the nickel is recognized in the filtrate by adding a little piece of solid caustic soda. In the acid analysis the acids are classified by the character of their barium and silver salts, and their most characteristic reactions well discussed.

Part IV., the appendix, contains the preparation of reagents, specific gravity and solubility tables, and considerable physical data. In the strength of reagents, it is gratifying to see that another convert has been added to the comparatively few teachers who have adopted the Reddrop system of normal reagents. The great advantage of the system is that the student knows the strength of the reagents he is using, and soon comes to avoid the use of great excess. Unconsciously he becomes familiar with the elements of volumetric analysis. The strengths recommended by the author differ a little from those originally suggested by Reddrop. For dilute acids and alkalies, 4 N solutions are used, and for salts $N/2$ generally. The ordinary reagents are N. In this laboratory $5N$ for acids, $5/2\,N$ for alkalies, and $N/5$ for most salts have been found convenient.

The press work of the book is excellent and typographical errors are very few. There is a complete index.

JAS. LEWIS HOWE
WASHINGTON AND LEE UNIVERSITY,
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SCIENTIFIC JOURNALS AND ARTICLES

THE March number (volume 13, number 6) of the *Bulletin of the American Mathematical Society* contains the following articles: Report of the Thirteenth Annual Meeting of the American Mathematical Society, by F. N. Cole; Report of the December Meeting of the Chicago Section, by H. E. Slaught; 'The Decomposition of Modular Systems Connected with the Doubly Generalized Fermat Theorem,' by E. H. Moore; 'Systems of Extremals in the Calculus of Variations,' by Edward Kasner; 'A Necessary Condition for an Extremum of a Double Integral,' by Max Mason; Shorter Notices; Nielsen's Handbuch der Theorie der Gammafunktion, by Virgil Snyder; Jouffret's Mélanges de Géométrie à Quatre Dimensions, by Peter Field; Lanner's Neuere Darstellungen der Grundprobleme der reinen Mathematik im Bereiche der Mittelschule, by D. E. Smith; Reformvorschläge für den mathematischen und naturwissenschaftlichen Unterricht, entworfen von der Unterrichtskommission der Gesellschaft deutscher Naturforscher und Aerzte (Zweiter Teil), by J. W. A. Young; de Peslouan's N. H. Abel, sa Vie et son Oeuvre, by Florian Cajori; 'Notes'; 'New Publications.'

The April number contains: Report of the February Meeting of the American Mathematical Society, by F. N. Cole; 'The Construction of a Field of Extermals about a Given Point,' by G. A. Bliss; 'Some Particular Solutions in the Problem of n Bodies,' by W. R. Longley; 'On the Matrices of Period a Power of p in Jordan's Linear Congruence Groups, Modulo p^{α},' by Arthur Ranum; 'On the Construction of an Integral of Lagrange's Equations in the Calculus of Variations,' by D. C. Gillespie; 'Algebraic Numbers and Forms' (Review of Bachmann's Allgemeine Arithmetik der Zahlenkörper and König's Einleitung in die allgemeine Theorie der Algebraischen Grössen), by L. E. Dickson; 'Notes'; 'New Publications.'

SOCIETIES AND ACADEMIES

THE AMERICAN CHEMICAL SOCIETY, NEW YORK SECTION

THE fifth regular meeting of the session of 1906–07 was held at the Chemists' Club, 108 W. 55th Street, on March 8.

Pursuant to the amendment to the by-laws of the section adopted February 8, the annual election of officers, to assume their duties at the close of the June meeting following, was held with the following result:

Chairman—H. C. Sherman.
Vice-Chairman—F. J. Pond.
Secretary and Treasurer—C. M. Joyce.
Executive Committee—Virgil Coblentz, G. C. Stone, C. H. Kiessig, Durand Woodman.

The chairman called attention to the great loss to the society occasioned by the untimely death of its honorary member, Henri Moissan,

and Dr. C. A. Doremus presented an obituary notice.

Professor S. C. Prescott, of the biological department of the Massachusetts Institute of Technology, spoke 'On the Utilization of Micro-organisms in Industrial Processes.'

This wide subject could only be considered very briefly during the short time available and the lecture was devoted to an outline of the advances made in the fermentation, milk and canning industries through the technical application of the science of biology.

A historical sketch was given of Pasteur's studies of the diseases of wine and beer and how these finally led to the use of pure yeast cultures, in the brewing industry. The advantages of the further use of pure cultures in wine making were pointed out and their application in the manufacture of other fermentation products such as spirits, vinegar, lactic and butyric acid was suggested.

Plates were shown which indicated in a striking manner the vastly increased purity of milk brought about by the use of proper sanitary precautions in the barns of the small farmer where much can be accomplished by intelligent inspection.

In the food-preserving industries, great advances have been made by isolating the germs producing decay and finding experimentally what treatment will destroy them. For example, the use of superheated steam in sterilizing cans of corn before sealing will accomplish the result in ten minutes instead of the four hours required when boiling water was used, whereas the latter readily sterilizes preparations of fruits. The use of such knowledge as this has brought about a considerable improvement in the quality of the finished products.

The inoculation of soils with nitrogen-fixing bacteria was discussed, and some very favorable results obtained in experiment stations were described. The bad showing made with the use of cultures sent out by the Department of Agriculture was attributed to their becoming partly, and at times completely, sterile during the drying process preparatory to shipping.

Professor Prescott showed numerous slides to illustrate the different subjects discussed and his lecture was much appreciated by a large attendance.

C. M. Joyce,
Secretary

SECTION OF GEOLOGY AND MINERALOGY, NEW YORK ACADEMY OF SCIENCES

At the monthly meeting of the academy on January 7, Dr. E. O. Hovey presented notes on a recent visit to the volcanoes of Toluca, Colima and Popocatepetl in Mexico, illustrated by a series of lantern slides. The section then proceeded to an examination, in adjoining rooms, of the exhibits of geology, paleontology and mineralogy in the New York Academy of Science's exhibition, under the guidance of committeemen in charge of the exhibits.

At the monthly meeting, February 11, Dr. John M. Clarke, state geologist of New York, gave an informal description of the geography of the Atlantic Devonian, with lantern illustrations. Professor James F. Kemp also offered notes on mineral localities visited during the summer of 1906 in Canada and Mexico, and exhibited a collection of specimens of minerals and ores.

At the monthly meeting, March 4, the session was devoted to a description of Letchworth Park (Glen Iris), the new State Reservation on the Genesee River, New York, recently presented to the state of New York by Mr. William Pryor Letchworth.

Professor A. W. Grabau first described the geology and scenery of the Upper Genesee falls and gorges.

In the first part of the paper the speaker discussed studies made by him for some years on the drainage systems of central New York in preglacial time. It was pointed out that all the characteristics of the ancient valleys indicate a southward drainage in late Tertiary time. In all cases where the valleys are traceable they unite southward into trunk streams, a condition wholly inexplicable on the supposition that these valleys were formed by northward-flowing streams. This is readily seen by an inspection of the topographic sheets as well as of the magnificent geologic sheets

of this section recently published by the state survey. Where the connection is broken, this can generally be shown to be due to drift deposits.

The following drainage systems were tentatively outlined, the outline being presented as a report of progress rather than as a final settlement in any one case.

On the west, the Wyoming (Warsaw) valley probably had the Dale valley, now occupied in part by the Little Tonawanda, as a western branch, joining it north of Warsaw. The Warsaw valley is still believed to have been continuous with the Upper Genesee valley, above Portageville, by way of Glen Iris, as outlined by the speaker in 1894 and earlier. The valley of Silver Lake joined the Warsaw valley somewhere near Silver Springs. A narrower valley, now occupied by the Genesee from Gibsonville to St. Helena, is continued by a buried gorge from that place to Portageville, where it joins with the Warsaw-Glen Iris valley and another valley from the northwest, to continue southward in the large valley now occupied by the Upper Genesee.

The Canasseraga valley, now occupied in part by the Genesee, was cut by an independent stream. This is the largest valley of the region and was that of the master stream. The Nunda-Cashaqua valley, generally held to have been the former path of the Genesee, is probably only an inner-lowland type of valley, carved on the contact between Portage shales and Chemung sandstones. It may have been in part a tributary of the Genesee at Portageville. The Canasseraga, above the junction of the Cashaqua, is as broad and flat-bottomed as below that point, and was certainly continuous throughout, being carved by a single stream, the Tertiary Canasseraga, as suggested nearly fifteen years ago by the speaker. This river, flowing southward, received as a tributary the Conesus, the valley of which is broad and open to Scottsburg. Hemlock and Canadice rivers joined southward, receiving another branch near Springwater, the united series joining the Canasseraga by way of Wayland. Honeoye and Canandaigua rivers, joined near Naples having another eastern branch in West River. Originally this series may have drained southward by way of Cohocton, but may later have been captured by a branch of the Canasseraga. This proposition, however, needs careful study. Another branch of this system seems to have been the Flint, the valley of which, traceable for twenty miles or more, points toward the Cohocton outlet. Another system is represented by the two branches of Keuka Lake, which have other branches uniting with them southward.

Other systems are represented by the valleys of the more eastern lakes. So far as the study has proceeded, these valleys could only have been formed by a southward drainage, as outlined in Bulletin 45, New York State Museum.

The remainder of the paper consisted of a description of the gorges and falls about Portage, illustrated with lantern slides. The successive stages in the development of the lower falls received special attention.

Dr. George F. Kunz then presented a plan of development of the park as a means for scientific education. Both papers were illustrated with series of beautiful lantern slides.

ALEXIS A. JULIEN,
Secretary of Section

THE TORREY BOTANICAL CLUB

THE meeting of December 11, 1906 was called to order at 8:15 o'clock P.M., at the American Museum of Natural History, with President Rusby in the chair. Eight persons were present.

The scientific program was as follows:

'*Some Hawthorns of the Vicinity of New York City*': Mr. W. W. EGGLESTON.

Species and variations of *Cratægus* growing within the vicinity of New York City were described and illustrated by herbarium specimens.

'*Centers of Distribution of Coastal Plain Plants*': ROLAND M. HARPER.

One of the most familiar phenomena of plant distribution is that neighboring areas of equal extent often differ considerably in the number of species they contain. And it usually happens that a region with a rich flora (if a large enough area be taken into consideration) contains a considerable num-

ber of endemic species, also that many species which are not endemic grow more abundantly or vigorously in such places than in other parts of their ranges.

A well-known example of a center of distribution is the southern Appalachian region, which has the greatest variety of trees to be found anywhere in temperate eastern North America, most of which grow larger there than anywhere else, and many species are now confined to that region, though some of them were doubtless more widely distributed in prehistoric times. Isolated islands and mountain peaks in all parts of the world are also noted for their endemic species.

Our Atlantic coastal plain (shown on map which was exhibited), though in some respects a unit, contains several fairly well defined centers of distribution. Beginning at the northern end, the first center to be considered is the so-called 'pine-barrens' of New Jersey. From the available literature if would seem that the following species are either confined to that region or else are much commoner in New Jersey than in adjoining states.

Schizæa pusilla, Sporobolus compressus, Dichromena colorata, Rhynchospora pallida, R. Knieskernii, R. Torreyana, Xyris fimbriata, X. flexuosa (*torta* of most authors), *Eriocaulon Parkeri, Juncus Cæsariensis, Abama Americana, Helonias bullata, Xerophyllum asphodeloides, Oceanoros leimanthoides, Tofieldia racemosa, Uvularia sessilifolia nitida, Aletris aurea, Lophiola aurea, Gyrotheca tinctoria, Pogonia divaricata, Arenaria Caroliniana, Drosera filiformis, Corema Conradii, Ilex glabra, Hypericum adpressum, Rhexia aristosa, Dendrium buxifolium, Pyxidanthera barbulata, Gentiana Porphyrio, Sclerolepis uniflora, Chrysopsis falcata, Coreopsis rosea.*

Most of these are monocotyledons, and there are more species of Melanthaceæ in the list than of any other one family.

The next well-marked coastal plain center seems to be in the southern corner of North Carolina. The following species are rarely if ever seen more than 100 miles from Wilmington.

Tofieldia glabra, Hypoxis micrantha, Dionæa muscipula, Kalmia cuneata, Coreopsis falcata, Leptopoda Curtisii.

The following species of wider distribution seem to be more abundant within about 50 miles of Wilmington than they are at a distance of 100 to 200 miles in either direction.

Selaginella acanthonota, Pinus palustris, P. serotina, Aristida stricta, Campulosus aromaticus, Dichromena latifolia, Zygadenus glaberrimus, Lilium Catesbæi, Smilax laurifolia, Habenaria blephariglottis, Nymphæa sagittifolia, Amorpha herbacea, Polygala lutea, P. ramosa, Gordonia Lasianthus, Cyrilla racemiflora, Clethra alnifolia, Vaccinium crassifolium, Sabbatia lanceolata, Carphephorus bellidifolius, Aster squarrosus, Marshallia graminifolia.

By far the greatest center of pine-barren plants or perhaps an aggregation of two or more sub-centers, is in Georgia and northern Florida. Probably three fourths if not nine tenths of all pine-barren species can be found in Georgia, at least a dozen are confined to that state, and many more to Georgia and Florida together. In the Altamaha Grit region (the middle third of the coastal plain) of Georgia there are nearly 150 species on sand-hills, about the same in dry pine-barrens, 200 in moist pine-barrens, and 75 in pine-barren ponds. These numbers are undoubtedly larger than for the same habitats in any other state unless it is Florida.

In subtropical Florida there are, of course, many plants not found farther north, but practically all of these center in the tropics, and are therefore outside of the region under consideration.

Going westward from Florida we find in the vicinity of Mobile and Pensacola a center comparable with that in southern North Carolina. To this belong *Myrica inodora, Sarracenia Drummondii, Drosera filiformis Tracyi, Pitcheria galactioides,* and perhaps *Carphephorus Pseudo-Liatris. Chamæcyparis thyoides* and *Sarracenia purpurea,* which are as common within fifty miles of Mobile Bay as they are in New England, seem to be entirely wanting at twice that distance, and do not appear again within two or three hundred miles, as far as known.

Pine-barrens extend as far west as Texas, and there ought to be some species of pine-barren plants confined to Louisiana and Texas, but too little is known of the flora of those parts as yet.

Plants of muddy swamps seem from all accounts to be most numerous in the Mississippi embayment of the coastal plain, from about the mouth of the Ohio River southward. Characteristic species of this region, most of them woody plants, are:

Taxodium distichum, Echinodorus radicans, Arundinaria macrosperma, Hymenocallis occidentalis, Leitneria Floridana, Hicoria Pecan, H. aquatica, Quercus Michauxii, Q. lyrata, Planera aquatica, Celtis occidentalis, Brunnichia cirrhosa, Platanus occidentalis, Cratægus viridis, C. apiifolia, Amorpha fruticosa, Ilex decidua, Acer saccharinum (dasycarpum), Berchemia scandens, Nyssa uniflora, Bumelia lycioides, Adelia acuminata, Trachelospermum difforme, Asclepias perennis, Gonolobus lævis, Vincetoxicum gonocarpos, Bignonia cruciglia, Tecoma radicans, Conoclinium cœlestinum, Mikania scandens, Eupatorium serotinum.

Most of these are not wholly confined to the coastal plain, but they are more common there than elsewhere, and few if any of them ever ascend more than 1,000 feet above sea-level. Going eastward in the coastal plain they become perceptibly scarcer. There are fewer of them in Georgia than in Alabama, still fewer in the Carolinas, and only about half of them reach Virginia, though there is nothing in the climate to hinder them, as far as known.

In contrast to these five or six evident centers a few of the regions with poorer flora may be mentioned.

The coastal plain of Delaware, Maryland and Virginia seems to lack many of the species common to New Jersey and the southern pine-barrens, though some of them will probably be reported when those parts are better explored. South Carolina too seems to be a rather uninteresting state floristically, and there are perhaps no good species confined to it. The upper fourth of the coastal plain of Georgia (*i. e.*, that part outside of the pine-barrens) has quite a diversified topography and vegetation, but practically all the plants growing there range either northward to the mountains or coastward to the pine-barrens.

A part of the Cretaceous and Eocene regions of the coastal plain from western Alabama through northern Mississippi and West Tennessee to Kentucky is remarkable for the paucity of its flora. It is entirely outside of the pine-barrens, and nearly all of its species seem to be common and widely distributed. The same remarks will probably apply to the coastal plain of Arkansas.

The ultimate reason why so many species are found in some parts of the coastal plain and so few in others is still obscure, and perhaps each center will require a different explanation. But the importance of locating these centers is obvious; for any one who wishes merely to collect as many species as possible will save time by confining his operations to the vicinity of known centers, and the possibilities of discovering new species are greater there than in the poorer regions. When the species belonging to each center are more accurately listed it may then be possible to discover their significance.

C. STUART GAGER,
Secretary

DISCUSSION AND CORRESPONDENCE

INHERITANCE OF THE BELT IN HAMPSHIRE SWINE

THE Hampshires are a breed of black and white hogs, the white being confined to a belt around the body at the shoulders, sometimes occurring also on the hind feet and the tip of the tail. The breed has recently risen to prominence in the middle west. Its origin is somewhat obscure. Hogs of this peculiar coloring are seen occasionally throughout the south, north to the Ohio River, and even beyond. The white belt in hogs the breeding of which is left to chance behaves in a very erratic manner, usually occurring in only a small proportion of any herd. Even amongst registered Hampshires about 10 per cent. of the progeny is without the belt. Breeders have endeavored to eliminate the 'blacks,' *i. e.*, hogs lacking the belt, but are not yet able to avoid them. The writer recently undertook to collect data from breeders with a view to analyzing the belt character, and thus learning