used; the suction unfortunately was felt throughout the country. Stevenson was also concerned with the indispensable mycological library; he arranged for the reprinting of some of the classics and assembled a large personal library, including many needed rarities; these were given to the Smithsonian, to remain available with the herbarium.

Valentina Pavlovna Wasson was co-author of the initial exposition of a new phase of the study of fungi, mushroom folk-lore or ethnomycology. She and her husband, R. G. Wasson, brought out in 1957 the two magnificent volumes of Mushrooms Russia and History, the fruit of some twenty years' work in linguistics, literature, psychology, the fine arts, history, and, of course mycology. As was true of Beardslee, the Wassons can be accounted amateurs only in the radical sense of the term. V. P. Wasson was born in Moscow, and left Russia with her family after the Bolshevik revolution. She was educated at Barnard College, New York, and Bedford College, London, and received her medical degree from the London University in 1927. Returning to New York, she was pediatrician at New York University until shortly before her death in 1959 at the age of 57. She participated in all segments of the ethnomyological study, including the latest, the uncovering of the ritual use of mushrooms in the Mexican highlands. There is somewhere a record of the chapters for which each of the authors is responsible, but even a careful reader may be unable to detect differences in style or point of view. A work of discovery and scholarship.

Luella K. Weresub was born in 1918 in the central Ukraine; at the age of five she came to Saskatchewan with her family. Much of her early education was acquired at Winnipeg but later she returned to Saskatchewan and completed her studies in the public schools at the age of sixteen, earning school prizes, including one in Latin, and a national scholarship to Queen's University in Ontario. Through the operation of the depression and other family misfortunes she was unable to finish her undergraduate work until 1950, meanwhile working for several years as copy-writer and announcer in radio stations. At Queen's, as in secondary school, she collected scholarships, fellowships, and prizes; thence she went to Toronto for her M.A. After three years of teaching at the University of Manitoba she returned to Toronto for a Ph.D. in mycology with H. S. Jackson and, after his death, with R. F. Cain. Her thesis (1957) dealt brilliantly with

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Peniophora sect. Tubuliferae. At the Biosystematics Research Institute of the Canada Department of Agriculture in Ottawa she studied various groups of the Thelephoraceae, dealt with many problems of mycological nomenclature, and served as adviser, helper, and conscience for colleagues on both sides of the border and the Atlantic. She was as keen and thorough a nomenclaturist as our time has known; her taxonomic publications, far too few, are definitive; and her use of the English language is exemplary. In a more general area, the study carried out jointly with W. B. Kendrick entitled “Attempting Neo-Adansonian Computer Taxonomy at the Ordinal Level in the Basidiomycetes” must, for mycologists concerned with a natural classification, constitute the coup-de-grace to numerical taxonomy. She contributed greatly to the ordering of the newer era of the Deuteromycetes at the Kananaskis conferences and in their publications. She died in 1979.

W. H. Weston, Jr., born in New York City in 1890, attended Dartmouth for his undergraduate work; for graduate study he went to Harvard University and Thaxter; his Ph.D. was awarded in 1915. For two years he was instructor at Western Reserve, and for the next four, pathologist with the U.S. Department of Agriculture. His special assignment was the downy mildews of cereals, and he spent two years in the Philippines, and shorter periods in Guam and Hawaii, in field work; a number of his papers are devoted to Sclerospora, which he made his own—species, occurrence, behavior, and control. In 1921 he returned to Harvard as assistant professor, becoming professor of cryptogamic botany in 1928, and remaining throughout his active life. Under Weston the nurture and dissemination of mycology continued, in many ways, the work of Farlow—as indeed, Thaxter’s work was continued in Linder. Most of his study deals with Oömycetes, but one paper, a model of scientific and literary craftsmanship, with an early discovery of an aquatic ascomycete; and his interest extended to all groups of fungi. In the early forties he headed a program of the Army Quartermaster Corps looking to the control of fungal destruction of equipment in the tropics. His writings show an ability, too rarely cultivated, to discuss scientific and technical matters not only with clarity but in language free of the usual professional jargon and conforming to the best standards of literate English. In speech he was equally eloquent, and in both writing and speech there was often a humorous or ironic top-spin that made it important not to miss a syllable. Cap Weston was one of the great teachers—in his own laboratory, and as visiting lecturer elsewhere. Perhaps his most
famous paper was one on "The Delivery of Scientific Papers"—not R.F.D. (who deliver it right to your door, carefully wrapped, even though it's only a copy of *Ballyhoo*), not A. & P. (who have the stuff but don't deliver it), not delivery by twilight sleep (painless, but with the recipient retaining no recollection of the process), but "let your delivery be Special." His last paper, published with R. Emerson, introduced the genus *Aqualinderella*, a remarkable aquatic with extraordinary preferences as to habitat and puzzling disinclination to laboratory cultivation. He died in 1978.

The founders of the American mycological journals have already been mentioned. The first number of the *Journal of Mycology*, for January, 1885, was edited by Kellerman with the assistance of Ellis and Everhart, and issued from Manhattan, Kansas. Its contents were chiefly taxonomic, with regular and often quite informative reviews of current mycological work. For four years it continued as a monthly; the last number of volume 4 announced that in the future the *Journal* would be published at Washington by the Department of Agriculture, under the editorship of B. T. Galloway, chief of the Section of Vegetable Pathology. Volume 5 appeared as a quarterly, "devoted to the study of fungi, especially in their relation to plant diseases"; it had become chiefly phytopathological, but articles similar to those of the earlier volumes continued to be published. Volume 6 appeared over two years, and the four numbers of volume 7 in four successive years. After an interval of eight years the *Journal* was returned in 1902 to Kellerman, who continued it as a quarterly, published at Columbus, Ohio, with many more pages and an attempt to incorporate a running index to new fungi and literature. Volumes 8-13 were completed under his editorship; volume 14 number 2, of April, 1908, announced the death of its editor and ended the *Journal* under that title.

With Murrill as editor volume 1, number 1, of *Mycologia*, for January, 1909, was published by the New York Botanical Garden "in continuation of the *Journal of Mycology* founded in 1885." Whether by this continuation *Mycologia* inherits the seniority possessed by the *Journal of Mycology* is scarcely worth debating. *Mycologia* has from the beginning been bimonthly; it has from the beginning accepted articles on all phases of mycology, including lichenology, pathology, and even bacteriology. In 1924, with volume 17, F. J. Seaver assumed the editorship, continuing through 1945 (volume 37); since 1932 editors-in-chief have been elected by the editorial
board. At some time during Seaver's tenure of office the proposal was made to clear out the accumulation of back numbers for scrap paper; he secured possession of the condemned collection, traded some for herbarium specimens, and sold more, and with the proceeds and a private gift established the Mycologia endowment fund, whose income has done much to insure the solvency of the publication.

Organizations as well as persons and publications have a history, and the early history of the Mycological Society of America and its predecessors has been well reported by the Society's first secretary and historian, H. M. Fitzpatrick, in volume 29 of Mycologia. Briefly, the American Association for the Advancement of Science first met in 1848; its Section F, for biology, was established in 1882, with botanists and zoologists serving as chairmen in alternate years; in 1883 at the Minneapolis meeting a botanical club of the A.A.A.S. was formed, an unofficial but exceedingly useful body consisting of whatever botanists were attending the sessions of Section F; in 1893, at Madison, Section G was established for botany and the Botanical Society of America was founded by action of the Botanical Club. Ten "prominent and active" botanists were elected and instructed to choose an additional fifteen, the whole group to constitute the charter membership of the society. Five declined, of whom Farlow was one; Arthur, Atkinson, C. E. Bessey, Halsted, Thaxter, W. T. Swingle, Clements, and H. von Schrenk worked with fungi. Thaxter had resigned after four years. Meanwhile, the Botanical Club and Section G continued to hold the meetings attended by most botanists. In 1903 the American Mycological Society was formed, with 27 members, including both senior mycologists (some of them members of the Botanical Society) and juniors who could not expect to be elected to the Botanical Society for years, if ever. The organizing committee was composed of Clements, Earle, and Shear; Thaxter was elected president. Meanwhile, in 1898 and for similar reasons, the Society of Plant Morphology and Physiology was founded with Farlow as the first president. With the formation of the American Mycological Society, a joint committee of the three societies was constituted to negotiate a re-union. In January of 1906 reorganization was approved and Atkinson, a member of all three of the uniting groups, was elected
president of a Botanical Society of America with 119 members, but 
still with the distinction between associate and full members and still 
showing little tendency to include the applied phases of botany. In 
1910 the American Phytopathological Society first met, with a dem-
cratic constitution and a charter membership of 130; next year the 
journal Phytopathology was established. As a result, the Botanical 
Society faced the necessity of publishing a journal and of increased 
membership to support; the American Journal of Botany commenced 
publishation in 1914, and 125 were admitted to membership. In 1919 
a mycological section of the Botanical Society was established; it met 
every year through 1931. In the summer of that year a questionnaire 
was sent by H. H. Whetzel to the members of the section to elicit 
their opinion concerning the formation of a mycological society; 
nealy four out of five replies were favorable. A similar vote by 
personal subscribers to Mycologia was practically unanimous. Ac-
cordingly, at the meeting of the Section at New Orleans in December, 
1931, the matter was presented by Whetzel, discussed at length, and 
the Society almost unanimously voted into existence. A president, 
W. H. Weston, Jr., a secretary-treasurer, H. M. Fitzpatrick, and three 
councillors were named and commissioned to organize the society. 
At Atlantic City, in 1932, the Mycological Society of America held 
its first meeting, under the presidency of Weston, with 279 charter 
members, approved a constitution, adopted Mycologia as the Society’s 
journal, elected officers and the editorial board of Mycologia (who 
chose Seaver as editor-in-chief), and heard forty mycological papers. 
Annual meetings have been held except for a brief hiatus during the 
second world war. The first foray took place in the summer of 1933 
at Highlands, North Carolina, and annual forays have continued 
except for the war years and an occasional summer when the society 
met in a mycological desert. Until 1947 the M.S.A. invariably met 
with the A.A.A.S. during the Christmas holidays. In that year the 
Association astonished the affiliated societies by announcing that in 
1948 it would hold its own meetings to celebrate its centennial with 
no distraction of society programs; it was strongly implied that the 
A.A.A.S. had more important things to do than organize meetings 
for the scientific societies; there were eloquent pronouncements 
about the “frontiers of science.” The various biological societies, thus 
left high and dry, hastily organized meetings independent of the 
Association, under what at first was an informal and cooperative, later 
a self-conscious and at times self-assertive entity known as the 
American Institute of Biological Sciences. Subsequent M.S.A. meet-
ings have almost invariably been with the A.I.B.S., although the
A. A. A. S. has at times wooed the Society with invitations to participate in its meetings with such programs as symposia. During its nearly fifty years of existence the Society has met and solved a number of problems, often arising out of limited views of its membership and purpose. One early suggestion was that the location of future forays should be determined by the mailing addresses of those attending recent ones. Since at that time successive forays had not ventured outside of states bordering on the Atlantic Ocean, this would have made it unlikely that the west coast, the Rockies, the middle west, or the south would ever have a foray; fortunately the suggestion was opposed, and it has been discovered that fungi grow even in Louisiana and Oregon. A second proposal was that the annual meeting be held in Havana, "closer to us than St. Louis"; again the opinion prevailed that there were mycologists even west of the Appalachians. And a strong effort was made at least once to see that Mycologia favored papers dealing with certain phases of mycology and limited the acceptance of others; thus far the Society has escaped sectarianism. The identity of the Society has not escaped misrepresentation; even in the pages of Mycologia the Mycological Society of America has inadvertently or ignorantly been called the American Mycological Society.

Notes relating to mushroom manuals

Since no publisher was found for M. A. Curtis's work in the 1860's on edible fungi or Mary E. Banning's colored illustrations of mushrooms, the provision of books on mushroom identification was left to others and a later day. The dozen plates of the Mushrooms of America, Edible and Poisonous, "edited by" J. A. Palmer, Jr., published in 1885, seem to have been earliest in the field. It is hard to imagine any other reason for the commendation in the first volume of the Journal of Mycology and the twelfth of the Bulletin of the Torrey Botanical Club. The author (of at least the General Directions) seems to have had a lively history, though not entirely a mycological one. He characterized himself as a "sea-captain-journalist," was born in Boston in 1840, attended public school, and after Andover Academy went to sea at 17; had command of both sailing- and steamships; served as special correspondent in Hawaii for Boston and New York newspapers and as private secretary to Queen Liliuokalani; settled down in Honolulu; and died in 1899. Between 1877 and 1885 he published half a dozen articles on mushrooms and mushroom poisoning, including one in French on sure antidotes for Amanita toxin (atropine
or tobacco); he acquired works of Berkeley, Cooke, W. G. Smith, and Badham for "the study of mycology as a science." In 1894 appeared an enlarged work About Mushrooms.

Also in 1885 the Report of the Commissioner of Agriculture included an article of less than eight pages on "Edible Mushrooms of the United States," with one color plate, illustrating and describing twelve species. This was the work of T. Taylor, microscopist of the U.S.D.A. It can scarcely be described as a mushroom book, although it may have been the first American approach to one.

In 1895 was published W. H. Gibson's book Our Edible Toadstools and How to Distinguish Them. Gibson, a native of Connecticut, was an artist and naturalist, the author of a number of outdoor books, who contributed illustrations and some articles to several prestigious magazines as well as preparing paintings for lithographers. Like Palmer's, his work presents only thirty species; the artistic quality of his plates puts it in a different class from most such work of the period. As sources of information he refers to a number of able American and British authors, including Peck and Curtis, and his book was for its day a dependable means of identification; but his confident quotation of some of McIlvaine's more horrifying dicta, from the latter's medical publications, renders his notes on edibility and toxicity quite dangerous. His eulogy of Curtis ("The most conspicuous disciple of mycophagy—almost the pioneer indeed, in America—was the late Rev. M. A. Curtis of North Carolina.") touches on a matter undeservedly overlooked by more recent authors.

In the same year Peck's 48th Report (for 1894) achieved print, much of it devoted to the "Edible and Poisonous Fungi of New York," an article composed of 135 pages and 43 colored plates. Shorter pieces on the same subject appeared in 14 subsequent reports. Since the drawings are mechanical and primitive, the accompanying text better presents the characters of the species. How widely the report was available to mushroom collectors is uncertain; but Peck was a principal source of useful taxonomic information to both mycological and lay authors, and for years the only professional in the field.

L.M. Underwood's Moulds Mildews and Mushrooms, described as "a guide to the systematic study of the Fungi and Mycetozoa and their literature," and published in 1899, had a two-fold aim—an
introduction to systematic mycology and "to meet the popular interest in fungi as an article of food"; it may as a result have received less attention than it merited. The arrangement is that of Engler & Prantl, widely adopted at the time; references are given to important literature in English, French, German, and Latin; keys to conspicuous genera and short descriptions of principal species are supplied. A chapter describes briefly the history "of mycology in general and its study in America in particular," and another, on "The Geographic Distribution of American Fungi," provides references to works on the fungi of the several American states and countries much more complete than those offered earlier in this brief history. Like Farlow, Underwood was one of the distinguished students of cryptogamic botany; by pteridologists he is considered a great student of the ferns, and by bryologists one of the fathers of American hepaticology. Born on a farm in upstate New York, he was a farm hand by the age of eleven, free to attend school only during a few winter months; at seventeen he was compelled to take charge of the family farm, and during the winter to work at lumbering. But at intervals he was able to attend Cazenovia Seminary, and in 1873 the new Syracuse University; in 1877 he graduated from the university, and in 1879 completed graduate work there with a thesis in geology. At various times he taught an ungraded elementary school, at Cazenovia Seminary, as professor of natural sciences at Hedding College in Illinois and subsequently of geology and botany at Illinois Wesleyan University, and as instructor, and later professor of geology, zoology, and botany at Syracuse. During a year's leave of absence in 1890 he worked on hepatics and the Polyporaceae in the herbaria at Harvard, and for the U. S. Department of Agriculture on orange diseases in Florida and Cuba; in 1891 he became professor of botany at DePauw University in Indiana, accepting a lower salary for the privilege of working only in botany. In 1895 he went to Alabama Polytech as professor of biology, and there prepared with Earle their long paper on Alabama fungi; his first note on fungi, "The clover rust," had been published in 1888. From 1896 until his untimely death in 1907 Underwood was professor of botany at Columbia University. He was honored for his erudition and industry, the breadth of his activity, and his care and generosity in assisting his students, colleagues, and other friends. Twenty-nine of his publications dealt with fungi.

In 1900 appeared the most imposing and ambitious of early American books on mushrooms, entitled Toadstools, Mushrooms, Fungi / Edible and Poisonous / One Thousand American Fungi, by C.
McIlvaine, "assisted by" R. K. Macadam. The work is usually referred to by the last part of the title, and perhaps because the first person singular is frequently used in the text, attributed to McIlvaine alone. A revised edition, by McIlvaine "and" Macadam, was published in 1902, and a "new edition, revised throughout" by C. F. Millspaugh, in 1912. Whether anyone has actually counted the thousand is not recorded; the preface twice refers to "more than seven hundred edible varieties"; at one time the title was to have been Eight Hundred American Fungi; there are in fact fewer than 850 species, with 16 added in a Supplement in the second edition; but such enumerations as that of ten varieties of Boletus scaber serve to increase the tally. The author says that he has "personally test[ed] the edible qualities of hundreds of species," and refers to "toadstool friends (as I lovingly call those who, from all over the land, send me specimens for identification)," and to "my many published articles." One could wish to know more of him from other witnesses. In Who's Who in America he describes himself simply as "author." He was born in Pennsylvania in 1840; attended country school and grammar school until the age of 13; "studied engineering" and in 1859-61 was civil engineer with a local railroad; captain of infantry and staff officer, 1861-63, when he resigned his commission; again a railroad civil engineer for one or two years. He published in medical journals at least three articles on mushroom toxicology and was president of the Philadelphia Mycological Center and principal of the School of Mycology, N.Y. Chautauqua. Like Palmer, he equated the toxins of the phalloides and the muscaria groups of Amanita, and their symptoms, and regarded atropine as an antidote for all. He wrote one outdoor book and, under the pseudonym Tooe Hodge, a number of humorous or sentimental stories in rural dialect for various magazines; one of them, A Legend of Polecot Hollow, was reissued in book form in London. Where did he become acquainted with a thousand fungi? Lloyd says that he lifted most of his material from Peck's reports, and characterizes him as "a mycophagist rather than a mycologist." If such, he was a brave one; he ate, and found edible, Clitocybe illudens, Russula emetica, Claudopus nidulans, Hypholoma fasciculare, Gyromitra esculenta, two species of Scleroderma, and five phalloids. The book's notes on edibility are to be regarded with perhaps more skepticism than they received in the earlier years of the century; the descriptions make possible the identification of species missing from other manuals of the time. The plates are good. Macadam is the author of an uncompleted treatment of the genus Russula in the Journal of Mycology; most of the text appears between quotes. He was a Boston business man who had
compiled descriptions and references to "2,000 species of the Hymenomycetes . . . found in this country."

In 1900 was published a work earlier mentioned, Atkinson's *Studies of American Fungi / Mushrooms / Edible, Poisonous, etc.,* except for Peck's *Report* and Underwood's dual-purpose book the only authoritative manual of the period. The illustrations, especially black-and-white photographs, are an admirable basis for identification of the species. An enlarged edition was issued in 1904 and reissued in 1911.

*The Mushroom Book / A Popular Guide . . .*, by Nina L. Marshall, appeared in 1901, and again in 1904 as a part of a series of natural-history books. Miss Marshall, a native of Kingston, New York, was a graduate of Wellesley and author of *Mosses and Lichens* (1907) in the same series. The book describes and illustrates by black-and-white or hand-tinted photographs 83 species; it derives its authority from Peck and Underwood, who assisted the author; the work is as a whole dependable.

In 1908 appeared *The Mushroom Edible and Otherwise / Its Habitat and Time of Growth*, by M. E. Hard. The half-tone illustrations are as vivid and helpful as Atkinson's; the text, which includes careful notes on occurrence, is mostly written from the author's experience in various parts of Ohio, although when specimens were not at hand at the time of writing, descriptions from authorities are quoted. The notes on edibility are a good deal more cautious than McIlvaine's, and seem to accord with the best knowledge of the time. A fair range of macrofungi, edible, merely inedible, or toxic, is presented, and the book is still a usable beginner's introduction. Lloyd's judgment, "A good popular work on common fungi," may stand. There seems to be no information available on Hard's personal history; he was superintendent of schools in a number of Ohio cities, where he collected and studied mushrooms and wrote the book. He died in 1914.

In 1918 the State of Michigan brought out Kauffman's *Agaricaeae of Michigan*, already noted, for many years the most authoritative, and still the least incomplete, manual of American gill fungi. Until the recent reprinting its use was limited by the difficulty of securing a copy, since every serious student of mushrooms found access to the work a necessity.
Mushrooms and Toadstools, by H. T. Güssow and W. S. Odell, published in 1927 by the Canadian Department of Agriculture, added to beauty and dependability the other desideratum for a guide to edible and poisonous fungi, availability: for perhaps twenty-five years it could be obtained from Ottawa, in either an English or a French edition, for one dollar. The senior author was born in Breslau, Germany, in 1879, and studied applied botany and plant pathology in the Breslau Botanic Gardens and the universities of Leipzig and Berlin. In 1903 he went to England as botanist with the Royal Horticultural Society, and in 1909 was brought to Canada as Botanist and later Dominion Botanist. His assignment was “economic botany and principally the study of plant diseases.” His early work resulted in the recognition and methods of control of important diseases of potatoes; later, the administrative tasks of the developing Department of Agriculture took most of his time. Queens University conferred on him the LL.D. in 1931. W. S. Odell, the co-author, was an enthusiastic and well-informed amateur, who collected many of the specimens photographed and described.

The latest mushroom book to be considered here was the work of W. S. Thomas, first a Field Book of Common Gilled Mushrooms, published in 1928, and then, with the addition of non-agarics, Field Book of Common Mushrooms in 1936; a third edition, with nothing changed but one specific epithet, appeared in 1948. Thomas was born in Poughkeepsie, received his M.D. from George Washington University in 1892, was naval surgeon during the Spanish-American and First World Wars and thereafter chief surgeon and later director of the Department of Allergy, St. Luke’s Hospital, New York City. His recreations were “angling and botany” and playing the flute, an admirably civilized choice; he brought about the reanimation of the New York Mycological Society, of which he was president. His writings “adhere strictly to the authoritative writings of Professor Peck, Dr. W. A. Murrill, the late Professor Atkinson . . . and Professor C. H. Kauffman”; the illustrations are the work of Miss Mary E. Eaton, a gifted botanical illustrator of the time. Like the books by Hard, Kauffman, and Güssow & Odell, Thomas’s is useful and dependable today.

In setting down these highlights or sketches of the history of mycology in America the original plan had been to include no one
now living. It is, however, very evidently impossible to avoid doing so. In conclusion, then, brief mention must be made of others who have had a part in that history—not all, certainly, not all of the best, but a small number, at least nominally retired for several years, whom most of us would miss: names, places of working, one or two accomplishments or special interests. Surely the history of mycology will not end in 1977 or 1981, and an appropriate note of appreciation will, at some later time, be written for these and others by associates well acquainted with them and their studies. There are omissions in these pages, and would be if the pages were twice as many; some from sheer ignorance, some from imperfect judgment; of these no one is as conscious as the writer.

C. J. Alexopoulos, University of Texas, Austin—Myxomycetes; mycology in toto.


M. P. Backus, University of Wisconsin, Madison—Eurotiales and other micro-Ascomycetes; cytology.

Gladys E. Baker, University of Hawaii, Honolulu—Morphology of Myxomycetes; antarctic lichens; lower Basidiomycetes.

Alma Whiffen Barksdale, New York Botanical Garden, The Bronx—Aquatic phycomycetes, fungi pathogenic to man, antibiotics, sex hormones in fungi.

H. L. Barnett, West Virginia University, Morgantown—Odd basidiomycetes, classification of imperfecti; synergism, physiology of fungi.

Mary Cecilia Bodman, Mundelein College, Chicago—Heterobasidiomycetes, Boletaceae.

R. F. Cain, University of Toronto—Sordariaceae; lower basidiomycetes.

Edith K. Cash, National Fungus Collections, Beltsville—Inoperculate discomycetes; mycological Latin.

C. M. Christensen, University of Minnesota, St. Paul—Molds and mushrooms; mycotoxins; fungal deterioration of stored grain.

I. L. Conners, Canada Department of Agriculture, Ottawa—Rusts, smuts, other cereal diseases; history of plant pathology.
W. B. Cooke, Taft Laboratory, Cincinnati—Polyporaceae; fungus ecology; Pacific Coast fungi.

J. N. Couch, University of North Carolina, Chapel Hill—Saprolegniaceae, Septobasidium, Coelomomyces; flagella.

G. B. Cummins, Purdue University, West Lafayette—Uredinales.

R. W. Davidson, Colorado State University, Ft. Collins—Xylophilous fungi; blue-stain fungi, Polyporaceae; cultural characteristics.

C. W. Dodge, Missouri Botanical Garden, St. Louis—Early medical mycology; gasteromycetes, lichens.


C. W. Emmons, National Institutes of Health, Bethesda—Birds and systemic mycoses; modern medical mycology.

G. W. Fischer, Washington State University, Pullman—Ustilaginales.

W. D. Gray, Northern Illinois University, DeKalb—Industrial mycology; fungus physiology.

K. A. Harrison, Canada Department of Agriculture, Kentville—Hydnaceae.

J. S. Karling, Purdue University, West Lafayette—Nonmycelial flagellated phlycomycetes.

Eleanor Silver (Dowding) Keeping, University of Alberta, Edmonton—Coprophilous pyrenomycetes; genetics of Gelasinospora; medical mycology.

V. G. Lilly, West Virginia University, Morgantown—Fungal physiology.

J. L. Lowe, Syracuse University, Syracuse—Polyporaceae.

Ruth Macrae, Division of Botany, Canada Department of Agriculture, Ottawa—Cytology and interfertility studies of basidiomycetes.

Mildred K. Nobles, Division of Botany, Canada Department of Agriculture, Ottawa—Classification of wood-destroying fungi by cultural methods.
R. Pomerleau, Laval University, Quebec—Forest pathology; Agaricaeae.

K. B. Raper, University of Wisconsin, Madison—Acrasieae; *Aspergillus* and *Penicillium*.

D. P. Rogers, University of Illinois, Urbana—Tremellales and lower hymenomycetes; basidial development; phylogeny; history of mycology.

D. B. O. Savile, Division of Botany, Canada Department of Agriculture, Ottawa—Biology and cytology of Uredinales; phylogeny.

C. G. Shaw, Washington State University, Pullman—Peronosporales; fungi of the Northwest.

R. Singer, Field Museum of Natural History, Chicago—Systematics and phylogeny of basidiomycetes; mycogeography, mycorrhizal relationships.

A. H. Smith, University of Michigan, Ann Arbor—Agaricales; agaricoid gasteromycetes.

E. C. Stakman, University of Minnesota, St. Paul—Epidemiology and infectivity of cereal rusts.

D. E. Stuntz, University of Washington, Seattle—Agaricaeae.

L. J. Wickerham, Northern Regional Research Laboratory, Peoria—Reproduction in yeasts.
Acknowledgement

I am greatly indebted to the late Professor H. M. Fitzpatrick for a copy of his unpublished Lectures on Mycology/General Introduction and Ascomycetes (1937 revision), with its section "History of mycology"; to Dr. L. R. Hesler for his unpublished Biographical Sketches of Deceased North American Mycologists (1975); to Miss Nancy Hardin, formerly a student at the University of Illinois, for her term paper A summary of works including North American fungi written before 1822 (1967), likewise unpublished; for the Farlow and Trelease "List of works on North American fungi . . . published before 1887" and its sequel; to Mr. I. L. Conners (and the Ottawa mycologists) for his Plant Pathology in Canada; and to my academic adviser Dr. G. W. Martin for the best possible introduction to the history and literature of mycology.

To Dr. Emory G. Simmons and Dr. Margaret E. Barr Bigelow, who edited the earlier History, for their care and the elimination of a number of egregious errors, I am equally grateful, as to the authors of biographical notices of mycologists, especially those in Mycologia, which have supplied not only essential information but much good reading, and to the authors of notes on Luella Weresub and W. W. Diehl for the privilege of drawing on their manuscripts before publication.

D. P. R., Urbana, June 1977; April, 1981.
A Brief History of Mycology in North America—corrigenda

Page 2 Line 22 - for 1940's read 1950's
Page 6 Line 15 - for another of read one of the younger
Page 14 from below - for 1792 read 1742
Page 9 Line 19 - after apparently insert a comma
Page 29 Line 20 - after telial for the comma substitute a semicolon
Page 3 from below - for has had its read have had their
Page 30 Line 12 from below - for Hypocreales read Hypocreales
Page 32 Line 26 - after Brazil insert Dr.
Page 35 Line 20 - for 1932 read 1931
Page 36 Line 12 from below - for 1950 read 1935
Page 35 Line 8 - for 1930 read 1931
Page 41 Line 5 from below - after 1878 insert a comma
Page 43 Line 6 from below - after mycologist for the period substitute a comma
Page 43 Line 3 from below last line - before Gilmore insert Miss
Page 44 Line 27 - for sciences read science
Page 44 Line 15 - for Stevens' read Stevens's
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