of the division, Dr. D. S. Robbins, of the New Mexico State College, Las Cruces, made his address on "Science and Religion."

Several brief trips were available to points of interest in and near Santa Fé, and on Thursday, May 2, there was an all-day excursion, of interest especially to archeologists and geologists, to the Bandelier National Monument.

The division as a whole elected officers as follows:

President: Harold S. Colton, director of the Museum of Northern Arizona, Flagstaff.

Vice-president: Jesse L. Nusbaum, Laboratory of Anthropology, Sante Fé, New Mexico.

Secretary-treasurer: Veon C. Kiech, Department of Chemistry, University of New Mexico.

Members of the Executive Committee for 3 years: Stuart A. Northrop, University of New Mexico; E. F. Carpenter, University of Arizona.

Officers of the sections are as follows:

Biological Sciences: Chairman, J. R. Eyer, State College, New Mexico; *Secretary,* R. H. Canfield, Jornade Experimental Range, Alamogordo, New Mexico.

Mathematics: Chairman, F. W. Sparks, Texas Technological College, Lubbock; *Secretary,* W. C. Risselman, State Teachers College, Flagstaff, Arizona.

Physical Sciences: Chairman, S. B. Talmage, New Mexico School of Mines, Socorro, New Mexico; *Secretary,* W. M. Craig, Texas Technological College, Lubbock, Texas.

Social Sciences: Chairman, E. W. Haury, Gila Pueblo, Globe, Arizona; *Secretary,* J. H. Provinse, University of Arizona, Tucson, Arizona.

The sixteenth meeting of the division will be held at Flagstaff and the Grand Canyon, Arizona, from April 27 to 30, 1936, and the seventeenth meeting at Denver, Colorado, jointly with the Pacific Division and the entire association, in June, 1937.

E. F. CARPENTER,
Secretary

STATE ACADEMIES

THE NEW HAMPSHIRE ACADEMY OF SCIENCE

THE seventeenth annual meeting of the New Hampshire Academy of Science was held at McKenzie's Hotel, Franconia, N. H., on Friday and Saturday, May 31 and June 1. The meeting was called to order on Friday at 7:45 P. M. by President Harold A. Iddles. After the presidential address, "The Development of Some Recent Chemical Processes," papers were read by members.

Papers by members were read on Saturday morning, followed by the business meeting. On Saturday afternoon an excursion was made to Wildwood C.C.C. Camp, Lost River, and Franconia Notch. After a banquet on Saturday night, Mr. Richard P. Goldthwait, of the Geology Department of Dartmouth College, gave the invitation lecture, "Living Glaciers in Alaska."

Resolutions were adopted by the academy favoring: (1) A careful and sane revision of the Pure Food and Drug Act; (2) only such advertising as contains statements not misleading; (3) the adoption of legislation adequate to control pollution of public waters, soil erosion and hydraulic development; (4) continued government support of scientific investigation along sane lines; and (5) preventative measures of research and community cooperation in problems of juvenile delinquency.

The following officers were elected for 1935–36:

President, Albert L. Clough, Manchester Institute of Arts and Sciences; *Vice-president,* Professor George M. Robertson, Dartmouth College; *Secretary-treasurer,* Professor George W. White, University of New Hampshire; *Member of Council,* Professor Harold A. Iddles, University of New Hampshire; *Councillor to American Association for Advancement of Science,* Professor Walter C. O'Kane, University of New Hampshire.

GEORGE W. WHITE,
Secretary-treasurer

SPECIAL ARTICLES

THE LUMBAR LOCALIZATION OF PARALYSIS IN EXPERIMENTAL POLIOMYELITIS AFTER INTRANASAL INOCULATION

IN a recent review of the pathogenesis of poliomyelitis[1] I concluded that the available evidence pointed to a spread of the infection from an entering point in the olfactory mucosa of the nose up to the olfactory bulb and thence downwards through the brain-stem to and through the spinal cord. In the same year (1933), Faber and Gebhardt[2] were able to furnish experimental corroboration of such a direction and pathway of invasion in monkeys, by showing the locations of virus after intranasal instillation on successive days of the incubation period. Since then Schultz and Gebhardt[3] and Brodie and Elvidge[4] have shown that intranasal inoculation (which involves

[1] H. K. Faber, *Medicine,* 12: 83, 1933.

[2] H. K. Faber and L. P. Gebhardt, *Jour. Exp. Med.,* 57: 933, 1933.

[3] E. W. Schultz and L. P. Gebhardt, *Proc. Soc. Exp. Biol. and Med.,* 31: 728, 1934.

[4] M. Brodie and A. R. Elvidge, SCIENCE, 79: 235, 1934.

swallowing by the animal of considerable amounts of virus and hence juxtaposition of virus also with the pharyngeal and gastrointestinal mucosa) is unsuccessful if the connections of the olfactory nerves with the central nervous system are severed, thus completing the demonstration of the olfactory nerves as the essential and probably exclusive pathway of invasion from the body surfaces when such surfaces are not mechanically injured or broken; that is, when conditions of infection are comparable with those occurring in man.

The theory of gastrointestinal invasion has few remaining advocates since the very convincing study of Clark, Roberts and Preston.[5] However, Dr. J. A. Toomey[6] has recently reaffirmed it in somewhat modified form. As an argument against my own views he states: "In the majority of human beings and monkeys, paralysis first develops in the muscles that receive their nerve supply from the lumbar enlargement and only secondarily in those whose nerve supply comes from the cervical area. This fact forms the basis for a fundamental objection to Faber's theory of virus spread."

Through the kindness of Dr. E. W. Schultz and L. P. Gebhardt, of the Department of Bacteriology at Stanford University, I am able to present data on the region of initial paralysis in 57 monkeys, selected at random, all inoculated intranasally by the method they have devised.[7] In these, the infection beyond any reasonable doubt entered through the olfactory nerves and passed through the brain-stem and spinal cord *from above downwards.*

Arms first paralyzed	25, or 43.9	per cent.
Legs first paralyzed	27, or 47.3	per cent.
Arms and legs paralyzed at about the same time	5, or 8.8	per cent.
Total	57	

These experiments in which entrance of infection from the gastrointestinal tract can be ruled out with some certainty and in which, nevertheless, the legs were more often first involved than the arms demonstrate clearly that initial involvement of the lumbar cord can not properly be used as evidence for the theory of the gastrointestinal portal of entry. On the contrary, they prove that the virus in descending through the cord can, and does in more than half the cases, produce its first manifestations in the lower segments. Knowing from previous experiments that the virus is actually present in all levels of the cord,[8] including the cervical, just before as well as when paralysis appears, I see no other possible explanation of the usually earlier and greater lumbar area paralysis than that offered by Fairbrother and Hurst:[9] the anterior horn cells in that area are somewhat more susceptible than others to attack by the virus of poliomyelitis.

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[5] P. F. Clark, D. J. Roberts and W. S. Preston, Jr., *Jour. Prev. Med.*, 6: 47, 1932.
[6] J. A. Toomey, *Ann. Int. Med.*, 8: 854, 1935.
[7] E. W. Schultz and L. P. Gebhardt, *Proc. Soc. Exp. Biol. and Med.*, 30: 1010, 1933.
[8] Faber and Gebhardt, *loc. cit.*

COCCO-BACILLIFORM BODIES ASSOCIATED WITH AN INFECTIOUS FOWL CORYZA

A STUDY of fowl coryza, based on material secured from infected flocks in the vicinity of Princeton, N. J., has shown two distinct clinical types of the disease. The interval elapsing between the injection of exudate in susceptible fowl is short in one case, 1 to 3 days, and prolonged in the other, 1 to 4 weeks. In both types the nasal discharge generally persists for 2 months and often for a longer period.

The fowl coryza bacillus, *Hemophilus gallinarum,* originally described by De Blieck,[1] is constantly associated with the coryza of rapid onset. Intranasal injection of this organism in normal birds is followed by a coryza which, unlike that produced by exudate, is generally of short duration. Moreover, while recovered birds may be resistant to reinfection with the bacillus they are not protected against a subsequent injection of exudate. These two facts have militated against the acceptance of *Hemophilus gallinarum* as the sole cause of the coryza of rapid onset and long duration.

Hemophilus gallinarum is not associated with the coryza of slow onset; attempts to isolate it from the nasal passages of infected birds have repeatedly failed. Generally the exudate does contain other bacteria, most of which grow freely in cultures. It can be said with certainty that all these bacteria are secondary invaders and of no direct etiological significance. It can also be stated that the responsible infective agent is unable to pass through Berkefeld V candles of average permeability.

It was found, however, that sterile filtrates from a V candle of abnormal permeability contained the infective agent and produced a coryza of slow onset in normal fowl. Bacteria free exudate, which is sometimes present in the orbital sinuses of infected birds, also proved to be infective.

Exudate from two birds originally infected with filtrate has been carried on in series by passage from infected to susceptible birds. Films made directly from this exudate, which regularly contains few bac-

[9] R. W. Fairbrother and E. W. Hurst, *Jour. Path. and Bact.*, 33: 17, 1930.
[1] L. De Blieck, *Vet. Jour.*, 88: 9, 1932.