

# The Changing Face Of Western Botany

By BARBARA ERTTER

*Adapted from a talk at the Native Plant Society of Oregon Annual Banquet, 14 May 1994, in Ashland, Oregon; dedicated to John Thomas (Tom) Howell, 1904-1994. As general references on the following history of botany in the western United States, see McKelvey (1955), Keeney (1992), Reveal (1972), and Reveal and Pringle (1993).*

Science does not occur in a vacuum, and the juxtaposition of philosophies and realities that shape the face of science undergo major shifts over extended periods of time. My original title, "The New Face of Western Botany," became "The Changing Face" when I realized that "Western Botany" has already gone through several "New Faces." The contemporary shift that first caught my attention is only the latest in a long series. Furthermore, the development of "Western Botany," intended to refer to the western United States, is rooted in the history of western civilization in general, beginning in Europe.

## Folk Taxonomy And Classical Roots

In prehistoric Europe, as in the rest of the world, the first Face of Botany, the first knowledge of plants by humans, was not a specialized branch of learning belonging only to an elite (or eccentric) intelligentsia. Rather, every member of a pre-agricultural society depended on an intimate knowledge of the local flora, for food, medicine, and a diversity of other uses. Taxonomic and floristic information were part of the essential cultural heritage of a society, amassed and transmitted orally over the span of uncounted generations. For this transmission to occur, the components of the surrounding flora needed to be labeled. The folk taxonomies resulting from this preliterate naming of plants have been studied by ethnobotanists such as Brent Berlin (1992). Those of Greece and Rome in fact provide the core of our current taxonomic nomenclature, introduced into written history by Theophrastus, the "Father of Botany."

The works of Theophrastus and the equally esteemed early Roman authority Dioscorides suffered the same fate as did those of other classical sources during the Middle Ages, becoming allegorized for their putative Christian symbolism and enshrined as immutable, unchallengeable authorities. Also parallel to other disciplines, botanical knowledge expanded during the Renaissance. The development of the printing press played a significant role, in that the beautiful herbals that had previously been laboriously hand-copied could now be more widely available. As a result, it became increasingly evident that the 600 or so plants known to classical authorities were not in fact all that existed, as had once been believed.

## Linnaean Names And Networks

Any final resistance to the heresy that different kinds of plants occurred in different parts of the world was washed away by the tidal wave of novelties arriving from distant shores. During the 250 years between Columbus and Linnaeus, the number of different plants known to European botanists in-

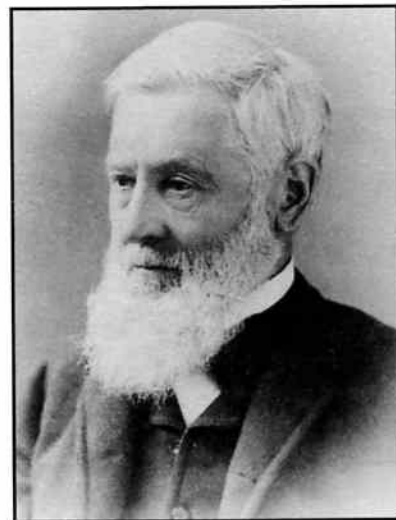
creased to nearly 10,000. Linnaeus, like his contemporaries, tried to assign each of these plants a descriptive phrase in Latin (the universal tongue used by scholars throughout Europe). However, he also provided a single-word epithet for each species in a genus. Linnaeus himself considered the resultant binomial to be a trivial nickname, of little significance, but this "trivial name" is what caught on and earned Linnaeus his own descriptive phrase, "Father of Taxonomy."

Once his fame was established, Linnaeus seldom ventured far from home, depending instead on the steady stream of novelties collected by his disciples and correspondents from around the globe. This system of an institution-based expert providing a clearinghouse for a network of field-based contributors proved to be very effective. Plant exploration requires covering vast areas, generally far from population centers, but the analysis of the resultant collections requires the resources of a major herbarium, with abundant comparative material and library facilities. The initial cataloguing of the New World flora therefore occurred as a function of travelling collectors sending specimens to the great herbaria in Europe, where the type specimens of so many common American species are located as a result.

## Establishment Of American Botany

In the decades following the American Revolution, resident botanists in the eastern United States gradually built up sufficient expertise and herbaria to declare botanical independence from European centers. The first center of American botany was, appropriately enough, Philadelphia, where American political independence had been declared.

The center shifted north in the early 1800's, triggered by the establishment by David Hosack of the Elgin Botanic Garden in New York, the first public garden in the United States. The garden itself failed (situated at the current site of Rockefeller Center, it was considered too far from New York City), but Hosack influenced Amos Eaton, a law student, to take up botany. In turn, "When he was jailed for his dealings in a troublesome land sale, Eaton taught the young son of the prison's fiscal agent his first lessons in the Linnaean method; the youngster was John Torrey" (Reveal & Pringle, 1993). Torrey (*Torreya*) ended up at Columbia College; he in turn inspired Asa Gray (*Grayia*), who founded the



Asa Gray

Courtesy Hunt Inst. of Botanical Documentation, Carnegie-Mellon Univ., Pittsburgh, PA

Gray Herbarium at Harvard University. Together, Torrey and Gray ("T. & G.") formed the clearinghouse and new voice of authority for American botany during much of the 19th century.

## Early Exploration Of Western North America

Turning finally to western North America, the pattern of increasing autonomy is continued. We tend to forget how far the West Coast was from the centers of Western civilization during this period. The Panama Canal did not exist, so the entire coast of South America was more accessible to exploration than was western North America. Even Australia was better known, by virtue of its status as a British colony. Furthermore, the United States was only a minor player during this period, having just recently come into existence as an independent nation.

The earliest collections from western North America were therefore samplings taken along the Pacific coast by European exploring expeditions, who were primarily interested in seeking profitable trade items and unclaimed lands. The first species described from the West Coast was the sand verbena, *Abronia umbellata* (Nyctaginaceae), grown from seed sent to France from California in 1786 (the ill-fated Laperouse expedition itself subsequently perished in the South Pacific). Other expeditions nibbled the coastline, such as a British surveying expedition commanded by Captain George Vancouver (*Vancouveria*) in the 1790's, which included the Scottish naturalist-surgeon Archibald Menzies (*Menziesia*, *Pseudotsuga menziesii*). The Russian presence during this period is evidenced by such eponyms as *Romanzoffia*.



Archibald Menzies

The only expedition from the United States during this early period was the one led by Meriwether Lewis (*Lewisia*) and William Clark (*Clarkia*) in 1805-1806, up the Missouri River and across the Continental Divide to the mouth of the Columbia River. The expedition was established by President Thomas Jefferson to survey the newly acquired Louisiana Territory (which Napoleon had sold in order to concentrate on European domination). By a complicated turn of events, the plants collected as part of the Lewis and Clark expedition were described not in Philadelphia, where the specimens are now housed, but in England.

The fledgling United States, however, was not in a position to follow up on any incipient claims to the West Coast,

leaving the land battle to European claimants, particularly Spain, Russia, and Great Britain. The latter's presence in the region was primarily in the form of fur-trading enterprises; British trading posts on the Columbia River provided bases for British botanical explorers, generally in the company of fur trappers and other explorers.

## Douglas And Nuttall

Undoubtedly the most significant of the botanical collectors during this period was David Douglas (Douglas-fir, *Douglasia*), from Scotland. Douglas collected plants throughout the British territories of western North America in the 1820's and 1830's. As a British subject, Douglas had access to the resources of the Hudson's Bay Company, a distinct advantage unavailable to explorers of other nationalities.



David Douglas

Douglas was part of William Jackson Hooker's network; his descriptions and names routinely appear in Lindley's *Botanical Register* ("Dougl. ex Lindl.>").

Another particularly noteworthy collector during this early period was Thomas Nuttall ("Nutt.," *Cornus nuttallii*), an Englishman working out of Philadelphia. In 1834, at the age of 48, Nuttall made the strenuous overland journey across the Rocky Mountains, in the company of Nathaniel Wyeth (*Wyethia*), a merchant from Boston who wanted to break into the lucrative fur-trading business (Wyeth built Fort Hall in what is now southern Idaho, but the venture failed when the British built Fort Boise in direct competition). While Nuttall described much of his own material, many names first appear in Torrey and Gray's *Flora of North America*.

The hazards and handicaps encountered beyond the frontiers by these early collectors were considerable, and not always appreciated by their institution-based collaborators. Douglas' relationship with his sponsor Hooker, for example, was often strained as a result. Keep in mind the limited transportation options, or the lack of medical treatment when constantly encountering grizzly bears, rattlesnakes, and other dangers. And how do you dry your collections after your boat has capsized, as happened to Nuttall? Consider also that you were likely to be trespassing into the territory of various Native Americans who might not welcome interlopers. The ameliorating factor was that the natives often treated foreign plant collectors with the same combination of respect and fear accorded to their own plant-collecting shamans and healers (or maybe just considered them "touched by spirits" and well worth leaving alone).



Courtesy Hunt Inst. of Botanical Documentation, Carnegie-Mellon Univ., Pittsburgh, PA.

Thomas Nuttall

## One Step Forward, One Step Back

The preceding and subsequent narratives may give the impression that knowledge of western botany increased in an unbroken lineage. Many of the events described certainly took place during a period when the American worldview was dominated by an unwavering faith in linear, ever-upward "Progress." As a counterpoint,

however, it is important to remember that the actual First Face of Botany in western North America, as in Europe, was composed of the diverse folk taxonomies developed by the prehistoric colonists who came across the Bering Strait thousands of years earlier. In this regard, the Great Period of Exploration was actually a period of net loss of botanical knowledge, as the indigenous cultures were decimated and their accumulated knowledge lost.

Still, it is interesting to contemplate just what aspects of Native American folk taxonomies were transmitted to any European and American botanical explorers who took advantage of interacting with the original resident "botanists." At least a few indigenous names were adopted and latinized, such as "quamash" into *Camassia quamash*. Besides nomenclature, are there perhaps more subtle concepts that were also transmitted?

## America Claims the West

After the Lewis and Clark expedition in 1805, several decades passed before the upstart United States again sent explorers to western North America. The ships of the United States Exploring Expedition, under the command of Charles Wilkes, arrived in 1841. The botanists, William Brackenridge and Charles Pickering, were able to make limited collecting trips inland, for the most part covering the same territory already gleaned by Douglas but nevertheless discovering some novelties, of which *Darlingtonia* is the most significant.

On the heels of the Wilkes expedition were three U.S.-sponsored overland expeditions in the 1840's. Numerous new species of plants were collected, among the first from the Great Basin. These were mostly described by Torrey, who had trained the leader of the expeditions, John Charles Fremont, in plant collecting techniques. Fremont (*Fremontodendron*), one of the more colorful personalities in the history of the western United States, is better known to historians as an instrumental figure in the seizure of California from Mexico, eventually becoming a Senator and a Presidential candidate.

These expeditions mark the beginning of a major transition, intertwined with the United States' vision of Manifest Destiny. In fact, the driving force behind the aforementioned expeditions was probably less a spirit of scientific inquiry than a necessary precursor for expansionism. The discovery of gold in California (including some on Fremont's property) made an already swelling tide of immigration from the eastern United States unstoppable. By the time the dust settled, the United States spanned the continent, encompassing territory formerly claimed by Great Britain, Mexico, Spain, France, and Russia (as well as that of uncounted Native Americans).

The impact of American expansionism on western botany took several forms. For a start, the sporadic collecting of disputed or unclaimed territory before 1850 gave way to a New Face, that of major government-funded expeditions surveying newly annexed lands. In addition to military surveys of recently established borders, the need to keep the newly expanded nation united spurred a series of expeditions to survey potential railroad routes. Most surveys incorporated a botanical component, though a quote from McKelvey (1955) is of interest in this regard:

"Although, over the years, the United States government had permitted plant collectors to accompany some of the expeditions which it has sent into the field, it had not approached the problem of scientific participation (botanical participation certainly) in what might be called a generous spirit. We have seen examples of this more than once. Men such as Gray and Torrey exerted pressure in Washington and, as a result, their fieldworkers were usually given military protection but scarcely more than that; even in 1849 Wright, accompanying an army contingent, was obliged to proceed on foot from San Antonio to El Paso." (p.674)

## The Dissolution Of Gray's Hegemony

Another aspect of the New Face was that specimens flowed no longer primarily to Europe, but to respected botanists at established herbaria in the eastern United States. Asa Gray's influence grew as that of his mentor Torrey waned, and for nearly 30 years Gray's hegemony dominated American botany. This, however, was already giving way to yet another New Face by the time of Gray's retirement in 1873.

Gray's successor in his herbarium at Harvard was Sereno Watson ("Wats."), who had been a botanical collector on one of the great western expeditions, that of the U.S. Geological Survey of the 40th parallel across Nevada and Utah in 1867-74, led by Clarence King. Watson, "a shy man with a checkered past" (Reveal & Pringle, 1993), showed up in King's camp in Nevada, barefoot, age 42, looking for a place in the expedition. He started as camp cook, but eventually replaced the botanist, William Bailey (*Ivesia baileyi*), who became ill (Goodale, 1893). After becoming Gray's assistant, Watson described much of the new material still flowing from the West, but he was unable to continue Gray's hegemony in the face of increasing decentralization.

Competition came from several directions. The National Herbarium, initiated with the collections from the Wilkes

expedition, had first claim to specimens collected by subsequent government-funded expeditions. As a result, several western state floras were published as *Contributions from the National Herbarium*, e.g., Washington (Piper, 1906) and Utah and Nevada (Tidestrom, 1925). The upstart New York Botanical Garden acquired Torrey's herbarium and library in 1899, claiming Torrey's former mantle with them. The Missouri Botanical Garden, founded by Henry Shaw in 1859, was ideally situated at the confluence of the Missouri and Mississippi rivers to dominate the center of the country, an opportunity well taken advantage of by botanist George Engelmann (*Picea engelmannii*).

## The West Gains Autonomy

The most significant break from Gray's hegemony, however, came from the west itself, where the population had grown to the point of supporting resident botanists. Whilst the great eastern institutions jostled to divvy up North America among themselves, autonomous centers began to develop west of the Great Plains. As early as 1853 the California Academy of Sciences was established in San Francisco by a group of gentlemen physician-scientists, with Albert Kellogg (*Kelloggia*, *Quercus kelloggii*) as primary botanist. Unfortunately, the herbarium, except for types, was destroyed in the fire following the Great San Francisco Earthquake of 1906. By coincidence, this was the same year that Louis Henderson's herbarium at the University of Idaho was likewise destroyed by fire.

The break from eastern domination was furthered when Aven Nelson ("Nels.") started the Rocky Mountain Herbarium at the University of Wyoming in 1894. In 1880 the Young Naturalists Society of Seattle founded the herbarium that would eventually find a home in the University of Washington. Albert R. Sweetser established the University of Oregon Herbarium in 1903. Other herbaria began to spring up across the country, variously allied to or independent from existing botanical centers.

## The Rise Of "The New Botany"

On a broader front, the Morrill Act of 1862 created the great system of land-grant colleges. Botany was a required subject, thereby creating a great market for aspiring botanists in the late 1800's. Land-grant colleges provided a bigger challenge than just a multitude of competing herbaria, however, in the form of academic "professionalization." At the forefront of the professionalization of botany was Charles E. Bessey (*Besseya*), a professor of botany at Iowa and Nebraska. Bessey championed "the New Botany," with the goal of creating a true science of botany, characterized by explicitly objective and experimental methodologies comparable to those being developed in other scientific disciplines. Within academia, the field blossomed as a result; where botany had once been synonymous with plant collection and classification, it now expanded to include what would become the subdisciplines of plant anatomy, physiology, genetics, and ecology.

The impact of "the New Botany" on taxonomy itself was the creation of the subdiscipline of systematics. In the broad sense, systematics can be divided into three subdivisions: basic tax-

onomy, phylogenetic relationships, and evolutionary processes (Stuessy, 1990). A primary result of efforts to make systematics more "scientific" was a shift of emphasis away from taxonomy, which was considered "merely descriptive," to the more overtly experimental subdivisions of phylogenetics and evolutionary processes. To a certain extent, this can be seen as a rebellion against the authoritative, apparently subjective, undefined methodologies in place at the turn of the century, especially when espoused by mainstream contenders fighting against or striving to reclaim Gray's hegemony.

As a result, the Academic Face of Botany has taken the form of an on-going quest for ever-more sophisticated experimental techniques offering increased precision, rigorousness, and objectivity. The first major step in this direction was actually pioneered in the West, in California, where the seminal experiments in biosystematics were carried out by Jens Clausen, William Heisey, and David Keck (1940). Cytogenetics followed, and then chemotaxonomy. Computers triggered the development of phenetics and cladistics, both pre-adapted to handle the wealth of point-data now being generated by a diversity of molecular sequencing techniques.

## An Example From California

The University of California at Berkeley is used to illustrate the development of this Academic Face of Botany (Constance, 1978), with similar chronologies occurring elsewhere in the West. Edward Lee Greene was the first professor of botany at the University of California following its establishment at Berkeley in 1868. Greene, eight years younger than Watson and 24 years younger than Gray, was at the forefront of dissidents against Gray's hegemony and eastern domination of western botany.



Edward Lee Greene

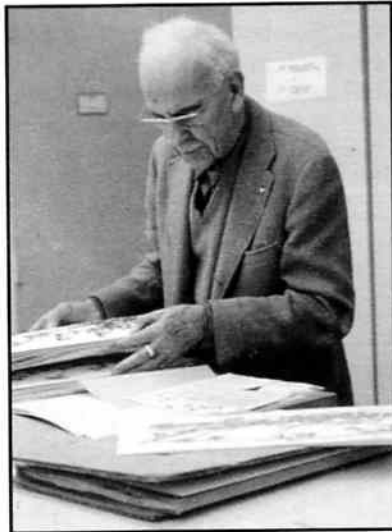
It is hard for us to appreciate the limitations under which Greene and his western contemporaries were working. Only a rudimentary library, essentially no access to type specimens of previously described species, and few other specimens other than the ones he collected himself. Greene was also operating within a very different philosophy and set of standards than are now considered the norm; for one thing, he was an avowed Creationist. He also adopted a "splitter's" strategy; when in doubt, emphasize the differences. In spite of this, McVaugh (1983) has calculated that 70 percent of the taxa described by Greene have withstood the test of time.

Green was nevertheless a primary example of the arrogant, authoritative, "it's a species because I say it is" approach to taxonomy that practically begged to be attacked, thereby in part triggering the development of "the New Botany." Ironically, Bessey, as a visiting lecturer of botany, actually antedated Greene at Berkeley.

When Greene accepted a position at Catholic University (taking his herbarium with him, which eventually ended up at Notre Dame), he was succeeded by his first student, Willis Linn Jepson (*Jepsonia*), who continued as Professor of Botany at Berkeley for over 40 years. Jepson himself represented a New Face of Western Botany, in that he was a native Westerner, with a native's love of the region extending well beyond mere professional interest.

In conjunction with his floristic focus, Jepson claimed hegemony over California, established Berkeley as a clearinghouse, and developed a network of contributors and collaborators. At the same time, however, he incorporated some of the principles of "the New Botany" into basic taxonomy, resulting in the development of the monographic style of floristic writing which is the current standard, in contrast to previous floras which were generally little more than annotated checklists. Furthermore, he emphasized plants as organisms within specific physical and biotic environments, rather than as isolated specimens (Constance, 1974).

A balance between basic taxonomy and "the New Botany" flourished at Berkeley among the students of Jepson and his successor, Lincoln Constance (*Cardamine constancei*, "Math. & Const."). A native of Eugene, Constance was a protege of Louis F. Henderson at the University of Oregon and subsequently a student of Jepson. Under Constance's guidance, the Academic Face of Botany at Berkeley took the form of in-depth monographic studies incorporating the latest experimental techniques, primarily biosystematics and cytogenetics.



BARBARA ERKTER

Lincoln Constance

## The Decline Of Taxonomy In Academia

As was the case with general botanical knowledge during the Great Period of Exploration, it would be an oversimplification to present "the New Botany" as unmitigated linear progress. The wheel that Bessey set in motion did not stop, but began to erode the status of basic taxonomy as a legitimate academic pursuit. In the West, as elsewhere, recruitments for faculty openings in plant systematics now concentrate on

expertise in computer-assisted phylogenetic analyses incorporating data from molecular sequencing, de-emphasizing floristic and basic taxonomic knowledge.

The operating assumption, that "the New Systematics" addresses everything covered by "the Old Taxonomy," has not held up. This is not because the current crop of academically successful systematists is incapable of or uninterested in basic taxonomy; often quite the opposite! But the priorities of modern systematics put a limit on how much time and resources can be devoted to time-consuming activities fundamental to basic taxonomy: botanical exploration, specimen collecting and identification, learning the local flora, and annotating herbarium specimens. New species descriptions are considered to be minor contributions, even though these represent the foundation for all other botanical knowledge. Floras are deemed unsuitable for doctoral work in systematics, and even monographs may be counterproductive in an academic environment that is geared to multiple small papers per year. Such is the Current Face of Academic Botany.

If basic taxonomy were obsolete, then its potential disappearance from mainstream academia would be a non-problem. Instead, the need for the products of basic taxonomy is at an all-time high, as the source of answers to fundamental questions involving biodiversity, extinction, and conservation biology. How, after all, can we take measures to conserve species that have not yet been discovered and studied? How do we know which ones are rare if their ranges have not been determined? How can inventories be done without up-to-date floras and monographs with which to identify the specimens? And who will provide determinations for problematic specimens if taxonomic specialists are not replaced in kind?

Who, then, is doing basic taxonomy, who is writing the floras, discovering the new species, carrying out the inventories, and identifying the specimens, if these activities are no longer considered proper activities for the Academic Face of Botany? The answer is that academia is only one facet of the "Changing Face of Botany" theme, and it is outside of mainstream academic systematics that basic taxonomy is not only alive, but flourishing.

## The Professionalization Of Botany

The seeds for the development of this alternate Face of Western Botany beyond academia are well described by Keeney (1992) in *The Botanizers*:

"Until the late 1870s American botanists, professional and amateur alike, were overwhelmingly dedicated to taxonomy... When, in the fourth quarter of the nineteenth century, the vast majority of professionals turned from natural history to biology, amateurs found that natural history, which at first had aligned them with the mainstream of professionals, now separated them from it..." (p. 148)

"Unlike field botany, the New Botany required specialized training and equipment, making it inaccessible to many amateurs. Professionals used the New Botany to institutionalize and to develop professional autonomy..."

Professionals perceived the new approach as giving botany 'greater scientific authority,' which in part meant that it placed the science firmly in the grasp of professionals. Only professionals had the expertise to execute the New Botany, and certainly only they could judge it." (p. 128)

"This was not simply a case of professionals cutting amateurs out of the action: amateurs generally found the New Botany unappealing... Seen through the eyes of professionals, amateur botany had failed to adjust to professionalization and the modernization of botany. The view from the botanizers' perspective tells a different story... Botanizing met the twentieth century on its own terms as a thriving hobby outside the view of science." (pp. 133-134)

How well does the rift between professionals and amateurs described in *The Botanizers* describe a Face of Western Botany? In general, most of botany (or plant sciences, the term preferred by non-taxonomists) has indeed securely become the province of professional academia, and much of systematics has followed suit. Articles such as "A chloroplast DNA phylogeny of the Caryophyllales based on structural and inverted repeat restriction site variation" [Syst. Bot. 19:235] are generally of little interest to the uninitiated. Simultaneously, botanizing had indeed flourished outside of academia, in the form of numerous native plant societies and conservation organizations. The Native Plant Society of Oregon is an excellent example, as are the Heritage programs established in various state departments by The Nature Conservancy.

At least in the West, however, the schism is neither as well-defined nor the situation as straight-forward as described in *The Botanizers*. The readership of *Kalmiopsis* is vivid proof of that, including individuals who are both academic botanists and active members of the Native Plant Society of Oregon. The key lies in two additional Faces of Western Botany in the 20th Century. First, the flora of western North America was far from being fully explored at the time that "the New Botany" was being promoted. Second, "professional" and "academic" are no longer synonymous, and the growing number of professional botanists outside of academia are an increasingly significant Face of Botany in their own right.

## The Search Continues

One factor potentially contributing to the shift away from basic taxonomy is the fact that Charles Bessey and many other champions of "the New Botany" were situated in the Midwest, where the taxonomy had already been pretty well worked out. Bessey himself spent much of his career in Iowa, where the tongue-in-cheek "Key to the Flora of Iowa" supposedly goes: "Plants green — corn. If not corn, you're not in Iowa."

Be that as it may, basic plant taxonomy has remained a fruitful field in the western United States, as noted by Constance (1964):

"Many otherwise informed persons assume that the exploratory phase of botany is essentially complete; this assumption is, of course, an entirely erroneous one."

While the truth of this statement is generally accepted for the distant tropics, its relevance to western botany is less well appreciated. Nevertheless, as calculated by Shevock and Taylor (1987; updated by Taylor, pers. comm.), an average of ten new plants per year have been described from California for the last several decades; a similar trend could probably be calculated for Oregon and other western states. As a result, for most of this century, exploratory taxonomy and floristic studies have continued to play a prominent role in western botany alongside the flourishing of "the New Botany."

## The Heirs Of The Botanizers

Increasingly, however, the exploratory taxonomy and floristic studies have been done not by the professionals in academia, but by the heirs of the botanizers. Jepson cultivated some of these botanizers as part of his network, as did curators at herbaria elsewhere in the West. California Academy of Sciences in particular provided a fertile ground for the continued taxonomic contributions of amateurs. An incipient tradition was brought to fruition by Alice Eastwood, grand dame of botany at the Academy during the first half of this century. Under her guidance, devoted amateurs comprising the California Botany Club learned the local flora, brought in specimens from around the state, and provided a support group for herbarium curation.



Alice Eastwood

What Eastwood began, her assistant John Thomas Howell energetically continued. Following a model established by Howell, most of the county floras that have appeared in California during the last half century have been compiled by members of the Club. Even during this last decade, when Howell's health prevented much attention to his own research, he continued to provide inspiration for the California Botany club. Among other collaborative projects involving amateurs spearheaded by Howell was "Base Camp Botany," a series of collecting trips to the High Sierra under the aegis of the Sierra Club. The last trips in this series were overseen by Peter Raven, who first came under the tutelage of Eastwood and Howell at the tender age of nine (Raven, 1995), and who subsequently, as Director of the Missouri Botanical Garden, has become one of botany's leading spokesmen.

The heirs of the botanizers include more than talented amateurs and incipient academic botanists, however, an increasingly significant Face of Western Botany is that of the non-academic professional. This Face has resulted at least in part because nature-study did not remain merely a hobby, but instead provided one of the nuclei from which the environmental movement arose. As a result, there are now more botanists in the western United States working for various federal and state government agencies than there are in academic positions. Nor should one overlook the increasing number of botanists employed by the private sector, primarily environmental consulting firms. As one consequence, new plant species in the West are now as likely, perhaps more likely, to be described by agency botanists, environmental consultants, horticulturalists, and native plant enthusiasts as by academic botanists.

### The Jepson Manual Example

Even within academia the dichotomy between "professional" and "botanizer" is not clear-cut, such that much of the basic taxonomy still being done under the aegis of academia has personal satisfaction rather than professional advancement as a reward. Take, for example, one of the most recent floristic efforts, the new *Jepson Manual* (Hickman, 1993). For background, the terms of Jepson's endowment to the University of California stipulated that his original manual (Jepson, 1925) be updated, and his multi-volume *Flora of California* be completed. For the reasons previously discussed, the activities necessary to meet these terms were not compatible with professional advancement, so neither *Manual* nor *Flora* were priority items for endowment-funded curators.

Only when the previous curator, Lawrence R. Heckard (a Washington native who majored in horticulture at Oregon State University prior to pursuing doctoral studies with Constance at Berkeley), took a cut in his own salary to provide seed money for funding-raising efforts, was the new *Jepson Manual* project initiated. The project was subsequently spearheaded by James C. Hickman, whose doctoral work at the University of Oregon had focused on plant ecology and taxonomy in the Cascades. Mainstream funding (i.e., from the National Science Foundation) was obtained only at the tail-end of the project; most funding came from a diversity of alternate sources.

Furthermore, funding primarily provided only for the infrastructure, the editing and coordinating of the output of the nearly 200 unpaid contributors who provided the bulk of the actual text. As a rough calculation, only about half of the contributors were faculty or research staff at colleges and museums, and this is including retirees, non-systematists, and faculty at colleges too small to have a decent herbarium. The remainder consisted of non-academic staff, consultants, agency botanists, students, and other miscellaneous contributors, all of whom prepared treatments in their spare time (as, for that matter, did many of the faculty and research staff). This is the same pool on which other floristic projects currently depend, including the Oregon Flora Project.

### Separating The Tool From The Trade

On the one hand, this way of doing floras provides a wonderful outlet for a diversity of taxonomically talented individuals outside of the academic systematic mainstream. On the other hand, it illustrates a system that depends on a fragile network that contains some potentially weak links. One obvious weak link is the heavy reliance on emeriti, retired professors from the monographic era who are not being replaced in kind. No incipient umbel expert is in line to replace Lincoln Constance, for example.

Another problem is that active taxonomists are being separated from the primary tool for doing taxonomy, the herbarium. In a very real sense a major herbarium, with associated library, is a fully equipped laboratory for doing basic taxonomic and floristic research. However, the best university-based herbaria are generally at the same institutions that are the forefront of "the New Systematics," while the small colleges that could otherwise provide a refuge for basic taxonomy generally have limited herbaria and library facilities, in addition to restricted research opportunities. This situation is exacerbated when major herbaria are combined, as happened with the recent transfer of the University of Oregon herbarium to Oregon State University. As a result, botanists in the Eugene area must now travel to Corvallis in order to undertake critical taxonomic research.

This separation of tool and research occurs even within an institution, where activities that were formerly considered the province of taxonomists are now often fragmented among departments of geography, ecology, and resource management. The herbaria, meanwhile, remain with the mainstream systematists, even when they are primarily involved in laboratory-intensive research and have limited curatorial interest or experience. Is it any wonder that herbaria are having trouble justifying their continued existence?

### The Developing New Face Of Western Botany

In spite of these and other difficulties, I find room to hope. Taxonomy is not dead; on the contrary, it is alive and well, but *outside* of mainstream academic systematics, among the heirs of the botanizers. In fact, I have come to believe that we are in the midst of developing a New Face of Western Botany, a change as fundamental as that triggered by "the New Botany," that of a collaborative partnership between academia, non-academic professionals, and dedicated amateurs. Many NPSO members are already involved in this kind of collaboration, such as for the Oregon Flora project.

A prime example of the partnership in action is provided by the Shasta snow-wreath, *Neviusia cliftonii* (Rosaceae). The discovery and publication involved two botanical consultants, a forest service botanist, and a university-based taxonomist in a non-research position. A year after the discovery, the word was spread that anyone wanting to assist in the search for new populations should congregate at a group campground that had been reserved by the local forest service botanist, former Oregonian Julie Kierstead Nelson. The forest service also provided a boat to ferry some participants across Shasta Lake.

Nearly 50 botanists showed up, mostly agency botanists and consultants on their own time. As a result, five more populations were found, bringing the total currently known to eight (Shevock, 1993). Several participants were from Oregon, who hoped next to search for outlying populations in the limestones of southwestern Oregon.

This kind of project provides a model for future programs, particularly those related to major biological inventory efforts as originally envisioned under the National Biological Service. To bring the necessary partnership to full fruition, however, the dispersed pieces of taxonomy need to be tied together, with a sharing of resources, a free flow of information, and a coordination of efforts. To accomplish this, we first need to realistically determine where the necessary expertise and resources are, both within and outside of academia. The next step is to strengthen the weak links and compensate for any missing pieces. Finally, the components need to be woven together into a mutually rewarding system. The challenge is daunting, but invigorating, and we all have a part to play in the Ever-Changing Face of Western Botany.

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