will exist, but of which the top and bottom will be suppressed. If we present this cell to the wind in such a way that two of the sides shall be horizontal and two others vertical, it is evident that the air will pass freely through the cell without exerting any pressure capable of raising it; but if we elevate the front edge of the cell slightly, the wind, in pressing the lower surfaces of the walls that were previously horizontal, will tend to raise the apparatus The latter will have great stability by reason of the existence of the two vertical sides, which, in a manner, play the same part as the keel of a boat.

The sides of the cell that undergo a pressure are the sustaining planes, and the vertical sides the directing ones. If we place two of these cells one behind the other, in leaving between them an interval equal at least to their length, we shall have the Hargrave cellular hovering kite adopted at the Blue Hill Observatory (in the United States), where through the intermedium of meteorological registering apparatus, it is used for exploring the upper regions of the atmosphere. In certain experiments, such apparatus have reached heights of from 5,000, to 6,500 feet.

If, on the contrary, we juxtapose not two but a greater number of cells, say six, eight, twelve, or more, in the same frame, we shall obtain the multicellular hovering kite, which we have devised and constructed after numerous tentatives.

We at the outset placed four rectangular cells one above another, and thus obtained an apparatus having exactly the form of a set of shelves. We tried this upon the beach of Cobourg in 1898; but, since the stability did not prove as great as that which we desired to obtain, we were led to multiply the number of cells and to employ square cells, with one diagonal and horizontal and the other vertical.

Each cell taken isolatedly thus flies upon the side and presents to the wind surfaces that are inclined, one to the right and the other to the left, somewhat as in the case of a boat that is floating upon its keel.

We have in this way constructed a kite of wonderful stability, which rises with the greatest ease and maintains itself in the air with complete immobility.

Our multicellular hovering kite is very easily constructed. It requires as a rigid frame only four wooden rods having the length of one cell and placed at the four corners of the entire affair formed of all the cells, and two cross pieces, one in front and the other behind to give rigidity to the whole.

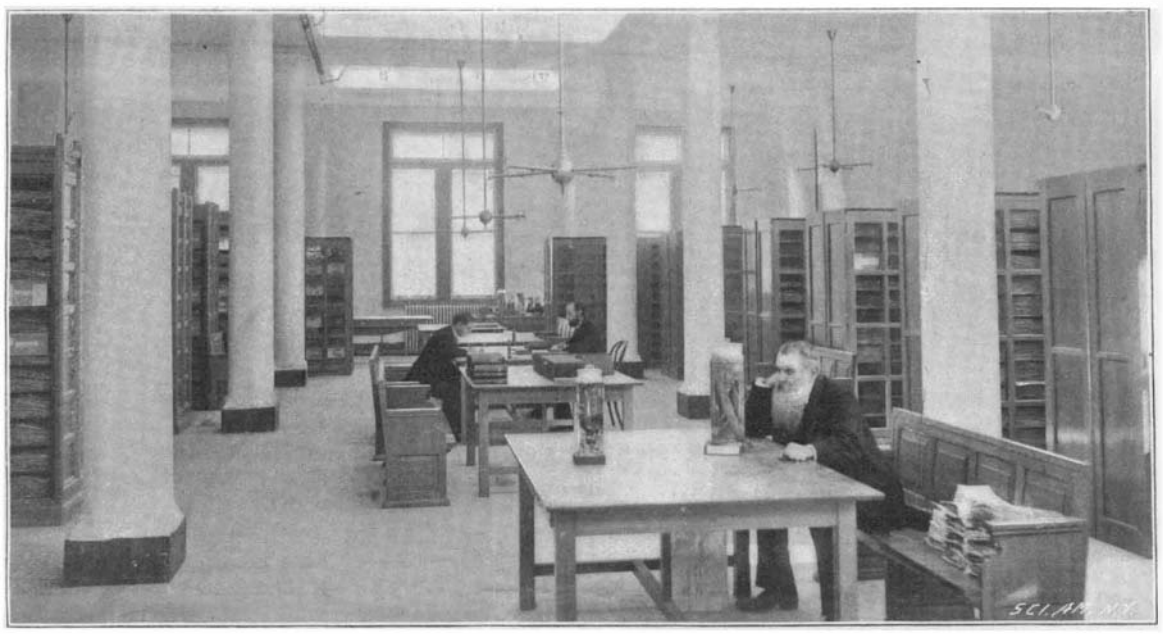
It may be put together and taken apart in a few minutes with the greatest ease. After being taken apart, it may be rolled up and carried very easily upon a bicycle.

It is so easily managed that any one can send it aloft and maneuver it without difficulty. When it is in the air, it is so stable that ten yards of string may be suddenly paid out without causing it to fall. Finally, its sustaining power is so great that, in a brisk wind, we have been able to make it raise a dummy formed of a child's clothing and fixed to an umbrella. And yet the kite is not of very large size, its dimensions being four feet in length and breadth and 16 inches in depth, while its weight is a little less than four and a half pounds.

We are indebted to La Vie Scientifique for the description of this form of kite.

THE NEW YORK BOTANICAL GARDEN.

New York city is fortunate in having within its corporate limits a park which contains both a botanical garden and a zoological park. Until within a comparatively short time there were few visitors to Bronx Park, notwithstanding the fact that this tract with its thick woodlands, waterfalls, glens and rustic bridges, is really one of the choicest parks in the country. Its chief merit is that in no sense does it resemble the ordinary park. The Botanical Garden part does not show the imprint of the landscape architect. It is the purpose of its managers to leave the paths as rugged as at present, and only the main arteries of travel will be macadamized and made easy for visitors. The Park is readily reached from the Grand Central Depot by the Harlem Road, and the visitor breaks his journey at Fordham for the Zoological Park and at Bedford Park for the New York Botanical Garden.



VIEW OF HERBARIUM, MUSEUM OF BOTANICAL GARDEN.

In 1889, a committee of the Torrey Botanical Club was appointed with authority to procure such legislation and funds as would be necessary for the establishment of a botanical garden in New York city. This committee succeeded in securing the interest and cooperation of the city authorities and of many influential private citizens. The provision of the charter, which was obtained in 1891, and was amended in 1894, was that a corporation should be established from which a board of managers was to be chosen, supplemented by an ex-officio board of scientific directors to have the management and control of the scientific and educational departments of the corporation. The Mayor and the President of the Board of Commissioners of Public Works were also to be members. Upon the corporation securing by subscription a sum of not less than $250,000, the Commissioners of Public Works were directed to set aside and appropriate a portion of the Park land not exceeding 250 acres for establishing and maintaining a botanical garden and museum and to construct and equip within such grounds suitable buildings at a cost not to exceed $500,000. It was also provided that the grounds should be opened to the public daily without charge. The sum of $250,000 was raised by subscription, and on July 31, 1895, the Commissioner of Parks appropriated 250 acres in the northern part of Bronx Park for the purpose of the corporation. About two years were then devoted to the preparation of the plans and the preliminary improvement of unsightly portions of the tract. $500,000 for buildings was made available by vote of the city authorities in the summer of 1897, and the buildings were commenced about the end of that year. The result of the co-operation of the municipal authorities and private individuals has proved most satisfactory in the American Museum of Natural History and the Metropolitan Museum of Art, and the new enterprise in Bronx Park in which the city is a partner will prove no less interesting and valuable to the citizens at large and to science.

THE MUSEUM OF THE NEW YORK BOTANICAL GARDEN.

The section of the Park given to the city is admirably adapted for the purpose of a botanical garden. It is not too far away to be accessible and is still out of immediate contact with the smoke and vitiated air of a great city. Every variety of growth finds a fitting habitat in the land reserved for the garden. There are broad meadows for the grasses, bogs for the sedges, flags and other plants, and clear running water and quiet lagoons for aquatic vegetation. There are tree-shaded lowlands for ferns and scattered rocks and ledges for mosses and lichens. The tract through which the Bronx River now flows will be left intact for the benefit of the students of forestry, and since Lorillard built a large stone house on the east bank of the gorge a century and a half ago, the trees have been almost totally undisturbed by the ax of the woodman.

The popular features of a botanical garden are not omitted, and as soon as the visitor enters the ground he begins to see the labels attached to trees and plants throughout the garden. The various classes of trees and plants into which the garden is divided are termed "plantations." The swampy forest land is being drained, but will be reserved as a forest area, as these forest features are considered of the greatest importance in the general plan. West of this is the fruticetum, a plateau consisting of 3 or 4 feet of loam resting on a layer of gravel 12 feet or more in depth. This is divided into sections for the planting of shrubs according to the family and following as far as possible a natural sequence and grading broad levels of greensward between the families. Beyond this are the bog gardens and the portion devoted to plants like the willows. South of the fruticetum and bog gardens are some springs forming a bog. This bog is to be excavated to a depth of 6 feet and converted into lakes separated by a longitudinal driveway. There will be a water area of 6 acres when all the

various improvements are completed, irrespective of the Bronx River. About the museum 25 acres of land have been reserved for ornamental purposes. South of the museum is a glade devoted to the systematic display of a collection of herbaceous plants. It is a meadow intersected by a stream and bordered by trees.

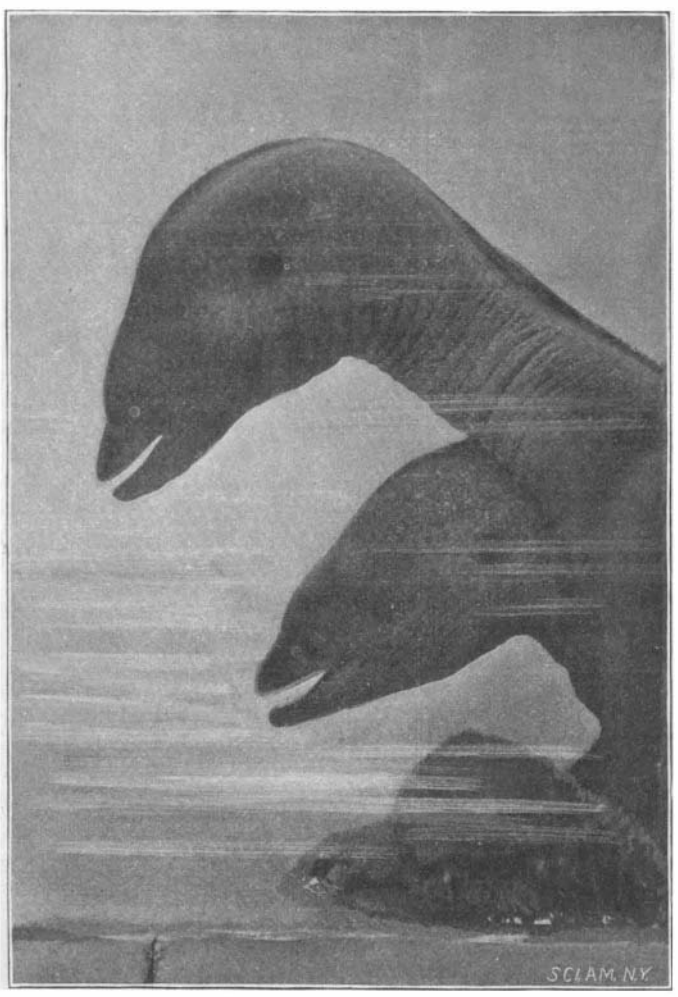
In this space provision is made for hillside plants and those which thrive best in the shadow of woodlands. Upward of 5,000 plants have been set out and labeled, and already the plantations afford a valuable opportunity for study. The Pinetum west of the herbaceous grounds has been stocked with many fine specimens of pines, firs, spruces, and larches.

The museum building is at present the most interesting feature of the Garden. It is 308 feet long, 50 feet deep, and 70 feet high. The building is designed in the Italian renaissance style, and the classic order used is limited to two stories because these are the chief portions of the structure and are thus appropriately marked in their external character, and the upper story is thus left susceptible of freer and more varied treatment. The central feature is the dome of the reading room, which rises higher than any other part. The whole stands upon a basement which is masked by the approaches and terraces; thus the apparent height is lessened and the skyline varied without injury to the utilitarian interior. The materials are of white brick and terra cotta with the exception of the marble columns. The principal entrance is on the first floor level, so that all of the public museum halls are up only one flight of stairs. This is accomplished by forming a terrace along the main front of the building reached by an inclined approach. The first floor of the building is devoted to economic botany and the specimens will include samples of barks, fibers, food, plants, timber, etc., the object being to show the plant and tree and fruit or product at all its various stages. The process of manufacture will be illustrated either by charts and diagrams, or in some cases by models. Such apparatus as a cotton gin will be shown on a small scale with the raw material and the varied products. On the second floor of the building is the Museum of General Botany where types of each of the various families will be shown. The exhibition will be of a synoptic nature arranged with a view to pedagogical effect.

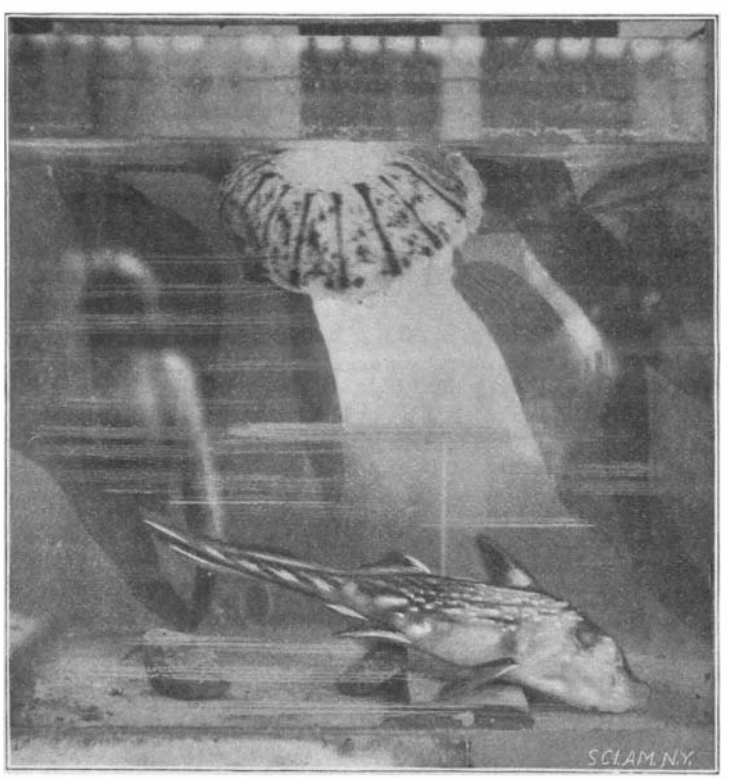
The third floor of the building is arranged for investigation purposes, with a library in the center. In the rotunda under the dome is the main reading room; adjacent is the stackroom, provided with metallic shelves capable of containing twenty thousand volumes. To the west of the library is the laboratory for plant embryology and cytology. Adjacent to this is the general morphological laboratory, the Director's office and a seminar room; adjoining and on the northwest corner is a specially constructed room with greenhouse for plant physiology, and an elaborate heating system makes it possible to secure any desired temperature. Research rooms, chemical laboratory and a photographic laboratory are on the west side of the floor. At the end of the library there is a large laboratory and various research rooms. Another east wing is occupied with a herbarium shown in our engraving, which is already equipped, as the large herbarium in Columbia University is in place with cases and specimens in perfect order. It is fitted up with oak tables and chairs, and is an ideal place for botanical study. It now contains between 600,000 and 700,000 specimens. In the library the Columbia University Botanical Library will be installed in the course of a few weeks, and the garden has also acquired on its own account some valuable collections of books. The lecture room in the basement is practically complete and is arranged in the amphitheatrical form and will accommodate 720. In this room public lectures under the auspices of the garden will be given from time to time on botany and allied subjects.

Outside the museum building work is being carried on in the way of grading, planting, drainage, etc., vast quantities of porous tiling being used for drainage purposes. A 36-inch water main running through the grounds has been tapped for a 6-inch main, thus providing an adequate water supply, for it is necessary to use vast quantities of water in summer in order to promote the healthy growth of the plants. The power house is located directly on railroad and it will supply heat to the museum and the range of horticulture houses. A subway carries the steam pipes and electric wires from the power house to the museum.

Opposite the museum and fronting the Southern Boulevard are the horticultural houses. When completed they will be thirteen in number and will cover an area of 45,000 square feet. The central feature of the range is a palm house with a diameter of 100 feet, and it is nearly 90 feet high. From each side of the houses connecting wings 116 feet long and 30 feet wide will extend east and west. These houses have a cruciform termination, being 84 feet wide, 16 feet high to the main cornice, 38 feet to the lantern cornice, and 46 feet to the ridge. There will be various other connecting greenhouses. These houses are largely constructed of glass and the work on them is proceeding very rapidly. Palms, ferns, and tropical fruits will form a feature of the taller houses, while one of the low connecting houses will cover a pond for the aquatic plants. Heat will come from the power house which supplies the museum. The garden staff, which is already doing most efficient work, is under the direction of Dr. Nathaniel L. Britton, to whom we are indebted for courtesies in the preparation of the present article. The members of the staff are Dr. D. T. Macdougal, director of the laboratories, Dr. John K. Small, curator of the museums, Dr. P. A. Rydberg, assistant curator, Samuel Henshaw, head gardener, and there are other assistants.



LIVING FISH IN THE SANTA CATALINA ZOOLOGICAL STATION.



COLORED JELLY FISH AND FISH PHOTOGRAPHED UNDER WATER.

PHOTOGRAPHING LIVING FISHES AT SANTA CATALINA ZOOLOGICAL STATION.

BY PROF. C. F. HOLDER.

The islands of the Southern California group, especially Santa Catalina, which has a town and mail service to and from every day in the year, have long been an interesting field to the zoologist, the fauna being in many respects peculiar. The "Albatross" has dredged here, and doubtless the National Museum has a very perfect collection representing the deep sea life of the adjacent channel and the submarine plateau that reaches away from the various islands. To place the representative forms of life here within reach of the public, students, and teachers, the owners of Santa Catalina Island have opened a zoological station and equipped it with a very creditable aquarium, so being able to present to the teachers of the National Educational Association, which met in Los Angeles, a fairly representative collection of the marine animals of this region, few, if any, of which have been seen or displayed alive.

The aquarium is on the beach at the little town of Avalon, which is 3½ hours from Los Angeles. The present building is 60 by 20 feet with an end room for purposes of study. The tanks consist of one 60 feet in length, which can be used as a single tank or divided into ten or twelve compartments; this faces the sea. In the center of the building is a shark tank, 40 feet in length, with one division. In one end of the room are several small tanks, while the west or land side is also occupied by a row of small tanks 3 by 4 feet. The water is pumped from the bay to large reservoirs about 150 feet above, and from there runs down and is distributed by the injectors which aerate the tanks.

The conditions here are almost identical with those of Naples, only the climate at Avalon is almost perfect, the temperature ranging not much over 10 or 12 degrees between winter and summer; hence the dangerous changes which threaten some aquariums are reduced to a minimum. On entering the aquarium a tank of corals is first seen. Here is a beautiful branching scarlet gorgonia brought up in the channel from 600 feet of water, a large and heavy branch of coral and an attractive glass sponge from the same depth. The floor of the tank is sandy and on it are the "sea pansies" of the layman, or renellas cousins of the corals, throwing out long white polyps. The coral Dendrophyllia is seen here; the polyps when alive are a rich sulphur yellow. A line of small tanks follow, all tastefully arranged with living algæ. In the first are two remarkable fishes known as "drums," from the fact that they utter a loud grunting sound that can be heard all over the building though made under water. They are about a foot in length, the eyes directed upward, as in the case of the star-gazer, and on the lower surface and sides is a remarkable arrangement of mother-of-pearl spots apparently like those of Scopelus, also found here. The next tank is devoted to the great keyhole limpet, its velvet black body concealing the shell and in sharp contrast to the great yellow foot, almost 6 inches long, that is fastened to the glass.

In the adjoining tank are young rock bass, their beautiful eyes an interesting study. Then comes a tank of the smallest of the surf fishes—the shiner; a family group that was born here in the latter part of June. Like others of this family of fishes, they were born alive. The parents are four or five inches in length, and the young at present an inch and a half long. Each female gave birth to six or eight young, which were expelled tail first, and were at once capable of taking care of themselves, making no attempt to follow the mother, though they schooled. These little creatures are very tame and readily feed from the hand. The young males are beginning a unique courtship, which consists in penning a female in a corner and darting about her, pretending to seize food with open mouth and carry it to the demure female that remains in a given position. The male observed at this time drove off all rivals. The autumn—September and October—is the so-called mating time. In the following small tanks are young marbled morays, kelp fishes and some singular deep-sea spider crabs that were taken from a depth of six hundred feet. To all intents and purposes they are dead, so slow are their movements.

In the center of the hall is a long tank filled with macrocystis and various algæ, in the center of which is a notable group, consisting of three or four marbled morays—huge creatures of great bulk, veritable sea serpents, their mouths open, showing sharp fanglike teeth. Swimming up and down about them is a young sheepshead, rock bass, curious kelp fishes that mimic the leaves, and others. Two large sting rays press their grotesque faces against the glass, provoking much amusement from those to whom they are new,