ceived renewed study from the standpoints of comparative anatomy and comparative embryology by some of our ablest morphologists, but none of these researches appears to give adequate attention to the recent phases of the doctrines of nerve components and the functional subdivision of the nervous system. Professor Johnston reviews this literature exhaustively from the new point of view and in the light of his own researches (partly not before published), discussing the problems of head morphology and segmentation with illustrative diagrams and tabular summaries. The phylogeny of the organs of special sense is discussed fully with reference to their primitive segmentation and their derivation from more primitive types of sensory mechanisms.

Bird-Lore for May–June contains the following leading articles: 'The Motmots of our Mexican Camp,' C. William Beebe; 'Some Early American Ornithologists, II., William Bartram,' Witmer Stone; 'The American Bittern at Home,' E. G. Tabor; tenth paper on 'The Migration of Warblers,' W. W. Cooke; Notes and Book News and Reviews. The section devoted to 'The Audubon Societies' contains much encouraging information in regard to bird protection, but shows that continued effort is still necessary, particularly in the case of game birds. The final paper is a 'leaflet' devoted to the Barn Owl and showing his good qualities as a mouser.

The Popular Science Monthly for June contains papers by the following contributors:

William A. Locy: 'Von Baer and the Rise of Embryology.'

Edward S. Holden: 'Galileo.'

Arthur H. Daniels: 'The Teaching of Logic.'

Charles A. White: 'The Mutations of Lycopersicum.'

Henry S. Williams: 'What is Research?'

W. J. Beal: 'Plants that Hide from Animals.'

SOCIETIES AND ACADEMIES.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

The 168th meeting of the Geological Society of Washington was held on April 26 at the Cosmos Club.

As informal communications, Mr. L. C. Graton exhibited photographs of Taughannock Falls, New York, and Dr. F. E. Wright explained a new method of determining the optical character of minerals. The regular program included the following papers:

The Ore Deposits of the Ouray Quadrangle, Colo.: Dr. J. D. Irving.

The ore-deposits are located in a small area of about three and one half miles square in the precipitous country in the near vicinity of Ouray, Colo.

The rocks of the region comprise a series of sedimentaries ranging in age from Algonkian to Cretaceous, with included porphyries, while the higher hills are capped by thick beds of volcanic tuff.

The ores are classified as silver-bearing fissure veins, gold-bearing fissure veins, replacement deposits in quartzite, replacement deposits in limestone.

The silver-bearing fissure veins penetrate the sedimentaries and pass occasionally upward into the volcanic tuff. They carry galena, tetrahedrite and some other sulphide in a gangue of barite and quartz. Replacements of limestone occur where beds of this rock are penetrated by the fissures. The silver values are present in the tetrahedrite.

The gold-bearing fissure veins are associated with intrusive dikes of monzonite-porphyry, and contain chiefly auriferous pyrite with some chalcopyrite in a gangue of quartz and crushed country rock.

The replacement deposits in quartzite are flat shoots of gold-bearing pyrite with a little galena and other sulphides which have been deposited in quartzite. It is thought that they owe their origin to alkaline waters that have ascended to the quartzite through minute fissures. The quartzite is fully replaced only in the neighborhood of the fissures and is surrounded by empty solution cavities in the quartzite resembling those usually encountered in the limestone beds. The ores range from $30 to $600 in value.

The replacement deposits in limestone are of three kinds. One is in the limestone beds along the courses of the normal fissure veins

where they form flat, lateral enrichments of such veins.

2. Large flat bodies of silica and barite with silver-bearing ores associated with minute supplying fissures.

3. Deposits of gold-bearing ore composed of an intimate mixture of pyrite and magnetite with actinolite, quartz, epidote and other minerals of supposed contact origin. This class of deposit carries low values in gold and is thought to have been deposited by replacement together with the associated minerals by circulating waters subsequent to the porphyry intrusions.

The geological age of all of these ores is Post Eocene.

Structure of the Great Plains and the Mountains on their Western Margin: N. H. DARTON.

With this communication there was presented an illustration showing the configuration of the Dakota sandstone under the Great Plains and on the flanks of the uplifts westward. This widespread formation has been extensively explored in its underground distribution, by numerous deep wells, and its outcrop area has been mapped so that the structure of much of the region which it underlies is ascertained. This structure was shown by 100- and 500-foot contour lines and it exhibits many notable features. In general, under the Great Plains, the formations have but little dip and wide areas are monoclinal. The uplifts along the mountain border and in southeastern Colorado are marked features and it has been discovered that there is a low anticline extending across north-central Kansas and western Nebraska nearly to the Black Hills. In the bottom of the basins about Denver and northeast and northwest of the Black Hills the Dakota sandstone lies below sea level. In eastern South Dakota it abuts against the Sioux quartzite and is overlapped by Benton formation.

Two diagrams were exhibited, illustrating the configuration of the Black Hills and Bighorn Mountain uplifts by contour lines drawn at the surface of Minnekahta limestone in the former and Bighorn limestone in the latter. In the central area of these uplifts, where the sedimentary beds have been removed by erosion, hypothetical contours are given. Both these uplifts are of the 'Uintah type,' steep-sided and flat-topped and evidently due to direct upward pressure and not to crustal contraction. Profound but local faults along the east side of the Bighorn Mountains are notable features, due mainly to local uplift in Laramie time.

Fault Phenomena Near Glen Echo, Md.: G. K. GILBERT.

The locality is a disused quarry on the north bank of the Chesapeake and Ohio Canal, about one fourth mile east of Glen Echo. The rock is gneiss. It is traversed by numerous systems of joints, as many as twenty having been noted. These are inclined in various directions and at various angles. The joints of each system are approximately parallel, with interspaces ranging from a few feet to at least several yards. The joint surfaces most broadly exposed are not true planes, but show curvature. Many of the joints are evidently surfaces of slipping, or fault planes, the observed dislocations ranging from a fraction of an inch to two or three feet.

The joint systems may be classed in two series, of which one is younger than the other. Many of the joint faces of the younger series are slickensided, and some of the joints contain veins of quartz. The older joints show no slickensides and carry no veins, although there is independent evidence that they are planes of faulting. Their surfaces have a faint but persistent undulation or mammillation.

Where two fault planes of the older systems intersect, each is dislocated by the movement along the other, but the dislocated parts are connected by a fluted surface suggestive of an ogee molding. This phenomenon is supposed to indicate simultaneous (or alternating) movement on the intersecting planes while the rock was within (or at the border of) the zone of flowage. Similar movement in the zone of fracture produces splintering or crushing at the intersections.

The joint systems are interpreted as the re-

sults of successive strains distributed through a long period, the older having occurred when the rock lay below the zone of fracture.

Geo. Otis Smith,
Secretary.

THE CHEMICAL SOCIETY OF WASHINGTON.

The 159th regular meeting was held Thursday evening, May 11, 1905, in the assembly hall of the Cosmos Club.

The first paper, entitled 'Chemical Glassware,' was presented by Mr. Percy H. Walker. Analyses and tests of durability and solubility of a number of beakers and flasks were given, and samples of the various glasses shown. The most suitable for chemical use were zinc boro silicates, and may be distinguished by permanent trade marks. Much of the lime alkali silicate glass sold in this country is of very poor quality.

The second paper, entitled 'A Colorimeter for General Use,' was presented by Dr. Oswald Schreiner. The speaker called attention to the increasing use of colorimetric methods for purely analytical and commercial purposes for both organic and inorganic compounds, and also for carrying on scientific studies in physical, physiological, sanitary and agricultural chemistry. A colorimeter of improved form was then exhibited and described. The parts coming in contact with the liquids are entirely of glass, mounted in a camera of wood. This instrument has the great advantage of speed and accuracy combined with great versatility of application to colorimetric solutions, together with simplicity in construction.

The third paper, entitled 'The Occurrence of Extractives in Apple Skin,' was presented by Mr. H. C. Gore. The quantities were given in which apple wax and apple vitin occur in the epidermis of the apple, both on ripe apples and on apples examined at intervals during growth. The method of analysis of apple skins for apple wax and apple vitin, stated briefly, consisted of extracting the marc of the skin with petroleum ether, followed by chloroform, the petroleum ether extracting the wax and the chloroform removing the vitin. The extracted wax was green or yellow colored, and melted at 59°–60°. The crude vitin was a white powder tinged with green or yellow and melted at 240°–250° C. The two varieties of summer apples examined were poorer in these extractives than the five varieties of winter apples. The extractives were found to increase steadily during the growing season. In case of ripe winter apples the wax amounts to about 30 mgms. per apple, the vitin to about 60 mgms. The probable importance of such studies in connection with the disease resistance of fruits was discussed.

Mr. F. P. Dewey exhibited a specimen of sodium ferrocyanide.

A. Seidell,
Secretary.

THE NEW YORK ACADEMY OF SCIENCES.
SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

The regular monthly meeting of the section was on April 17 at the American Museum of Natural History, with Dr. W. S. Day in the chair in the absence of Dr. Ernest von Nardroff. The program consisted of the following papers:

Purposes and Plans of the Solar Eclipse Expedition of August, 1905: S. A. Mitchell.

Dr. Mitchell gave an outline of the plans of the various expeditions to be made to observe the total solar eclipse which takes place next August and which will be visible in Labrador and Spain. He also spoke of the different problems that the members of the expeditions will endeavor to solve. The U. S. Naval Observatory expedition which Dr. Mitchell will accompany will go to Spain on the U. S. cruiser *Minneapolis* early in the summer. The paper was illustrated by lantern slides.

Variation of the Duration of Afterglow with Change of Electrical Intensity and Frequency of Oscillation of the Electrodeless Discharge: C. C. Trowbridge.

A long-continued study of the duration of afterglow has shown that smooth curves can be readily obtained showing the variation of the duration of the afterglow with change of pressure of the gas. It has been found that the maximum of duration of these curves, when

the electrical intensity is small, is at the same pressure approximately as the minimum sparking potential of the electrodeless discharge, or the point at which the discharge is most easily started. Also, when the frequency of the discharge is altered by a change of capacity, the position of the maximum point of the duration curve is altered to correspond to the displacement of minimum sparking potential of the discharge.

Lengthening the spark gap and thereby increasing the electrical intensity inside of the vessel in which the discharge takes place changes the form of the duration curve, and when the electrical intensity is thus increased above a certain amount the curve obtained is completely altered in form. When the afterglow in the rarefied air is allowed to diffuse into a vessel cooled to liquid air temperature, the duration curve is displaced some distance towards the higher pressure and is also changed in form, other conditions being the same; otherwise, the duration of the afterglow, which in the experiments was approximately thirty seconds, was found to be little different than when the air is at normal temperature. That a long-enduring glow can be obtained at the low temperature of liquid air and a pressure approximately one tenth of one millimeter is obviously important in its bearing on problems of astrophysics.

The Figure of the Sun, an Explanation of the Motions of Mercury: C. L. POOR.

This paper, which is being published by the Academy, was read by title.

The meeting then adjourned.

C. C. TROWBRIDGE,
Secretary.

THE AMERICAN CHEMICAL SOCIETY.
NEW YORK SECTION.

THE eighth regular meeting of the New York Section of the American Chemical Society was held at the Chemists' Club, 108 West 55th St., Friday, May 5, at 8:15 P.M. The chairman, Dr. Wm. J. Schieffelin, presided.

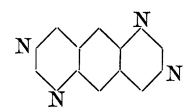
The program of the evening was as follows:

An Improved Form of Viscosimeter for the Testing of Oils: DANIEL D. JACKSON.

The earlier forms of instruments for the determination of the viscosity of oils consisted of bottles or bulbs which delivered a certain quantity of oil through an orifice of definite size. The necessity for jacketing such instruments soon became evident, and various methods were employed for this purpose. In only a few cases, however, has any attempt been made to protect the orifice so that a uniform temperature at this point would be assured, and in the cases where the orifice has been protected the oil under examination has been allowed to flow into a vessel which was outside the instrument. This causes a fall in temperature from the beginning to the end of the operation which is very considerable. A form of apparatus designed by the author for the testing of the viscosity of oil at 70° F. (21.1° C.) and 212° F. (100° C.) is so arranged that both the orifice and the oils under examination are kept at an exactly uniform temperature throughout the entire operation, and two very considerable errors in the results are thereby eliminated.

Condensation of Succinylosuccinic Ester with Guanidine: A. W. DOX and M. T. BOGERT.

Various attempts were made by the writers to produce a naphttetrazine of the following structure:

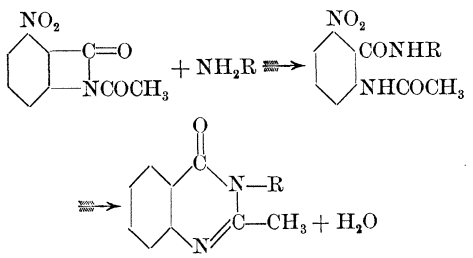


The well-known quinazoline syntheses when applied to *p*-diaminoterephthalic acid, in which the anthanilic acid grouping is present on both sides of the nucleus, should give such a compound. But diaminoterephthalic acid proved to be very inert, and no condensations could be made with it. It was found, however, that succinylosuccinic ester and guanidine condensed to a derivative of the above naphttetrazine. The method of preparation and subsequent analyses showed the product to be 2, 6-diimino- 4, 8-dioxy-hexahydro- 1, 3, 5, 7-naphttetrazine. There is a possibility also that the compound exists in the tantomeric form, having two amino instead of imino groups. The substance is soluble

only in caustic alkalies and strong mineral acids. From sodium hydrate it crystallizes as a di-sodium salt in beautiful yellow needles with green fluorescence. On the other hand, a sulphuric acid salt can be obtained in colorless rhombohedra by diluting the sulphuric acid solution with water.

Synthesis of Quinazolines from 6 Nitro-acet-anthranil: H. A. Seil and M. T. Bogert.

The 6 nitro-acet-anthranil was prepared by the action of acetic anhydride on acetanthranilic acid. It is much more reactive than the acetanthranil. It combines at once with primary amines forming first, the acid amide by direct addition, and then by loss of water passing over to the quinazolines.



The 6 nitro-acetanthranil is treated with an excess of the amine in a water solution of 1 to 3. It is brought to boiling and the excess of amine is distilled off. The solution is then made acid with acetic acid and filtered. The quinazoline thus obtained is purified by crystallization from alcohol.

The derivatives prepared are the methyl, ethyl, normal propyl, iso propyl, secondary butyl, iso butyl, iso amyl and allyl substitutions of the (2)methyl (5)nitro- (4)ketodihydroquinazoline. These are all white crystalline solids of high melting points; soluble in hot alcohol, slightly soluble in cold; soluble in dilute acetic acid (from which they can not be crystallized) and practically insoluble in water.

Influence of Organic Acids on the Precipitation of Antimony Sulphide: A. H. Peterson.

In the presence of a slight excess of mineral acids, relatively large quantities of certain organic acids prevent the complete precipitation of antimony sulphide by sulphuretted hydrogen. The influence was studied quantitatively and it was found that the influence was not directly proportionate to the masses of acid present, a limit being reached in each case, although the ratio of acid to the antimony present was inordinately large. The maximum effect obtained was for citric acid, which retains, in solution, seventy per cent. of the antimony present.

Of the acids studied, ethyl tartaric came next, then malic, while tartaric was the least energetic. The effect seemed confined to the oxy-acids, because succinic acid is without any effect and the influence of the citric acid is entirely lost when its hydroxyl group has been acetylated.

The Crystallization of Sodium Iodide from Alcohols: Morris Loeb.

It was accidentally observed that sodium iodide is extremely soluble in methyl alcohol and was not precipitated, even on the addition of considerable volumes of anhydrous ethyl ether. The alcohol solution, on cooling to room temperature, separates out crystals in long shining plates. Below 0° a voluminous mass of fine needles separates out, which are identical in composition, but different in appearance from those just mentioned. Melting point, 22 to 23°. Formula, $NaI.3CH_4O$. Under similar circumstances, ethyl alcohol dissolves the salt and crystallizes with it in proportion, $NaI.C_2H_6O$, while propyl alcohol yields $5NaI.3C_3H_8O$.

F. H. Pough,
Secretary.

THE TORREY BOTANICAL CLUB.

A meeting of the club was held at the museum of the New York Botanical Garden on Wednesday afternoon, April 26, 1905, with seventeen persons present and President Rusby in the chair.

The announced paper by Dr. P. A. Rydberg on 'The Composition of the Rocky Mountain Flora' was omitted by reason of the absence of the author.

'Notes on the Wire-Grass Country of Georgia' was the title of the paper presented by Mr. R. M. Harper.

The wire-grass country takes its name from the wire-grass, *Aristida stricta,* which is common all over it. In a broad sense, the wire-grass country coincides with the pine-barrens, which constitute about two-thirds of the coastal plain of Georgia, but for the present purposes the term is restricted to the Altamaha Grit region, an area of about 11,000 square miles.

The climate of the region, as compared with New York City, is about 18° warmer in winter and 9° warmer in summer. The rainfall averages about fifty inches a year, and most of it falls in the growing season. The geographical conditions are remarkably uniform throughout, and on account of this uniformity the flora is not very rich, only about one half as many species being known there as in the state of New Jersey, though the area is larger.

The region is naturally forested throughout, but the forests are mainly of long-leaf pine, which gives little shade. Consequently, the most striking feature of the vegetation as a whole is the adaptation to sunlight, usually manifested by reduction of leaf-surface.

The plants of the wire-grass country can be classified according to habitat into fifteen or twenty groups. The principal habitats are rock outcrops (constituting perhaps about one one-hundredth of one per cent. of the area), pine-barrens (over half the area), swamps, ponds, sand-hills, hummocks and bluffs, some of these with several subdivisions.

Civilization has influenced the flora principally through agriculture, lumbering, turpentining and fires. Only a small proportion of the land may be said to be under cultivation. Lumbering has little effect on the herbaceous flora, for the removal of the pine trees does not appreciably diminish the amount of shade. The turpentine operators have been practically all over that part of the country, and have done great damage to the forests. Fires sweep over most of the region every spring, being set purposely by stock-raisers to burn off the dead grass, but the fires do little damage where lumbering and turpentining operations have not been carried on.

The known flora of the Altamaha Grit region consists of about 725 native species of flowering plants, 75 weeds, 20 pteridophytes and 60 bryophytes and thallophytes. The lower cryptogams have been little studied. The largest families are Compositæ, 100 species; Cyperaceæ, 83; Gramineæ, 68; Leguminosæ, 50; Scrophulariaceæ, 30.

Some of the commonest species of the region are *Pinus palustris, P. Elliottii, P. serotina, Taxodium imbricarium, Aristida stricta, Serenoa serrulata, Eriocaulon decangulare, Quercus Catesbaei, Eriogonum tomentosum, Magnolia Virginiana, Sarracenia flava, S. minor, Kuhnistera pinnata, Cliftonia monophylla, Nyssa biflora, N. Ogeche, Oxypolis filiformis* and *Pinckneya pubens.*

The following species are common in the wire-grass country (each being known from at least three counties), but are seemingly confined to Georgia: *Sporobolus* (a species with terete leaves), *Rhynchospora solitaria* Harper, *Eriocaulon lineare* Small, *Polygonella Croomii* Chapm., *Siphonychia pauciflora* Small, *Viola denticulosa* Pollard (with leaves a foot and a half long), *Dicerandra odoratissima* Harper, *Pentstemon dissectus* Ell., *Baldwinia atropurpurea* Harper, *Marshallia ramosa* Beadle & Boynton and *Mesadenia* sp. (near *lanceolata*).

One of the most interesting features of the pine-barren flora, not generally known to botanists, is that the whole region was submerged beneath the sea in Pleistocene times, consequently the species now confined to the pine-barrens (from New Jersey to Texas), perhaps several hundred in number, have probably originated since that time.

Mr. Harper's remarks were illustrated by many photographs and specimens. The paper was discussed by Drs. Britton and Rusby.

Mrs. Britton then spoke of certain interesting southern mosses, especially of *Erpodium,* a curious genus having the habit of a *Frullania* or *Lejeunea.* A species of this collected many years ago by Sullivant at Augusta, Ga., was published by Austin as a hepatic under the name *Lejeunea biseriata.* Mrs. Britton discussed and exhibited also numerous mosses from the extreme southern part of Florida.

A few of these appear to be undescribed, but most of them are of species that are widely distributed in the West Indian region.

Dr. Rusby showed specimens of spurious ipecac roots which have found their way into the markets. The true ipecac (from *Cephaëlis Ipecacuanha* of the family Rubiaceæ) is now hard to obtain and high-priced. Some of the spurious root comes from other species of the same genus, but the most common adulterant is from the genus *Ionidium* (*Calceolaria*) of the family Violaceæ. Dr. Rusby exhibited also specimens of *Porteranthus stipulatus,* which is sometimes called the North American ipecac.

Dr. Britton showed living plants of two species of Crassulaceæ which had come into flower in the greenhouses of the New York Botanical Garden. One was *Sedum Nevii,* hitherto described from dried material, a species collected originally in southwestern Virginia, but since found to extend to Indiana. The other was a *Pachyphytum* from Mexico. Dr. Britton stated that in North America, north of the Isthmus, 284 species of Crassulaceæ may be recognized, distributed in 25 genera. Representatives of all these genera have now been studied in the living state.

Marshall A. Howe,
Secretary pro tem.

DISCUSSION AND CORRESPONDENCE.

THE METRIC ERROR.

To the Editor of Science: In your issue of March 24, Mr. Henry B. Hedrick, of the United States Naval Observatory, Washington, D. C., shifts from one metric fallacy to another. The regulation school children fallacy, as illustrated by the Hon. James H. Southard, chairman of the Committee on Coinage, Weights and Measures, in his report to the House of Representatives in 1902, and by Lord Belhaven in discussing a compulsory metric bill in the House of Lords on February 23, 1904, is that the adoption of the metric system will shorten the school life of every child, including all branches of study, from two thirds to three years; in other words, that the eight years will be cut down to seven and one third or even to five years. It is on this basis that Mr. Southard estimates a saving of $1,000,000,000 in every generation. It is clearly impossible to save by the adoption of the decimal system any of the time occupied by the study of non-mathematical branches, such as physical training, penmanship, languages, geography, history, nature study, drawing, cooking, sewing or music. The saving must be made in the time devoted to the study of compound numbers, weights and measures, which occupy 20 per cent. of the school arithmetic. Applying this rate, 20 per cent., to the 34⅛ weeks occupied during the eight years by all branches of mathematics, we find 6.8 weeks to be so consumed. This estimate is not only fair, but extremely liberal to the metric system. It is based on the eight-year schedule adopted for the public schools of New York City. The weekly time of 1,500 minutes is apportioned among the different branches, and the uncertain amount of time devoted to study outside of school hours is not included. Thus there is no confusion of schedule weeks with regular weeks. The case is simple. This metric fallacy is the claim that from two thirds to three years of the entire school life can be saved by the adoption of the metric system of weights and measures; when in fact, less than seven weeks is now devoted to compound numbers, weights and measures.

Turning from this old fallacy, let us consider the new one formulated by Mr. Hedrick to the effect that the adoption of the metric system would save ten per cent. of the time devoted to mathematics, or about two thirds of what may be called a mathematical year of school life. In other words, that 'the pupil would be about a year ahead in mathematics at the end of the eight years if he had only the decimal system to learn.'

In exposing this new fallacy it is unnecessary to dwell on the fact that the study of weights and measures in the school is merely very superficial memorizing and that the real knowledge of weights and measures is acquired outside of the school by using them; nor on the fact that the 34⅛ weeks covers