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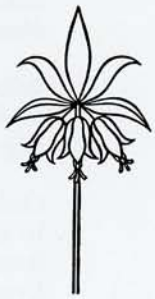

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Botanical explorations in Washington, Oregon, California and adjacent regions

John H. Thomas

SINCE THE ADVENT of European man on the North American Continent in the 15th century, knowledge of the kinds of New World plants accumulated slowly. In the west, however, until near the end of the 18th century, this knowledge was what might be called anecdotal (see for example, Simpson, 1961). Accounts of plants were intermingled with descriptions of landscape, people, and customs, or were mainly medicinal accounts.

The Spanish soldiers, clergy, and settlers, the first Europeans in western North America, came not to learn about the wonders of a new land, but to convert the Heathen, accumulate wealth, and expand the Empire. The Spanish contributions through almost three centuries was minimal in comparison to that of other nations. Pennell (1945) has summarized early botanical exploration in the Latin parts of North America.

The history of western botanical exploration can be divided into three phases: (1) exploration by European expeditions and collectors; (2) exploration by the United States government or eastern institutions; and (3) exploration by resident botanists. These three phases are certainly not mutually exclusive, but in general, foreign explorations had ceased by about 1850. The second phase occupied much of the 19th century, starting with the explorations of Lewis and Clark. The third phase had its origin about 1850 and has continued until the present. There are, of course, other ways of dividing botanical history as Rydberg (1907) has done.

In this paper, I will concentrate most heavily on the third phase. The history up to 1850 has been thoroughly covered and documented by McKelvey (1955) in her masterful *Botanical exploration of the Trans-Mississippi West, 1790-1850*, and to a lesser extent by others including Alden and Ift (1943), Dupree (1959), Eastwood (1939), Ewan (1955), Graustein (1967), McClintock (1967), and Rogers (1942).

Any historical account must be limited in scope, length, and detail, a necessity that pleases the author no more than the reader. I hope to be pardoned for what may seem to others to be omissions, lack of comprehension in some areas, particular emphasis, or organization. One omission is the very large group of botanical collectors and explorers who worked with non-vascular plants. This present account deals with the botanical explorations as they concern vascular plants — ferns, fern allies, gymnosperms, and the flowering plants. Many collectors, especially in earlier days, collected voraciously, not limiting themselves to one or several

taxonomic groups as is increasingly the case today. The primary emphasis in this account is the three Pacific States of the United States, Washington, Oregon, and California. For the most part it has been in these western states that the best botanical work has been done. In the Appendix, references are given to major papers dealing with exploration in the other states from the Rocky Mountains westward and in adjacent Canada and Mexico.

Thousands of individuals have collected vascular plants in the Pacific States at one time or another. Some were freelance collectors who made their livelihood in this way; others were professionals of one sort or another, for whom collecting was only one phase of their work; still others were amateurs who enjoyed botanical exploration as a hobby or avocation, often amassing large and valuable collections; and yet others collected as part of course work during a portion of their schooling. All have made a contribution, but few can be mentioned in a brief account.

The great days of mass collecting of vascular plants in the Pacific States, and indeed in the West as a whole, are over and it is interesting to note that at present there are relatively few large-scale and organized collecting activities going on. Increasingly, too, the problem of adequate storage and care for the large western collections we already have here must be met realistically and independent of emotional ties to the past. Some areas are better known than others. The eventual preparation and publication of *Flora North America* (Shetler, 1966) will do a great deal to unify our knowledge and indicate the areas in most need of selected, additional, and critical exploration.

Increasingly, in the West and in the Pacific States in particular, man's population increase and resultant effects upon the environment are changing the composition of plant communities, exterminating many over thousands of square miles, and causing many species to become extinct or very restricted in range. At the present rate of population increase, we will have precious little left of our native vegetation. Perhaps professional botanists, whether systematists, ecologists, or physiologists, should become more concerned about the basic ingredient of their profession — living plants in natural populations!

FOREIGN EXPLORATIONS IN AND ALONG THE PACIFIC COAST

Several European nations, most importantly Great Britain, France, Russia, and Spain sent expeditions to, or established commercial and military enterprises on what are now the Pacific States of the United States (Wash-

ington, Oregon, and California) during the period starting in 1791 and extending beyond the middle of the 19th century. Botanists or men trained in natural history from the British Isles, or in the employ of the British, very clearly did the largest share of botanical exploration during this period.

To the French, however, belongs the honor of the first scientific collection of plants from the Pacific Coast. In September of 1786, Jean-Nicolas Collignon, a member of the La Perouse expedition, spent 10 days at Monterey. Although the expedition met a disastrous end in 1788 in the Solomon Islands, brief accounts of the vegetation of Monterey and at least two packets of seeds eventually reached Europe. From one packet Lamarck described *Abronia umbellata*, a member of the Nyctaginaceae. It is the first plant described, other than anecdotally, from west of the Mississippi River.

Probably because of Napoleon's European misadventures, no other French naturalist seems to have visited this region until 1828. Paolo Emilio Botta, a member of Duhaut-Cilly's expedition around the world, 1826-1829, visited several ports from Fort Ross to San Diego during 1827 and 1828. This expedition was sponsored by French merchants who hoped to expand their trade opportunities in the Pacific and elsewhere. Botta was a naturalist making collections for the Paris Museum of Natural History. His collections were confined to coastal plants and his contribution to zoology was greater than that to botany.

Spain, as indicated above, sponsored very little botanical work of a scientific nature. But in 1791 a Spanish expedition under the command of Malaspina (Cutter, 1960), visited Monterey from September 13-23. Aboard was Thaddeus Haenke, a Bohemian and a Doctor of Philosophy from Prague. Haenke's collections, most of them made in the vicinity of Monterey, eventually were described by K. B. Presl in *Reliquiae Haenkeanae*, published between 1825 and 1835 (Barneby, 1963a; Hulten, 1940).

Russian interests in western North America were not primarily scientific. Had they been, and had Russia undertaken more detailed explorations, she might not have been so willing to sell Alaska and relinquish her colonies. Despite this, however, the collecting activities of several men added greatly to the early knowledge of western plants. The first of these was Georg Heinrich von Langsdorff, surgeon and naturalist of the von Krusenstern expedition, who was in San Francisco and environs in 1806. His collections were meager.

In 1816, the *Rurick*, a Russian ship under the command of Otto von Kotzebue, and carrying two naturalists, Adelbert von Chamisso and Johann Friederich Eschscholz (Fig. 2; Jepson, 1929b) visited San Francisco

Fig. 2. Dr. Johann Friederich Eschscholz
(Frontispiece, *Madroño*, Vol. 1, 1916-1929, by permission.)

Bay during the month of October (Lincoln, 1966). Most of Chamisso and Eschscholz's collections were made in what is now San Francisco and have been listed by Mahr (1932) and Eastwood (1944). The most notable plant described from these collections is the California poppy, *Eschscholzia californica*. Eschscholz was in California again for two months in the fall of 1824 on the ship *Predpriatie*. This time Eschscholz was able to travel beyond the confines of the San Francisco peninsula. From his collections he described a number of new species in 1826.

In October and November of 1837, the French ship, *Venus*, visited Monterey for about a month (Howell, 1935). At least one botanical collection was made by Du Petit-Thouars, the commander of the *Venus*. Perhaps others were made; the archives of France are a storehouse of stored-up treasures! What we now know as *Hemizonia corymbosa*, a member of the Compositae, long thought to be an endemic of the Galapagos Islands through sloppy bookkeeping, was collected along the Monterey coast, probably by Du Petit-Thouars himself.

From the Russian outpost at Fort Ross, about 60 miles northward along the coast from San Francisco, seeds and specimens were sent to Saint Petersburg by such men as Baron Ferdinand Petrovitch Wrangel and I. G. Vosnesensky and probably by others. Wrangel, better known as a governor of the Russian territories in North America, spent several years at Fort Ross from 1829 on. I. G. Vosnesensky was at Fort Ross in 1840-1841. He was a curator in the Zoological Museum in Saint Petersburg. Unfortunately, his California collections were overlooked for many years and not identified until about a century later. It is interesting to speculate what the course of nomenclature might have been for a number of California plants had

Vosnesensky's collection been examined in the 1840's. Many of Wrangel's collections were described by Fischer and Meyer. An example is what is now known as *Plectritis congesta* (Lindl.) DC. ssp. *brachystemon* (Fischer & Meyer) Morey, based on a Wrangel specimen collected in 1834, "propre colonium Ross in California."

BOTANICAL COLLECTORS FROM THE BRITISH ISLES

Although Sir Francis Drake explored the west coast of North America during the latter half of the 16th century, he brought back little in the way of plant material (Eastwood, 1939). It was not until over two centuries later that Archibald Menzies (Fig. 3), a member of George Vancouver's expedition of 1791-1795, visited the Puget Sound region, collecting at several points along the coast of what is now northern California, San Francisco, Monterey Bay, Santa Barbara, and San Diego. Menzies was the surgeon-naturalist of the expedition aboard the *Discovery*. Menzies' specimens are now at Kew, the British Museum (Natural History), and elsewhere (Gray, 1840). A number of new species were described from Menzies' collections by Pursh in his *Flora americae septentrionalis* (1814).

Dr. John Scouler (Lange, 1956), a physician and naturalist, and a friend of David Douglas, spent from April through October of 1825 in the Pacific Northwest. Scouler collected from Fort Vancouver, on the Columbia River, northward to Nootka Sound. His specimens were examined and published upon by W. D. Hooker.

Of all the early 19th century western botanical collectors, the name of David Douglas (Fig. 4; Dunn, 1956; Griffin, 1964; Lange, 1956; 1958; Young and Young, 1966) stands out not only as one of the most important and

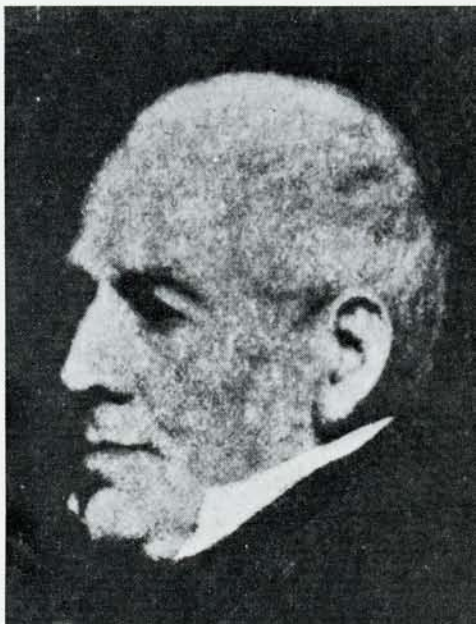

Fig. 3. Archibald Menzies
(From the *Occasional Papers of the California Academy of Sciences*, No. 10, 1943, by permission.)

Fig. 4. David Douglas
(Frontispiece, *Douglas of the Fir*, by A. G. Harvey, Harvard University Press, 1947, by permission.)

prominent, but also certainly as one of the most romantic. Douglas was trained as a gardener and came to the attention of Hooker at Glasgow. On Hooker's recommendation, Douglas made his first trip to America under the auspices of the London Horticultural Society. From 1825-1827, Douglas traversed much, for his days, of what is now Washington, Oregon, and southern British Columbia. He did so again during the period 1830-1834 and also spent some 20 months in California. Between his two expeditions, Douglas returned to Great Britain via the difficult overland route that included Hudson's Bay.

Many of his specimens were described as new species by John Lindley. Not only did Douglas collect specimens and seeds, but he introduced many western plants into cultivation in Europe. His death in the Hawaiian Islands in 1834 ended what might have been the most prolific collecting career of any botanist in western North America.

Alexander Collie was the surgeon on one of Captain Beechey's voyages and was in California in 1826 and 1827. Tradescant Lay was the naturalist of the voyage, but he remained in the Hawaiian Islands when the voyage ship, *Blossom*, visited California in 1826. The specimens that Collie and Lay collected came mainly from San Francisco and Monterey and were published upon by Hooker and Arnott in their *The botany of Captain Beechey's voyage* (1830-1841).

Dr. Thomas Coulter (Anon., 1952a; Brewer, 1880; Coulter, 1951), an Irishman and naturalist, was employed as a doctor with a mining company in Sonora, Mexico, from 1829-1831. In 1831 he went to Monterey where he met and collaborated with David Douglas. Coulter travelled southward to San Diego and thence across the deserts to Arizona. His collections were in

excess of 50,000 specimens and of them Coville wrote (1895): "His collections were very large, and their enumeration, had it been published as a single report, would have formed probably the most valuable contribution to North American botany ever issued . . ." Coulter's collections are at Trinity College, Dublin, where he served as a curator for many years.

Dr. William Frazer Tolmie was employed by the Hudson's Bay Company in the Pacific Northwest, serving at various forts from 1833-1841. In 1841 he returned to England via the overland route and Hudson's Bay. He returned to America in 1846 and remained until his death in 1868. Tolmie's collections reached Hooker who distributed many of them, some reaching Torrey and Gray. Tolmie was the first botanist to climb Mt. Rainier. A number of the specimens communicated to Hooker by Tolmie were actually collected by a fur trader, by the name of John McLeod.

Another Hudson's Bay Company physician was Dr. Meredith Gairdner. He collected in the vicinity of Fort Vancouver from 1833 to 1835. His specimens are at Kew.

Richard Brinsley Hinds was aboard the English survey ship *Sulphur*, as surgeon, and George Barclay (Raven, 1964) was the collector sent out by the Royal Botanical Garden at Kew. The *Sulphur* was under the command of Edward Belcher. Hinds and Barclay were in California in 1837 and 1839 and at Fort Vancouver in 1839. Hinds was one of the first collectors to travel far inland from San Francisco, and he did reach the lower reaches of the Sacramento River. The botany of the voyage was published by George Bentham as *The botany of the voyage of H.M.S. Sulphur* (1844-1846). Hinds and Barclay made additional important collections in hitherto unvisited parts of Baja California.

Charles A. Geyer was a free-lance botanist, a German by birth, and a western collector of note. He collected extensively in the Pacific Northwest in 1843-1844. Many of his earlier collections from North America went to Torrey, Gray, and Engelmann, but his Pacific Coast ones went to Hooker who published upon them over the years 1847 through 1856. The extent of Geyer's movements in the 1840's in the Pacific Northwest were a clear indication of how rapidly inroads were being made into the area.

Joseph Burke (Beattie, 1956; Ewan, 1967) collected extensively in much of what is now Washington and Oregon from 1844 to 1846. He was under the patronage of W. J. Hooker and the Hudson's Bay Company. Despite his extensive collections, the specimens received little attention upon arrival in England.

Another explorer sent out to get potentially useful horticultural plants and specimens was Karl Theodor Hartweg (Anon., 1935; Eastwood, 1911). He

spent some 20 months in California in the years 1846-1848. His explorations were sponsored by the London Horticultural Society. He visited many of the easily accessible places, such as Monterey and San Francisco, but was the pioneer botanist of the Sacramento Valley and portions of the Sierra Nevada of California. His collections were reported upon in George Bentham's *Plantae Hartwegianae* (1839-1857).

William Lobb (Eastwood, 1911b) was in California and Oregon from 1849 to 1853 under the auspices of the English nurseryman William Veitch to collect seeds, bulbs, and specimens. Rather the most noteworthy of the material he sent to England was what Lindley described as *Wellingtonia gigantea* (1853) and what we know now as *Sequoiadendron giganteum* (Lindley) Buchholz, the giant redwood, one of the truly remarkable trees of the world.

John Jeffrey, a Scottish botanist, whose name is commemorated in one of the largest of western pines, *Pinus jeffreyi*, was sent to America by a group of Scottish horticulturists who called themselves the Oregon Botanical Association (Coville, 1897; Hughes, 1939; Johnston, 1939). Jeffrey collected extensively but his specimens had less impact on the development of botany in western North America than their number would suggest. He collected in Oregon and northern California, 1851-1853.

Thomas Bridges (Dall, 1866; Barneby, 1963b; Jepson, 1933b; Johnston, 1928; Stearns, 1887), an Englishman and an early South American explorer and collector lived in central California from 1856 until 1865. He collected widely in much of California, sending his specimens to Hooker. Bridges was aware of the California Academy of Sciences, but apparently preferred working with European botanists rather than with local ones. After his death his remaining collections were given to the Smithsonian Institution.

Davis Lyall (Blankinship, 1904; Hughes, 1939; Piper, 1906; Muenscher, 1941), a native of Scotland, was the botanist on the British Columbia Boundary Commission from 1858-1861. He collected as far south as the Columbia River and eastward into Montana. His collections are at Kew and some are in the Gray Herbarium.

EXPLORATION FROM EASTERN NORTH AMERICA

For much of the 19th century, periodic exploring and survey expeditions were sent westward by the United States Government. Some of these were geological surveys, some were boundary surveys, some were railway route surveys, and others were military expeditions (Goetzmann, 1959). On most of them botanical collections were made, often by the surgeon of the party.

As the century progressed, trained naturalists, botanists, or professional collectors increasingly were involved in exploring the west.

Although the foreign explorations often produced many "new species" in proportion to the total size of collections, it was the American expeditions and surveys that filled in the many gaps not only in the knowledge of the kinds of plants, but in their ranges. By 1900, in general, the flora of the west and in particular that of the Pacific States was relatively well known.

The first exploration from the east is the well-known expedition of Meriweather Lewis and William Clark (Allen, 1957; De Voto, 1953; Jackson, 1962; Orr, 1949; Rudd, 1954). They went from Saint Louis to the mouth of the Columbia River on the Pacific Coast and back from May, 1804, through September, 1806, to explore the Louisiana Territory. Their plant collections, while not large, and made under not the most ideal of circumstances, were described by Frederic Pursh in his *Flora americae septentrionalis* (1814).

Nathaniel Wyeth, a Boston fur trader, travelled to the Pacific Northwest in 1833 and made a small collection of plants which he placed in Thomas Nuttall's hands. In the following year Nuttall (Fig. 5; Graustein, 1967; Jepson, 1934b; Lange, 1956; Smith and Thieret, 1959; Stuckey, 1968), accompanied by Wyeth, travelled from Saint Louis to the mouth of the Columbia and then along the California coast in 1836 (Coville, 1899; Higgins, 1959). Nuttall was for many years a Harvard faculty member and his interesting life story has been recorded in great detail recently by Graustein (1967).

William Gambel (Beidleman, 1958), better known to historians as an ornithologist than as a botanist, collected plants in various parts of southern California from 1841 through 1849. He travelled overland from Santa Fe to Los Angeles. His collections came from such localities as San Diego, Santa Barbara, Catalina Island, and from near Monterey and many were described as new by Nuttall (1848).

Fig. 5. Thomas Nuttall
(Frontispiece, *Madroño*, Vol. 2, 1930-1934, by permission.)

Between 1838 and 1842 the United States Government sent out an exploring expedition under the command of Commander Charles Wilkes of the Navy. The purpose was to survey the South Seas and the Pacific Coast. Two naturalists were attached to the expedition: William D. Brackenridge (Eastwood, 1945) and Dr. Charles Pickering (Gray, 1878). They visited the Pacific States during 1841, eventually going from Washington to California. Their collections are in the Smithsonian Institution and were critically examined by Torrey (1874).

John Charles Fremont (Fig. 6; Bashford and Wagner, 1927; Ewan, 1950; Fremont, 1956; Gianella, 1959; Gudde and Gudde, 1958; Hafen and Hafen, 1960; Parish, 1908; Parkhurst, 1959; Reifschneider, 1964), one of the most colorful of western explorers and adventurers, was the leader of several exploring and surveying expeditions for the Federal Government from 1842-1849. He collected plants as the opportunity presented itself. These were published upon by Torrey in his *Plantae Fremontianae* (1853).

A missionary, who sent his collections to Gray, Henry Harman Spaulding, collected in Idaho and eastern Oregon in 1843.

Norman Bestor (Brewer, 1880; Higgins, 1959) travelled from Santa Fe to San Diego in 1846 with Lt. W. H. Emory's expedition. Bestor's collections, often attributed to Emory, eventually reached Torrey's hands.

Dr. Charles Christopher Parry (Ewan, 1950; Jaeger, 1953; Jones, 1930c; Parish, 1909; Wright, 1961), better known as a Rocky Mountain collector, served as the botanist of the United States and Mexican Boundary Survey from 1849 through 1852. This survey was under the command of Lt. William Hemsley Emory, a seasoned western military leader. Parry collected extensively from California to Texas and northward in California to Monterey. The botany of the survey was published in 1859, the main part being by

Fig. 6. John Charles Fremont, in 1844
(From *Trail & Timberline*, Vol. 291, March 1943, by permission.)

Torrey. Parry collected again in California in 1876 and for some years after spent his winters in California.

Arthur Carl Victor Schott (Brewer, 1880; Higgins, 1959; Standley, 1920-1926) was attached to the Boundary Survey in 1851 and collected in southern California.

Another Boundary Survey botanist was Dr. George Thurber (Ewan, 1950; Woodward, 1936) who was in California in 1851 and 1852. Gray published on his collections under the title of *Plantae novae Thurberianae* (1855).

From 1853 through 1855 a series of surveys designed to explore railroad routes west of the Mississippi River were organized by the War Department. The results of the botanical activities associated with them, commonly known as "The Pacific Railroad Reports," were published by the leading eastern botanists of the day and have been summarized by Johnston (1943). Not all the Railroad Surveys reached the Pacific Coast.

John Strong Newberry (Britton, 1893; Gillett, Howell, and Leschke, 1961; Higgins, 1959; Hughes, 1939; Merrill, 1934), later a professor of geology at Columbia College in New York, was on the survey commanded by Lt. R. S. Williamson in 1855 which explored much of Washington, Oregon, and northern California. At a later date, Newberry was with the Ives' expedition which explored the Colorado River in 1857-1858.

Three botanical collectors were associated with the survey under Isaac I. Stevens in the Pacific Northwest. There were George Gibbs, George Suckely, and James Graham Cooper. Dr. Gibbs (Brewer, 1880) had previously collected near the gold-mining town of Columbia in California. Suckely (Ewan, 1950), also a physician, collected in Washington and the northern Rocky Mountains. The best known of the three is Dr. Cooper, the distinguished American ornithologist for whom the Cooper Ornithological Club was named (Ewan, 1950; Grinell, 1930; Higgins, 1959). He collected in California in subsequent years following his service with the Railroad Survey.

Dr. John Milton Bigelow (Brewer, 1880; Ewan, 1950; Howell, 1949a; Jepson, 1938, 1962) was the botanist on the Pacific Railroad Survey under Lt. A. W. Whipple. This group explored from the Mississippi River to San Pedro, California, in 1853-1854. Bigelow later collected extensively in central California and eastward into the Sierra Nevada.

Adolph Lewis Herrmann collected in California (Brewer, 1880; Ewan, 1953; Twisselmann, 1967) in 1853 under Lt. Williamson. Dr. James Aitken Snyder (Brewer, 1880; Ewan, 1967) was part of Lt. E. G. Beckwith's Railroad Survey party from Salt Lake City to Sacramento, California, in 1854. Dr. Thomas Antisell, a geologist, collected in California in 1854-1855 with Lt. J. G. Parke's portion of the Railroad Survey. Another geologist, William Phipps

Blake (Ewan, 1950; Higgins, 1959; Merrill, 1906), served under Lt. Williamson on his portion of the survey from Fort Yuma to southern California in 1854 to 1856.

For the most part, railroads were built along the routes laid out by the surveys. The railroads, opening up vast territories, allowed a rapid and usually uncontrolled exploitation of much of the western part of the United States. The railways are of little importance now in the carrying of passengers, but they still exert considerable economic and political influence through their vast land holdings.

Charles Wright (Ewan, 1950; Geiser, 1958-1959; Gray, 1886), a member of the North Pacific Expedition under Captain Rogers, collected in central California in 1855-1856. He is better known as a pioneer collector in Texas and the southwest. Earlier, Wright had participated in the Mexican Boundary Survey, but he did not reach the Pacific Coast.

John Xantus de Vesey (Fig. 7; Draper, 1950; Madden, 1949; Twisselmann, 1967), a Hungarian by birth, an adventurer and a bit of a scoundrel, collected in and around Fort Tejon in southern California from 1857 to 1859 for the Smithsonian Institution. He was the first person to explore this relatively arid portion of California thoroughly. Gray published upon Xantus' collections (1859-1861). Xantus is also well known as a collector of animals and as an explorer in Mexico.

Dr. Edward Palmer (Fig. 8; Blake, 1961; McVaugh, 1956), a professional collector best known for his Mexican activities, collected in various parts of California from 1861 onward, particularly in southern California.

John Torrey, one of the great North American systematists, and for many years professor of botany and chemistry at Columbia College in New York (Humphrey, 1961; Rogers, 1942), went to California in 1865, collecting in central California, Santa Barbara, and the Sierra Nevada.

Fig. 7. John Xantus de Vesey, in 1861

(From *Xantus, Hungarian Naturalist in the Pioneer West*, by Henry Miller Madden, Books of the West, Palo Alto, 1949, by permission.)

Sereno Watson, Gray's protege and successor at Harvard (Dupree, 1959; Humphrey, 1961; Reifschneider, 1964), did a considerable amount of collecting in Oregon, Utah, Nevada, Montana, and California from 1867 to 1880 at various intervals. He was responsible for the botanical collecting of the survey of the 40th Parallel in Nevada and Utah under Clarence King (Watson, 1871). He is the author of a large part of the first flora of California (Brewer, 1880).

California with its unique and interesting flora attracted the attention at one time or another of most of the leading eastern botanists. Asa Gray (Fig. 9; Dupree, 1959) was no exception. Gray, the outstanding American systematist of the century, was in California in 1872, 1877, and 1885, being in Monterey, San Francisco, Santa Barbara, Yosemite, and Mt. Shasta. In 1877, Joseph Dalton Hooker (Allan, 1967) was in California with the Grays and visited central California as well as Yosemite and Mt. Shasta. A large valley Oak, *Quercus lobata* Nee, in Chico, California, one of the largest specimens of this species, was named the Sir Joseph Dalton Hooker Oak (Stern, 1963), and though recently damaged, still stands as a monument to Hooker's visit nearly a century later.

Joseph Trimble Rothrock (Ewan, 1950; Reifschneider, 1964) explored extensively from 1871 through 1875 as the botanist of the U.S. Geological Survey west of the 100th Meridian under Lt. G. M. Wheeler. Rothrock was in California in 1875 (Twisselmann, 1967) and in subsequent years.

Clinton Hart Merriam (Ewan, 1950), the founder of the U.S. Bureau of Biological Survey and a contributor to several volumes of the *North American fauna* collected in Mt. Shasta in northern California in 1898. Earlier, he had collected in Idaho with Vernon O. Bailey and still earlier had explored in the northern Rocky Mountains.

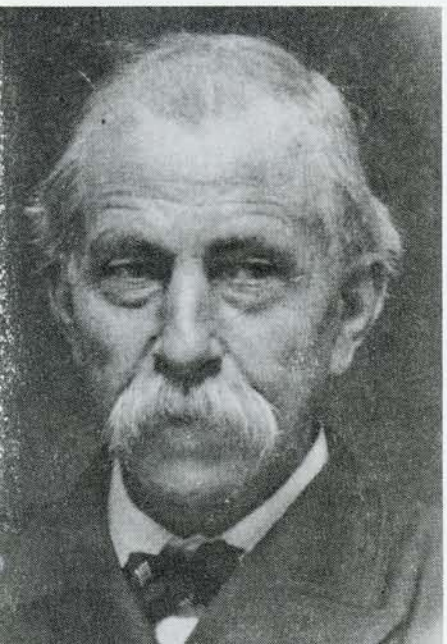

Fig. 8. Edward Palmer
(From *Edward Palmer, Plant Explorer of the American West*, by Rogers McVaugh, University of Oklahoma Press, by permission.)
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Fig. 9. Asa Gray
(From *American Botany, 1873-1892, Decades of Transition*, by Andrew D. Rogers, III, Princeton University Press, 1944, by permission.)
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George Englemann (Humphrey, 1961; Jones, 1930b; Ewan, 1950; Reifschneider, 1964), the "father" of the botanical collections of the Missouri Botanical Garden, visited the Pacific Coast briefly in 1880, being in Portland, San Francisco, and San Bernardino, where he visited with Parish.

Cyrus Guernsey Pringle (Davis, 1936; Evans, 1935; Pennell, 1937), a professional botanical collector of note, but best known for his Mexican activities, collected at various times in California in the 1880's. The herbarium at the University of Vermont is named in his honor.

Philadelphia nurseryman, Thomas Meehan (Ewan, 1950; Jones, 1936), made a collecting trip in 1883 from Portland to Sitka, Alaska, making small collections en route.

In 1890 to 1891, Frederick Vernon Coville (Clokey, 1951; Maxon, 1937), then of the U. S. Department of Agriculture, was the botanist of the Death Valley Expedition. The results were published promptly by Coville as the *Botany of the Death Valley expedition* (1893). Assisting Coville were Frederick Funston (Cantelow and Cantelow, 1957; Ewan, 1967) and Vernon Orlando Bailey. The collections of the expedition were not limited to the confines of what is now Death Valley National Monument, but ranged widely over the arid parts of southern California and adjacent Nevada. (Coville's interests included the families Grossulariaceae and Juncaceae, and in the course of studying them, he visited the Pacific States in subsequent years.)

From 1891 to 1894, Dr. Edgar Alexander Mearns (Miller, 1933) served as the medical officer for the U. S. and Mexican Boundary Survey. He collected from the Colorado River to the Pacific Ocean.

Another well-known collector, Carl Albert Purpus (Ewan, 1950; Higgins, 1959), collected in California at various times from about 1894 through 1913. Purpus is best known for his Mexican collections.

The number of botanists who have been in the Pacific States from the end of the 19th century on has increased and their numbers are so large that it would take several volumes to detail their activities. Increasing from this time onward, the botanical exploration in the Pacific States was in the hands of resident botanists.

RESIDENT BOTANICAL EXPLORATION IN THE PACIFIC STATES

THE STATE OF WASHINGTON

General and detailed accounts of recent botanical explorations in Washington are available in the publications listed in the Appendix (pp. 42-46).

Two institutions, the University of Washington in Seattle, and Washing-

ton State University in Pullman, have been the centers for collecting activities in Washington, and have become the two major repositories for herbarium material in Washington. Many distinguished taxonomists have received a portion or all of their graduate training at either Seattle or Pullman.

WASHINGTON STATE UNIVERSITY, PULLMAN

This institution was initially established as the agricultural college in the state of Washington's system of higher education and an herbarium was started there about 1890. The single most important collection contained in it is that of Wilhelm Nikolaus Suksdorf (Fig. 10). Suksdorf's personal history is an interesting one (Carter, 1942; Jones, 1933c; Pickett, 1935; Piper, 1906; Preece, 1955; St. John, 1955; Weber, 1944). He was born in Germany in 1850, grew up in Iowa, was a student at the University of California in Berkeley briefly from 1874 to 1876, and for most of his life lived in Bingen, a small town on the Columbia River, about 50 miles upstream from Portland.

Suksdorf sent many of his Washington specimens to Gray at Harvard. Eventually this resulted in an offer from Gray to be his assistant. Suksdorf spent two years, starting in 1886 at Cambridge working with his own collections and absorbing some of the atmosphere, excitement, and learning then available at Harvard. After Gray's death in 1888, Suksdorf, perhaps feeling the lack of Gray's sympathy and protection, returned to Washington State, via Iowa. Had Suksdorf had a different background, the course of North American systematic botany might have been quite different. But speculation is of theoretical interest only.

For the rest of his life Suksdorf supported himself by selling both living and dried plants as well as seeds. He died in 1932, the victim of a train acci-

Fig. 10. Wilhelm Nikolaus Suksdorf, about 1900
(From *Research Studies of the State College of Washington*, Vol. 23, 1955, by permission.)

dent. His own personal herbarium of over 30,000 specimens was willed to Washington State University before his death. It is certainly the best ever assembled by one man for Washington plants.

An early member of the faculty of Washington State University was Charles Vancouver Piper (Beattie, 1928; Hitchcock, 1928; Humphrey, 1961; Pieters, 1926; Vinall, 1926) from 1893 to 1903. During this time and after he collected extensively throughout the Pacific Northwest. His library and personal herbarium are at Pullman. His main work is the *Flora of the State of Washington* (1906). Three other floras were done with R. Kent Beattie, *Flora of the Palouse region* (1901), *Flora of the Northwest coast* (1915), and *Flora of southeastern Washington and adjacent Idaho* (1914). From 1903 until 1926 Piper worked for the U. S. Department of Agriculture in Washington, D.C.

R. Kent Beattie (Piper, 1906) was on the faculty at Pullman from 1903 until 1912 and, as indicated above, collaborated with Piper and added to the knowledge of the plants of western Washington through his collecting.

Additions to the collections at Washington State University were made by subsequent botanists; in particular, Harold St. John, who taught at Pullman from 1920 until 1929. He produced three editions of his *Flora of southeastern Washington and of adjacent Idaho*, the latest appearing in 1963.

After W. C. Cusick sold his original herbarium to the University of Oregon in 1913, he started collecting again in the Pacific Northwest and this collection was purchased by Washington State University.

The University of Washington, Seattle

The collections of the University of Washington were established in 1880 and are concerned mainly with the plants of the Pacific Northwest. A number of important botanists have been associated with the University, notable among them being Theodore Christian Frye, George Neville Jones, and C. Leo Hitchcock.

Theodore Christian Frye (Howard, 1963; Marckx, 1959) was a long-time member of the faculty from 1903 until his retirement in 1949. Although he is perhaps better known as a bryologist, his studies and collecting did include vascular plants of the Pacific Northwest. (Frye, 1934). He and his associate George R. Rigg published their *Elementary flora of the Northwest* (1914) in response to the need for a book that contained family descriptions and keys to complement Piper's *Flora of the State of Washington* (1906).

George Neville Jones was a member of the University faculty for a number of years prior to 1937, when he went to the University of Illinois. He collected extensively in the Olympics, on Mt. Rainier, and elsewhere during this period. Two very detailed and model floras resulted from this work:

A botanical survey of the Olympic Peninsula, Washington (1936), and *The flowering plants and ferns of Mt. Rainier* (1938).

Charles Leo Hitchcock (Ewan, 1967) a distinguished student of the flora of the Pacific Northwest, became associated with the University of Washington in 1937. His collecting activities have been extensive and cover not only Washington, but most of western North America. Much of his collection, especially in Idaho and Montana, was done in conjunction with C. V. Muhlick. Another collaborator was J. S. Martin, a student of *Trifolium*. In addition to his monographic studies, Hitchcock is perhaps best known as the senior author of the *Vascular plants of the Pacific Northwest* (1955-1964).

A very prolific collector associated with the University is J. W. Thompson (Jones, 1936; Muenscher, 1941). His specimens from many parts of Washington and adjacent regions have been widely disseminated. He is one of the authors of the *Vascular plants of the Pacific Northwest* (Hitchcock, *et al*; 1955-1964).

Amos Arthur Heller (Fig. 11) was one of the most prolific of all western collectors from about 1892 until at least 1940 (Cantelow and Cantelow, 1957; Clokey, 1951; Ewan, 1950; Harshberger, 1899; Holmgren, 1942; Jones, 1910b; Pennell, 1943; Reifschneider, 1964; Thomas, 1961; Twisselmann, 1967). His early western collecting was with Sandberg, Leiberg, and MacDougal in Idaho, and these specimens as well as his later ones are in most major herbaria. Heller lived in Los Gatos, south of San Francisco, from 1904 to 1908 and during this time he collected extensively in central California. He published *Muhlenbergia* from 1900 through 1915. Some of his early collecting in California was done with H. E. Brown (Cantelow and Cantelow, 1957; Cooke, 1940). He wrote many of the articles and set the type and printed *Muhlenbergia* himself. From 1909 until 1913 he was associated with the University of Nevada and collected extensively with Paul Beeverage Kennedy (Reifschneider, 1964). In 1913, Heller moved to Chico, California, and taught

Fig. 11. Amos Arthur Heller, about 1921

(From *Flora of the Santa Cruz Mountains of California*, by John H. Thomas, Stanford University Press, by permission.)

in the local high school, but continued to collect extensively. His first herbarium of over 10,000 sheets is at the Brooklyn Botanical Garden. His second herbarium and library is at the University of Washington, in Seattle.

Other recent Washington collectors

Walter Conrad Muenscher (Clovis, 1958; Coleman, 1965), usually associated with Cornell University and an expert on weeds and poisonous plants, resided in Whatcom County, Washington prior to 1914. He returned periodically and in 1941 published his *The flora of Whatcom County, State of Washington*. Many of Muenscher's more than 10,000 Whatcom County specimens are in western herbaria as well as at Cornell.

John M. Grant (Jones, 1935, 1936, 1938; Piper, 1906) collected extensively in the Olympic Mountains. J. B. Flett's name is often on labels of Washington plants (Jones, 1936; Piper, 1906).

Collecting in Oregon

The two most important names in this period of botanical collecting history in Oregon are those of Thomas J. Howell and Morton E. Peck. Many others from the various universities and colleges in Oregon as well as botanists from other parts of the country have collected in Oregon. General information about the many other collectors may be found in the papers listed in the Appendix.

The University of Oregon

Thomas J. Howell (Fig. 12) was without doubt the pioneer resident Oregon botanist (Lange, 1953; Jepson, 1932a; Smith, 1913). He was almost completely

Fig. 12. Thomas Jefferson Howell, in 1910
(From *The Scientific Monthly*, Vol. 77, Oct. 1953, by permission.)
←

Fig. 13. Morton Eaton Peck
(From *Taxon*, Vol. 9, 1960, by permission.)
→

self-taught, a farmer for a portion of his life, and for most of it rather poor financially. His collections from Oregon, Washington, Idaho, and Alaska made from 1876 onward until near his death in 1912 now form the basis for the Universtiy of Oregon Herbarium in Eugene. Howell was to Oregon what Suksdorff was to Washington. The two men knew each other, but their geographical spheres of interest were such that there was no antagonism between them. Howell's main botanical contribution was his *A flora of northwest America* (Howell, 1897-1903; Lange, 1955; Thompson, 1935), a work which he not only wrote, but also set in type and printed himself. Many of his collections were sent for determination to the leading eastern botanists of the day, Gray, Watson, Greene, Vasey, and others.

Louis F. Henderson (Hughes, 1939; Jones, 1936; Piper, 1906) was curator of the University of Oregon Herbarium for many years. In 1906 his personal herbarium was destroyed in a fire at the University of Idaho, but most of his subsequent collections are now in Oregon. He was primarily a collector and published relatively little.

LeRoy Ellsworth Detling, from 1936 until his death recently, was in charge of the herbarium at Eugene. His special interests were the cruciferous genera *Cardamine* and *Dentaria* and the flora and plant geography of the lower part of the Columbia River and adjacent regions. He added many unique specimens to the herbarium.

An early Pacific Northwest collector, whose collection is at Eugene, was William C. Cusick (Brewer, 1880; Cantelow and Cantelow, 1957; Hughes, 1939). His most extensive collections came from eastern Oregon.

M. W. Gorman (Piper, 1906; Hughes, 1939; Muenscher, 1941), a friend of Thomas Howell and a longtime resident of Portland collected in many parts of Oregon and Washington around the turn of the century. His herbarium is now at the University of Oregon.

Willamette University, Salem, Oregon

The collections assembled by Morton Eaton Peck (Fig. 13) from 1908 until his death in 1959 stand as a monument to the devotion and energy of one man (Constance, 1960). "The Peck Herbarium at Willamette University, the finest collection of Oregon plants in existence and almost wholly the results of the Pecks' loving efforts, is a permanent and useful record of their explorations and a hospitable haven for botanical visitors" (Constance, 1951). The Peck Herbarium contains in excess of 40,000 sheets, mainly of Oregon plants. Peck's main published contribution was his *A manual of the higher plants of Oregon* (1941).

Oregon State University, Corvallis

The largest collection of plants in Oregon is at Oregon State University. In contrast to the other Oregon herbaria, this one contains no one large collection, although many of Thomas Howell's and L. F. Henderson's specimens are to be found there. It was rather the result of many local collectors, exchange, and activities related to agriculture and forestry. Several editions of *Handbook of northwestern plants*, the latest by Helen M. Gilkey and La Rea J. Dennis (1967), have come from this university.

CALIFORNIA, THE LAND THAT WAS BEAUTIFUL

Of the political subdivisions of western North America, California is incomparably the most rich, diverse, and interesting in terms of its vegetation and flora, to say nothing of climate, natural beauty, and endowment. The riches of the flora of California have been sampled, are being sampled, and will, with diminishing returns, continue to be examined. California has reached that unfortunate state or stage in which the continuing elucidation of the wonders presented in its natural laboratory is being negated by the crass and gross numbers of *Homo sapiens* Linnaeus. In California, and unfortunately elsewhere, but at a different rate, man is the despoiler, the raper, and the defiler of the environment — all with the consent, aid, and support, financial, verbal, and "moral," of the worst of unenlightened and selfish interests.

The "virgin" vistas visited by early explorers are no longer here. What is left is a poor tattered remanent.

Within the confines of California, it is true that much, if not most, of the interesting and innovative work in plant systematics and taxonomy of the west has originated during the last half century. The institutions mentioned in the following paragraphs have contributed most. Detailed and additional reference to botanical collectors can be found in the appendix.

The California Academy of Sciences

The California Academy of Sciences in San Francisco has, and continues to play, an important part in botanical exploration through the activities of its members and staff and is increasingly becoming a major center or repository for systematic collections in the West. The Academy was founded in 1853, four years after the discovery of gold in California. Through San Francisco passed not only miners on their way to the gold fields, but explorers, adventurers, and people seeking the promise of abundance in a new land. As the most important city in California it naturally attracted

men of learning who would proceed to establish educational and cultural institutions. The history of the Academy is well known through its *Proceedings, Bulletins, Occasional papers,* its popular journal *Pacific discovery*, and through a series of papers (Cantelow and Cantelow, 1957a, 1957b; Eastwood, 1947, 1952; Ewan, 1953; Howell, 1948-1953; Miller, 1953; Munz, 1953; Reese, 1966; Reiter, 1953; Sexton, 1953; Wilson, 1953a, 1953b), most important of all being Ewan, (1955).

Among the founders of the Academy was Albert Kellogg, a physician by profession, but a man with wide interests in natural history and in particular, in botany (Fig. 14; Anon, 1893, Brewer, 1880; Curran, 1885; Ewan, 1953; Greene, 1887; Jepson, 1933c). Kellogg collected throughout much of California and Oregon, and in 1867 was in Alaska.

"The scientists of the California Academy of Sciences have been leaders in the biological exploration of Baja California from the earliest days of the Academy's inception" (Johnson, 1958). The first of these explorers was Dr. John Allen Veatch, a medical practitioner and later curator of conchology at the Academy. His collections from Cedro Island, off the west coast of Baja California, were made in 1858 and were the most extensive of any made to that date (Ewan, 1955, 1967; Johnson, 1958); they were described by Kellogg in early editions of *The Hesperian*, a San Francisco weekly paper.

Another early Academy botanist was Hans Herman Behr (Gutzkow, Chismore, and Eastwood, 1905; Brewer, 1880; Ewan, 1953) who is best known for his several local floras (Thomas, 1961) based upon his extensive collecting in central California.

William G. W. Harford (Brewer, 1880; Ewan, 1953; Jepson, 1933a) and Dr. Gustav Eisen (Anon, 1940; Ewan, 1953, 1955; Rydberg, 1907) were additional noteworthy early collectors in California, Oregon, parts of Baja California, and Alaska.

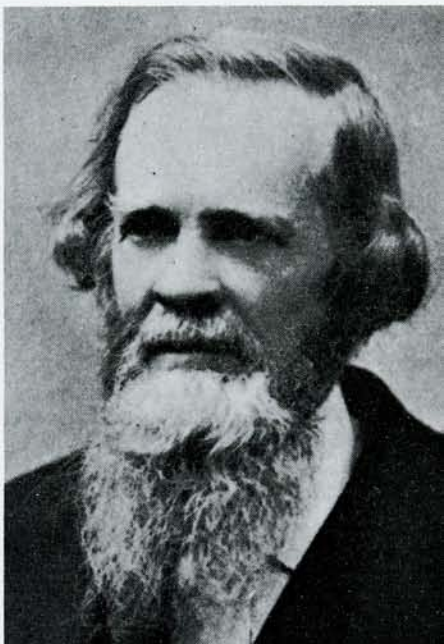

Fig. 14. Dr. Albert Kellogg
(Frontispiece, *Zoe*, Vol. 4. 1893.)

Perhaps one of the most colorful lady botanists anywhere anytime was Katharine (Layne) (Curran) Brandegee, curator of botany at the Academy from 1883 to 1894, when she and her second husband (Fig. 15), Townsend Stith Brandegee, whom she married in 1889, moved to San Diego (Jones, 1929a, 1933b; Setchell, 1926; Twisselmann, 1967). Her pithy and pointed comments against some of her contemporaries, such as E. L. Greene, make interesting reading (Ewan, 1942; Herre, 1960; Thomas, 1961). Mrs. Brandegee's collecting spanned the years 1882 through 1918 (Ewan, 1942). There was scarcely a county in California she did not collect in, and except for a trip to Baja California in 1893 and collections in those portions of Nevada adjacent to California, her activity was confined to California. In 1891 she founded the California Botanical Club (Anon., 1891), the first one in the state. The Club was then continued both by Alice Eastwood (Eastwood, 1941), and later by John Thomas Howell, becoming increasingly more social than botanical. With the help of her husband and others (Anon., 1969), Mrs. Brandegee published a general journal of natural history, *Zoe*, from 1890 to 1908.

T. S. Brandegee (Setchell, 1926), an engineering graduate of Yale University in 1870, collected through the western part of the United States from 1871 through 1913 (Ewan, 1942; Moran, 1952), the earlier collections being mainly in the Rocky Mountains, particularly in Colorado. From 1889 much

Fig. 15. Katharine and Townsend Stith Brandegee, in 1899.
(From *University of California Publications in Botany*, Vol. 13, pl. 13, by permission.)

Fig. 16. Alice Eastwood
(Frontispiece, *Proceedings of the California Academy of Sciences*, 4th Series, Vol. 25, 1943-1949, by permission.)

of his effort was directed toward Baja California and resulted in numerous papers on the flora of that fascinating region, particularly of the tip of the peninsula, the Cape Region. He was a member of the Academy though not a member of the staff.

Upon her "retirement" as curator at the Academy in 1894, Mrs. Brandegee was succeeded by Miss Alice Eastwood (Fig. 16), who herself did not retire until 1949, at the age of 90. Her early collecting was in the Rocky Mountains, later extending to most parts of western North America. Her taxonomic recognition and discrimination was very acute and she tended to be a "splitter" in the groups with which she worked extensively, *Arctostaphylos* and *Lupinus*, for instance.

Miss Eastwood probably has had more written about her than any other resident western botanist. Her heroic action in saving the types and some other important specimens at the Academy during the great San Francisco fire and earthquake of 1906 earned her a reputation and made her something of a legend. It was Miss Eastwood who built up the collections of the Academy after the fire and reestablished the Academy in that field. In addition to the two books written about her (Dakin, 1954; Wilson, 1955), and the biographical sketches mentioned by Ewan (1955), there are numerous other sketches (Anon., 1943, 1953; Howell, 1949a, 1954a, 1954b, 1954c; MacFarland and Sexton, 1949; MacFarland, Miller, and Howell, 1949).

John Thomas Howell (Fig. 17) joined the Academy (Anon., 1968; Cantelow and Cantelow, 1957; Howell, 1954c, 1964b) staff in 1929 and retired in 1968. His collecting was of an individualistic nature, that is, he concentrated very largely on collecting the plants in a given area, and not trying to amass

Fig. 17. John Thomas Howell, in 1968
(Frontispiece, *Madroño*, Vol. 19, 1967-1968, by permission.)
←

Fig. 18. Thomas H. Kearney, about 1940
(From a photograph in the Dudley Herbarium, taken by Roxana S. Ferris.)
→

great numbers of duplicates. His numbers exceed 40,000 (Twisselmann, 1967) and have enriched the collections at the Academy immeasurably. Howell collected in most of the western states, parts of Mexico, and made important collections on the Galapagos, Revillagigedo, and Guadalupe Islands (Howell, 1934-1935, 1941, 1949a, 1957). He is perhaps best known for his *Marin flora* (Howell, 1949a, 1959), his studies in *Eriogonum* and *Phacelia*, and several local floras written in collaboration with colleagues (Howell, Raven, and Rubtzoff, 1958; Gillett, Howell, and Leschke, 1961; Linsdale, Howell, and Linsdale, 1952; and Howitt and Howell, 1964).

In 1932, Mr. Howell and Miss Eastwood started *Leaflets of western botany*, a journal that ran into ten volumes and contained not only their own work, but that of many other botanists from throughout the United States and abroad. A cumulative index was published in 1968.

Dr. Thomas Henry Kearney (Fig. 18), best known for his *Arizona flora* (Kearney and Peebles, 1951), experimental breeding work with cotton and other crop plants, and monographic studies in the Malvaceae, associated himself with the Academy from his retirement from government service in 1944 until his death in 1956 (Anon., 1952a; Kearney, 1958; McClintock, 1958; Miller, 1957; Wiggins, 1952; Tidestrom and Kittell, 1941). His western collection was confined largely to the state of Arizona.

The list of botanists associated with the Academy in recent years as members, friends, and volunteers is long. Prime among these is Lewis Samuel Rose (Anon., 1962a; Cantelow and Cantelow, 1957; Thomas, 1961; Twisselmann, 1967), who through his voluminous collecting and exchange program has been responsible for adding over 70,000 specimens to the

herbarium (Howell, 1953a). Mr. Rose's activities have been on a volunteer basis and his curatorial work at the Academy has been invaluable.

Other botanists include J. W. Stacey, a student of western North American *Carex* (Howell, 1944); Dorothy Sutliffe (Howell, 1953b); Susan G. Stokes, a student of *Eriogonum* (Howell, 1955); Henry Pollard, an astute collector in Santa Barbara County, California (Twisselmann, 1967); and Earnest C. Twisselmann, a student of the flora of Kern County, California (Twisselmann, 1967).

Since 1958, a series of expeditions have been made to Baja California under the auspices of the Belvedere Scientific Foundation including not only Academy personnel, but also botanists from Stanford, the San Diego Natural History Museum, and the University of California, Berkeley (Lindsay, 1962, 1964, 1966; Wiggins, 1960).

Berkeley, the giant of them all

Without doubt, the University of California at Berkeley has, since its founding in 1868, contributed more to the continual development and maturation of systematic botany, not only in terms of exploration, but in terms of changing an art into a science and in producing a larger number of excellent botanists, than any other western institution.

The first taxonomist at Berkeley was Edward Lee Greene (Fig. 19), who served on the faculty from 1885 to 1895, from whence he went to the Catholic University in Washington, D.C. Numerous biographical sketches and remembrances have been written about him. (Brandegee, 1893; Bartlett, 1916; Herre, 1960; Ewan, 1950; Jepson, 1895, 1918, 1931, 1943; Kistler, 1936; Lange, 1955; Main, 1929; Nieuland, 1915; Reifschneider, 1964.) From 1871 to 1895 he collected extensively in Colorado, New Mexico, and California and after

Fig. 19. Edward Lee Greene
(From the *Newman Hall Review*, Oct. 1918, Berkeley, California.)

that throughout the west. On leaving Berkeley in 1895 he took his collections east and eventually willed them to the University of Notre Dame, where until recently they were available only at Notre Dame, much to the inconvenience of many workers.

Greene, like so many botanists before and after, was an individualist and he was one of the first western botanists to publish extensively himself, rather than sending plants east to be described by Gray and others. He founded the journal, *Pittonia*, later started *Leaflets of botanical observation and criticism*, and contributed to *Erythea*, a journal started by W. L. Jepson in 1894. His *Manual of the botany of the region of San Francisco Bay* (Greene, 1894) and his *Flora Franciscana* (Greene, 1891-1897), provided the first local manuals for any part of California that could be called scholarly. Of the former, however, Katharine Brandegee (1894) wrote: "The title should have been *A Phanerogamic Flora of — counties in the State of California, omitting Typhaceae, Lemnaceae, Naiadaceae, Alismaceae, Juncaceae, Cyperaceae, Gramineae, Coniferae and numerous species in other orders; with thirty 'new species' none of which are new, and nearly all vaguely characterized both as to character and station; and with every change of name which the author's present knowledge admits.*" Greene's specific concepts were far from modern and raised the ire of many of his botanical colleagues (see also Jones, 1912).

Greene was a man of strong opinions and reactions, eliciting frank and often harsh responses. Jones (1929b), for instance, wrote of Greene:

There have been several notable deaths in the botanical world since my last Contributions. Greene, the pest of systematic botany, has gone and relieved us from his botanical drivel. They say that the good that men do lives after them, but the evil is interred with their bones. I suspect that his grave must have been a big one to hold it all.

Greene was succeeded at Berkeley by Willis Linn Jepson (Fig. 20), who remained faithful to his work on the California flora until his death in 1946.

Fig. 20. Willis Linn Jepson, "Telescope Peak, Panamint Range, 11,000 feet, looking toward the Sierra Nevada, May 13, 1917"

(From a portrait in the Jepson Herbarium, University of California, Berkeley, by permission.)

Numerous biographical sketches have appeared about Jepson and have recently been listed by Heckard, Howell, and Bacigalupi (1967). To these should be added some of Howell's personal reminiscences (Howell, 1954c, 1946b). Jepson probably exerted a greater influence upon California systematic botany than any other man. His major works include *A flora of California* (1909-1943), *Flora of western middle California* (1911), and *A Manual of the flowering plants of California* (1923-1925). Jepson's large library and herbarium continue to function as an important part of Berkeley's Department of Botany, and until recently were under the able curatorship of Rimo S. Bacigalupi (Thomas, 1961). Jepson's collection was confined almost completely to California.

Jepson founded the California Botanical Society in 1913 and served as the first editor of its journal, *Madroño*, and from 1919 through 1927 edited *Nemophila*, a meeting and field guide, that contains not only distributional notes, but also detailed accounts of the activities of members of the society.

Among Jepson's many students were H. L. Mason, Harvey M. Hall, Lincoln Constance, and Ivan M. Johnson.

Harvey Monroe Hall (Babcock, 1934) received his doctorate from Berkeley in 1906 and was a member of the faculty from 1902 until he joined the Carnegie Institution of Washington in 1919. His early collecting was in southern California (Hall, 1902, 1907). After that he collected throughout California and adjacent states and published *A Yosemite flora* (Hall and Hall, 1912). Hall was a lifelong friend of Ernest Brown Babcock (Stebbins, 1955) and the two of them collected together for many years. Babcock is perhaps best known for his cytogenetic work on *Crepis*. Hall strove to make taxonomy increasingly more objective and his work with Carnegie resulted in the establishment of the Division of Plant Biology on the Stanford campus, where the well-known work of Jens Clausen, David D. Keck, and William M. Hiesey (1940) established it as the center for experimental taxonomy in North America. Hall's death came in 1932.

Herbert Lewis Mason (Anon., 1962b; Reifschneider, 1958), a student of the Polemoniaceae, the marsh vegetation of California, and theoretical ecology, continued Jepson's work at Berkeley, guiding many exceedingly good students through their doctoral work. Mason edited *Madroño* from 1935 to 1963. He collected extensively in the Pacific states and adjacent ones, and in Baja California (Eastwood, 1929).

Lincoln Constance, a student of the Umbelliferae, Hydrophyllaceae, and phylogeny, has carried on the tradition of scholarly monographic work and collecting at Berkeley since 1937.

Although we usually associate Ivan Murray Johnson (Correll, 1961;

Howard, 1961; Munz, 1961) with the Arnold Arboretum of Harvard University, he was a graduate student at Berkeley in the 1920's, during which time he collected extensively in southern California and in the Gulf of California (Johnson, 1924).

Curatorial work in the Berkeley Herbarium has been carried out by a number of persons, among them Ethel Crum (Mason, 1943), Annetta Carter (Anon, 1966), and Helen Sharsmith. Miss Carter is a distinguished collector and student of the flora of Baja California and Mrs. Sharsmith is known for her floristic work in central California (Sharsmith, 1945).

A number of important private herbaria came to Berkeley. The Jepson Herbarium has already been mentioned. Others are the herbaria of I. W. Clokey, J. P. Tracey, J. G. Lemmon, and the Brandegees.

Ira Waddell Clokey (Mason, 1950; Ewan, 1950; Reifschneider, 1964), a mining engineer by profession, collected through the west and is best known for his study of the Charleston Mountains in southern Nevada (Clokey, 1951).

Joseph Prince Tracy, 1879-1953 (Bacigalupi, 1953; Blake, 1937; Cantelow and Cantelow, 1957) added considerably to our knowledge of the northwestern part of the state through his extensive collecting.

John Gill Lemmon (Fig. 21; Brewer, 1880; Cantelow and Cantelow, 1954; Copeland, 1939; Dunn, 1961; Ewan, 1967; Gillett, Howell and Leschke, 1961; Higgins, 1959; Jepson, 1933d; Reifschneider, 1964; Twisselmann, 1967) was a pioneer collector in California, Nevada and Arizona, and at one time was a teacher, forester, and bookseller. Sarah A. Plummer (Jepson, 1933d), who became Mrs. Lemmon, a collector in her own right, contributed in many parts of California.

The Brandegees, who have been mentioned in connection with the

Fig. 21. John Gill Lemmon, about 1885
(From *Madroño*, Vol. 5, 1939, by permission.)

California Academy of Sciences, moved to Berkeley in 1906 after giving their collections and library to Berkeley. Mr. Brandegee, an honorary Curator at Berkeley, continued his explorations, especially in Mexico and California.

Annie Montague Alexander and Louise Kellogg (Clokey, 1951; Grinnell, 1958; Johnston, 1958; Reifschneider, 1964) from 1938 on collected extensively in California, Nevada, and Baja California, adding nearly 18,000 superb specimens to the Berkeley Herbarium.

Botany at what was then a farm

When Stanford University opened its doors to students in the fall of 1892 (Baumberger, 1954; Peirce, 1929), the botanical sciences were represented by Prof. Douglas Houghton Campbell, whose specialty was lower plants (Humphrey, 1961; Smith, 1956) and Prof. William Russel Dudley (Fig. 22), whose interests centered on the taxonomy of vascular plants and forestry, but also included systematic mycology. The arrival of these two men caused an anonymous author, presumably Mrs. Katharine Brandegee (Anon., 1892) to write:

> Prof. W. R. Dudley, late of Cornell has taken the chair of systematic botany at Stanford University. With such men as he and Prof. Douglas H. Campbell in charge of the botanical work at Stanford University, where botany is taught according to modern methods, we may expect to have in time, a body of resident botanists whose entire stock of botanical knowledge is not confined to the possession of a limited terminology and a large capacity for discovering new species that do not exist.

This not very veiled comment was aimed at E. L. Greene.

Dudley (Cooke, 1956; Thomas, 1961) collected assiduously in California, and although he published very little at Stanford, he did an amazingly thorough job, especially in the California Coast Ranges. He had a long-standing interest in forestry, and had he had his way would have established

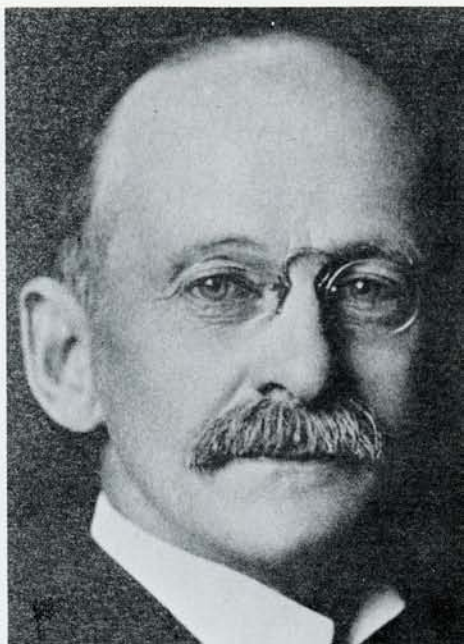

Fig. 22. William Russel Dudley, about 1900
(From a photograph in the Dudley Herbarium, Stanford University.)

a school of forestry at Stanford (Casamajor, 1965). Knowledge that W. L. Jepson was at work on *The silva of California* (Jepson, 1910) put an end to Dudley's plans for a similar work (W. C. T. Herre, pers. comm.). Although Jepson was one of the greatest of North American plant taxonomists, Dudley's knowledge of the trees of California was probably more profound. By the time of his death in 1911 of tuberculosis (Branner, et al., 1913; Jordan, 1911), Dudley had established a tradition of systematic botany at Stanford and had trained a number of good students, especially LeRoy Abrams. Dudley's California collections, those he brought with him from Cornell, plus the Harvey Collection, a set of duplicates from the personal herbarium of William Harvey of Trinity College, Dublin, constituted what was then named the Dudley Herbarium of Stanford University.

LeRoy Abrams (Wiggins, 1957; Wilson, 1956), who served on the Stanford faculty from 1902 until his retirement in 1940 did his early collecting in southern California and published several papers and books as a result (Abrams, 1904, 1910, 1917). An interesting account of how field work was done and the ardor involved in the early part of the century has recently been written (McGregor, 1965) under the title of *Dr. LeRoy Abrams' collecting trip of 1908*. Abrams (Fig. 23) is best known for his four-volume *Illustrated flora of the Pacific States* (Abrams, 1923-1960; Ferris, 1960; Howell, 1964c) and most of his field work from about 1916 on was done in direct connection with the preparation of that flora which was closely patterned after *An illustrated flora of the northern United States, Canada and the british possessions*, by N. L. Britton and A. Brown. Although Abrams' remaining correspondence does not make mention of a Pacific Coast flora until 1916, it is most likely that this idea had long been uppermost in his mind. Abrams had studied for his doctorate under Britton at Columbia. In 1927 Abrams started the *Contributions from the Dudley herbarium*, a journal which after running to five volumes was closed in 1961.

Fig. 23. LeRoy Abrams, in 1923
(From a photograph in the Dudley Herbarium, Stanford University, by Rimo Bacigalupi.)

We think of Adolph Daniel Edward Elmer (Copeland, 1949; Thomas, 1961; van Steenis, 1950) mainly in connection with his work in the Philippines and southeast Asia, he collected extensively and intensively in the Pacific States and especially in Central California from about 1895 through 1904. Although the broad outlines of the Pacific Coast flora were known by the end of the 19th century, there were still "novelties" to be found as illustrated by two of Elmer's papers (1903, 1905).

The tradition of floristics and botanical exploration that Dudley had started at Stanford continued with the appointment of Mrs. Roxana S. Ferris to the staff of the Dudley Herbarium in 1916. Much of her collecting activity, like that of Abrams, was directed toward the *Illustrated flora*, and she is responsible for not only Volume 4 (Ferris, 1960), but also for much editorial and organizational work for the other three volumes. Her collecting ranged eastward into Texas and southward into Mexico and to the Tres Marias Islands (Ferris, 1927). Her patient curatorial work over 50 years was the making of the Dudley Herbarium (Anon., 1958; Thomas, 1961; Ferris, 1969).

Elmer Ivan Applegate (Thomas, 1961), a Stanford undergraduate in 1895 and an honorary curator at Stanford from 1929 through 1949, added much to our knowledge of some of the more arid and less accessible parts of northern California and southern Oregon through his collections and two floras (Applegate, 1938, 1939).

In 1928, Ira L. Wiggins (Anon., 1964) joined Stanford after having completed a dissertation on the flora of San Diego County, California (Wiggins, 1929), and immediately started a series of extensive collecting trips into the Sonoran Desert. These culminated with the publication of the *Flora of the Sonoran Desert* (Wiggins, 1964), the companion volume to Forrest Shreve's *Vegetation of the Sonoran Desert* (Humphrey, 1961; Humphrey and Wiggins, 1951; Shreve, 1951). An avid collector, Wiggins has added over 20,000 specimens to the Dudley Herbarium from Pt. Barrow, Alaska, to the Galapagos Islands, and east through the Rockies.

Numerous other faculty members, staff, and students have contributed to our understanding of the plants of western North America through their association with Stanford (Thomas, 1961). A number of important herbaria of independent collectors have come to Stanford; among these are the collections of S. B. Parish, C. R. Orcutt, Volney Rattan, G. B. Grant, C. P. Smith, Herman Knoche, and C. L. Anderson.

Samuel Bonsal Parish (Fig. 24) was a rancher in San Bernardino in southern California from 1872 until 1920 when he moved to Berkeley (Jepson, 1932) and became Honorary Curator of the University of California Herbarium.

Fig. 24. Samuel Bonsal Parish
(From *University of California Publications in Botany*, Vol. 16, pl. 32, 1932, by permission.)

He was the first resident southern California botanist and his papers, though often short, contributed greatly to the understanding of the plants of that region. Parish was considered by his professional botanical colleagues at Berkeley, Stanford, and elsewhere to be their peer. A letter (in the files of the Dudley Herbarium) from Parish to Abrams indicates clearly the respect that was held for him.

San Bernardino, Cal.
Dec. 21, 1911

Dear Prof. Abrams,

Some years ago, as you will probably recall, when you proposed to me to assist in the preparation of a Flora of Southern California I was unable to do so, as I had previously promised to do what I could for a similar project of Dr. Jepson's. This, I understand, is now abandoned, so that I am free to say that I shall be glad to assist in your proposed work.

I hope [H.M.] Hall may be willing to take part, for not only would his knowledge of our flora be of great value, but it would be a very happy thing to have the two Universities represented in this work.

When Dr. [A.S.] Hitchcock was here a year or two ago, and we were talking of the desirability of a Flora of Southern California, he expressed a willingness to contribute the Grasses to such a work, if it were undertaken by a suitable person. If you chose to interest him in your proposed Flora, one difficult family would be provided for.

In the matter of nomenclature it seems to me that the only sensible course is to adopt the International Laws. No code will be satisfactory to everyone, and after all, codes are matters of convenience, not of conscience, so that the decisions of the majority should command the concurrence of all. This is the code of the botanical world, and is likely to remain for years. Even in our own country it is evident, when men like Bessey, Nelson, etc., record, that the American Laws are losing ground.

I take it that in the supplement to your L. A. Flora, you desire to include additions to the flora of L. A. [Los Angeles] County only, so understanding I will go over the book and make notes of any such additions as may occur to me.

I wish you would send me 2-3 capsules of your No. "Juncus bufonius." Fernald writes me that, as he has it, it is J. sphaerocarpus. Please also give me the exact data of the label.

Mr. Grant has given me his entire collection of western plants. Among his own collections are a number of duplicates. Would you like me to send you some of them?

Faithfully yours,
S. B. Parish

The proposed southern California flora never came to fruition and Abrams' attention was increasingly devoted to the *Illustrated flora of the Pacific States*.

Parish's herbarium was purchased by Stanford in 1917 and contained over 30,000 specimens, representing the most important collections of southern California plants to that time. Parish held an honorary lectureship at Stanford for some years before his death in 1928. He was a gentleman and even the most caustic of western botanists, Marcus E. Jones, wrote (1930a): "S. B. Parish was a polished gentleman of the old school. If he ever had an enemy no one ever knew it. I never knew him to write but one caustic comment, and that was on the disreputable C. R. Orcutt, who also has passed away in Mexico recently." Actually, Orcutt died in Haiti (Jepson, 1929d).

Charles Russell Orcutt (Ewan, 1963; Jepson, 1929d) lived in San Diego for nearly half a century before his death in 1929. He was a professional collector of natural history items and sold them within the United States and abroad. His western botanical explorations were mainly in the southwest, California, Baja California, mainland Mexico, and the southern Rocky Mountain states. Most of his specimens lack adequate field data, even by 19th century standards. He published among other journals, *The west american scientist*, an interesting, if diffuse, periodical to which a number of naturalists contributed. His remaining collections were purchased by Stanford in 1926. Dr. Abrams, after examining Orcutt's specimens felt that he may have made a less than wise purchase (R. S. Ferris, pers. comm.). This assessment was quite correct and most of the specimens are still in their original newspapers. Jepson (1929d) wrote of Orcutt: "Although so peculiar in his business dealings with customers, he was not evilly disposed, nor malicious nor vindictive, but rather simple-minded and naive, with an intense devotion to field work which was wholly genuine and unflagging."

Volney Rattan (Jepson, 1928a) contributed to our knowledge of central California and the ranges to the north of San Francisco through his collecting from about 1863 (Brewer, 1880) onward for about three decades. Many of his specimens went to Asa Gray who in turn named a number of new species after Rattan. Rattan's influence was probably greater as a teacher in San Francisco and San Jose and as a writer of popular botanical texts (Monachino, 1963) than as a collector. His collections, which included some H. N. Bolander specimens, came to Stanford in 1904 (Thomas, 1961).

George Bernard Grant (Ewan, 1950; Higgins, 1959; Millspaugh and Nuttall, 1923) collected extensively in southern California, mainly around the turn of the century. His specimens were in general of rather poor quality, and his labels poor, but nevertheless useful. He gave his collection to S. B. Parish and in turn it was acquired by Stanford, though many duplicates are elsewhere.

For over 50 years until his death in 1955, Charles Piper Smith (Thomas, 1956) roamed western North America looking for lupines. He was a Stanford Ph.D. of 1927 and although his early work was sound, increasing age, isolation, and consequent lack of awareness of the then new systematics, caused him to divide *Lupinus* into finer and finer units. He felt compelled to publish his own journal, *Species Lupinorum*, from 1938 to 1953, in which to present his work, studies that could not be accepted elsewhere. His extensive lupine collection, including over 250 holotypes, was given to Stanford in 1956 by his widow. Smith was a boyhood friend of H. H. Bartlett, and their correspondence over the years (in the Dudley Herbarium) shows how fate and temperament propels once good friends along different and divergent paths.

Herman Knoche (Raven, 1963; Thomas, 1961), who is best known for his flora of the Balearic Islands (Knoche, 1921-1923), collected in many parts of California. He is responsible for the purchase and eventual gift to Stanford of the Gautier Herbarium of Mediterranean plants (Anon., 1911; Thomas, 1961) and the private reprint collection of Adolph Engler.

The grass collection of Charles Lewis Anderson (Jepson, 1929a; Reifschneider, 1964; Thomas, 1961), came to Stanford probably about 1900. Anderson is best known for his pioneer collecting in the vicinity of Carson City, Nevada, in the 1860's, and later in central California. He sent most of his specimens to Asa Gray (1865) who described a number of new species from among them.

The Claremont Herbarium

A long list of important botanical names are associated with the Clare-

Fig. 25. Philip Alexander Munz, about 1960
(Frontispiece, *Madroño*, Vol. 15, 1959-1960, by permission.)
←

Fig. 26. Marcus Eugene Jones
(From a photograph in the Dudley Herbarium, Stanford University.)
→

mont Herbarium (Munz, 1961, 1968a), the result of the fusion of the herbaria of Pomona College and the Rancho Santa Ana Botanic Garden in 1950 (Lens, 1963). The guiding force behind this has been Philip Alexander Munz (Fig. 25; Anon., 1960; Cantelow and Cantelow, 1957; Carlquist, 1968; Raven, 1963; Reifschneider, 1964). From 1917 until 1944 Munz was a faculty member of Pomona College and from 1946 until 1960 was the director of the Rancho Santa Ana Botanic Garden. In 1950 he moved the garden from its isolated and rural, but beautiful, setting in Orange County to Claremont. Munz is best known as a student of the Onagraceae and the flora of California (Munz, 1935, 1959, 1968b). His collections come from many parts of California and adjacent states and were made since 1917.

Charles Fuller Baker (Essig, 1927; Ewan, 1950; Higgins, 1959; Jones, 1933a; Munz, 1968a) collected very widely in California, Colorado, Nevada, and New Mexico from 1892 to 1912 when he went to the Philippine Islands. Many of his early Colorado and New Mexico collections were published upon by E. L. Greene (1901) under the title of *Plantae Bakerianae*. He sold his specimens, those from 1902-1904 being listed in an advertising brochure entitled *West american plants*. Baker's herbarium formed the basis for that of Pomona College and including exchanges numbered about 100,000 sheets.

One of the most prolific of all western collectors was Marcus E. Jones (Fig. 26; Broaddus, 1935; Ewan, 1945; Jaeger, 1952; Jepson, 1934a; Reifschneider, 1964). His herbarium of about 100,000 numbers was purchased by Pomona College in 1923. Jones collected from 1876 until his death in 1934 and in every western state and in many parts of Mexico (Blake, 1945; Jones, 1965; Howell, 1964; Morton, 1942; Munz, 1965). His early collecting was in Colorado.

Shortly after the turn of the century, he collected extensively in Montana (Jones, 1910a), and for many years extensively in the Great Basin. He was primarily a collector, one of the old school. His labels are sketchy and he often used obscure railroad names as localities. Although he published fairly extensively, his theoretical knowledge of systematic botany was rather old fashioned. From 1891 until his death he published his own journal, *Contributions to western botany*, much of it hand-set by Jones himself. The first six numbers appeared in *Zoe*. The final part of No. 18 was finished by his daughter, Mabel Jones Broaddus (Ornduff, 1962). The *Contributions to western botany* make interesting reading as Jones, always an individualist, wrote freely about his feeling toward others, and contain much autobiographical material. Jones' last ten years were spent at Pomona College.

Frank Warrington Peirson's (Cantelow and Cantelow, 1957; Munz, 1952) extensive Sierra Nevada and southern California collections, as well as other collections, went to the Rancho Santa Ana Botanic Garden in the 1950's. For many years, Peirson sent duplicates to W. L. Jepson of Berkeley.

M. French Gilman, although better recognized as an ornithologist, collected extensively in Death Valley during the 1930's, adding many records to the flora of that interesting area (Munz, 1945).

Carl Brandt Wolf, a student of *Rhamnus* and *Cupressus* was the taxonomic botanist at the Garden from 1930 until 1946. During this time he collected extensively in California, adding both living plants to the Garden and herbarium specimens to its herbarium (Anon., 1931).

The Rancho Santa Ana Botanic Garden and its herbarium, affiliated as it is with the Claremont Graduate School, has become one of the important centers for systematic botany in the west.

The journal *Aliso* now in its 6th volume, was started by the Garden in 1948, for the publication of the work of its staff and students.

San Diego Museum of Natural History

The botanists associated with this institution, founded in 1874, have concentrated most of their collecting efforts on southern California, mainly San Diego County, and adjacent Baja California. Chief among them are: Frank Ganders (Higgins, 1959; Johnson, 1958), Ethel Bailey Higgins (Lindsay, 1963), long-time curator and author of an annotated list of San Diego County plants (Higgins, 1949), and Reid Venable Moran (Raven, 1963; Higgins, 1959), a student of the Crassulaceae, the flora of Baja California, and of Guadalupe Island. Mrs. Higgins published a very useful paper (1959) giving many details of collecting activity in San Diego County.

Although not associated with the San Diego Museum, Rufus Davis Alderson (Moran, 1962; Higgins, 1959; Ewan, 1963) was one of the most prolific of San Diego County collectors, mainly between 1891 and 1896 and some of his specimens are in the San Diego Museum of Natural History.

The State Geological Survey, 1860 to 1873

Two names are associated with collections resulting from the State Survey, Brewer and Bolander. William H. Brewer was in charge of the botanical work of the Survey until 1864 when he became a professor at Yale University. Prior to this time, most of the collecting in California was coastal, few persons had penetrated far inland. Brewer wrote of his California adventures in *Up and down in California in 1860-1864* (Brewer, 1949).

Brewer was succeeded by Henry M. Bolander (Fig. 27; Brewer, 1880; Ewan, 1953; Higgins, 1959; Jepson, 1898) as botanist with the State Survey and continued in this capacity until 1873. Between them, Brewer and Bolander covered most major areas of California at one time or another. Most of these specimens went to eastern herbaria. Bolander wrote several local plant guides (Thomas, 1961).

Other noteworthy California collectors

Brief mention should be made of several additional persons who made significant collections.

Anstruther Davidson (Ewan, 1934; Millspaugh and Nuttall, 1923; Spaulding, 1932; Twisselmann, 1967), a physician, collected extensively in southern California and Arizona and was associated with the Southern California Academy of Sciences. His major work, *Flora of Southern California* (Davidson and Moxley, 1923) was done in collaboration with George L. Moxley, an

Fig. 27. Henry N. Bolander
(From *Erythea*, Vol. 6, pl. 2, 1898.)

observant public utilities meter reader and a student of the genus *Zauschneria*. Many of these collections are now in the Los Angeles County Museum.

Milo Samuel Baker (Cantelow and Cantelow, 1957; Mason, 1962; Rubtzoff, 1953), a student of the Violaceae and for many years at the Santa Rosa Junior College in California, collected many thousands of plants, particularly in the ranges north of San Francisco from about 1890 on. Many of J. W. Blankenship's California collections (L. R. Heckard, personal communication) are now at Santa Rosa.

Daniel Cleveland (Brewer, 1880; Higgins, 1959; Jepson, 1929c; Mason, 1937) was a long-time resident of San Diego, from 1869 until his death in 1929, and an amateur collector who sent his specimens mainly to Gray and Greene.

George Hansen (Jepson, 1928b) made extensive collections in the central Sierra Nevada from 1889 to 1896, distributing his specimens widely to major herbaria.

Rachel Merrit Austin (Applegate, 1938; Cantelow and Cantelow 1957; Gillett, Howell, and Leschke, 1961; Jepson, 1934a, 1934d) was a pioneer collector in northeastern California from 1866 to 1900.

APPENDIX

Included under the headings of the western states of the United States, Canada, and Mexico are general selected references which will serve as a guide to the history of collecting in these regions. Some general and standard references are listed first.

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