Result of Conjugation,' by Sara White Cull. Experiments were made to determine (*a*) whether conjugation always produces rejuvenescence and (*b*) whether the fertilization resulting from conjugation is or is not mutual. Conjugating pairs of *Paramecium caudatum* were isolated and the individuals, after they had been separated, were isolated and counted at intervals for a month. The statistics gathered show that (*a*) conjugation frequently fails to produce rejuvenescence in either conjugant and (*b*) that conjugation, among the infusoria, is not mutual and there are strong indications that it is incipient fertilization as seen among higher forms. 'Artificial Parthenogenesis in Thalassema mellita,' by George Lefevre. An investigation of artificial parthenogenesis in *Thalassema mellita* has shown that the unfertilized eggs of this worm can be induced to develop into actively swimming trochophores by immersion for a few minutes in very dilute solutions of both inorganic and organic acids. Nitric, hydrochloric, sulphuric, carbonic, acetic and oxalic acids were used successfully, and in favorable experiments 50–60 per cent. of the eggs developed into swimming larvæ that were hardly distinguishable from normal trochophores of a corresponding stage. The parthenogenetic development in many cases involves a perfectly normal maturation, a more or less regular cleavage, and the usual processes of differentiation leading up to the formation of the normal larva. The reduced number of chromosomes (twelve) persists when the maturation has been normal, and has been repeatedly counted even in late blastula and gastrula stages. Differentiation of the egg does not occur in the absence of cleavage, and all ciliated bodies, whether normal or abnormal, possess a cellular structure. 'Concerning the Theory of Tropisms,' by Jacques Loeb. 'The Mechanism of the Galvanotropic Orientation in Volvox,' by Frank W. Bancroft. O. P. Terry's result, showing that volvox colonies subjected to a bright light swim to the cathode, while those subjected to a dim light or darkness swim to the anode was confirmed. This difference was found to be due to a reversal of the pole at which the galvanic current acts. In anodic colonies the galvanic current stops the flagella current on the anode side of the organism. In cathodic colonies the orientation is produced by stopping the flagella current on the cathodal side. Pressure on anodal colonies reverses the pole at which the galvanic current produces its effect.

SOCIETIES AND ACADEMIES

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 633d meeting was held on April 13, President Hayford in the chair.

Professor Newcomb discussed the question of the variability of the sun's radiation, giving the results of a statistical investigation on that subject. The line of investigation was directed upon the point whether there is any tendency to synchronism between spells of high and low temperature in widely separated regions of the earth. The material included annual mean temperatures, as observed from 1820 to 1904, and deviations during terms of ten days, and of one month, from 1872 until 1904. The general conclusion was that there were no well-marked deviations other than those which resulted from local causes, and that when these were duly allowed for, the temperature of the earth at large remained constant within a fraction of a degree. The only appreciable indication of any cosmical cause affecting the whole earth was in the monthly deviations. So far as the investigation had been carried, these indicated that there really was a deviation, which could be accounted for by a change in the sun's radiation from month to month, sufficient to change the temperature of the equatorial regions by an average amount of about one third of a degree centigrade. But even this small change may be due to the trade winds and other great movements of the air, by which a body of air colder or warmer than the normal is carried from one region to another within the monthly limits. The only ascertained law of change was that of the sun-spot period. The result reached by Köppen, that the temperature of the earth generally was somewhat higher the fewer the sun-spots,

is confirmed; but the amount of the change is less than one half that found by Köppen, the deviation being only 0°.13 C. on each side of the mean.

The general conclusion was that if the sun's radiation of heat is variable at all, the amount is too small to have any appreciable meteorological effect.

It was distinctly set forth that the research referred only to the radiation of heat, and not to the electric radiations which are known to proceed from the sun, which vary from time to time and which are related to magnetic storms, and perhaps also to the atmospheric electricity.

In the course of the general discussion of Professor Newcomb's paper, Dr. Abbott exhibited some diagrams showing the variations of terrestrial temperatures corresponding to certain variations of solar radiation as derived from bolometric measurements at a mean latitude of 39°.6 N. He called attention to other curves he had constructed showing the annual temperature variations observed at coast and inland stations in the United States, the variation at the inland stations being three times that at the coast station. Another curve was shown of an hypothetical earth (earth assumed as a black body) which truly followed the variation of solar radiation.

At the conclusion of the meeting Dr. Abbott called attention to a disc photometer which he had recently designed, and which he afforded the society the opportunity of seeing in operation.

R. L. Faris,
Secretary

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 189th meeting of the society held in the Cosmos Club on Wednesday evening, March 20, the president announced the receipt of a letter from the Washington Academy of Sciences stating the intention of the academy to erect a building to be devoted to the use of the scientific societies of Washington, and asking that the Geological Society indicate the amount of room needed and how much it would contribute to the building fund. Action concerning the matter was deferred to the next meeting.

Regular Program

The following papers, illustrated by lantern slides, were presented:

Some Features of the Geology of Magdalena and Black Range Region, New Mexico: C. H. Gordon.

The area to which this paper relates lies along the west side of the Rio Grande Valley, extending from near the north line of Socorro County southward to Deming. The valley of the Rio Grande here is from twelve to forty miles in width and is bounded on the west by several parallel mountain ranges which constitute the southeastern border of the Great Plateau country as outlined by Dutton. In the Black Range a nearly complete sequence of Paleozoic rocks occurs, resting upon the eroded surface of pre-Cambrian granites and schists. In the Magdalenas the Lower Carboniferous limestone rests directly upon greenstone schists and granites. Rocks of Cretaceous age occur in a number of places, resting upon the eroded surface of the Pennsylvanian series. No Tertiary sedimentaries were observed, this period being characterized by extensive eruptions of andesite, and rhyolite. Intrusions of monzonite and quartz-monzonite and their associated porphyries are common, and with them occur also granite porphyries, and rocks of basic composition like diabase. Remnants of extensive flows of basalt occur, resting upon the mesa gravels filling the valley.

Structurally the region is characterized by block faulting. With the uplift of the plateau on the west there appears to have been a relative sinking of the belt now represented by the Rio Grande Valley, with crustal breaking and readjustment giving rise to tilted blocks which appear here and there as elevations rising out of the general plain level. Extensive erosion has supplied from the adjoining slopes a vast amount of débris which covers the valley in places to a depth of from 1,000 to 2,000 feet.

At the north end of the Magdalena range near the town of Magdalena are located the lead and zinc mines of Kelly. The ores occur along the bedding planes of carboniferous limestones which have a westward inclination

of 30° to 40°. The sedimentary block which constitutes the back (west) slope of the mountain is affected by numerous faults, the chief of which extend north and south, and constitute the main fault scarp on the east side of the range. At the foot of the range on the west side, the sedimentary rocks are cut off by quartz-monzonite-porphyry the intrusion of which appears to have furnished the solutions from which the ores were derived. Of interest in this connection is the occurrence of pyroxene intergrown with amphibole and specularite together with quartz and calcite along the boundaries of the sulphide ore bodies with the inclosing limestone.

The Santa Maria Oil District, California: RALPH ARNOLD.

The Santa Maria oil district, comprising the Santa Maria, Lompoc and Arroyo Grande fields, occupies the central and northern portions of the Lompoc and Guadalupe quadrangles, northern Santa Barbara County, and the southern part of the San Luis quadrangle, southern San Luis Obispo County.

The San Rafael Mountains, 2,000 to 6,000 feet high, trend northwest across the northeastern portion of the area, while the Santa Ynez Range skirts the southern. Occupying the angle between the two ranges are low hills and broad valleys. The developed fields cover the flanks of two of the low ridges in this basin region, the main or Santa Maria field proper being located on Graciosa Ridge, about eight miles south of the town of Santa Maria.

The formations involved in the geology of the district include the Franciscan (Jurassic) sandstone, shale, glaucophane schist, jasper and intruded serpentine; Knoxville (lower Cretaceous) conglomerate, sandstone and shale; pre-Monterey (which may include both Cretaceous and older Tertiary) conglomerate, sandstone and shale; Sespe (Eocene or Oligocene) sandstone; Vaqueros (lower Miocene) conglomerate, sandstone and shale; Monterey (middle Miocene) diatomaceous and clay shale and volcanic ash; Fernando (Miocene-Pliocene-Pleistocene) conglomerate sandstone and shale; and Quaternary gravel, sand, clay and alluvium.

Two structural systems prevail in the district, those features in the northeastern portion striking northwest and southeast, those in the southern portion striking east and west; while in the intervening region are features trending in a direction intermediate between the two. Few faults of importance were noted in the field. The productive territory lies in a region of more or less gentle folds in the central part of the area, the wells usually being located along or near anticlines.

The wells vary in depth from 1,500 to over 4,000 feet. In the Santa Maria and Lompoc fields they obtain their oil from zones of fractured shale or sandy layers in the lower portion of the Monterey (middle Miocene) formation. The production of the individual wells varies from 5 to 3,000 barrels. The gravity of the oil ranges from 19° to 35° Baume, the yield from the greater part of the field being about 25° to 27°. In the Arroyo Grande field the oil comes from sandstone at the base of the Fernando and is of 14° gravity.

Notes on the Geology of Japan: ROBERT ANDERSON.

This paper gave an outline of the general topographic features and geological structure of the Japanese islands. To sum up the main points: The ground plan of the group was laid during the earliest geological times, Archæan gneisses and schists and a great thickness of Paleozoic sedimentary, metamorphic and igneous rocks being the basement complex. Mesozoic, Tertiary and Quaternary formations are wide-spread and diversified, having the character of a superstructure over an older land mass. The island chain is continental in character, not chiefly of volcanic origin, although volcanic activity has always been a feature of its history. It is a country of long-continued and great geological activity, as shown by the variety of its rocks, by the presence of a thick column of strata representing the earliest and latest as well as intermediate times, by the metamorphism and excessive disturbance of these strata as the result of repeated movements, by the presence of many igneous intrusions and volcanic remains which show that similar igneous forces as are at work

to-day have always been active, and by the modern land movements forming depressed broken shore lines and terraces and keeping a fairly new face on the topography of areas occupied by the oldest rocks, these movements being illustrated in the every-day earthquakes to which Japan is subjected.

In a number of points a similarity exists between the geology of Japan and that of the western coast of America: In the existence in both California and Japan of a somewhat similar thick basement complex; our Franciscan is probably Jurassic in age; the Japanese terrane with which it might be compared is supposedly Paleozoic; both formations are intruded by similar serpentine of Jurassic or Cretaceous age. In the apparent Mesozoic age of the wide-spread and important intrusions of granite. In the similarity of the old and recent faunas and floras, as has been partially brought out by a few paleontologists. In the presence in both countries of a large amount of schist formed of the blue amphibole glaucophane, whereas it is rare in all but a few places elsewhere. In the fact that both countries have been long coastal belts of volcanic activity during Tertiary and Quaternary times, the thickness and wide extent attained by the Tertiary tuffs in Japan being remarkable. In the recency of earth movements, as shown in the multitude of earthquakes, the presence of upraised Quaternary deposits and marine terraces, and by the evidence of present oscillations in the level of the coasts. And the resemblance holds good particularly in the tremendous land-building activity of the Tertiary on both sides of the Pacific, contributed to by tectonic movements and the rapid denudation of land areas and deposition along narrow belts. This feature is illustrated by the great thickness of the Tertiary formations, their structural disturbance and their lithologic alteration.

Ralph Arnold,
Secretary

THE CHEMICAL SOCIETY OF WASHINGTON

The 174th regular meeting of the Chemical Society of Washington was called to order by President Fireman, on April 11, at 8 P.M.

A committee, consisting of Messrs. L. M. Tolman, F. K. Cameron and S. S. Voorhees, was appointed to consider the advisability of cooperating with the Washington Academy of Science relative to the erection of a suitable building to serve as a home for the academy and all the affiliated societies.

The president of the society was invited by the commissioners of the D. C. to confer with a committee appointed to consider the milk supply of the district.

S. S. Voorhees read a paper on 'Buying Coal under Specifications.' The speaker said that the present specification was the outgrowth of six years' experience in the purchase of coal by the Treasury Department. The specification requires the bidder to state the name and location of mines from which deliveries will be made with per cent. of ash in dry coal and B. T. U. in coal as delivered; the price paid for deliveries is based on price stated in proposal corrected for heat value and ash found in average sample representing deliveries above or below standard established by bidder.

W. O. Robinson read a paper on 'The Solubility of Calcium Sulphate in Aqueous Solution of Sodium Sulphate and Sodium Chloride at 25°.' At 25°, Cameron and Seidell found the solubility curve for the system sodium sulphate, sodium chloride and water to consist of three branches representing solution in equilibrium with sodium sulphate decahydrate, anhydrous sodium sulphate and sodium chloride.

Calcium sulphate was introduced into this system and, after complete reaction had taken place, was found to occur in the solid phase as gypsum at the sodium sulphate and sodium chloride ends of the curve. In intermediate concentration, however, the solid phase containing calcium occurred as fine needle-like crystals. As these were decomposed by washing, ordinary methods of analysis could not be used. By the double triangular diagram method, this calcium salt was found to be represented by the formula $3Na_2SO_4 \cdot 2CaSO_4$. This conclusion was fully confirmed by the zero method and by precipitation with a weighed amount of calcium sulphate.

H. E. Patten's paper on 'Energy Changes accompanying Adsorption' showed that absorption could be looked upon as a special case of adsorption by combining the inbibition effect with the adsorption effect where both take place in the fine pores of a cellular body. Where the pores become very minute we may think of a solid solution as a limiting case of such an absorption effect. A résumé of the energy changes accompanying absorption was given.

On May 1, a special meeting was held at the George Washington University Lecture Hall. This was the first of a series of meetings to be held for the discussion of sanitary matters. W. C. Woodward, M.D., health officer of the District of Columbia, spoke on the 'Health Department of the District of Columbia, its Functions and Organization.' The speaker gave a history of the department; its relation to other branches of the city government; and told about the work of enforcing the smoke-, food-, marine products-, milk- and slaughter-house-regulations.

J. A. LECLERC,
Secretary

BUREAU OF CHEMISTRY,
WASHINGTON, D. C.

DISCUSSION AND CORRESPONDENCE

ANOTHER WORD ON THE VULTUR CASE

IN SCIENCE of May 3 (pp. 708, 709) Mr. Stone makes a brief reply to my article on how the 'first species' rule works in determining genotypes in ornithology.[1] Inasmuch as he makes no attempt to traverse the principal positions there taken, it is perhaps almost ungracious again to open the subject. For the expert no reply is necessary, but the general reader may be misled by some of his statements.

Of the seven cases he would throw out from my list of twenty-one generic changes made necessary by the first species rule, *Spinus* may be saved by the rule of tautonomy, and *Colymbus* may be excluded by the provision exempting Linnæan genera from its scope. Respecting the other five cases, Mr. Stone and I simply hold different views, and the details need not be here discussed.

In regard to the 'several inconsistencies' he claims to have pointed out in the *Vultur* case, one I frankly admitted, and explained as a pure blunder; the rest of the 'several' exist only in his imagination. While *gryphus* is the type of *Sarcorhamphus,* founded in 1806, it did not become its type at that date; it did not become the type till the other two of the original three noncongeneric species had been removed, and thus does not in the least affect the type of *Vultur* as determined by my elimination. By the current usage of all 'experts' in elimination—except Mr. Stone—*aura* and *papa* both go out at 1816, instead of the latter at 1854, as claimed by Mr. Stone. So this 'excellent illustration of the complexity of the elimination method and the opportunities it offers even to experts to fall into errors' fails completely to illustrate anything except Mr. Stone's ideas about methods of elimination.

J. A. ALLEN
NEW YORK,
April 8, 1907

[1] See SCIENCE, N. S., Vol. XV., No. 640, pp. 546–554, April 5, 1907.

SUNSPOT ZONES

TO THE EDITOR OF SCIENCE: It occurs to me that Sporer's law of the sunspot zones might be accounted for in this way: When the last ring of planetary material was detached, it seems likely that a part of the material of the sun should have been lifted with this ring, only to fall back into the sun after the moment of parting. In the gaseous mass of the sun this may be supposed to have produced a system of waves of ring-like shape, whose velocity of propagation might be such as to pass from latitudes 30 to 5 in fourteen years. Their paths might perhaps be such as to come nearest to the surface in the latitudes where the sunspots have their maxima.

Any such progressive disturbance near the surface of some deep layer in the sun might be sufficient, in connection with the deflective influence of the sun's rotation, to occasion surface eddies, 'cyclones' as suggested by Faye. Or, they might cause 'eruptive' phe-