

DREAMS AND NIGHTMARES OF NEOTROPICAL ASCOMYCETE TAXONOMISTS

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ABSTRACT

Is taxonomic inquiry outdated, or cutting edge? A reassessment is made of the goals, successes, and failures of taxonomists who study the fungi of the Neotropics, with a view toward what we should do in the future if we are to have maximum scientific and societal impact. Ten questions are posed, including: Do we really need names? Who is likely to be funding our future research? Is the collapse of the Ivory Tower of Academia a dream or a nightmare?

I have been invited here to present a talk on my views on what taxonomists working on Ascomycetes in the Neotropics should be doing. Why me? Perhaps just because I am one of the oldest ascomycete taxonomists, who just might have some shreds of wisdom to impart. I take the challenge seriously, and somewhat to my surprise I have come to some conclusions that shock me, as well they may shock you.

OUR HISTORY

Let's take a brief view of the time frame I want to talk about. It's really not that old. Most of us think of Elias Magnus Fries as the "father of mycology," a starting point for fungal names as the sanctioning author for most of the fungi. In 1825 Fries was halfway through his *Systema Mycologicum*, describing and illustrating fungi on what he could see without the aid of a microscope. I was born exactly one century later, and became a mid-20th Century taxonomist whose major interest was in Discomycetes. Many more tools for investigating microscopic features of fungi were at my disposal, and the genetics of fungi was giving us new insights. Culture collections began to flourish, and means of keeping fungi alive or in suspended animation opened up new horizons.

Where were the taxonomists of the 19th and 20th centuries employed and trained? For the most part we were housed either in museums or in universities in the Ivory Tower of Academia. In universities one found mycologists in departments of Botany, amongst algologists and other students of cryptogams and of seed plants. The science of Phytopathology developed only in the 20th century as it became evident that fungi were the main instigators of plant disease. Some mycologists then began to be parts of Departments of Plant Pathology, the case of my predecessor, Harry Morton Fitzpatrick, at Cornell University, who boasted that he was a pure scientist in an applied science department. We had some 25 or so phytopathologists teaching and doing research on the fungi, bacteria, nematodes, other microbes and viruses that cause plant disease. We had but one mycologist.

What were the research requirements of the taxonomic mycologists when I began my career over sixty years ago? Whether housed as botanists or amongst plant pathologists, there was typically no pressure to do one's research on pathogens. Whatever interested one, because of its beauty or its uniqueness was fair game. Non-pathogenic Agarics, Gasteromycetes, and larger Ascomycetes were often studied because they were encountered not only by mycologists but by the general public. Students doing their research degrees under your supervision could be working with any

group of fungi, pathogens or saprophytes. Your job as a mentor was to guide them to use the literature, the herbarium, and the tools available to allow them to make taxonomically sound decisions on relationships. Often you encouraged them to do monographic studies, but surely to collect widely and to improve their own understanding of all fungi. Comprehending the intricacies of the International Code of Botanical Nomenclature was another important facet, often not sufficiently emphasized. Oddly enough, the lichenized fungi were often ignored, as the techniques of lichenological study became more and more difficult for the typical mycologist to follow. I, for one, never had access to any courses dealing with lichens.

CURRENT TIMES

It's time now to look at what you, the 21st century taxonomists, are doing, and why. Some of you are traveling the same road as the 19th and 20th century folks, Your tools have improved, and new tools, especially molecular tools, have taken hold as ways to learn the true relationships of the species and genera we encounter. RNA and DNA studies, as well as genetic studies, give us entirely new insights that are compelling and fascinating..

What are your goals as taxonomic mycologists in this second decade of the 21st century? You still need to dispel the frequently voiced opinion that taxonomists are like stamp collectors. Clearly you still want to know what species and genera are out there, hoping always you can catalogue the diversity we know exists. You may have been discouraged to learn that we may have only named 4 to 5% of the species "out there," and that the tropics contain the vast majority of undescribed genera, species, and even higher level ranks of taxa. Ideally you may be delighted to take on the task of finding that diversity and, if you are wise, somehow maintaining it in culture collections even as the rainforests of the Neotropics disappear so rapidly before our eyes. Latin American scientists live where the diversity is the greatest, and opportunities to study undescribed genera and species abound.

I need not discuss our many successes as taxonomic mycologists, for at a Congress such as this one, we will be hearing one success story after another. So what is this business of "Nightmares of Neotropical Ascomycete Taxonomists" that I chose as part of the title of this talk? Well, that is what I shall focus on for the rest of this talk.

TEN QUESTIONS

There are ten questions I shall pose to you as thoughts to each of which I am convinced you should be giving serious attention.

Number (1): What are our goals, and can we justify them?

As taxonomists, our delight is to collect and correctly identify the species and genera in the area of our studies, either geographically limited or a world monograph, describing, if need be, new species, new genera or even new taxa of higher rank, in an attempt to catalogue the observed diversity. We seek the truth about relationships, using any and all tools, some highly sophisticated. Perhaps our basic justification may be, simply put, that we seek the truth.

Number (2): What have we failed to do?

We have failed to produce sufficient taxonomists to work on the fungi or to garner enough financial support to do the collecting needed. Most of us realize that the task of doing a full

catalogue can never be attained, and that the number of taxonomists is rapidly shrinking, not growing.

Number (3): Can we justify our studies of often minute fungi overlooked by the majority of scientists, even mycologists?

Given that size has nothing to do with truth, but a lot do with the way we collect, we can easily justify studies of minute fungi, many under a millimeter in diameter, that we can find only if we get on our hands and knees and start leaf-turning and examination of twigs and litter with the aid of a good hand-lens.

Number (4): What is our purpose in finding new taxa?

Of course we have thus added new information. Is that what really drives us? Or do other aspects play at least a partial role in why we feel that discovery of something new and with providing it with a name is a worthy task? Do any of us deny that doing so and publishing one's discoveries play a role — in finding a job, becoming "famous," or getting tenure in academia? Let's think about how many hours we need to examine one undescribed taxon in great detail so that others who encounter it can recognize it. In declaring it as new how many hours, days and weeks have we spent comparing it with a literature often a hundred years old? How many hours have we invested in obtaining the type or authentic specimens of its possible relatives and of then spending how many hours comparing those specimens to make sure that they do not provide older names for our supposedly "new" taxon, but were merely not adequately and correctly described when named earlier, forcing us to adopt such a name or epithet because of our rules governing priority of publication? Add together all those hours and days for each purportedly new taxon for your paper, and your non-taxonomic colleagues may begin to understand why good taxonomy is so amazingly slow.

Number (5): Was C. G. Lloyd right about "advertising"?

There may be a few of you taxonomists who are not knowledgeable about one of mycology's most famous curmudgeons, Curtis Gates Lloyd. He was unusual in many ways, not the least of which was that though he had no formal training in mycology, his studies were frequently awe-inspiring. Independently wealthy, he traveled extensively, especially in Europe, Great Britain, and Scandinavia, visiting herbaria and annotating specimens. Without a degree, he and his work were frequently ignored by academicians, allowing Lloyd to come to the conclusion that the closed club of academia, and the journals that rejected his submissions, were worthy of his scorn. He began publishing papers as privately printed documents, never available by subscription, but only in return for dried specimens sent to him in exchange. He intentionally suppressed any author citation for the species he described, illustrated, and worked with, calling such author names "advertising," and transfers merely "name juggling." Do we try to find and describe new species and genera merely so that future scientists will cite our names as the first describer of that taxon, or the person who has first transferred some species from one genus to another or one rank to another? Can we really say our motives have nothing to do with "advertising" ourselves as fungal scholars? Was, indeed, C. G. Lloyd right on target when he challenged our intentions?

Number (6): Do we really need names?

Here's a somewhat unexpected —even shocking — reply from someone who has spent his lifetime convinced that what taxonomists needed to do was to provide a correct name for every fungus we have described, placing in synonymy all names not appropriate for our currently

accepted classification. We were supposed to hate identifications such as "*Helvella* sp." or "*Helvella* sp. 2," or "*Helvellaceae*?" Our herbaria and indeed the literature contain many such labels, awaiting later, more complete identification by the depositor or future students. The collecting data and presumably the adequate dried material for such future studies are preserved in a herbarium, perhaps imperfectly, but serving an important function, even without affixing a precise name.

It occurs to me that as taxonomists we are faced with a far more important goal than describing and naming specimens. It is encapsulated in the concept of saving the diversity of extant fungi—named or nameless, Is not this the time to establish one or more new foundations that will support taxonomists willing to forego teaching all the methodology of taxonomy to produce a crop of scientists like themselves? Instead I propose we teach, at least part of the time, parataxonomists. Their job will be to recognize fungi in the field and forest—not to genus, even, but as something they can possibly bring into culture. The basic idea is to get these fungi into culture collections where they can be maintained as living entities and where their genomes are not lost even though the habitats where they were collected may have been destroyed. Molecular analysis of such cultures will be the job of still others, trained DNA extractors who need no mycological training at all. All this data will be connected to a herbarium specimen number in an established herbarium, associated with a dried specimen for comparative purposes. Not a name, but a number is a possible goal.

Number (7): What about anamorphs and one name for one fungus?

My suspicion is that many of you are unaware of the Amsterdam Declaration. It is a recent document proposed by a small group of mycologists intending to solve the problem of fungi having different names for their so-called imperfect (now called anamorphic) states and the so-called perfect (now called teleomorphic) states. These problems are currently governed by Article 59 of the International Code of Botanical Nomenclature. These few mycologists are determined to either delete the whole article or to drive mycologists to erect a new Mycological Code of Nomenclature. A critical response to this Declaration has been published and co-authored by Walter Gams, Walter Jaklitsch and 77 others, myself included. It is this summer when this will all come to a boil at the International Mycological Congress in Melbourne, Australia. We are all agreed that one name for one fungus makes sense, but the problems of deciding on what names should be used are far too difficult to make a quick change in the Code, or, far worse, to plan for a new Code of Mycological Nomenclature.

Number (8): As a corollary, can we afford to spend our time tinkering with Codes of Nomenclature?

Ever since mycologists succeeded in getting an exception in the International Code of Botanical Nomenclature to allow different names for different states of a fungus (article 59 of that Code), that Article has been the most frequently modified one in the Code. My conclusion is that almost every such tinkering with the article has been a step in the wrong direction. It is amazing how much time has been wasted by mycological taxonomists on this one aspect of the Code. Botanists have bent over backwards in helping us to solve the one-name-one-fungus problem. We cannot allow anything that would drive us away from the Botanical Code where we have many, many non-mycological colleagues who have helped us not only with crafting Article 59 but also with all the other Articles in the Code. Anyone who proposes a Mycological Code as a solution completely overlooks one impossible problem: we do not have anywhere near enough mycologists to maintain and oversee all aspects of such a Code. And trying to do so would keep such mycologists from doing taxonomic work, or to pursue their duties to society.

Number (9): Who is likely to be funding our future research?

Universities and a few Museums have been the main source of funds to pay the salaries of professors, their students, their research fellows, their travels, and to provide the equipment, facilities, and chemicals for doing taxonomic research. During my lifetime the source of funding has drastically changed. The taxonomic scientist today is expected to obtain outside support for any necessary travel, for salaries for any postdoctoral research fellows, and for expensive equipment and supplies. Incredibly, it is not uncommon for a university taxonomist now to spend 30 or 40 percent of that taxonomist's time writing grant proposals. In the United States, most of those grant proposals go to either the National Science Foundation or the National Institutes of Health. All of you know or should know that both of these sources would automatically reject any proposal just to collect fungi for future study of the collections — and merely as a means to save the diversity we know exists. To discover the funding for our parataxonomic students or our parataxonomic foundations we must think outside of the box. Perhaps we must work with the devils, and convince the wealthy pharmaceutical firms that we are the best source for their future discoveries of medically useful products. If there are other sources of support, I fail at the moment to guess where that will come from.

Number (10) :Is the collapse of the Ivory Tower of Academia a dream, or a nightmare?

I am no longer a champion of academia as a haven for taxonomic studies done at the whim of an appointed professor who studies just what seems intriguing or just beautiful, or are done as a source of fame through taxonomic "advertising." The truth is that it is the Ivory Tower that has ceased to provide that climate, and has, quite unintentionally, turned to the granting agencies to make the final decisions on what research shall be done and how it shall be performed. Without grants, the professor is deemed unworthy of tenure or additional university funding. Those granting agencies, in turn, have boards of scientists who judge the value of the work, and who almost invariably insist that grantees use the most "modern" (and often expensive and time-consuming) technologies. I see that Ivory Tower collapsing before my eyes.

I do not find this to be a doomsday picture, but rather a candid view of our future in which we can find hope — by changing our focus —to pursue the holy grail of saving whatever we can of our natural diversity. Mycological taxonomists in the Neotropics can and must apply themselves to that task. Few others can or will. I see this as a moral duty, and I am convinced we have the ability to change our focus to one of serving society, and not just doing taxonomy for the admittedly sheer fun of it.

I thank you for your attention to the ramblings of an old-school taxonomist and nomenclaturalist who appears, at last — in what is surely his final sermon —to have seen the light. Thank you.