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## Notable historical databases of fungal names

Ronald H. Petersen<sup>1</sup> and David L. Hawksworth<sup>2,3,4</sup>

<sup>1</sup>Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN 37996-1100, USA; corresponding author e-mail: repete@utk.edu

<sup>2</sup>Department of Life Sciences, The Natural History Museum, Cromwell Road, SW7 5BD London, UK

<sup>3</sup>Departamento de Biología Vegetal II, Facultad de Farmacia, Universidad Complutense de Madrid, Plaza Ramón y Cajal, Madrid 28040, Spain

<sup>4</sup>Comparative Plant and Fungal Biology, Jodrell Laboratory, Royal Botanic Gardens, Kew, Surrey, TW9 3DS, UK

**Abstract:** Present-day electronic databases of fungal names are 21<sup>st</sup> century versions of previous compilations for the same purpose. The comprehensive indices attached to books by Persoon and Fries summarized names known at those times. Later compilations appeared piecemeal in journals or free-standing, always improving but hardly available for “rapid retrieval.” Twentieth century *Index of Fungi* required tedious data entry from thousands of journals over many years, but the result could later be inserted into electronically retrievable computer programs. *Index Fungorum* includes data harvested from *Index of Fungi*, but perhaps its major source has been Saccardo’s *Sylloge Fungorum*, probably the most prodigious compilation of the 19<sup>th</sup>–20<sup>th</sup> century. Names for lichen-forming fungi were gleaned from the catalogues of Zahlbruckner and Lamb. The role of the Commonwealth Mycological Institute, its predecessors and its successors, has been significant.

**Key words:** compilations, nomenclators, name registration, *Index Fungorum*.

### INTRODUCTION

Among the several definitions of the term “database,” two parameters seem almost universal: data must be arranged for rapid retrieval and the instrument for retrieval is the computer. While “computer” is open to only limited interpretation, “rapid” is certainly a relative term. “Rapid retrieval” two centuries ago might be currently judged intolerably slow. Nonetheless, using nothing more than mental acuity, penmanship and type-setting prowess, cumbersome mycological data has been presented for “rapid retrieval” for nearly two centuries. The intent of this paper is to outline some of the important sources of organized mycological data on fungal names over the years leading to our current state.

For the purposes of this paper, such compilations (including databases) are attempts to synthesize or distill previous data (i.e. monographs, checklists, etc.) in order to bring together concise data (whether fungal names, protologues, host records or literature citations), but only the first constitutes a “database” of fungal names. In this way, for example, Fries’s *Systema Mycologicum* is not a database of fungal names, but the *Index Alphabeticus* following volume III is such. In the same way, *Index Fungorum* is a database, but with links to *Species Fungorum*, which includes heterotypic synonymy and suggestion of a “current name.”

### PRE-1900

Even the “founding fathers” of mycological taxonomy had access to and studied previous floristic studies which included names for fungi. To be sure, written descriptions in several prior works on fungi were less than fastidious (by modern standards), but some of the more influential works were well-illustrated. Petersen (1976a, 1977a, b, c, 1983a, b, c) dissected some of these works, drawing attention to how such authors as Schaeffer, Bolton, Bulliard, Sowerby and Fries simply substituted their own preferred species epithets for prior names. The result was a body of names with checkered histories available to the “founding fathers,” who, together with attempting to submit fungi to philosophical systems, sorted the taxa for acceptable names. It was the first peristalsis of names since the introduction of Linnaean binomial nomenclature. It would not be the last.

Pfister *et al.* (1990) and Petersen (1975a, b, 1976b, c, 1977c) summarized the name-giving, pre-1821 mycological literature which contributed to the library available to the “founding fathers”

The *Synopsis Methodica Fungorum* by Christian Hendrik Persoon (1801) was a summary of a taxonomic scheme used to gather descriptions (and a few illustrations) of all fungi known to Persoon. As such, it did not constitute a “database” but in reality was a philosophical treatise with fungi as examples. The *Index Botanicus sistens omnes*

*fungorum species in D.C.H. Persoonii Synopsi Methodica Fungorum ...* dated 1808 (but bound in with the reprint edition of the *Synopsis*; Johnson Reprint Corporation, 1952), acted as an early database to fungal names treated by Persoon. Taken together, they constituted the first such comprehensive offering dealing with fungal names since the time of Linnaeus (1753) (Jarvis 2007).

The proliferation of plant names, including cryptogams (which included fungi), was growing apace. In Germany, Christian Gottfried Daniel Nees von Esenbeck (1776–1858) gained respect as a philosophical and academic botanist. As he used Persoon’s *Synopsis*, he ventured his own system of arrangement and logic on the fungi, and in 1816–1817 published *Das System der Pilze und Schwämme* (Nees von Esenbeck 1816–1817). It appeared concurrently with Fries’s *Observationes Mycologici* part I, but was far more comprehensive. Deeply steeped in Romantic philosophy, Nees von Esenbeck’s volume was soon a cornerstone, with significant influence on Fries and others over many years.

When still rather young, Elias Magnus Fries began writing summaries of the fungi he found in Småland in southern Sweden (Petersen 1996, Petersen & Knudsen 2015). First came two editions of *Observationes Mycologicae* (1815, 1818) and during the in-press time for the second part, the first draft of *Systema Mycologicum*

part I was begun. As with Persoon, Fries' *Observationes* was intended to summarize taxa. But in his autobiography, Fries wrote "Having learnt by experience that Persoon's system is not sufficient, I began in 1816 to produce another, and to subject all species to an entirely new investigation" (Fries & Fries 1955). The *Systema* was intended to overhaul Persoon's "*Methodicus*" and to substitute his own (Fries') "*Systema*". Again, it was a taxonomic treatise embedded in a philosophical scheme. But Vol. 1 of the *Systema* included so many names that Fries appended an index, thus offering a "database" of hymenomycete names.

A friend of Nees von Esenbeck, Ernst Gottlieb Steudel (1783–1856), a physician and botanist, was struck by the plethora of plant names. Perhaps influenced by Nees von Esenbeck, Steudel gathered a compendium of plant names, published in 1824 as *Nomenclator Botanicus* (Steudel 1821, 1824). Accepted names and synonyms were included (distinguished by type point), and fungi were included: part I (Steudel 1821) did not include cryptogams, but part II (Steudel 1824) did so (covering all fungi, including lichen-formers). Prominently mentioned in his introduction were Fries' *Systema* and Persoon's *Mycologia Europaeae* (of which only volume I had then been published; Persoon, 1822). Names from Fries were cited arcanelly under the appropriate genus, followed by the tribe number and the species number in *Systema* I.

In the culmination of *Systema Mycologicum* (vol. 3, 1832), a dense, five-part summary of fungi as Elias Magnus Fries knew them, Fries felt constrained to append an inclusive index of the fungal names included throughout the volumes. He even took pains to use Roman versus Italic type-faces to represent names he accepted and names he included either in synonymy or in discussion but did not directly adopt. While his motives (other than completeness) are no longer clear, "legislation" by the mycological community nearly a century later mandated inclusion of the *Index Alphabeticus* as part of the *Systema* and *Elenchus* and thus elevated Fries's comprehensive index as a compilation of validly published names versus "devaluated" (a term used for some years when dealing with the "starting point" of non-lichen fungal nomenclature)<sup>1</sup>. Steudel's volume appearing as it did during the years in which Fries' *Systema* and *Elenchus* volumes were being published, eventually was recognized

as a very early compendium of fungus names AFTER the nomenclatural starting point and it therefore took on added importance. More recent nomenclatural changes have diminished the implications of Steudel's "database". Parenthetically, Steudel's (1840–1841) second edition of *Nomenclator Botanicus* did not include cryptogams.

Shortly after the turn of the 20<sup>th</sup> century, several mycological journals from Europe and United States were providing significant pagination for authors intent on describing: (1) taxa (a term not adopted until 1950) putatively new to science; (2) descriptions of life-histories of fungal pathogens, largely of plants, agricultural and/or horticultural; and (3) descriptions of the mycobiota of "exotic" regions, including Central and South America, Africa, Pacific landmasses and, to a lesser extent, Asia. As it had evolved for prior botanists (botany, of course, traditionally included mycology), the mycological literature of the day was becoming nationally and linguistically burdened with too many names, too many organisms, exacerbated by thousands of specimens arriving at famous botanical institutions, usually in western European national capitals, from the far corners of the world. National pride as well as biogeographical ignorance surely rendered redundant names for the same organisms. After all, specimens from Africa could come to Berlin, Brussels, Lisbon, London, Paris or Vienna, often from contiguous regions of the continent.

## CONSOLIDATION AND COMPILATION

How to create a handle with which mycological workers could more easily plumb the literature for simple data such as preoccupied names, sizes of genera and for authors whose experience had made them expert in some selected fungal group?

The lists of fungus names, even in the United States, were becoming inconvenient; already extant, but not readily available. Schweinitz's (1822, and published in Leipzig, 1834); lists of American fungi (Berkeley & Curtis 1856); Lea's (Berkeley 1847), Curtis' (Berkeley & Curtis 1849a, b, c, d, 1853, 1859, Petersen 1980), and Ravenel's specimens sent to Berkeley (Berkeley 1872a, b, c, 1873a-k, 1874a-d, 1875a-d, 1876a, b) and a few to Montagne (1856); Hitchcock's

(1829) list from Amherst, MA; Somers' (1882, 1887, 1890, 1891) "Nova Scotia fungi," Peck's growing contribution (Vogelenzang 1980–1988), especially of fleshy fungi, were all accumulating over the years. Rogers (1981) mentions more. At the end of most numbers of the *Journal of Mycology* (commenced in 1885) there appeared an "Index of North American mycology," combining fungus names (i.e. *Colletotrichum*), authors (i.e. Cobb, N.A.), geography (i.e. Colorado myxomycetes) and hosts (i.e. Cranberry, *Crataegus*). Certainly the most comprehensive compilation of fungus names during these years was *Nomenclator Fungorum* by Wenceslao Materno Streinz (1792–1876; Streinz 1862). While Streinz may have imposed some taxonomic judgements (Ainsworth 1976<sup>2</sup>), his coverage was thorough. Around the same time, Louis (Ludwig) K.G. Pfeiffer (1805–1877) prepared his massive 1698-page *Nomenclator Botanicus* of names above the rank of species of all "botanical" groups published up to the end of 1858 (Pfeiffer 1873–74); this work is not often cited by mycologists but includes, amongst other things, usages of generic names and indications of type species. While useful, these indices are difficult to search and especially to ferret out the literature in original form, as citations are often cryptic. Meanwhile, amateur mycological clubs were generating data on local fungi<sup>3</sup>, mostly discounted by the professional mycological community.

Given the emphasis on "Hymeomycetes" by Persoon and Fries, it is interesting that an early fungal "database" came from the United States (Harvard), dealt with parasitic fungi, and was derivative, arranged by plant hosts rather than by fungal names (Farlow & Seymour 1888, 1890, 1891; Fig. 1). William Gilson Farlow (1844–1919; Fig. 2) recognized several problems: (1) fungal taxa could be found on more than one host (considering the sophistication of fungal identification of that day); (2) fungal taxa were being named based on their hosts and even by the particular plant organs on which they were found; (3) little was known about the taxonomic or geographic breadth of pathogenic fungi; and (4) the number of fungus names was increasing too rapidly. Farlow (Farlow & Seymour 1891) wrote: "...believing that an approximately complete list of our parasitic species and their hosts would aid materially in the advance toward a more accurate study of our mycological

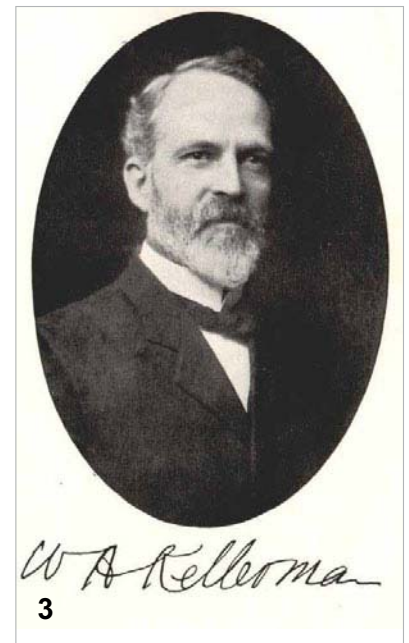
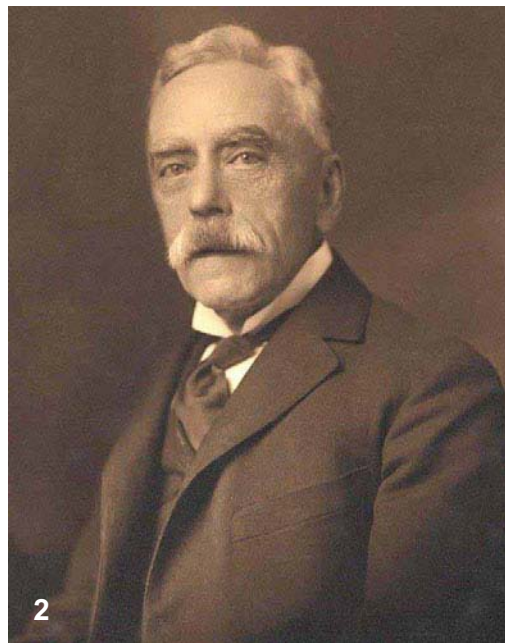
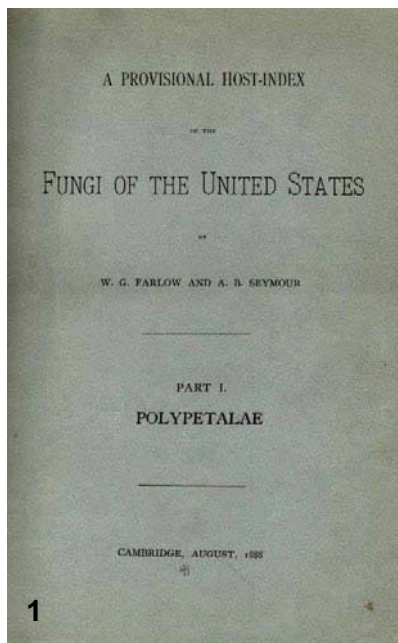


Fig. 1. Cover of Part I. Farlow and Seymour's *Provisional host-index of the fungi of the United States*. 1888; Fig. 2. William Gilson Farlow; Fig. 3. Willam Ashbrook Kellerman (1908, *Journal of Mycology* 14(1), facing p. 51).

flora and would tend to lessen the amount of indiscriminate species making which has already become a serious evil, the present index, the result of work extending over several years, has been prepared for publication."

By the time the "Host Index" was published, the *Journal of Mycology* was already three years old. Volume 1 (1885) was edited by William Ashbrook Kellerman (1850–1908; Fig. 3), assisted by J.B. Ellis<sup>4</sup> and B.M. Everhart, and emanated from Manhattan, Kansas, not exactly the hub of science in 19<sup>th</sup> century United States. Almost immediately, the journal took on an agricultural cast – plant pathogenic fungi, diseases caused by fungi, etc. Starting with volume 4, this tendency was recognized formally by shifting publication to the Department of Agriculture. Volumes 5–7 were unabashedly agricultural, and Kellerman (by then at Ohio State University) took the journal back starting with volume 8 (Fig. 4). Kellerman wrote: "The journal was at first published most exclusively in the interest of systematic or taxonomic mycology". While practical papers were still solicited, the journal again sought to become "an index" for all new species of fungi from the US. Many amateurs and professionals had dropped subscriptions to the journal because its direction had changed, and Kellerman invited them back.

The *Journal of Mycology*, though, was

almost uniquely American (after all, the organizers and editors were American and the audience was almost totally so), and while Europeans had some publication outlets (i.e. *Flora*, *Grevillea*, *Bulletin de la Societ  Royale de Botanique Belgique*, *Hedwigia*, *Bulletin de la Societ  Botanique de France*, Engler's *Botanisches Jahrbuch*), most catered to linguistically narrow audiences and authors and most were inclusive of wide botanical subjects (at least cryptogams), with mycology only a minor stepchild (with the exception of *Revue Mycologique*, exclusively French, and started in 1879). *Bulletin de la Societ  Mycologique de France* (from 1885), *Journal of Mycology* (also from 1885) and *Transactions of the British Mycological Society* (from 1895) joined somewhat later. Kellerman had received his PhD in Z rich, so was familiar with German but most other Americans were linguistically challenged. The situation in reverse was no better in Europe.

In 1876, confronted with pyrenomycete literature in a dozen languages often unfamiliar to workers with limited linguistic breadth, Pier Andrea Saccardo (1845–1920; Fig. 5) of Padua, Italy, began a compilation of pyrenomycete generic names reported from Italy, their literature sources, their geographic origins and, most important, their descriptions rendered in a single language, Latin (Saccardo 1875). The result, he hoped, was to make these data available to anyone with cursory experience in the "universal

language". Whether Saccardo was cognizant of America's insularity cannot be known, but even American workers were usually exposed to a year or two of Latin in grade school. Mycological taxonomic literature continued to grow and Saccardo published a series of lists of fungi from various European countries or regions. By 1882, Saccardo again saw a need to summarize pyrenomycete names and literature, this time under the title *Sylloge Fungorum* (Saccardo 1882). Saccardo's second volume (Saccardo 1883) under the new title was intended to be the last, but unanticipated, Saccardo's effort (and over the years with other collaborators) produced 25 monumental volumes of *Sylloge Fungorum*, finally ending posthumously in 1931<sup>5,6</sup>.

## SEARCHING FOR A NEEDLE IN A HAYSTACK

But how to find a particular fungus (assumedly a pyrenomycete) in such a stupendous compendium? Saccardo was obliged to adopt a system of classification. The principles of the system (see Kellerman 1907) were laid out in the preface to Volume 1 and by the end of the 19<sup>th</sup> century, Saccardo's classification system was in place for all known fungal groups (Anon. 1898, Reed & Farr 1993). Especially fortified with keys – in Latin, of course – all workers were provided with a

# Journal of Mycology

VOLUME 8 - MAY 1902

## TABLE OF CONTENTS

KELLERMAN - Continuation of the Journal of Mycology .....	1
MORGAN - Notes on some Florida Myriostomas and Geasters .....	3
MORGAN - A New Genus of Fungi .....	4
KELLERMAN - Ohio Fungi. Fascicle III .....	5
ELLIS AND EVERHART - New Fungi from Various Localities .....	11
KELLERMAN - <i>Puccinia peckii</i> (DeToni) Kellerm. n. sp. ....	20
KELLERMAN - Notes on North American Mycological Literature ..	20
KELLERMAN - Index to North American Mycology .....	22
NOTES .....	48

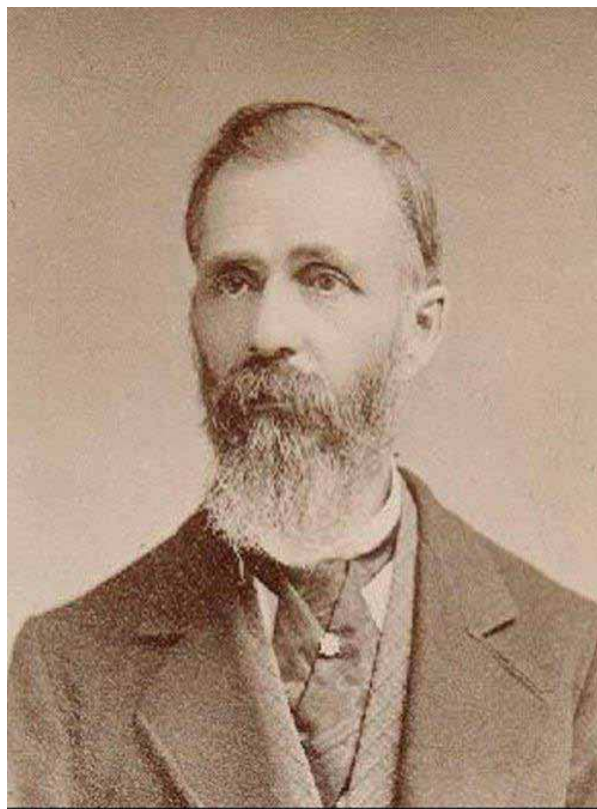
### CONTINUATION OF THE JOURNAL OF MYCOLOGY

The Journal of Mycology was inaugurated in 1885 by the undersigned, Messrs. J. B. Ellis and B. M. Everhart joining in the editorship. Under this arrangement the publication was continued four years; it was then discontinued by reason of expense involved, but the United States Department of Agriculture, Division of Vegetable Pathology, issued three volumes during the years 1889-94.

The Journal was at first published almost exclusively in the interest of systematic or taxonomic Mycology. The later volumes however were much changed in character and devoted mainly to the economic phase of the subject. Important articles in the first four volumes were such as North American Geasters, Enumeration of the North American Cercosporas, New Kansas Fungi, Heterocismal Uredineæ, North American Species of Ramularia, Canadian Fungi, The Phyllostictas of North America, New Species of Fungi, North American Agarics, Septorias of North America, etc.

In the last three volumes most space was given to such articles as Treatment of Gooseberry Mildew and Apple Scab, History of the Development of the Pyrenomycetes, Peach Rot and Blight, A New Holyhock Disease, Recent Investigations in Smut Fungi and Smut Diseases, Experiments in the Treatment of Plant Diseases, Treatment of Pear-Leaf Blight, etc.

There was from the first a generous support on the part of many amateurs and all of the working mycologists of the country but the number was of course then very limited. It is believed that now the good company has so much increased, the general



Job Bicknell Ellis

Fig. 6. Job Bicknell Ellis (1906, *Journal of Mycology*, 12 (2). Frontispiece).

Fig. 4. Volume 8, page 1, *Journal of Mycology*, upon return of W.A. Kellerman as Editor.



Fig. 5. Pier Andrea Saccardo (Wikipedia) *Journal of Mycology*.

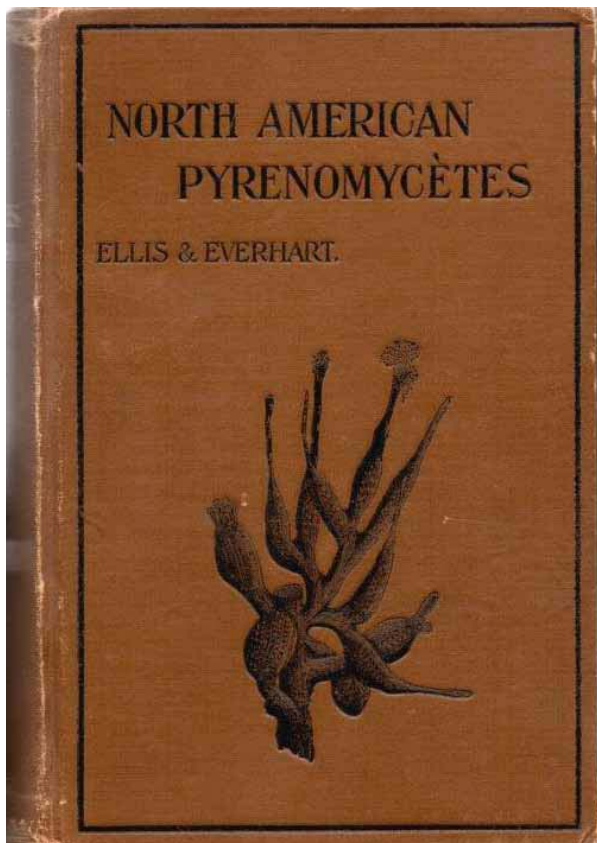


Fig. 7. Cover of *North American Pyrenomycetes*, with figure from *Laboulbeniales*.



Fig. 8. Paul Sydow, founder and Editor of *Annales Mycologici*, (1905, *Journal of Mycology*. 11(6). Frontispiece).



Fig. 10. Gustav Lindau, compiler, with Hans Sydow, of the *Thesaurus Literaturae*. (1907, *Journal of Mycology*. 13(2). Frontispiece).

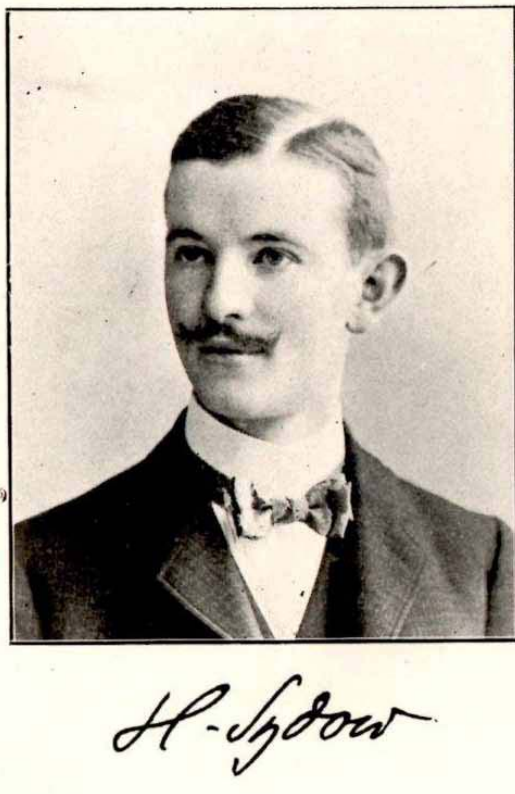


Fig. 9. Hans Sydow (1906, *Journal of Mycology* 12(6). Frontispiece).

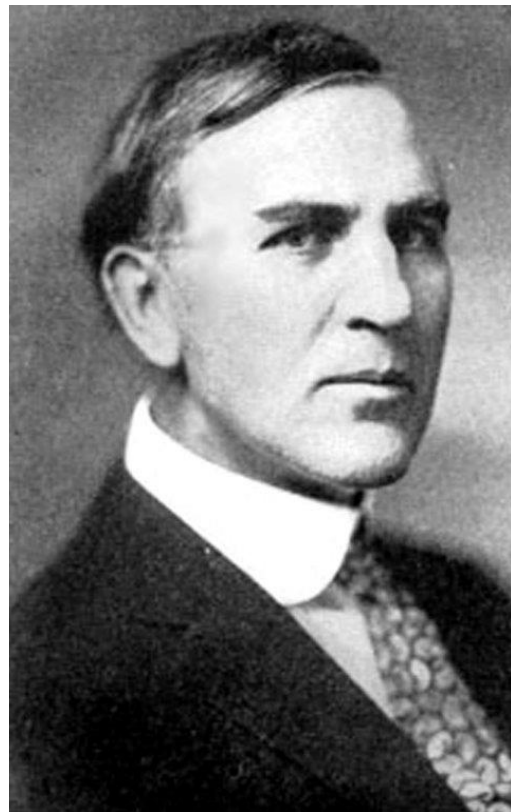


Fig. 11. Frederic Edward Clements (Google images).

taxonomic scaffold upon which to match an unidentified fungus to those in *Sylloge*. Even so, availability of *Sylloge* was not universal (down-loaded on-line scans were well over a century away), so many workers continued to struggle. Cooke (1884–1890) summarized the pyrenomycetes as he knew them. Job Bicknell Ellis (1829–1905; Fig. 6) and Benjamin Matlack Everhart (1818–1904) were self-taught and picked their way through three preceding systems<sup>7</sup>. Nonetheless, they were able to amass their early monographic tome, *North American Pyrenomycetes* (Ellis & Everhart 1892; Fig. 7), which not only transmitted all that was known about the fungus group north of Mexico, but in retrospect must be regarded as typical of the fungal groups which were being most carefully examined at the turn of the 20<sup>th</sup> century. Ellis, while receiving specimens from widely scattered locations, centered his research around Newfield, New Jersey, his home, and Everhart, who mined prodigious collections from eastern Pennsylvania, did not travel outside the US. While keys to genera were included in the text, in my copy of *North American Pyrenomycetes* is added “Analytic key to the suborders, families and genera of the North American Pyrenomycetes and Hysteriaceae” by an anonymous author. With full descriptions and 39 composite plates, this work is still the only attempt to cover all North American non-lichenized pyrenomycete fungi available today.

In the greater scheme of things, Curtis Gates Lloyd (1859–1926) was not a major character and surely did not intend to be a compiler in the sense of this paper. In fact, his only first-hand compilations were the indices at the ends of most of his writings, which extended from 1898 through 1925. Comprehensive compilations based on his publications came some years later (Stevenson & Cash 1936, Stevenson 1933, Anon. undated), and so do not form an integral part of the “turn-of-the-20<sup>th</sup>-century” chronology. Nonetheless, Lloyd was not only an eccentric man and wealthy enough to travel widely and to publish his own research, including caustic and sometimes injurious musings on the work of others, but through correspondence and personal interactions he was often the only American “mycologist” known first-hand by international professionals and, therefore, had influence on taxonomic mycology.

## POST-1900

By the turn of the 20<sup>th</sup> century, Moses Ashley Curtis (1808–1872) and Miles Joseph Berkeley (1803–1889) were dead. Mordecai Cubitt Cooke (1825–1914) emerged as the most prolific British mycologist. B.M. Everhart (1818–1904) was in his final years, as was his partner, J.B. Ellis (1829–1905). Farlow (1844–1919), Peck (1843–1917) and Saccardo (1845–1920) were in their prime. From Germany, however, a new father and son team, Paul (father, 1851–1925; Fig. 8) and Hans (son, 1879–1946; Fig. 9) Sydow, endeavored to start a new mycological journal. Although, by now, some mycological journals already existed (i.e. *Bulletin de la Société Mycologique de France*), none were German or Germanic. Hans Sydow was careful to invoke the names of reputable mycologists as “cooperators”<sup>8</sup>, and in 1903, launched *Annales Mycologici*. Immediately, it served as an outlet for a few authors, most of whom also appeared on the list of “cooperators”. While the journal itself could not be considered a compilation (but always with extensive indices), it persisted continually until the concluding days of World War II. By the time *Annales Mycologici* first appeared, Saccardo was gathering data for Volume 17 of *Sylloge Fungorum*. Once Hans Sydow founded *Annales Mycologici*, “H. and P. Sydow” became dominant co-authors for several years, but in 1921, Paul’s name disappeared, with Hans continuing to publish without his father.

Paul Sydow was a professional biologist. His early publications were on mosses, but by middle age, he had shifted his attentions to fungi, especially *Uredinales* (rust fungi) and *Ustilaginales* (smut fungi). In the 1880s, he amassed and distributed a huge exsiccata of these fungi, of which copies may be found all over the western world.

By 1908, Paul Sydow established a relationship with Gustav Lindau (Fig. 10) which resulted in their compilation, *Thesaurus Litteraturae Mycologicae et Lichenologicae* (Lindau & Sydow 1908–1917). Gustav Lindau was already an influential and widely published German lichenologist/ botanist by the time he partnered with Sydow. He had contributed significantly to Engler & Prantl’s *Die Natürlichen Pflanzenfamilien* (several groups of ascomycetes and deuteromycetes), he had coordinated organization and publication of *Kryptogamenflora der Mark Brandenburg*, had written three editions of *Hilfsbuch für das Sammeln und Präparieren*

*die niederen Kryptogamen* and two volumes of *Die Pilze Deutschlands*. In all cases, his research was taxon-based.

Two chief justifications were furnished to demonstrate the need for this new *Thesaurus* focusing on mycological, and including lichenological literature. First, citations of the collected works of various authors were unavailable. Examples given were Saccardo, Traverso, Farlow, McAlpine, v. Krempelhuber, Pissarschewsky, etc. Second, previous bibliographic compendia were inadequate, either because they were obsolete: Dryander’s *Bibliotheca Banksiana* (Dryander 1798–1800); v. Miltitz’ *Handbuch*<sup>9</sup> (Miltitz 1829) or because they were too broad in content: *Catalog of Scientific Papers*<sup>10</sup> (Royal Society 1869–1921); Pritzel’s *Thesaurus*<sup>11</sup> (Pritzel 1872); Richter’s *Codex* (Richter 1840); Just’s *Jahresbericht*<sup>12</sup> (Just, 1873–1922)]. The new *Thesaurus* authors set out their aims (transl.):

“We hope to give, through these designed advances, just as one previously could hardly find a scientific discipline in the general totality, we ourselves are nevertheless aware that spaces are still empty and that the nominally readily attainable periodicals or wholly inaccessible literature from other lands must furthermore be provided. We strive, if possible, to fill out these spaces too, but if we should not succeed from any direction, may we be granted good will, and receive at least a fair assessment”.

The first two volumes listed citations by author to 1906. Volume three listed literature from 1907–1910, and the final two volumes recapitulated the literature of the previous volumes, this time divided into subject areas. Thus, *Thesaurus Litteraturae* brought the mycological literature bibliography up to 1910, although volume five was published in 1917. Just at that time, World War I was at its height, with the United States newly enlisted on the side of Britain and France. Although not directly concerned with fungus names, the *Thesaurus* bridged the hiatus between Saccardo’s *Sylloge*’s abbreviated literature citations and the primary literature itself. It was useful throughout the mycological community, and the original edition sold out. Subsequently, the Johnson Reprint Company published a facsimile, which helped circulation.

HYALODIDYMAE—PHAEODIDYMAE 31

y. Paraphyses present  
 (x) Spores with a mucous layer produced into a spatulate ring  
     **Pteridiospora 14: 539**  
 (y) Spores without a mucous layer  
     m. Spores ellipsoid to fusoid **Melanopsamma 1: 575**  
     n. Spores botuliform **Thaxteria 9: 687**  
     o. Spores botuliform **Pseudolizonia 9: 682**  
 (b) Asci 16-spored  
 (2) Perithecia with hairs or bristles  
 (a) Paraphyses lacking **Echinothecium 16: 484**  
     x. Perithecia lichenicole  
     y. Perithecia typically on leaves, rarely on stems  
         **Venturia 1: 586**  
         **Eriosphaeria 1: 597**  
         **Othiella 1: 739, 17: 662**  
 (b) Paraphyses present  
 II. Perithecia cespitose  
 III. Perithecia in, or rarely upon, a stroma  
 1. Stroma scanty  
   a. Perithecia smooth **Gibbera 1: 599**  
   b. Perithecia setose **Cacosphaeria 9: 699**  
 2. Stroma well-developed  
   a. Stroma white or colored  
     (1) Stroma white and soft **Melchiora 14: 538**  
     (2) Stroma bright yellow **Endothia 1: 601**  
   b. Stroma black, rarely yellowish  
     (1) Perithecia botryose, crumpled, superficial  
         **Myrmaecium 1: 600**  
     (2) Perithecia immersed  
       (a) Spores septate near the base **Aplacodina 16: 485**  
       (b) Spores septate near the middle  
       x. Stroma vasa-like  
       (x) Conidial stage Melanconium **Melanconis 1: 602**  
       (y) Pycnidial stage Rabenhorstia **Hercospora 1: 605**  
       (z) Pycnidial stage Phoma **Diaporthe 1: 606**  
   y. Stroma eutype-like or ditrype-like  
     **Euporthe 1: 631, 1: 662**  
     **Phaeodidymae**  
     1: 701, 9: 723, 11: 312, 14: 551, 16: 498, 17: 675  
 Spores 1-septate, dark, fuliginous to brown, ovoid, oblong or fusoid  
 I. Perithecia separate  
   i. Perithecia covered **Phaeosphaerella 9: 723**  
     a. Paraphyses lacking (incl. *Lizonia* 1: 574)  
     b. Paraphyses present  
       (1) Asci 8-spored  
       (a) Spores surrounded by a hyaline sheath **Massariella 1: 716**

Fig. 12. Page of keys from Clements (1909) *The Genera of Fungi*. Bold face includes reference to volume and page in Saccardo's *Sylloge Fungorum*.



Fig. 13. Franz Petrak (WikiPedia).

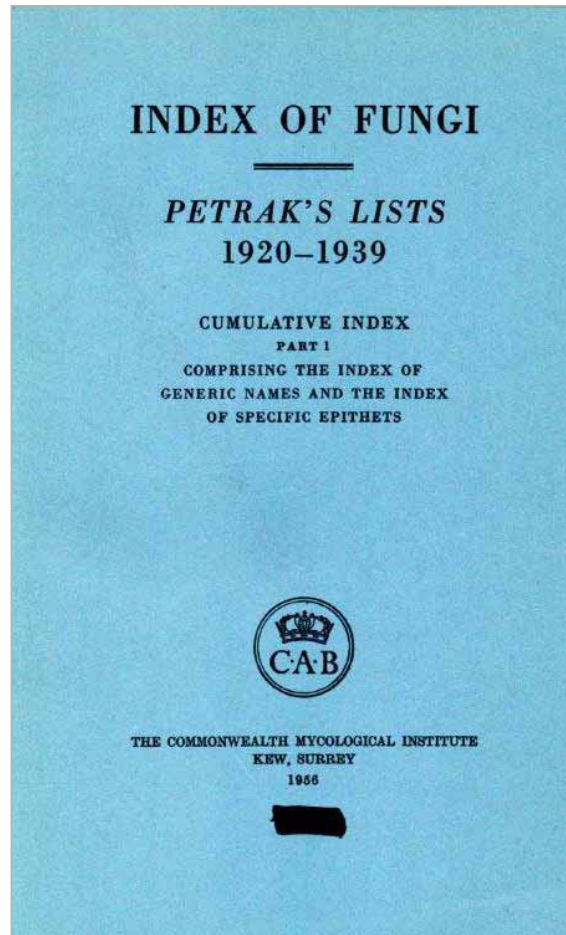


Fig. 14. Cover of *Petrak's Lists* in *Index of Fungi* from Commonwealth Mycological Institute.

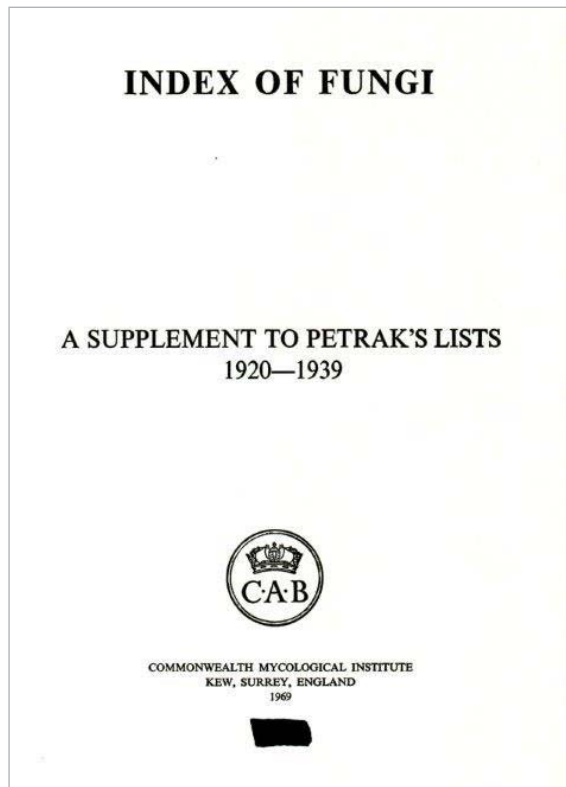


Fig. 15. Cover of *A Supplement to Petrak's Lists* in *Index of Fungi* from Commonwealth Mycological Institute.

Rafaele Ciferri (1897–1964), of Pavia, Italy, revived the *Thesaurus Literaturae* in 1957 (Ciferri 1957–1960), even appending Lindau and Sydow's names to the title page, in volumes purporting to be supplements of literature from 1911–1930. Ciferri was a prolific author in plant pathology with early papers in the 1920s, but continuing to publish for a half-century. By 1957, the economic situation in Italy had improved from the depths of World War II. A new form of reproduction was available, and the revived *Thesaurus* was a duplication of typescript on somewhat inferior paper. To cover the mycological (including lichenological) literature from 1911–1930, four thick volumes were filled, the last published in 1960.

If Lindau and Sydow's *Thesaurus* was author-based, Saccardo's *Sylloge* was taxon-based. In 1920, the mycological community mourned Saccardo's passing. Subsequent volumes of *Sylloge Fungorum* were entitled "*Supplementum Universale*," and were edited by a small group of collaborators of Saccardo. Publication ceased in 1931. A "Volume 26" was edited by Cash in 1972 (see Saccardo in bibliography) and all volumes were indexed by Reed & Farr (1993). The posthumous volumes compiled by Cornelis Antonie Jan Abraham Oudemans (1825–1906) arranged the fungi by their plant associates<sup>13</sup>

The relative opacity of Saccardo's classification system due to its presentation in Latin impeded its adoption in the United States. Frederic Edward Clements (1871–1945; Fig. 11)<sup>14</sup> then a teacher at the University of Minnesota, translated the keys in Saccardo's first eight volumes (1882–1889) into English and reproduced them for classes in mycology. "It immediately proved so convenient and usable that the preparation of a complete guide to the fungi was begun the same year". The product of the effort was published (Clements 1909) in 1909, as *The Genera of Fungi* (Fig. 12). Clements was able to cite Saccardo's *Sylloge* through vol. 18 (1906), but used only the keys from the earlier volumes.

The translation, understandably, was dominated by keys, largely translated from Saccardo's Latin but here and there revised by Clements, based on what he considered better literature. It was other chapters, however, which qualify the book as a compilation: Index of families in Saccardo's "*Sylloge Fungorum*" and Rehm's "Discomycetes"; list of new genera and types; index to genera, subfamilies,

families and orders. The latter provided the reader with a "database" of generic and suprageneric names. What was not appreciated until much later was the listing of a type species for every genus, whether supplied by Clements himself or a previous author (including the author of the taxon).<sup>15</sup>

Years later, once retired, Clements partnered with Cornelius Lott Shear (1865–1956)<sup>16</sup> at the Bureau of Plant Industry (US Department of Agriculture, Beltsville, MD) to produce a revised volume (Clements & Shear 1931). In it, more than 5000 generic names were reviewed, keys were significantly revised and genera were not only typified but illustrated as well. The volume (reprinted in 1954) presented a comprehensive "database" of fungal generic names.

## PETRAK'S LISTS

An improbable man stepped in to carry on the tradition. Franz Petrak (1886–1973; Fig. 13) was an ascetic man and during his early years often subsisted on potatoes and vegetables which he grew. In later years he was variously described as painfully thin or gaunt. His diet may have contributed to later gastric symptoms. Petrak was born in rural Austria, but after preliminary schooling, moved to Vienna and earned a doctoral degree under Richard von Wettstein. In 1910, Petrak obtained the mycological herbarium of C.A. Eichler, plus a few volumes of Rabenhorst's *Kryptogamenflora*, both of which introduced Petrak to fungi. Soon, he was totally involved in mycological research, and published his first paper in *Annales Mycologici* in 1914. In the Austrian army during World War I, Petrak collected fungi in Galicia, Bosnia, Albania and Macedonia (the Balkans). Upon his return home after the War, he resumed his research, and soon began a series of contributions to *Just's Botanischer Jahresbericht* compiling all new names and literature sources of fungi. The series summarized this information for names from 1920–1939, and was published through 1944<sup>17</sup>. The series came to be called "Petrak's Lists" (Samuels 1981, 1982, 1983, 1986).

His close and protracted relationship with Hans Sydow provided Petrak with an organ (*Annales Mycologici*) in which to publish his research results, often in multiple papers per number. Through this relationship Petrak received numerous exsiccata, and may have named his only son, Hans, after his professional friend.

During World War II and afterward (1938–1951), Petrak served as a "contract worker" at his alma mater, the Naturhistorische Museum Wien, in a position far lower than his intelligence and experience. He oversaw the removal of the library and herbarium to safe places during World War II, and their return (completed in 1958). In 1950–1951, under a fellowship from the American Philosophical Society, Petrak spent the year at Beltsville, USA, identifying many specimens.

Concurrent with compilation of "Petrak's Lists", Petrak also edited *Sydowia*, the continuation of *Annales Mycologici* after WW II. It is said that one of the reasons for editing *Sydowia* was to provide himself with an outlet for publications, especially since Petrak was one of the last to persist with hand-written manuscripts.

Influenced by Saccardo, Austrian lichenologist Alexander Zahlbruckner (1860–1938) embarked on a *Catalogus Lichenum Universalis*, which appeared in 10 volumes over the years 1921–1940 (Zahlbruckner 1921–1940). This was taxonomic, listing names under accepted species, and unlike the *Sylloge* aimed to cite all published uses of the names. The indexing of names of lichen fungi published from 1932–60, was continued by Ivan Mackenzie Lamb (1911–1990; later Elke Mackenzie), arranged alphabetically, not taxonomically, as *Index Nominum Lichenum* (Lamb 1963). William Louis Culberson (1929–2003), who produced a 100-part series, "Recent Literature on Lichens" in *The Bryologist* from 1952–78, planned a continuation of Lamb's *Index*, but he was unable to complete this and passed his data to CMI for completion and editing; this was published as a supplement to the *Index of Fungi* in 1972.

An unfortunate consequence of the different catalogues for lichenized fungi, as opposed to fungi with other biologies, was that many lichenicolous fungi, and some with uncertain biologies, were overlooked; Saccardo often missed these fungi when in primarily lichen works, and Zahlbruckner and Lamb did not list them as they were not lichen-formers.

In the same year that Petrak began "*Petrak's Lists*", 1920, the Imperial Bureau of Mycology (IBM) was established on Kew Green, adjacent to but separate from the Royal Botanic Gardens, as a centre for gathering mycological information for the British Empire (Aitchison & Hawksworth 1993). In 1930, it became part of the



Imperial Agricultural Bureau (which had been established in 1927) and was renamed the Imperial Mycological Institute (IMI). IMI provided an identification service for pathogenic fungi from 1921 onward, and in 1922 started publishing abstracts of research literature in the *Review of Applied Mycology* (RAM). RAM was not a compilation of mycological names, but a listing of pertinent mycological literature. It was “Petrak’s lists” which maintained the thread of the *Sylloge Fungorum* from 1920–1939.

The series called *Supplement to Review of Applied Mycology*, commenced in 1940 by IMI<sup>18</sup>, but after Supplement 15 (1948) changed its name to *Index of Fungi* (<http://www.cabi.org/publishing-products/online-information-resources/index-of-fungi/>), issued in two parts per year, covering new fungal names (also those of lichen fungi from 1970), initially at the ranks of genus, species and below and including both a host index and a cumulative index for every volume of 20 parts. The *Bibliography of Systematic Mycology* commenced in 1947, essentially carrying forward Ciferri’s *Thesaurus*. Recognizing the change in character of the Empire in the wake of World War II, in 1948, the name of IMI was changed to the Commonwealth Mycological Institute (CMI)<sup>19</sup>, and in 1986, to CAB International Mycological Institute (following the change to international legal status of the parent body to CAB International, CABI), and in 1990, resurrected the simpler International Mycological Institute, IMI. In 1998, the four Institutes of CABI were reorganized into a slimmer CABI Biosciences, and the IMI no longer had a separate identity or Director. CABI, however, continues to produce both *Index of Fungi* and *Bibliography of Systematic Mycology*. The Institute also reproduced, as supplements to the *Index of Fungi*, *Petrak’s Lists* (Fig. 14) and *A Supplement to Petrak’s Lists* (Fig. 15)<sup>20</sup>. As a step toward a complete nomenclator of fungal names at all ranks, David (2002) prepared a preliminary catalogue of names of fungi above the rank of order.

Encumbered by the inefficient, laborious data-entry work of the times, at least two difficulties emerged as anticipated: (1) the number of “obsolete” names (i.e. moribund names, names for which no accurate identification was available, *nomina herbaria*, etc.) was unwieldy in all fungus groups, and required excessive effort to pin them down with the required nomenclatural details, particularly typification (the category of

“epitype” was still in the future); and (2) The search for new published names in world-wide journals, often with limited subscription lists, geographical coverage and press runs, was already a growing problem requiring manpower and tedious harvest (and funds to support the effort). Around 12,000 journals were being regularly scanned by CABI for its abstracting journals and any with new fungal names were flagged and drawn to the attention of IMI staff. Some additional journals not at Kew or IMI were regularly scanned in the libraries of the Natural History Museum in central London.

As part of the post-World War-II reorganization of botanical taxonomy as a field of research, a proposal was made to compile a summary of generic names for plants (including fungi) and their type species. Such an index had been underway as a series of index cards, but now a more concerted effort was undertaken and over 35,000 cards were amassed. Eventually, funding for a full-blown project was obtained, and a team, led by Dr. Ellen Farr, toiled over a decade and produced *Index Nominum Genericorum* (“ING”), with over 63,500 generic names and their types, issued as volumes of *Regnum Vegetabile* (Farr *et al.* 1979).

## REGISTRATION AND PROTECTION OF NAMES

To alleviate the former problem in all groups of organisms covered by the botanical code of nomenclature, some 30 years ago David Hawksworth and colleagues, under the auspices of the International Union of Biological Sciences (IUBS), introduced the concept of protecting “names in current usage” over potentially competing earlier names. Through this effort, experts in various plant groups (and fungi) would be asked to compile lists of actively used names (thus removing from consideration the moribund names mentioned above), with the idea that these lists, once vetted by the nomenclature bureaucracy, would become an injected “starting point” for fungal (and plant) names. The idea was met by resistance by taxonomic “purists”, who took issue with the lists of people to be invited to compile suitable fungal name lists and the dismissal of historical names the “validity” of which, while often obscure, was historically correct. The “names in current usage” concept did not find sufficient traction in

the botanical and mycological community and was rejected by the 1993 International Botanical Congress in Yokohama, despite an overall list of family names, generic names, and species lists for sample families having already been published (Greuter *et al.* 1993a, b, c). The unveiling of *Index Fungorum* (more below) abruptly revealed all manner of names, and “names in current usage” has evolved into the concept of lists of protected names, which was accepted at the Melbourne Congress in 2011.

Hawksworth and colleagues’ proposed renovation of name compilation also included “name registration”, which moved the responsibility for detecting and compiling lists of new names (all taxonomic ranks as well as new combinations, etc.) from the journal subscriber to the author of the taxon. This idea was not new in mycology, having been discussed at the Geneva Conference in 1954 (*Regnum Vegetabile* 5: 47–48) and formally proposed a year later (Ainsworth & Ciferri 1955). The concept was approved for all organisms covered by the botanical code at the Yokohama Congress of 1993, and incorporated into the Tokyo Code, to become obligatory after the next Congress. However, that Congress, in St Louis in 1999, voted against the scheme, which had been proposed for algae, fungi and plants, and the provisions were deleted from the *Code*. Several centres for name registration had been envisioned to ease submission of names world-wide. Again, the idea was greeted with mixed opinions, but eventually was approved through the nomenclature hierarchy and incorporated into what was, and is still known today, as *Mycobank*, headquartered at CBS-KNAW Fungal Diversity Centre (CBS) in Utrecht, The Netherlands, but now owned by the International Mycological Association. Following support for the scheme at the 9<sup>th</sup> International Mycological Congress in Edinburgh in 2010, proposals to make registration part of the requirement for the valid publication of new fungal names was approved by the subsequent International Botanical Congress in Melbourne the following year, with effect from 1 January 2013. The Nomenclature Committee for Fungi was charged with approving one or more registration centres, subject to ratification at the next International Mycological Congress in Bangkok in 2014; *Mycobank*, *Index Fungorum*, and *Fungal Names* were approved and the decision ratified at the Bangkok Congress.

In the few templates completing the registration process, not only are names submitted, but also all elements required for the valid publication of names, including typification and diagnosis. Names are given a unique registration number (“identifiers”), and if journals accept a new name or combination without a registration centre designation, such unregistered names are now ruled as not validly published for nomenclatural purposes. The system takes advantage of the electronic age.

*Index Fungorum* (<http://www.indexfungorum.org/>) was initiated at IMI, with the co-operation of the US National Fungal Collection who generously made available the database used to produce the index to the *Sylloge* (Reed & Farr 1993). Generic and species names for lichen fungi were keyed in from the index volume of Zahlbruckner’s *Catalogus* by its last Director’s son, Julian L. Hawksworth. It went on to develop as a collaboration among CABI, CBS, and Landcare Research, New Zealand. This on-line database largely parallels *Index of Fungi*, which is print- and subscription-only. *Index Fungorum* acts as an umbrella over several subsidiary databases: taxon name-based (including *Species Fungorum*, which gives accepted names and synonyms, and provides the input for the now annual editions of the multi-disciplinary *Catalogue of Life*), author-based, bibliography-based, etc. This service is the latest to carry on the tradition of the great mycological compilations. While it is “state of the art” in the early 21<sup>st</sup> century, it stands on the shoulders of the great compilations (and compilers) of the past.

Although not directly in the line of databases nor names of fungi, mention must be made of *Taxonomic Literature*, second edition (“TL-2”), for within its pages is found exhaustive information about the workers who compiled such data. Its entries open doors into the lives and times of the workers mentioned here<sup>21</sup>.

It takes a particular personality and mentality to persist in compilatory work. For many years, printed compilations were the product of solitary workers (or small groups of collaborators, but centered in individuals) written in long-hand on paper. Today, a single database (i.e. MyCoPortal; <http://mycoportal.org/portal/index.php>) can canvas several other databases almost instantaneously. Individual compilers still continue to accumulate new information for databases (there is no escape from data entry) but mycological research is

flourishing due, in part, to the foundations laid by past and present compilers.

## ACKNOWLEDGEMENTS

Don Pfister made valuable suggestions to a prior draft of this paper. As usual, many years ago Marinus Anton Donk sowed the seed of the value of compilations in mycology. Modern databases, including those of leading botanical libraries (chiefly The New York Botanical Garden) have included accurate citations, and electronic compendia (i.e. JSTOR, Biodiversity Heritage Library, etc.) include many of the classical publications useful in this discussion.

## END NOTES

<sup>1</sup> There is no scientific historical reason to assume that the *Index Alphabeticus* was printed and bound into volume 3 of *Systema* simultaneously. Only an undated title page to the index was produced and the *Index* (title page) seems to start a new signature. The *Index* itself is paged separately from volume III, which makes inclusion of the *Index* in the *Systema* volumes a retroactively open choice.

<sup>2</sup> Ainsworth (1976) is especially noteworthy for he furnishes a significant historical bibliography arranged in chronological order, through which some continuity of writers and disciplines can be traced.

<sup>3</sup> The July number of the Boston Mycological Club’s publication mentions other such clubs: Westfield Toadstool Club (organized in March, 1895, and therefore older than the Boston Club), and similar organizations in Dedham (MA), New York (NY), Washington (DC), and Philadelphia (PA).

In a Presidential lecture, “Dr. Francis ... spoke of the need for more accurate and extended studies in regard to the season, habitat, and distribution of species that are familiar or that can be easily identified; also the value of such data as can be gathered in regard to unfamiliar plants. The importance of such work he would insist on, not to the exclusion of the popular and more generally interesting purpose of the Club, but as a necessary adjunct and basis for that work, if it is to have value. Chief among our needs are: 1, a complete and accurate list of species already found in the country, or at least in the northeastern portion of it; 2, some expert authority to visit our exhibitions and deal in a final way with the species gathered.”

<sup>4</sup> Coincidentally, Ellis attended Union College (1849-1851) as did Peck (1855-1859),

and both men taught at various preparatory academies. Their career tracks eventually diverged, with Peck appointed as State Botanist of New York and Ellis again teaching, farming and selling fungus exsiccati.

<sup>5</sup> A full outline of all volumes of *Sylloge Fungorum* is furnished by Reed & Farr (1993)  
 Vols. I (1882)–IV (1886): edited by P.A. Saccardo  
 Vol. IVa (1886): Additamenta et volumen I-IV, P.A. Saccardo with A.N. Berlese and P. Oglin.  
 Vol. V (1887): P.A. Saccardo with collaboration by J. Cuboni and V. Mancini.  
 Vol. VI (1888): P.A. Saccardo with collaboration by J. Cuboni.  
 Vol. VII (Parts 1 and 2; 1888) P.A. Saccardo with collaboration by A.N. Berlese, J.B. De Toni, Ed. Fischer.  
 Vol. VIII (1889): P.A. Saccardo with collaboration by J. Paoletti, A.N. Berlese, J.B. De Toni, V. Trevasin.  
 Vol. IX (1891) Supplementum universale, part I. P.A. Saccardo.  
 Vol. X (1892) Supplementum universale, part II. P.A. Saccardo, with fossil fungi by A. Meschinelli.  
 Vol. XI (1895) Supplementum universale, part III. P.A. Saccardo.  
 Vol. XII (1897) Sylloge Fungorum. Authored by P. Sydow.  
 Vol. XIII (1898). Largely aided by P. Sydow.  
 Vol. XIV (1899) Supplementum universale, part IV. P.A. Saccardo and P. Sydow.  
 Vol. XV (1901) Synonymia, etc. authored by E. Mussat  
 Vol. XVI (1902) Supplementum universale, part V. P.A. Saccardo and P. Sydow.  
 Vol. XVII (1905) Supplementum universale, part VI. P.A. Saccardo, D. Saccardo (son), and J.B. Traverso. [with memorial to August Napoleon Berlese].  
 Vol. XVIII (1906) Supplementum universale, part VII. P.A. Saccardo and D. Saccardo (son).  
 Vol. XIX (1910) Index icones fungorum A-L. P.A. Saccardo and J.B. Traverso.  
 Vol. XX (1911) Index icones fungorum, M-Z. P.A. Saccardo and J.B. Traverso.  
 Vol. XXI (1912) Supplementum universale, part VIII. P.A. Saccardo and Alex. Trotter.  
 Vol. XXII (1913) Supplementum universale, part IX. P.A. Saccardo and Alex. Trotter.  
 Vol. XXIII (1925) Supplementum universale, part X, edited by Alex. Trotter, with collaboration by P.A. Saccardo, Dominic Saccardo (son), G.B. Traverso. [P.A. Saccardo died in 1920].  
 Vol. XXIV Sectio I. (1926) Supplementum universale, part X, edited by Alex. Trotter,

with collaboration by P.A. Saccardo, Dominic Saccardo (son), G.B. Traverso. Vol. XXIV Sectio II (1928) Supplementum universale, part X, edited by Alex. Trotter, with collaboration by P.A. Saccardo, Dominic Saccardo (son), G.B. Traverso. Vol. XXV (1931) Supplementum universale, part X, edited by Alex. Trotter, with collaboration by P.A. Saccardo, Dominic Saccardo (son), G.B. Traverso. [Vol. XXVI (1972) Supplementum universale, part XI. Edited by Edith E. Cash, compiled by Alex. Trotter].

<sup>6</sup> The final volumes of *Sylloge fungorum* were edited by a small group of collaborators: P.A. (posthumously) and his son, Dominic Saccardo, G.B. Traverso and A. Trotter. Type was set by Pergola (Italy) but printing was done by Friedlaender & Sohn, Berlin, the same company which produced *Annales Mycologici* over the same decades. A supplement volume was amassed by Trotter and compiled by Cash as volume 26 (1972; see Reed and Farr, 1993. Pages xi–xx are a summary of Saccardo's classification system for all fungi).

<sup>7</sup> In the preface to their monograph, Ellis and Everhart wrote: "The system of classification adopted (and stated elsewhere) is mainly that of Dr. Winter [1884–1887] in *Rabenhorst's Kryptogamen Flora* .... The system differs from that of Saccardo in his *Sylloge* mainly in the different grouping of the genera, in this respect standing intermediate between the Saccardian system and that adopted by M.C. Cooke [1884–1890] in his "*Synopsis Pyrenomycetum*." These references imply that these works were in the hands of Ellis and Everhart as they worked.

<sup>8</sup> "With cooperation of O. Appel (Charlottenburg), Geo. F. Atkinson (Ithaca), Abbate J. Bresadola (Triento), Fr. Cavara (Catania), P.A. Dangaerd (Poitiers), P. Dietel (Glauchau), A. Guilliermond (Lyon), R. Heinze (Halle A.S.), Fr. von Höhnel (Wien), E. Küster (Halle, A.S.), L. Matruchot (Paris), F.W. Neger (Eisenach), P.A. Saccardo (Padua), C.J.J. Van Hall (Paramaribo), P. Vuillemin (Nancy), J.E. Weiss (Freising), A. Zahlbruckner (Wien) und zahlreichen anderen Gelehrten." Atkinson was removed in volume 2.

Among the authors in volume 1 were: Atkinson, Bresadola, Cavara, Dangaerd, Dietel (4), Guilliermond, Heinze, Höhnel, Matruchot (2), Neger, Saccardo (3), Sydows (together, 10), Vuillemin, Zahlbruckner. So the "cooperators" are largely also the authors.

<sup>9</sup> Miltitz's "*Handbuch*" was a stand-alone volume summarizing botanical literature up to 1829, for use by botanists, librarians, book dealers and auctioneers, and included prices and comments. As such, not only was it botanical

(not mycological/lichenological) but also incomplete and obsolete by the turn of the century.

<sup>10</sup> First inspired by a lecture by Joseph Henry, leader of the Smithsonian Institution, to the British Association, the idea of a comprehensive compendium of scientific literature was taken up by the Association, mutated somewhat to include only periodical literature (not free-standing books, monographs, etc.), and delayed until it was possible to include literature from 1800–1863; the project was assumed by the Royal Society of London.

The first six volumes, commenced in 1867, covered the 1800–1863 literature. Embedded in those volumes was also a comprehensive list of the periodicals extracted and their abbreviations, eventually carried on in *Botanico-Periodicum-Huntianum* ("BPH," first edition, 1968). By the publication of vol. 6, 1872, there was a need to bring the literature forward, so a second series of two volumes (Series II), 1877, 1879, covered the decade 1864–1873. The *Catalog* was again continued, and volumes 9–11 (Series III), 1891, 1894, 1896, summarized scientific literature for 1874–1883. The final series (IV) intended to bring literature up to 1900, but the effects of World War I and staff reductions ended the effort with vol. 17, 1921, half-way through the alphabet.

Three subject indices were also published, dealing with mathematics and physics.

Armed with an author's name, the *Catalog* was relatively easy to search, but to find literature on mycology or plant pathology was like the proverbial "needle in the haystack," for the *Catalog* covered all the "hard sciences" as well as all the "natural sciences." It was this aspect which Lindau and Sydow attempted to overcome with their "*Thesaurus*," aimed specifically at the literature of mycology and lichenology.

<sup>11</sup> "*Pritzel's Thesaurus*," published in two editions, soon became a standard for botanical bibliography, partly because G.A. Pritzel (1815–1874) insisted (if humanly possible) on seeing every publication he listed. The first edition commenced in 1851, the second in 1872, but the reprint of the second edition has become the commonly consulted version. The second edition was published posthumously, with some parts furnished by C.W.J. Jessen, Pritzel's longtime friend. A total of 10,874 entries were included, often with a very few commentary words appended. To these were added numerous indices of literature by plant group, by geography, to authors, to "Botanica Applicata" (including medicinal plants), etc. For a summary concerning the "*Thesaurus*," see Stafleu (1973).

<sup>12</sup> Begun in 1873 by Johann Leopold Just (1841–1891), "*Botanischer Jahresbericht*" promised to be an annual summary of botanical literature. Just boasted of "winning a line-up of competent colleagues" whose names were listed on the title page and who were exclusively German-speaking (and writing). The journal continued to Vol. 50(1) in 1922. Not coincidentally, this was also the last year of the "*Catalog of Scientific Papers*" and very lean years for "*Annales Mycologici*" (q.v.).

Each issue of "*Jahresbericht*" had the advantage of being divided into "departments" (disciplines), of which one was "Kryptogamen." Each entry was listed with author, abbreviated title and number. The number referred to an abstract of the paper, sometimes quite brief, sometimes quite lengthy. Abstracts were, of course, in German. Each number included hundreds of pages. The roster of "cooperators" waxed and waned over the years, but always included 20 or more names, always from German-speaking cities, and over-weighted with Berliners.

Leopold Just edited the publication into the mid-1880s. Subsequently, several workers edited the series, and after Just's death (1891), the journal changed its name to "*Just's Botanischer Jahresbericht*." In 1902, F.K.G. Fedde (Charlottenburg: 1873–1942) became co-editor, and the following year became sole editor until 1922. Parenthetically, Fedde also started "*Repertorium novarum specierum regni vegetabilis*" in 1905, and remained editor until 1942 (the year of his death). This journal survives to the present as "*Feddes Repertorium*."

<sup>13</sup> Oudemans, a prominent Dutch medical doctor and botanist, compiled citations describing fungi associated with plants. When he died in 1906, these massive files remained unpublished, but some years later a consortium headed by Jan Willem Moll put them in publishable form. They appeared in five volumes (vol. 1, 1919; vol. 2, 1920; vol. 3, 1921; vol. 4, 1923; vol. 5, 1925), over 5700 total pages, the first four arranged by the groups of plants (i.e. Gymnospermae/Angiospermae, Monocotyledonae/Dicotyledonae, etc.) and their fungi, and the fifth volume a comprehensive index of all fungus names.

<sup>14</sup> In his day, Clements was better known for ecological research and philosophy than for mycology. He studied at University of Nebraska under Charles Bessey, and Clements began his observation of the flora of that state. Over years, he developed the idea of plant succession in which a flora could not be considered as static but developed over time in a series of successions. "Succession ecology" became

- a mainstay in biology and has remained an important influence in botany.
- <sup>15</sup> Comprehensive selection and listing of types can be traced to the *American Code of Botanical Nomenclature* which had been introduced as a counterweight to European attempts to codify nomenclature, but which mandated typification at all taxonomic ranks. In fact, once the mycological community understood the import of this typification, it was the second edition (with C.L. Shear in 1931) that drew attention. *The Genera of Fungi* (first edition) was the first such systematic summary.
- The Botanical Code of Nomenclature, however, declared typification by “mechanical means,” including mere recitation of the first species included in the genus by the author of the genus to violate the Code and render such typification null. The listing by Clements (and Clements and Shear) usually cited the first species in the original genus, and was considered a “mechanical means,” and therefore in violation of the Code. Over subsequent years, however, exceptions were found and it was realized that Clements (1909) and Clements & Shear (1931) were not arbitrary in typification, and that they had not slavishly followed the first species rule.
- <sup>16</sup> Years before their publishing partnership, Shear spent time in the laboratory of Charles Bessey at the University of Nebraska, and there met Clements. Like Clements, Shear was better-known for other (but related) disciplines than mycology. A career was spent studying plant diseases, especially by fungi, including trips to European herbaria. Shear was stalwart in insisting that types must be understood and studied if the causal organism was to be accurately identified.
- <sup>17</sup> Petrak, F. Verzeichnis der neuen Arten, Varietäten, Formen, Namen und wichtigsten Synonyme. 1930. Just's Botanischer Jahresbericht 57(1920), Abt. 2: 134–256. (reprinted as Index of Fungi 1920 by Commonwealth Mycological Institute in 1953).
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1938. Just's Botanischer Jahresbericht 57(1929), Abt. 2: 592–631. (reprinted as Index of Fungi 1929 by Commonwealth Mycological Institute in 1952).
- 1938 Just's Botanischer Jahresbericht 58(1930), Abt. 1: 447–570. (reprinted as Index of Fungi 1930 by Commonwealth Mycological Institute in 1967).
1939. Just's Botanischer Jahresbericht 60(1931), Abt. 1: 449–514. (reprinted as Index of Fungi 1929 by Commonwealth Mycological Institute in 1953).
1944. Just's Botanischer Jahresbericht 63(1935), Abt. 2: 805–1056. (reprinted as Index of Fungi 1932–1935 by Commonwealth Mycological Institute in 1955).
- <sup>18</sup> Although the narrative concerning recent history, contributed significantly by DLH, is somewhat detailed, it may represent the most concise summary of the modern compiling system available to international workers.
- <sup>19</sup> Commonwealth Mycological Institute. 1950. List of new species and varieties of fungi, new combinations and new names published 1936–1939 by F. Petrak, Vienna.
- Preface: “Dr. Petrak in parts of seven volumes of *Just's Botanischer Jahresbericht* attempted to give all new genera, species, combinations, and varieties of fungi published during the years 1920 to 1935 inclusive, the last contribution appearing in 1944. After the war Dr. Petrak informed [S.P. Wiltshire, Director of CMI] that he had continued his records of all names published down to 1938. The listing of new species of fungi in the *Index of Fungi* (formerly *Supplements to the Review of Applied Mycology*) was commenced in January, 1940, and the separate parts, each covering periods of six months, have appeared regularly since. There remained the serious lack of compilation of new names published during the four years 1936–1939. When Dr. Petrak learnt of this gap in the records he very kindly agreed to my suggestion that he should complete his list to the end of 1939, while the Institute on its part undertook to publish the list, since *Just's Botanischer Jahresbericht* was no longer being issued and its stocks had been nearly all destroyed.”
- <sup>20</sup> Commonwealth Mycological Institute. 1969. Index of Fungi. A supplement to Petrak's lists 1920–1939. CMI “1969”: 1–236.
- Introduction: “In the course of the past ten years or more, references have been accumulated to some five thousand new fungus names published during the twenty years 1920–39, inclusive, which were not included in Petrak's Lists.”
- Commonwealth Mycological Institute. 1956. Index of Fungi. Petrak's lists 1920–1939. Cumulative index part 1. Comprising the index of generic names and the index of species epithets. CMI “1956”: 1–168.
- Commonwealth Mycological Institute. 1957. Index of Fungi. Petrak's lists 1920–1939. Cumulative index part 2. Comprising host index, index of host genera, and other substrata index. CMI “1957”: 169–307.
- <sup>21</sup> Intended as a compilation of data gathered over years of writing on botanical bibliography and biography, Frans Antonie Stafleu (1921–1997) published *Taxonomic Literature* (1967), a one-volume guide to the literature (not to botanical – much less fungal – names) of this field of research. Received positively by the botanical community, Stafleu was able to obtain funding and assemble a team of data-gatherers, chief of whom was Richard S. Cowan, to scour leading botanical libraries world-wide. The result was a mammoth seven-volume second edition of *Taxonomic Literature*, universally known as *TL-2*. Exhaustive in its coverage, it has become essential as a source for information about botanical (including mycological) authors from 1753 to 1940. As Herculean as the volumes were, supplements were needed, and have appeared in eight volumes, covering workers' names through G. A small example of the usefulness of *TL-2* have been repeated references during the writing of the present paper. The full set is available on-line through Biodiversity Heritage Library.

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