One of the most interesting results is that all organic chlorine compounds, with one or two possible exceptions, have trivalent chlorine. The formulas of such compounds will need revision to take account of this fact. Methyl chloride, if free valences do not exist, would need to be written: $H_2C{=}ClH$, which would show at once why it dissociates so easily into hydrochloric acid and methylene. Fluorine is monovalent in fluorine compounds; the other halogens have not been computed. Sulfur is generally hexavalent, but in sulfur dioxide it is quadrivalent. It is hexavalent in carbon bisulphide. The formula might be:

The fact that chlorine is trivalent in its organic compounds confirms Drude's and Pascal's deductions from a study of the refractivity, normal dispersion, and molecular magnetic susceptibility of these compounds. Pascal found fluorine to be monovalent, chlorine to be polyvalent.

The fact that the cohesion is thus determined in part by the number of the valences, and that a relationship, long ago foretold by Laplace, is thus shown to exist between molecular cohesion and refraction and dispersion of light is of great interest. The formula $M^2K = c(\text{Wt. Val})^{2/3}$ shows, on the electronic theory, that the electrons of the atoms and those of the valences differ, and that they can not be summed. Hence the cohesion is proportional to their product, not to their sum. This conception was the starting point of Drude's reasoning concerning the influence of valence on refraction and dispersion. The general result of the establishment of this relationship between valence and cohesion, between gravitational mass and cohesional mass, between cohesion and light refraction, and between cohesion and diamagnetic properties is, on the whole, to lend support to Sutherland's view that molecular cohesion is of a magnetic nature. The fourth power law may possibly bear this out, as he urged. The relation of intramolecular cohesion, or chemical affinity, and intermolecular cohesion is also seen to be a very close one; and the latter is apparently dependent upon the former.

ALBERT P. MATHEWS
UNIVERSITY OF CHICAGO,
May 18, 1912

SOCIETIES AND ACADEMIES

THE NEW YORK ACADEMY OF SCIENCES
SECTION OF BIOLOGY

AT the regular meeting of the Section of Biology, held at the College of the City of New York, March 11, 1912, Chairman Frederic A. Lucas presiding, the following papers were read:

The Number and Kinds of Bacteria in City Dust: C.-E. A. WINSLOW and I. S. KLIGLER.

The authors presented the results of the examination of about 170 samples of dust from streets, schools, houses and public buildings in New York. The total numbers of bacteria found varied from 150,000 per gram to 145,000,000, averaging from 3,000,000 to 5,000,000 from the indoor dusts and 49,000,000 from the street dust. Spores made up usually less than one tenth of the total. The count obtained at body temperature was about half that at room temperature, averaging from 2,000,000 to 3,000,000 per gram in the indoor dusts and 22,000,000 in the street dusts. *B. coli* was usually present; in the street dust an average of 51,000 per gram was found and in two samples over 100,000, while none showed less than 100. The indoor dust, on the other hand, showed an average of between 1,000 and 2,000. Acid-forming streptococci, such as are characteristic of the mouth, were present to the extent of over 1,000 per gram in three fourths of the street samples and one half of the indoor samples. The average for the street samples was about 40,000 per gram; for the indoor samples about 20,000 per gram. The large proportion of these organisms, particularly in the indoor dusts, appears to be significant of buccal pollution.

The Aerial Transmission of Disease: C. V. CHAPIN.

The diffusion of contagion through the room or out of doors only was considered, not droplet infection, which does not take place beyond a meter. Bacteriological evidence was not discussed, though the quantititative work of Winslow on sewer air and spray infection was referred to, a work which he is now extending to dust. Epidemiological study and experiment have been rapidly narrowing the list of alleged air-borne diseases. We now

know that yellow fever and malaria are never air-borne. Experiments have shown that bubonic plague and Mediterranean fever are not. There is no evidence that cholera and typhoid fever are ever air-borne and much that they are not. The spread of influenza out-of-doors does not take place and perhaps not in-doors. The alleged evidence that smallpox virus is air-borne around hospitals is very weak. Careful observation in hospitals has shown that typhus fever, cerebro-spinal meningitis and poliomyelitis do not pass from patient to patient in the same ward. The same is true for uncomplicated scarlet fever and for diphtheria except by contact or close droplet infection. Probably measles and whooping cough, rubella, mumps, chickenpox and smallpox are not air-borne, even in the same room, but further observation may show that such infection may rarely take place.

At the regular monthly meeting of the section held at the American Museum of Natural History, April 8, 1912, the following papers were read:

Sex-linked Inheritance in Poultry: T. H. Morgan.

A summary of experiments carried out with the collaboration of H. D. Goodale: relating especially to the inheritance of the factor for barring in Plymouth Rocks and Dominiques crossed to Langshans. The paper is being published in the *Annals.*

The Spawning Habits of the Sea Lamprey, Petromyzon marinus: L. Hussakof.

An abstract of this communication was published in Science, March 22, 1912, pp. 460–461. The speaker exhibited a small model of the lamprey group now under construction in the American Museum.

Notes on Cuban Marine Fishes: John T. Nichols.

The speaker dealt with the results of a brief collecting trip to Cuba and exhibited various specimens. He passed in review some of the Scombriform fishes. The king fish, *Scomberomorus cavalla,* is highly esteemed, but another species, *S. regalis,* is said to be occasionally poisonous. *S. maculatus,* the Spanish mackerel, was not seen. While *regalis* and *maculatus* occupy more or less distinct areas, *cavalla* is abundant both in Florida, with *maculatus,* and in Cuba, with *regalis;* in the speaker's opinion these two last named species, which are still closely related, have recently become separated through the competition of *cavalla.* Two very widely separated forms, *Arbaciosa rupestris* and *Gobius soporator,* were found inhabiting adjacent rock pools; both were concealingly colored and could have been confused until their distinctive color patterns were noticed.

At the regular monthly meeting of the section held at the American Museum of Natural History, May 13, 1912, the following papers were read:

Note on the Habits of the Climbing Cat-fish (Arges marmoratus) from the United States of Colombia: R. D. O. Johnson.

Although living in streams of high grade and torrential force these fish were enabled not only to hold their place against the current, but even to advance up-stream and to climb out of a steep-walled, deep pot-hole. They did this by means of curious sucker-like adaptations of the mouth and ventral fins. The paper will appear in the *Annals.*

On the Changes in Behavior of the Eel (Conger malabaricus?) during its Transformation: Bashford Dean.

When at Misaki, Japan, the speaker had made observations upon the structure and behavior of a living leptocephalus larva which was kept alive in an aquarium for over three weeks, during this time undergoing its metamorphosis. Especially interesting is the rapidity with which the behavior of the young eel changes from day to day in its methods of swimming and resting, response to stimuli, etc. The speaker suggested that these marked differences in behavior in successive stages were correlated with kaleidoscopic changes in elements of the central nervous system; that when more fully known this would probably afford a suggestive case of parallelism between psychic reactions and neurological conditions. The paper will appear in the *Annals.*

Notes on Certain Principles of Quadrupedal Locomotion and on the Mechanism of the Limbs of Hoofed Animals: William K. Gregory.

The speaker gave a brief résumé of a paper that is being published in the *Annals.*

On the Dictyonema Fauna of Navy Island, New Brunswick: F. F. Hahn.

Read by title. To be published in the *Annals.*

The secretary gave an abstract of a communication from Dr. P. Bachmetjew, of Sofia, relating to the physiology of *Vesperugo pipistrellus* and *Miniopterus schreibersii.* In some cases these bats had been thawed out and the heart action had resumed even after the body had been cooled to — 7° Cent. below the body temperature.

The section adjourned until October 14, 1912.

William K. Gregory,
Secretary