THE VICTORIA REGIA.

WILLIAM H. SEAMAN, M. D.


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Compiled by William H. Seaman, M. D., Washington, D. C.

It was hoped by the local microscopists in Washington interested in the success of the American Microscopical Society, that there would be a large attendance of its members here in our Capital City. In this they were disappointed, and hence it seemed not unwise to add to the volume some especial souvenir of the meeting of the Society at the capital of the nation.

It happened that as a result of the interest now everywhere taken in the cultivation of water-lilies, a successful effort to grow the largest species in the world in the open air had been made at the Botanic Gardens, and also that it flowered for the first time this season while the Society was in session; so that it was thought sufficient interest in it would be felt by the large number of our members who have not had the opportunity of seeing it, to justify the publication of the accompanying plate and description.

The plate is a view of part of the basin of the Bartholdi fountain in the Botanic Gardens, west of the Capitol, from a photograph by Mr. Daniel Frazer, of this city, and was engraved for the Proceedings by especial permission.

The *Victoria regia* was first discovered by Haenke in Bolivia, South America, in 1801, who is said to have been so overcome at the sight of it as to kneel in adoration. After Haenke the next botanist who had the privilege of finding it was Bonpland, the companion of Humboldt in his Brazilian travels, but long after the latter had left the country. Bonpland in his eagerness to secure specimens nearly precipitated himself off the raft on which he was exploring a little river, and could talk of nothing else but the plant for a month. In 1825 he sent seeds and a full description to M. Mirbel, professor of horticulture in the Jardin des Plantes, at Paris, and this description seems to have been the first that attracted attention in Europe, Haenke's statements apparently having passed unnoticed. Bonpland himself only heard from his shipment twenty-nine years

after, when he saw the Brazilian ladies using French fans ornamented with miniature drawings of the great lily.

Next in succession was D'Orbigny, who gathered specimens in a tributary of the Rio de la Plata, in the province of Corrientes. He loaded his boat with leaves, flowers, and fruit, made careful drawings, and sent them, with other collections, to the Museum of Natural History, at Paris, in 1827.

Dr. Poppig appears to be entitled to the honor of giving the first printed botanical description in a little-known journal, Frorieps Notizen, in 1833.

Five years later Sir Robert Schomburgk, during a journey into the interior of British Guiana, found the plant, and, ignorant of the discoveries of his predecessors, addressed a letter of description to the secretary of the Geographical Society. He measured a leaf six feet five inches in diameter, the rim five and one-half inches deep, the flower a foot and a quarter across. From twenty to thirty beetles were sometimes found in one flower, completely destroying the center.

In 1845 Mr. Bridges, on a botanical trip in Bolivia, gave an enthusiastic account of the plant to the London *Journal of Botany*. He found aquatic birds walking from leaf to leaf, and as many as fifty flowers from 10 inches to a foot across in one group. Leaving some buds in his room and returning after dark, he found them all expanded and diffusing a most delightful odor. With the help of his Indians he obtained two entire plants, with about thirty flowers and leaves, in all stages of growth and decay. At the lower end of the stalk was a mass of fleshy hollow roots, the base of which seemed to decompose as new leaves put forth from the center, thus preventing the plant from elevating itself above the water. Captain Hislop, an old settler, stated the leaves were larger in winter, and that some measured 12 feet across.

The early attempts to introduce the *Victoria* into cultivation were very unsuccessful, as the seeds and plants sent over arrived in Europe in a condition unfit for germination or growth. The first living seeds were bought by the Kew gardens from Mr. Bridges, and were taken to England in a bottle with moist earth in August, 1846. Two plants were grown, but the dark, cheerless season appeared to be unfavorable, and in December they died. In October, 1848, roots were received at Kew in a Wardian case from Dr. Boughton; also seeds in the capsules and seeds in muddy water, but all alike were dead. Finally, February 26, 1849, Dr. Bodie and Mr. Luckie,

of Demerara, sent seeds in vials of pure water that made the journey in good condition. March 22d half a dozen seeds were sprouting, sown in moist earth in pots immersed in large pans of water enclosed in a glass case in a tropical propagating house, giving them the advantage of bottom heat. The young plants were distributed to the Duke of Devonshire, at Chatsworth ; the Duke of Northumberland, at Syon, and to Kew, and in this order they flowered. Mr. Paxton records that on receiving the young plant from Kew, at the gardens of the Duke of Devonshire, August 3d, 1849, it was placed in a pot filled with water and plunged in a bed heated to 85° until a large tank, about 19 feet in diameter, was ready, August 19. The plant was put in a hillock of prepared soil in the center of the tank, which in 79 days it completely filled. Calculating from the size of the box in which it arrived, it added daily to its surface 647 square inches, one of the most remarkable instances of rapid vegetable growth. November 11th the largest leaf was grown, nearly five feet in diameter, with the edge turned up two inches. This edge lasted about a month, then became flat, and was generally the first part to decay. From the first appearance of the leaf to its full development was from nine to twelve days, and until decay six to eight weeks. In January it had the largest number, twenty-five healthy leaves on it at one time.

The second year the plant grew much more luxuriantly, and a leaf about five feet in diameter sustained a weight of 112 pounds. November 9th, the anniversary of its first flower, it had produced 150 leaves and 126 flowers, and it never ceased flowering from the commencement. About the third day after the first expansion of the flower the seed vessel sank under the water, occasionally rising and falling, but never coming to the surface. The time occupied in ripening its seed varied from 28 to 37 days, and the number of seeds in each capsule from 25 to 179.

These plants grew in tanks about 40 feet in diameter, in which was kept up a circulation of warm water at a temperature of 85°, the air of the house between 80° and 90°, allowed to fall to 75° at night. It was at first supposed it would be necessary to keep up a circulation of water on the surface of the tank, but the blooming of sixty flowers in five months without it showed it was unnecessary, a small quantity of fresh water flowing in each day being all that was needed.

The requirements of this immense lily were so great, that a special house was built for it by Mr. Joseph Paxton, at Chatsworth, for the Duke of Devonshire, in which the roof was made on the ridge-and-

furrow principle, and when, in 1851, buildings were demanded for the first World's Fair, the experience of this lily-house led Mr. Paxton to suggest the principle as well adapted for the purpose of the exposition buildings, and his suggestions were successfully adopted. He has himself told the story in the London *Illustrated News*, August 9, 1851.

The credit of introducing this plant into the United States is due to Caleb Cope, at Springbrook, near Philadelphia, in 1851, under the care of Thomas ~~P.~~ Meehan. An unsuccessful attempt was made in 1850 with seeds from Sir William Hooker and from Downing. The seeds that grew were furnished by Prof. Asa Gray, from a living plant sent to him from Kew by Sir William Hooker. A diary of the progress of this lily may be found in the *Horticulturist*, volume VI, 1852. The flowers grew 17 inches in diameter and the leaves averaged six feet. It is asserted that the leaves turned up their edges most in abundance of light, and in winter time showed a tendency to lose this peculiarity. The flowers averaged two a week, and from August 13 to April 1 twenty-eight flowers appeared on the same plant.

The following year John F. Allen grew the plant in Salem, Mass., from seed furnished by Mr. Cope. The seed germinated January 13, 1852, and the plant lived through four summers, having matured over two hundred flowers.

These plants were cultivated under glass, at an average temperature of 85°; above 90° or below 80° an injurious effect was noticeable. In Salem, when the temperature accidentally fell to 67° the flowers remained in bloom for several days in cup-shape, but the older leaves spotted and decayed. Mr. Cope also grew the lily in a cement tank in the open air, introducing warm water through pipes from the green-house boiler. Leaves three feet or more were obtained, but no flowers perfected. Plants were also grown in the open air by John Pollock, gardener to James Dundas, Esq., of Philadelphia, Pa.; George McHattie, gardener for Mr. Spang, of Pittsburgh; by Nicholas Longworth, of Cincinnati, and D. Waldo Lincoln, of Worcester, Mass.

In 1882 E. D. Sturtevant, of Bordentown, N. J., produced perfect flowers in the open air 12 inches across and leaves 6 feet in diameter. Mr. Sturtevant succeeded in ripening seed from the first flower that opened, and at about the same time a gentleman in Georgia brought to perfection leaf, flower, and fruit in a carp pond, starting with a good, strong plant.

In all cases the seeds were germinated in pure, warm water, at a temperature of at least 85°, and the water in the fountains was kept warm by artificial means, except during the hottest summer days. The germination of the seeds was rendered more certain by filing the epiderm so that the water could reach the cotyledous, and some of the early failures were due to the hardness of the seed coat.

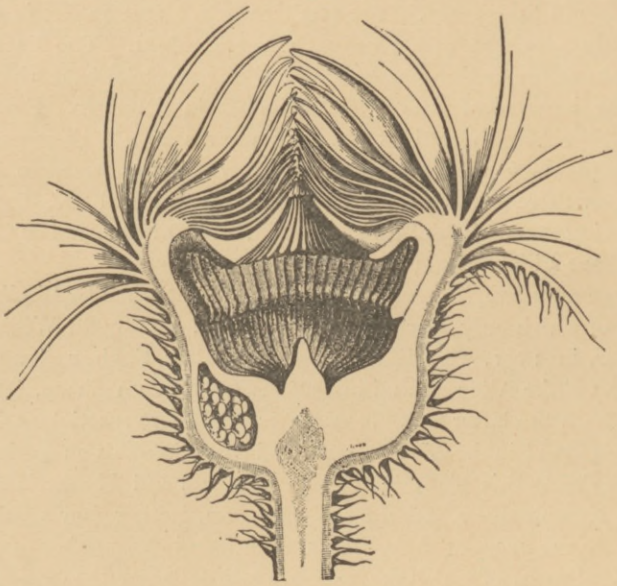
This year Mr. William R. Smith, superintendent of the Botanic Gardens, obtained some seeds from Mr. Sturtevant, and started the young plants, as usual. A plant was placed in each of the two fountains in the garden. The smaller basin, about 40 feet in diameter, was provided with a canvas cover at night. The Bartholdi fountain shown in our plate never had any artificial heat whatever, and the largest leaf grew 7 feet 4 inches in diameter. From our experience here there does not seem any reason why these extraordinary plants cannot be grown anywhere in the Southern States wherever there is a small pond and any one who will take the pains of starting them. Chicago, Pittsburgh, New Orleans, and San Francisco have all had examples this year.

Three monographs have been published on it—one by Lindley, in 1837, of which only 25 copies were printed; one by Sir William J. Hooker, in 1851, with illustrations by Walter Fitch, and another by John Fiske Allen, with illustrations by William Sharp, Boston, 1854, both the latter being large folios. Numerous articles relating to it are found in the *Horticulturist* and other journals on gardening.

Botanically this plant belongs to Bentham and Hooker's eighth order Nymphæaceæ, suborder Nymphæeæ, having four sepals adherent to the ovary at their base, and an indefinite number of petals in several rows, of which the outer are a little larger than the sepals, but which diminish in size toward the center, and change into stamens almost imperceptibly. The interior stamens are sterile. The ovary is nearly round, but with a cup-shaped top, in the center of which is a knob, and around the edge of this cup are the stigmas radiating from the center. The fruit is fleshy, ripening under water, having several cavities containing a number of seeds the shape and size of small peas. They have a thick, black skin and a very white, floury interior, that when ground, bolted, and baked forms a delicious article of food, considered a luxury in its native country, and similar in this respect to the Lotos of Egypt.

Our cut of the structure of the flower is from Baillon's History of Plants. The flowers usually open in the afternoons of two or three

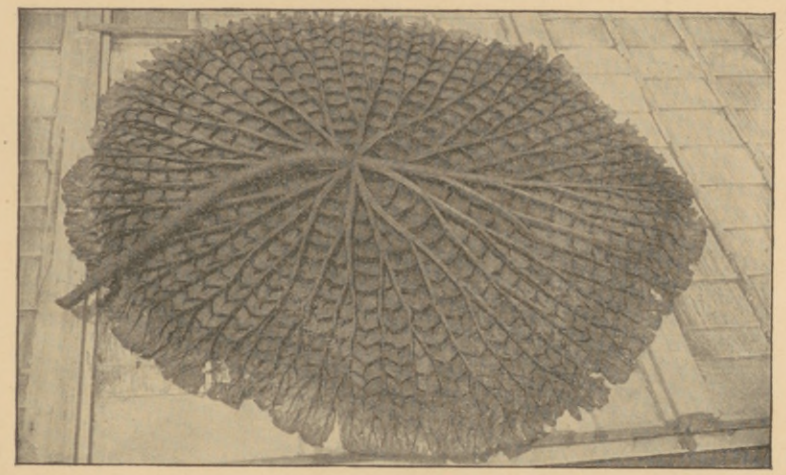
days, closing in the middle of the day, especially if it is hot. I the hand is plunged in its center while opening it will be found quite sensibly warm. The seeds germinate in about three weeks after planting. The first leaf is long and grass-like, the second quite slender, acutely halberd-shaped, the third stouter and the angles more obtuse, and the succeeding leaves gradually assume the tray-like form from which the Indian name of the plant "Yrupe," water-platter, is derived.



A young leaf unrolling and a bud may be seen near the label in the plate. The leaves are green and coriaceous above and purple on the under side, which is provided with a remarkable series of ribs radiating from the petiole and connected by cross-bars, as shown in the cut, from a photograph by the writer. This leaf was only 4 feet in diameter, as shown by the foot-rule in the upper corner, but the largest leaf grown here was 7 feet 4 inches in diameter. The leaves frequently supported a child weighing 75 pounds, and it is related by W. Sowerby, in the *Horticulturist* for 1870, that, desirous of testing the weight they would bear, he selected a leaf of the plant in Regents Park, London, 5 feet 6 inches in diameter, and gradually

spread gravel, previously weighed, on it, until it bore up 426 pounds, when an unlucky throw tilted it to one side and it sank.*

The ribs and stems of both leaves and flowers are supplied with large air canals, symmetrically arranged, which add greatly to the buoyancy of the plant. The under surface of the leaves and the stems are covered with stout, prickly hairs. The stomata are nearly circular, formed of two crescentic cells.† They measure $\frac{8}{960}$ of an inch in diameter, and are so closely placed that 139,843 are found in one square inch of epidermis. An ordinary-sized leaf, four feet in diameter, with a surface of 1,850.8 square inches, will thus contain upward of 25,000,000 of stomata.



The lower surface of the leaf has no stomata, but is thickly clothed with flexuous hairs, consisting of cylindrical cells, arising each from a small round basal cell very distinct from the other cells. These hairs average $\frac{1}{55}$ of an inch in length by $\frac{1}{490}$ inch in breadth. In addition there are scattered over the surface numerous round cells similar to those at the base of the hairs, apparently undeveloped hairs. All of these special cells are arranged so much like the stomata as to suggest their homology with the stomata, an idea which is strengthened by the presence of some chlorophyll, which is entirely

* A disk of water two meters across and one decimeter thick will weigh 314 kilos, or nearly 700 pounds.

† Quarterly Jour. Mic. Science, 1856, p. 163.

absent in the ordinary epidermal cells, but is present in the true stomata cell.

Like many other plants, the Victoria has been named several times. The following are its principal synonyms:

Euryale Amazonica, Poep; *Nymphæa Victoria*, Schomb; *Victoria Cruziana* D'Orbigny; *V. Amazonica*, Sowerby; *V. regia*, Lindley; *V. regina*, Gray, and *V. reginæ*, Hooker.

A blue variety has been called *Fitzroyana* and an extra red variety *Randii*, which was grown in the small fountain in the Botanic Garden here, and it is quite probable other gardener's varieties with other names will be obtained in time.

Wherever it has been cultivated it has been an object of the greatest interest to the public. It is estimated that 40,000 people visited the gardens in Washington while it was in flower, and numerous amateur photographers tried their skill on it, including several members of the American Microscopical Society, to whom we hope this description will not prove wholly unacceptable.