Disciplining botany: a taxonomic problem

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Summary

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This article offers historical and philosophical perspectives on the debate generated by the proposed name change of the Botanical Society of America. Historical and philosophical examination of the lives of disciplines like botany reveal a process of ordering and systematization analogous to botanical practices. The taxonomist of knowledge like the taxonomist of plants constructs categories or groupings which are provisional constructs of the disciplined "eye" of the taxonomist. The emergence of botany – a category or "branch" of knowledge – has been disciplined as such a category, and along with it has come the contentious issue of proper accurate naming of the practice. The "growth" of botany – especially in America – is examined through a re-examination of representations of the "trees of knowledge".

> *The very logical and systematic arrangement which prevails in Botanical science, has, without doubt, a tendency to induce in the mind the habit and love of order; which when once established, will operate in the minutest concerns.*
>
> Almira H. Lincoln, *Familiar lectures on botany*, 1832

> *. . . the number of real botanists is increasing in this country year by year . . .* F. C. Newcombe to Erwin Frink Smith, August 18, 1895

Background and introduction: the proposed name-change of the Botanical Society of America

American botanists recently experienced one of the most acrimonious debates in their history. Arguing that the name of their primary organization, the Botanical Society of America (B.S.A.), and its accompanying journal, *The American journal of botany*, no longer reflected the diversity and vitality of current botanical practice, some members of the society called for a name-change to alter their older image and rejuvenate their discipline and society. Instead of the older, more conventional term "botany", which emanated an "archaic odour", the newer, and more vital term of "plant biology" was suggested (see Evert, 1989, for the initial suggestion).

The call for the name change precipitated an outpouring of critical commentary in the newsletter of the society, *The plant science bulletin,* as suggestions for, or against, the name change were made. Central to the critical issues highlighted by the proposal was the problem of defining disciplinary identity, image, and allegiance to closely neighbouring disciplines. Complicating the discussion was the choice of the term "plant biology" which raised questions about the organizational relationship of

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botany to biology, a relationship of questionable reciprocity (see Bolick, 1989, for a discussion of the fate of botany in departments of biology). After a complex round of negotiations, which led to the reevaluation of their practice, their relations to other disciplines, and the rearticulation of their "mission", American botanists decided to preserve their original appellation (see Anonymous, 1991, for the final report).

With the debate now drawn to a close and with historical hindsight in place, the debate in the B.S.A. may appear to be a trivial or isolated event in one professional society's efforts to define itself. But the problem of the ordering and naming of disciplinary categories recurs every so often – across national and institutional contexts – as knowledge becomes more heterogeneous. The problem of ordering and naming, moreover, raises some fundamental questions of the problem of knowledge – epistemological in nature – that are familiar to practising taxonomists. Historical insight into the dynamics of disciplines gained from examples from the history of American botany may shed some light on why the disciplining of botany deserves constant close attention and rethinking as a persistent taxonomic problem.

The lives of disciplines

What scientists choose to call themselves, how they describe their activities, where they draw their disciplinary boundaries, and where their close affiliations lie, are all pertinent features of the lives of disciplines that few scientists to date have acknowledged explicitly. Here American botanists, who have just emerged from a serious discussion of these issues, can consider themselves at the frontiers of some sociological and cultural research, which is only just now recognizing these questions to be of fundamental epistemological importance. Botanists' critical self-reflection and "advanced" thinking in this arena comes as no great surprise, since these are also fundamental taxonomic questions, and botanists have always been sensitive representatives of taxonomic thinking. Mrs. Lincoln's thoughts in the opening quotation make this sensitivity transparently clear.

Just what a botanist is, and who counts as a botanist, and to whom, has been of concern to botanical ancestors as early as Linnaeus himself. In his *Philosophia botanica,* Linnaeus (1751) categorized botanists into two types: botanophils and true botanists. Botanophils included anatomists, gardeners, medical writers, poets and other such "lovers" of plants, while the truest of botanists appeared to be – without surprise – the taxonomists. Linnaeus's taxonomy of the profession may have functioned adequately in the eighteenth century, but it quickly became outdated by the nineteenth, a century which witnessed the efflorescence of botanical science. By the closing years of the nineteenth century proliferating botanical societies (including the B.S.A.) indicated that botanical practice had indeed become more and more heterogeneous, and increasingly defied any one simple categorical plan. Only a quick perusal through leading botanical journals points to the complexity of issues raised by the question of who counts as a botanist, and what "true" or "real" botany is all about (president's annual addresses can be especially revealing here). While it is not my intent to outline the essential features or support the notion of a "true" or "real" botanist – this would be ascribing to a typological and essentialistic way of thinking I wish to avoid – it is my intent to examine and lay bare some assumptions about the structure, the origin, and the dynamics of scientific disciplines (botanical and other) that may give some critical perspectives on the present perceptions about the organization of botanical knowledge.

Botanical metaphors and the "growth" of botanical knowledge

Views of the "growth" of knowledge, in western thinking at least, have drawn heavily on botanical metaphors. Knowledge is frequently depicted as growing in a dendritic fashion, emanating from a basal trunk which gives rise to developing shoots which in turn undergo ramification or branching. The metaphor of the "tree of knowledge", like the metaphor of the "tree of life", deeply structures ways of thinking about the world and most likely originated with human civilization itself in Mesopotamian cultures.

While trees of knowledge made some appearance in Antiquity, and in the early Modern period in the work of philosophers like Francis Bacon and Peter Ramus, it was in the Enlightenment that they began to bloom. The Philosophes' preoccupation with knowledge as a tool for human improvement, combined with the maturation and extension of taxonomic practice by the work of Linnaeus and others, was part of a historical process to reorganize and restructure existing knowledge. Thus, in keeping with the rational spirit of the Enlightenment, knowledge itself underwent systematization, as disciplines came to be represented as branches or clades in the trees of knowledge.

The systematization of knowledge was one major goal of Diderot and d'Alembert's *Encyclopédie*. In this celebrated compendium of knowledge, there stands one of the most prominent and influential trees of knowledge (see Fig. 1). Within the larger grouping of "knowledge of nature" there lie the categories of mathematics and physics (also called natural philosophy). The "mathematical branches" include all the "-ic" sciences, that is, those that came to be considered exact and precise: optics, acoustics, mechanics, etc. Within the grouping under physics (also called natural philosophy) there lie the following categories, mostly the "-logies" (with the exception of astronomy and botany), the logo-centric, language-based, descriptive sciences:

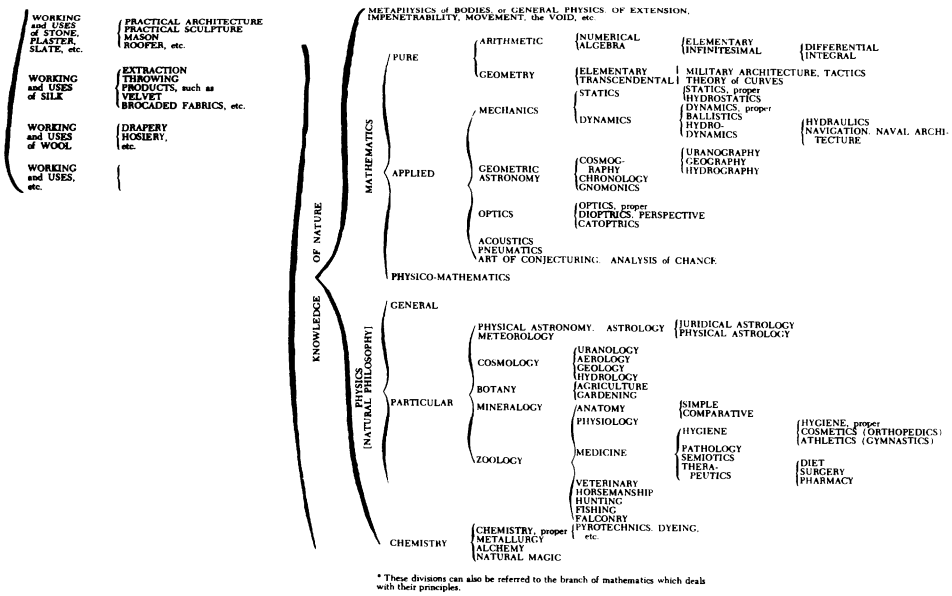

Fig. 1. Portion of Diderot & d'Alembert's system of knowledge. (From Gendzier, 1967; reproduced with his permission).

physical astronomy, astrology, meteorology; cosmology; botany; mineralogy, zoology. Botany is in turn subdivided into agriculture and gardening.

With the rise of Darwinian thinking in the nineteenth century, the trees of knowledge came to be seen in evolutionary terms. Affinities between the disciplines which had formerly been organized as inclusive sets of nested hierarchies took on ancestor/descendant (phylogenetic) relationships. Disciplines in turn came to be seen as giving rise to other disciplines in an orderly manner resembling phylogenetic patterns, so that disciplines, like biological species, underwent speciation events. In this representation, knowledge came to be seen as becoming more and more developed, refined, but also undergoing fractionation and fragmentation as it underwent specialization. The whole picture now led to diversification in types. While knowledge continued to diversify, some (though increasingly little) unity of knowledge – the cherished ideal of the German Naturphilosophen – would be preserved through the common point of origin.

The expansion and restructuring of universities especially in Germany, France, Britain, and the U.S., combined with the institutionalization of science through medical schools, museums, and through government sponsored programs, further led to the reorganization of knowledge in the nineteenth century. As textbooks – increasingly a necessity – came to represent these proliferating and ramifying branches of knowledge, the belief in the "growth of knowledge" (equated with phylogenetic trees) was rendered what contemporary philosophers term "tacit and unarticulated knowledge", i.e. knowledge that was taken for granted, part of the already received and established wisdom of the intellectual tradition. Within these textbooks, the typology of disciplines was usually discussed in the introductory chapters. Though growth metaphors often did not take on visual representation, some version of the metaphor was articulated through verbal representation. In later textbooks the selective pruning of collateral branches, further supporting the tree-like branching pattern, was reinforced through short, introductory disciplinary histories. With textbooks acting as powerful reinforcement, belief in the "growth of knowledge" and its classification into well-defined categories became one of the underlying assumptions that governed disciplinary self-perceptions (see Fig. 2; see also Wood, 1864; and Gray, 1866). [More recently, Mayr's (1982) monumental history of biology, upholds the growth metaphor and devotes a major portion of the introduction to a discussion of the "place of biology among the sciences".]

Botany's own location within biology and the "great divide" between botany and zoology within these textbooks only came into existence in the mid-decades of the nineteenth century. Only after the term "biology" was coined (in the early years of the nineteenth century), and only after the process of professionalization took place, did incipient biologists undergo the arduous but inevitable process of rethinking and renegotiating the relationship between and within the new "life" sciences, the naming of the various branches, and where their own close affinities and identities lay.

The "growth" of American botany

Botany itself underwent an extraordinary period of "transition" – as the historian Rodgers (1944) insightfully recognized – in the latter third of the nineteenth century.

Fig. 2. (opposite) The division of the sciences (from Lincoln, 1832). Mrs. Almira Lincoln's divisions of knowledge were also meant to discipline the student – in this case young women – of deeper moral and social values.

PART I.

LECTURE II.

General division of the sciences which relate to mind and matter—Different departments of Botanical Science—Parts of a flower.

THE Universe, as composed of *mind* and *matter*, gives rise to various sciences. The SUPREME BEING we believe to be *immaterial*, or *pure mind*.

The knowledge of *mind* may be considered under *two general heads*.

1. THEOLOGY,* or that science which comprehends our views of the Deity, and our duties to Him.

2. PHILOSOPHY OF THE HUMAN MIND, or, *metaphysics*,† which is the science that investigates the mind of man, and analyzes and arranges its faculties.

The knowledge of *matter*, which is included under the general term, *Physics*, may be considered under *three general heads*.

1. NATURAL PHILOSOPHY, which considers the effects of bodies acting upon each other by their mechanical powers; as their weight and motion.

2. CHEMISTRY, in which the properties, and mutual action of the elementary atoms of bodies are investigated.

3. NATURAL HISTORY, which considers the external forms and characters of objects, and arranges them in classes.

NATURAL HISTORY is divided into *three branches*.

1. ZOOLOGY,‡ which treats of animals.

2. BOTANY, which treats of plants.

3. MINERALOGY, which treats of the inorganized masses of the globe; as stones, earths, &c. GEOLOGY, which treats of minerals as they exist in masses, forming rocks, is a branch of mineralogy.

Having thus presented you with this general view of the natural sciences, we will now proceed to that department which is to be the object of your present study.

Departments in Botany.

BOTANY§ treats of the vegetable kingdom, including every

* From the Greek *Theos*, God, and *logos*, a discourse.

† From *meta*, beyond, and *phusis*, nature. This term originated with Aristotle, who, considering the study of the intellectual world as beyond that of the material world, or physics, called it *meta ta phusis*.

‡ From *zoe*, life, and *logos*, a discourse.

§ From the Greek, *botane*, an herb.

Divisions of the sciences which relate to mind—Those which relate to matter—Branches of Natural history.

In the U.S. especially, herbaria and museums expanded across the nation as the flora of the continental U.S. and protectorates was collected and catalogued. Contributing to this period of transition was the institutionalization of agricultural and horticultural practices in agricultural and medical schools, all of which led to the emergence of fields such as plant ecology, plant breeding, plant pathology, and plant physiology. New tools and technologies like the microscope, and the German import of "the new botany", added and altered features to the disciplinary map of botany so that what counted as botanical practice became vastly more textured and complex. By the close of the nineteenth century, the numbers of "real" botanists – in America at least – seemed to increase daily.

As the new generation of German-educated botanists took hold in America, moreover, the site of botanical activity began to shift to the U.S. where agricultural and horticultural practices became all the more tightly meshed with the more established systematic botany. Centers of instruction in the botanical sciences proliferated, as American universities – following the westward expansion – grew at places like Harvard, Cornell, Chicago and later on the west coast in the San Francisco Bay area (Smocovitis, 1988). Within these universities botanical practice took on its own character, and within the larger American context botany became more and more heterogeneous as it boomed. By the early years of the twentieth century the number of persons who could call themselves "botanists", and who could make a living by working with plants, had increased astronomically.

But with this sense of "growth" and diversification there also came a sense of fractionation, loss of direction, and a feeling of disunity with what increasingly was seen as the overspecialization of botanical fields. An awareness began to grow that an overdivergence of disciplines had taken place, and that botany had lost its sense of unity. At times, and to certain practitioners, there even appeared to be direct conflicts and animosities, and competition for resources at the borders of emerging or neighboring disciplines.

One such instance of friction took place between practising taxonomists and the newer experimental science of genetics just after the turn of the century. This conflict is apparent in the retirement address of the distinguished systematist of the *Gramineae*, A. S. Hitchcock, then also president of the B.S.A. Reflecting on the differences between his own older, descriptive science of taxonomy and the newer experimental genetics he wrote: "The taxonomist arrives at results not by the application of the experimental method, but by the repetition of observations. To be sure the geneticists are applying the experimental method with considerable success, but their results can have no immediate bearing on the subject under discussion. Ascertaining facts by the method of repeated observations lacks the precision and definiteness of the experimental method. The examination of hundreds of herbarium specimens, plant mummies, is not so fascinating nor so satisfying as it is to set up a piece of apparatus and see something happen. I believe this to be the chief reason why so many of our keenest minds have hesitated to join the ranks of the descriptive taxonomists, the results appearing to them in definite proportion to the time and energy spent in obtaining them" (Hitchcock, 1916: 8).

This sense of divergence in methods, disorientation in intellectual commitments, and sometimes open conflict between the subdisciplines of botany was nowhere more evident than at the premier turn-of-the-century center of botanical instruction, Harvard University. As a result of the independent endowments on behalf of botanical research, several independent institutions had been created at Harvard. By the 1930s

the institutions which contributed to botanical knowledge numbered over half a dozen and included: the Arnold Arboretum, the Botanical Garden, the Botanical Museum, the Farlow Herbarium and Library, the Gray Herbarium, Harvard Forest, the Bussey Institution, as well as the regular Biological Laboratories. Often with its own buildings, libraries, laboratories, and herbaria, each institution had at its helm an idiosyncratic director representing the interests of what had become a divided set of fiefdoms. The divisions in Harvard botany, which were not only conceptual, methodological and institutional, but personal as well, may very well have led to the demise of botany at Harvard (Morison, 1937; Smocovitis, 1988).

While not all botanists and not all of botany experienced such conflicts and competition between fields, many agreed that by the middle decades of the twentieth century botany appeared to have become an increasingly fragmented and an overspecialized discipline. Despite the growing need for integration and the dread of fractionation, journals and independent societies continued to proliferate as university departments, centers, and institutions, which supported plant research directly or indirectly, boomed. One needs only to scan the pages of the *Chronica botanica* published during the interwar period to witness the surge in botanical fields. This surge was even more apparent after the Second World War, as federal research money was channeled through not only the U.S.D.A., but also the National Science Foundation. Evaluating the growth of contemporary botanical thought McLeod & Cobley (1961) forewarned their readers of the dangers of such fragmentation: "Although it may not be possible for one individual to acquire exact factual knowledge of all botanical specializations, it is still possible, and certainly desirable, for all students of botany whether specialists or not, to make critical appraisal of the ideas current in the many advancing fronts of plant science. It is also essential, if integration of the science is to be maintained, that research in any one branch be carried out against a fully informed background of knowledge from the whole of plant science: there is a danger of botanical science becoming fractionated into a number of separate water-tight compartments – a danger which does not augur well for the continued health of Botany".

The new plant sciences – now a recognized category of research – appeared to ramify out of control as plant workers were reorganized and placed in increasingly tighter compartments within widely divergent institutional settings. By the late 1970s at an American institution like Cornell University, unusual in being an amalgam of statutory and endowed colleges, plant workers were housed not only in the obvious locales like the Department of Plant Biology and the Bailey Hortorium, but also in the departments of Ecology and Systematics, Plant Pathology, Genetics, Agronomy, Floriculture and Ornamental Horticulture, Vegetable Crops, Agricultural Engineering, Pomology, Natural Resources, Food Science, Landscape Architecture, Plant Breeding and Biometry, Soil Science, Food Science, and even Anthropology and Archaeology – not to mention the numerous extension personnel and adjunct persons associated with the Geneva Experimental Station, the Cornell Plantations, Boyce Thompson Institute for Plant Research as well as the Veterinary School.

And it would appear that the divergence continues. The present membership roster of the B.S.A. – another powerful indicator of heterogeneity – has never before claimed more diverse settings and institutional locales for its members. Even the sections within the society have increased in heterogeneity, with many members still feeling left out of a comfortable category. With so many different locales, practices, purposes, and goals it is no wonder that the B.S.A. recently underwent an identity crisis as

it reevaluated and renegotiated both its "mission" and its disciplinary identity; one could almost say that the botanical tree was long overgrown and very much in need of trimming!

Botanical metaphors from views of plant evolution

There is little doubt that the botanical sciences have become, and are becoming, more heterogeneous. New tools and technologies combined within increasingly diverse institutional sites and compartments as well as varying intellectual, economic, and aesthetic incentives fuel and sustain this heterogeneity. Heterogeneity is not the same as fractionation, or fragmentation, or even divergence, however. Only within a view of knowledge that is represented as a phylogenetic tree, so that knowledge itself appears to "grow" from a point of origin, or basal trunk, then ramify, is the belief in such divergence or fragmentation sustainable, indeed inevitable.

This picture of an increasing fragmentation or divergence of knowledge gives a misleading picture of botanical practice. Examples from the history of botany point to just as many instances of exchange and collaboration between workers and practices as there are instances of divergence and conflict. Tools, technologies, and "techniques" produced by one group or population of plant workers, possibly non-botanical, can become transported, adopted or adapted across disciplinary or sub-disciplinary boundaries to become connected and incorporated with other botanical practices. The immediate examples that come to mind include the tremendous "growth" of plant biochemistry which came shortly following the development of paper chromatography, a technology developed by chemists in the 1930s; gel electrophoresis as adapted to the study of plant evolution in the '60s and '70s; as well as the plethora of imaging devices like the scanning and transmission electron microscopes. All these "movements" and exchanges across populations, sub-disciplines or disciplines increase heterogeneity, and do not necessarily lead to fractionation or fragmentation, but may serve to bind these very same heterogeneous groups.

Nor is the relationship between and within botanical sub-disciplines necessarily so competitive or conflictual as to lead to divergence. One thinks of the great collaborations in the history of modern botany like the unlikely pairing of taxonomist Harvey Monroe Hall and plant ecologist Frederic Clements in the early 1920s. The result of this union led to the publication of their taxonomic manifesto (Hall & Clements, 1923). An even more dynamic and fruitful collaboration took place at the Carnegie Institution for Plant Biology in the 1930s. Jens Clausen, David Keck, and William Hiesey, who represented the disciplines of genetics, ecology, taxonomy and plant physiology, produced one of the most celebrated instances of team-work and fusions of botanical sub-disciplines in the history of botanical science. So productive was their union, that the names of Clausen, Keck and Hiesey have taken on almost mythic proportion in contemporary evolutionary botany.

With just these historical examples of fruitful union and exchange in mind, the conflictual and competitive view of knowledge leading to divergence and fragmentation – in my mind at least – gives a misguided if not fallacious picture of the organization of botanical knowledge (and knowledge in general). The "tree of knowledge", at least as classically depicted, is no longer a useful metaphor, since it does not represent instances of collaboration and "intellectual" introgressive hybridization. Drawing on another, more recently articulated botanical metaphor, botanical knowledge can be more accurately represented as resembling the diagram for evolution in the plant

genera *Madia* and *Layia*, found in Clausen (1951; see Fig. 3). In this diagram, species are represented as irregular "cables" composed of many intertwined strands. New strands arise through convergence and intertwining of the old strands, or through the splitting or breakage of strands. Loose ends represent defunct lines. The Clausen example represents two genera which have recently branched off from each other but are still able to connect through an occasional strand. In the verbal description of the diagram, Clausen makes it clear that the figure makes no attempt to present an overall picture of the relationships between the other 85 species of *Madiinae*, or the over 30,000 species of *Compositae*, or the rest of the plant kingdom. This complicated larger picture he leaves to the "reader's imagination". Tracing the strands upward in time, they come together to intertwine and diverge, forming aggregates or plexus-like patterns. The end result of Clausen's view is a heavily reticulating and anastomosing view of plant evolution. Any "natural groups" are based on best estimates of the degree of discontinuity based on morphology, ecology, distribution, chromosome number, and cytogenetics. Clausen's representation of plant evolution resembles more closely how we can view knowledge – as a reticulating and anastomosing and a highly convoluted process. If anything, Clausen's diagram is too neat and not sufficiently complex for the taxonomist of knowledge; the number of collateral "branches" and anastomoses in a full-blown taxonomy of knowledge would look more like Clausen's undrawn diagram left to the "readers imagination".

Any attempt to order knowledge through disciplines or branches of knowledge leads the taxonomist to construct "groups", as Clausen points out. How "natural" these groups are is highly contestable, the grouping being based on standards or

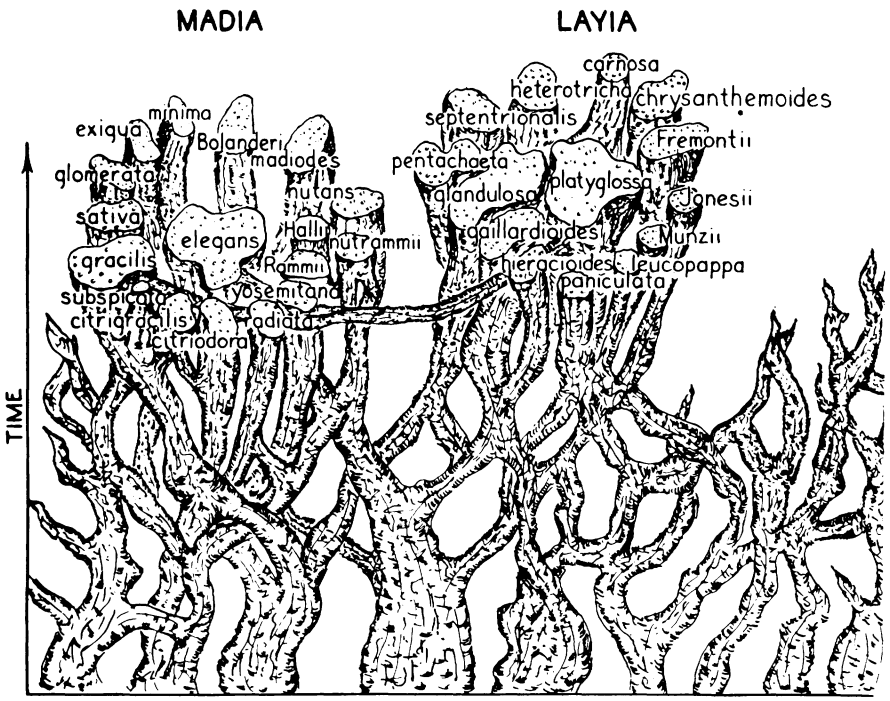

Fig. 3. Clausen's (1951) view of plant evolution in *Madia* and *Layia*.

criteria clearly constructed or fashioned by the standards of the taxonomist, the standards of the community of taxonomists, combined with the "natural constraints" of the group to be catalogued. Herein lie the problems familiar to the plant taxonomist.

The taxonomy of botanical knowledge

As categories of knowledge, disciplines like botany are really not unlike categories of plants: both pose taxonomic problems for the student of the systematization and organization of knowledge. How we choose to delineate the boundaries, where close affiliations lie, where and to what extent there are discontinuities between the groups, and which names we choose to identify membership, are precisely the same problems facing the taxonomist of the "natural" world. Whatever categories are constructed around groups are not just mechanically applied, but are persistently negotiated, highly provisional, and historically contingent. Such a view of taxonomic practice is more in line with a dynamic world in which the taxonomist – of knowledge and/or of plants – actively works at constructing a workable system.

All this discussion will most likely not catch a practising taxonomist by surprise, for taxonomy as a practice raises the deepest issues of epistemology. This sub-discipline or discipline of philosophy (depending on how one constructs the sub-categories of philosophy) can be generalized as the study of "how you know, what you know". Epistemological considerations force a deep rethinking of established and foundational patterns of thoughts. My own thoughts on epistemology and "how we know, what we know" echo the nearly lost thoughts of a much-neglected Harvard botanist, Charles Weatherby (1875-1949). In a letter to his younger botanical colleague Edgar Anderson, who requested a straight definition of genera, Weatherby eloquently replied: "It looks to me as you were trying to generalize on the assumption that there is a basic uniformity in taxonomic groups. There is nothing of the sort. Taxonomy is only a glorified guess – an attempt to construct a cross-section of lines of descent in a form intelligible to the human mind. It always contains two variable quantities – the plasticity of animate nature and the differing points of view of the people who work at it. You can generalize successfully, if at all, only by keeping these facts constantly in mind. I suspect that the situation is best expressed by the old aphorism: the only general rule is that there is no general rule. Therein lies the fascination of taxonomy for those who like it. It is not a matter of mechanically applying a universal set of categories to given groups of facts. Each group has to work out anew the method by which he may best achieve that transforming of order which is the greatest satisfaction of pure taxonomy." (Letter to Anderson, Nov. 23, 1937; Missouri Botanic Garden Archives).

Just as the taxonomist works out anew how to transform what is fundamentally a disorderly state of being into a workable order with each new taxonomic group he/she encounters, so botanists every generation or so have to perform a similar reordering to resituate themselves within the order of knowledge. Just as the taxonomist has to construct groups based on similarities and differences, so botanists have to reevaluate what keeps them together and what pulls them apart. The Botanical Society of America, just one of many botanical societies around the world that is attempting to represent an increasingly heterogeneous assemblage of practices, has just experienced a moment in its history when it has worked out once again what it is, and where it is going to "fit" within the disciplinary order of things.

Closing thoughts: the hidden meanings of botany

Recognition of the provisional nature of disciplinary categories and systems permits us to view our worlds as dynamic and what we can know about them as being provisional. Representations are just that: metaphorical depictions of the worlds we live in. Up until very recently, knowledge has been depicted as growing like a tree. The dendritic patterns of orderly branching at present not only have little relevance, but are misleading in giving a too simplistic picture of the process of knowledge production. Examples from the history of botany bring us to a view of botanical knowledge which resembles the reticulating and anastomosing pattern of plant evolution articulated by botanists like Jens Clausen in the 1950s.

Within such a view, botany can be imaged as forming a basal trunk, with branches constantly diverging, but also feeding into this main trunk. Practices feeding into the trunk can come from other disciplines closely or not so closely related to botany. The present picture of botanical practice is heavily anastomosing and reticulating, and becomes more so with time as the numbers of practitioners increase. Diversity in such a view may appear to be rampant, to the point of chaos, but unity is a possibility given the disciplining "eye" of the taxonomist of knowledge. The construction of categories around "sameness" and "difference" to lead to the transformation of order is – as Weatherby's quotation reminds us – "the greatest satisfaction of pure taxonomy".

In choosing to preserve the category and name of "botany" to redefine their identity and location, botanists evoke allegiance and preserve continuity with the main trunk. Botany, which emerged as an autonomous science in the early Modern period, has had an older history than biology, which emerged as an autonomous science only in the nineteenth century, and at least as old a history as "science" itself, which emerged in the early Modern period during the "scientific revolution". Botany has therefore stood on its own ground for at least as long as science, and much longer than biology. Evoking historical priority alone, one can therefore justify the preservation of the appellation "botany".

And there is further good reason for preserving this name. Though it is clear there are varied and divergent contemporary meanings of the term, botany says *something* about the study of plants. Uncovering the hidden meanings of "botany" – an ancient word – one finds the word "botos", Greek for herb, grass or fodder. As a study of plants, botany became an accepted practice only in the early modern period with the rise and institutionalization of taxonomic thinking. Within the choice of the term botany to describe this modern practice therefore, there lies the meaning of not only the study (analytical and systematic) of plants, but also the utilitarian, economic and more applied features of work with plants. Hidden within the modern meanings of the term "botany", one can find the scientific and systematic study of plants for their nutritive value, as economic materials, and as aesthetic objects; but also the study of plants in-and-of themselves. Whichever definition one chooses – for my historical purposes I choose the pared-down "work with plants" – disciplining botany has been, and continues to be, one formidable taxonomic problem.

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Literature cited

Anonymous, 1991. News from the society, the section and the committees. Ballot results: change article I, don't change name. *Pl. Sci. Bull.* 37(2): 2-3.

Clausen, J. 1951. *Stages in the evolution of plant species.* Cornell University, Ithaca.

Bolick, M. R. 1989. Botany departments vs. biology departments: is there a difference for Botanical Society of America members? *Pl. Sci. Bull.* 35(3): 2-3.

Evert, R. F. 1989. What's in a name? *Pl. Sci. Bull.* 35(3): 1-2.

Gendzier, S. J. (ed. & transl.), 1967. *Denis Diderot's The encyclopedia.* Harper, New York.

Gray, A. 1866. *Introduction to structural and systematic botany.* Ivison & al., New York.

Hitchcock, A. S. 1916. The scope and relations of taxonomic botany. *Science* 43: 331-342.

Lincoln (Phelps), A. H. 1832. *Familiar lectures on botany.* Huntington, Hartford.

Linnaeus, C. 1751. *Philosophia botanica.* Kiesewetter, Stockholm.

Macleod, A. & Cobley, L. S. (ed.), 1961. *Contemporary botanical thought.* Quadrangle, Chicago.

Mayr, E. 1982. *The growth of biological thought.* Belknap, Cambridge.

Morison, S. E. 1937. *Three centuries at Harvard.* Harvard University, Cambridge.

Rodgers, A. D. 1944. *American botany 1873-1892.* Princeton University, Princeton.

Smocovitis, V. B. 1988. *Botany and the evolutionary synthesis: the life and work of G. L. Stebbins jr.* Ph. D. thesis, Cornell University, Ithaca, NY.

Wood, A. 1864. *A class-book of botany*, ed. 1864. Barnes & Burr, New York.