was between spectral red and green. In the calculation of the results the amount of red light transmitted was taken as 14.6, and the amounts of green light calculated from the ratios obtained; these were as follows:

8.7	The mean of all the results was
8.9	8.78, instead of 8.4 per cent, as di-
8.7	rectly determined.
8.9	These measurements were made
9.4	by myself, but I thought it would be
8.6	interesting to see how nearly the
8.3	same result would be obtained by a
8.78	person wholly unused to the photometer, and in general to photometric work.

Miss L., after the nature of a flicker had been explained to her, at once obtained 9.07, which differs by $\frac{3}{10}$ of a per cent. from the mean of my more elaborate work.

Results of equal or greater accuracy were obtained by myself and others using blue and red light, or green and blue light, all of them being intense or saturated. No trouble was found in causing the disappearance of the flicker when the speed of the motor was properly regulated, nor were the eyes more fatigued than in making ordinary optical observations; of course, if the illumination is feeble the flicker becomes feeble; consequently the lamps and their distances from the prism should be so chosen as to afford the best illumination possible under the given conditions.

OGDEN N. ROOD.
COLUMBIA UNIVERSITY.

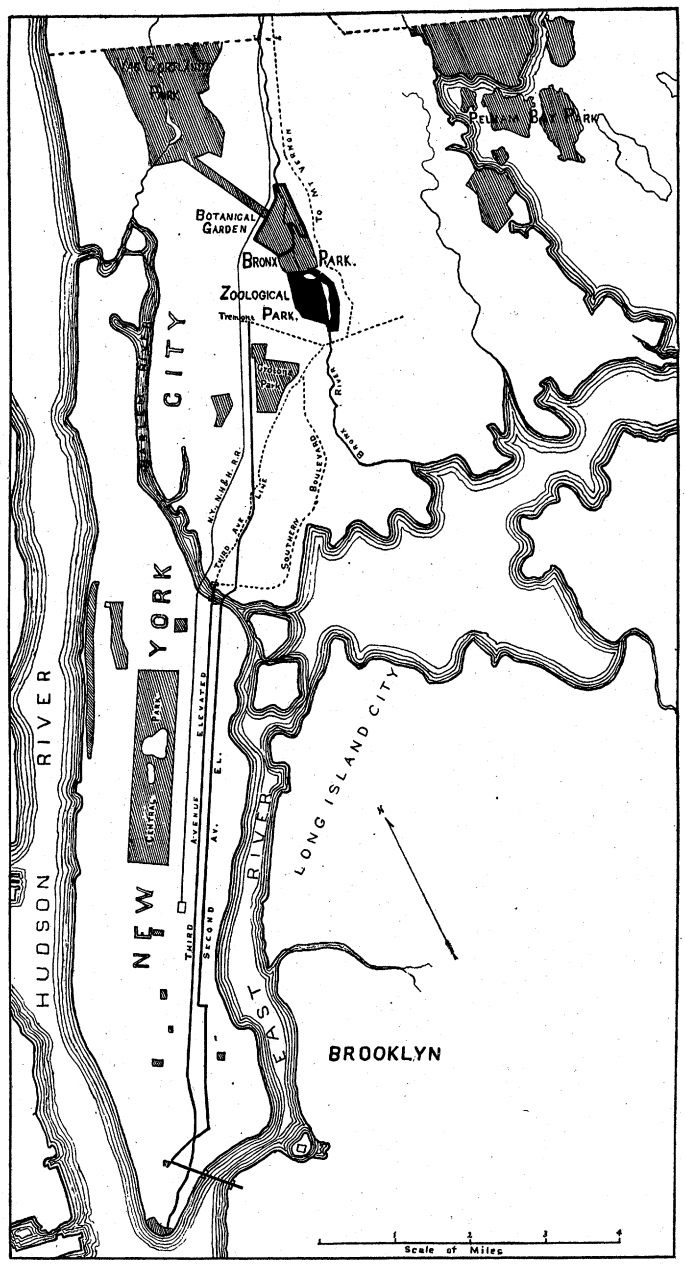
THE NEW YORK ZOOLOGICAL PARK.

MUCH progress has been made during the past year by the Zoological Society of New York, and the establishment of the Park in the near future now depends solely upon the cooperation of the city government. Under the present city administration, and especially with the policy of economy which has been generally adopted, it appears possible that the project may be somewhat delayed, although the Park Commissioners are in hearty sympathy with the project of the Society.

In the recently issued report of the Executive Committee, the following are enumerated as the chief results of the year's work: A contract with the City of New York, unanimously adopted by the Commissioners of the Sinking Fund, March 24, 1897; completion of the General Plan of the Park, and its unanimous approval by the Park Commissioners, November 22, 1897; subscription of the first $100,000 toward the gift of $250,000 from the Society to the city, completed February 15, 1898; preliminary plans of nine of the principal buildings, prepared and submitted for criticism to several American and European zoological garden specialists; increase of the membership of the Society from 118 to 600 active members.

According to the agreement with the city, $125,000 is to be expended by the city in the preparation of walks, sewers, public comfort buildings, boundary fences, etc., and a large part at least of this preliminary work is absolutely essential before the Society can judiciously expend any portion of its Park Improvement Fund of $250,000. During the next few weeks the matter will probably be decided, and in the meantime detailed plans for every division of work are being prepared with the greatest care.

The preliminary plan of the Park presented by Director Hornaday in 1896 was used as a basis for criticism and suggestion by various leading zoological experts of the country, especially by Dr. C. Hart Merriam, Mr. George B. Grinnell and Mr. D. G. Elliott, who made a careful inspection of the Park and offered a number of valuable suggestions. The preliminary plan was then approved by the Executive Committee and a close topographical servey of the Park ordered. The next step was the combination of the zoological or scientific with the



SKETCH MAP OF NEW YORK CITY.

Showing the Location of the proposed Zoological Park, and present Means of Access.

landscape and architectural features; and an able committee of experts consented to serve, as follows: Mr. Thomas Hastings, of Carrere & Hastings (architects of the new public library); on engineering, Mr. W. Barclay Parsons (of the Rapid Transit Commission); and upon the general landscape development, the late Park Commissioner, William A. Stiles. Professor Chas. S. Sargent, of Harvard University, also accepted a place on this Advisory Committee, but was subsequently prevented from serving. Messrs. Heins & La Farge were appointed architects, and began to develop the details of the plans, in constant consultation with the Director. Upon the general plans of the buildings for animals, Mr. Arthur E. Brown, Superintendent of the Zoological Garden at Philadelphia; Mr. Carl Hagenbeck, of Hamburg; Dr. J. A. Allen, of the American Museum of Natural History, among others were consulted, and kindly gave their valuable time and advice. After several months of labor a final plan of the Zoological Park was completed, and on November 15th was formally approved by the Park Commissioners. The following memorandum accompanied the plan:

The fundamental principles which the Zoological Society has observed in discharging its duty toward the City of New York and the general public in the planning and the development of the Zoological Park, may be briefly formulated as follows:

1. The Zoological Park must be established on lines by which it can be made a complete success zoologically, and also satisfactory and beneficial to the public.

2. The very valuable tract of park land, consisting of 261 acres, assigned to the Society's use as a site, must not be injured in any way, either permanently or temporarily, but must at all times be regarded as a trust.

3. Even of the area devoted to animal collections, the choice landscapes are to be preserved unharmed, by locating all the large closed buildings so that they will be unobtrusive, especially from the boundary boulevards.

4. In selecting suitable locations for the numerous collections of creatures that will be required to live in the open air all the year round, it is of paramount importance that such animals should have all the advantages that are available in the nature of shade, shelter from westerly winds, dry situations, etc., in order that they may survive as long as possible.

5. So far as it be possible, it is extremely desirable that all animals living in the open air should be so installed that their surroundings will suggest, even if not closely resemble, their natural haunts.

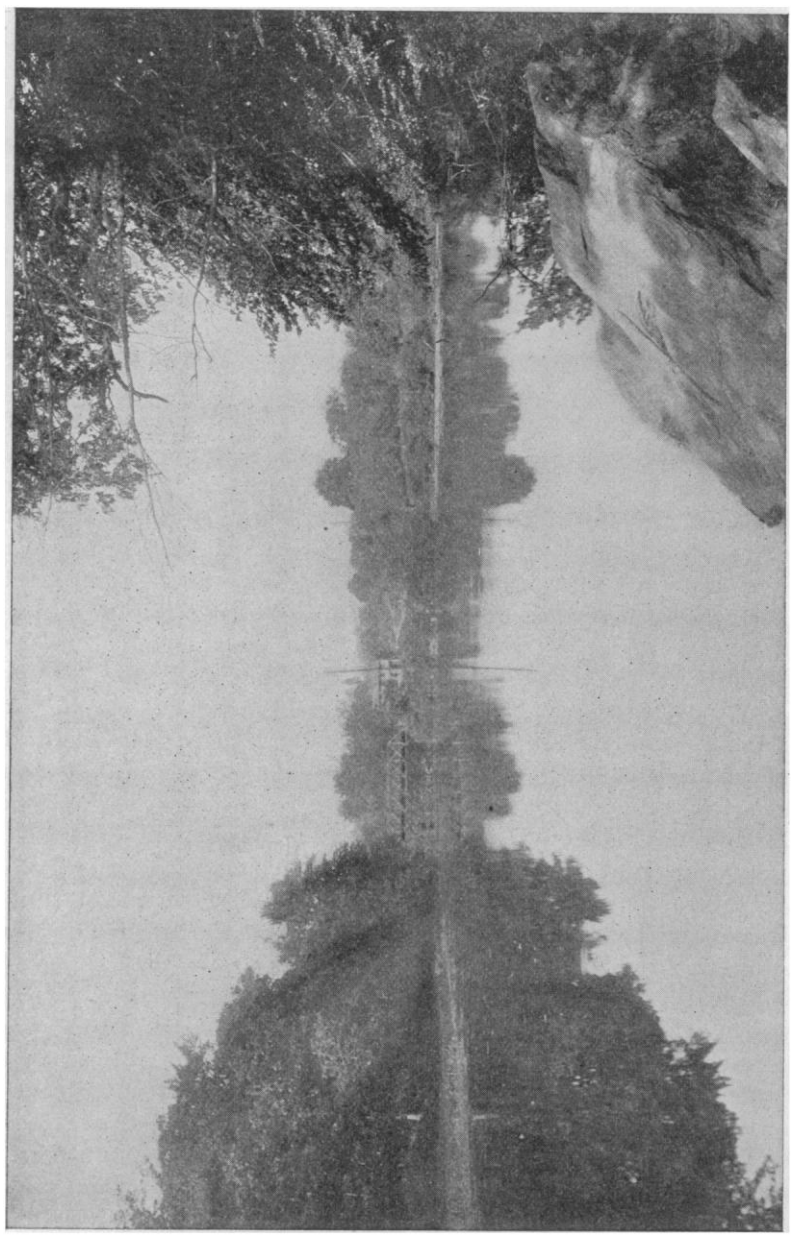
6. The fences for large animals in open ranges shall be of the lightest description consistent with the proper confinement of the animals, and all posts used shall be as unobtrusive as possible.

7. As far as possible, the general aspect of wildness which now characterizes South Bronx Park must be maintained. In other words, it is desirable that the Park should be maintained as a well-kept and accessible natural wilderness rather than as a conventional city park.

8. It is totally inexpedient and undesirable to have the area of the animals bisected in either direction by a carriage roadway, other than that projected to lead to the principal restuarant.

9. A single-track road for horseless carriages, so laid out as to reach the principal buildings and collections, but without interfering with pedestrians, is not objectionable, and will probably become necessary.

10. In order to protect and control the Zoological Park, the area for the animals, west of the Boston road, must be entirely surrounded by a light wire fence, save on the north side, where the water forms a natural barrier.



THE UPPER END OF BRONX LAKE, NEW YORK ZOOLOGICAL PARK.

The 261 acres assigned to the Park is an especially beautiful and diversified area, combining open glades with thickets, heavy forest, natural streams and waterfalls, long areas of rocky cliffs, and traversed by the beautiful waters of the Bronx. It seems to the visitor hardly credible that such an area should have been preserved so close to a large city. It is evident that it should be developed with the very greatest care, and it is believed that the final plan of the Zoological Park will preserve all the natural beauty of this tract, and greatly enhance its interest to the people of the City and State of New York.

In regard to the zoological arrangement and the development of the plans of the buildings, the Director reports as follows:

"Our final plan is believed to locate each species as nearly as possible where nature would design to have it placed; to absolutely avoid all disfigurement of the site; to make the most of the shade which nature has provided; to enable the visitor to see the whole series of collections with the least possible amount of walking; to yield the greatest return for the money that is to be expended, and last, but not least, to yield something that is hardly to be found to an equal degree in any smaller zoological garden or park—a logical and fairly symmetrical zoological arrangement.

"In the preparation of the plans for the buildings to be erected in the Zoological Park, the Director was required to furnish to the architects a series of preliminary ground plans, and the details of such other scientific features as cage arrangement and general assignment of space. In this connection it is a pleasure to acknowledge the assistance that has been derived from certain European zoological gardens, whose buildings have furnished points that have been incorporated in our own.

"The plan of our Lion House contains several ideas drawn from the admirable London Lion House, but with one noteworthy improvement, by means of which the out-door and in-door cages are provided with free communication. The plan of our Elephant House contains features derived from the well-nigh perfect 'Palais des Hippopotames' in Antwerp. Our Antelope House contains many ideas borrowed from that in Frankfort. Our Reptile House copies several features from that in the London Garden, but many of its most important features are original.

"Our Bird House, Monkey House, Subtropical House, Small Mammals' House, Winter House for Birds, Administration Building, Bear Dens, Wolf and Fox Dens, Alligators' Pools, Burrowing Rodents' Quarters, Squirrel Installations, Beaver Pond and Aquatic Rodents' Ponds all are features absolutely new, both in design and general arrangement."

The plans of nine of the principal buildings have now been drawn with great care, but, with the exception of the Monkey House and Reptile House, they are still in the formative stage of development.

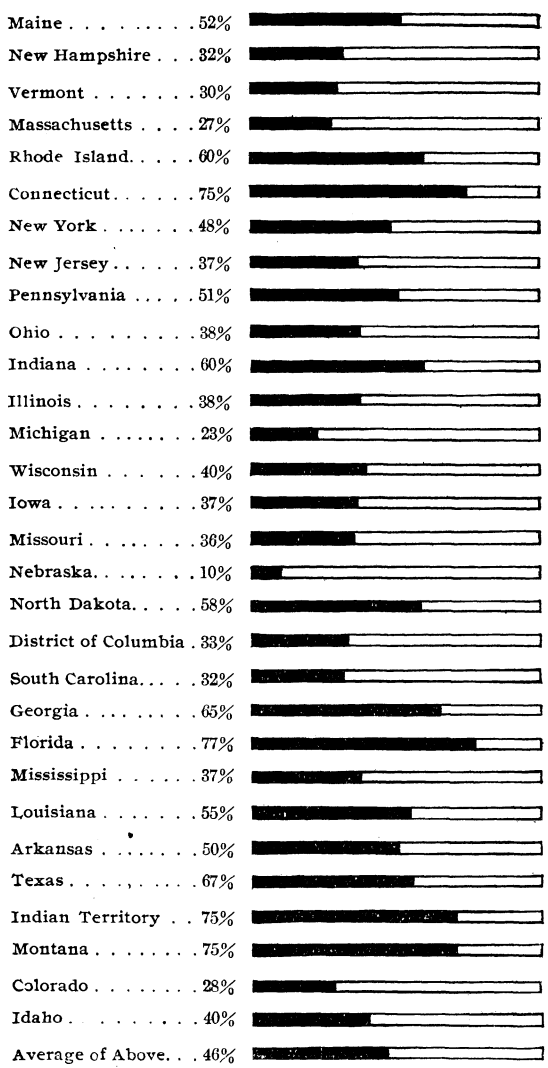
Although the principal work of the Society during the past year has been devoted to securing a firm financial basis, and to the development of a thoroughly satisfactory plan, some of the other objects have been considerably furthered.

It is our purpose to make especial provisions and facilities for artists and sculptors in the various buildings, in order to establish a school of animal painting and sculpture which shall be worthy of this city and country. As an object lesson for American cities, Director Hornaday has prepared a very careful and fully illustrated report upon "The London Zoological Society and its Gardens," which will be of interest to keepers and patrons of zoological gardens in all parts of this country. He has also made, by means of postal correspondence, an extended inquiry as to the destruction of

birds and mammals in different parts of the United States. While results obtained in this way express opinions rather than exact statistics, the column showing the percentages of decrease in bird life during the last fifteen years will be of value in arousing the national sentiment for the preservation of our rapidly disappearing wild life. The correspondence is published in detail, and a large edition of this special paper in the Annual Report has been ordered for distribution in various parts of this country where it will be of the most service.

DECREASE IN BIRD LIFE IN THIRTY STATES.

The shaded portions show the percentages of decrease throughout the States named during the last 15 years, according to the reports made to the New York Zoological Society.



During the past year four honorary members have been elected to the Society as follows :

Mr. Arthur Erwin Brown, Philadelphia Zoological Gardens.

Professor Daniel Giraud Elliot, Field Columbian Museum, Chicago.

Dr. C. Hart Merriam, Director of the Biological Survey, U. S. Department of Agriculture, Washington, D. C.

Dr. Philip Lutley Sclater, Secretary of the Zoological Society of London.

Public interest in this project has been stimulated by means of popular illustrated Bulletins. The Annual Report also is fully illustrated by engravings showing the Park as it is, and the London Zoological Gardens. A large colored map, executed by the Matthews-Northrup Co., of Buffalo, is included in report, and shows in detail the final plan as approved by the Society and the City.

Henry F. Osborn.

ENGINEERING NOTES.

The opportunity for further improvement in the manufacture of armor-plate and consequent reduction of cost and price is well seen in comparing prices of this class of steel with those of other and more familiar sorts. With rails costing but $15 to $17 a ton, $\frac{3}{4}$ cent a pound, to make and selling at fifty per cent. higher figures in the market, and armor-plate at the following quotations, say at 25 cents a pound, there is obviously a grand opportunity for the mills to make money to-day and the inventor and the breaker of the monopoly to make more money later. The figures which follow are taken from bids of various makers for armor-plate to be supplied the Russian