probable that the X-chromosomes may pass through that stage at a time different from that at which the other chromosomes pass. This would account for the production of the exceptional white-eyed males in the experiments if we consider that the X-rays were applied to the particular germ cell at a time when only the X-chromosome was in a condition suceptible to the dose given.

The writer wishes to express his great indebtedness to Dr. Willis R. Whitney, director of the Research Laboratory of the General Electric Company at whose suggestion work on fruit-flies was undertaken and without whose cooperation it could hardly have been done. He is also indebted to Mr. O. J. Irish for accurate and careful work as technical assistant throughout the investigation.

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EPIDEMIC PNEUMONIA IN REPTILES

DURING the spring and early summer months of 1919 there occurred an epidemic among the reptiles kept in captivity in the Bronx Zoological Gardens which resulted in the death of many of them.

The clinical course of this disease, if it may be considered the same disease in all, was difficult to follow on account of the well-known sluggishness of these animals, which often remain quiet for a long time and fail to eat anything. For this reason the attention of the caretakers was seldom attracted to sick animals until they were found dead. In some cases, however, it was observed that they suffered from an intense dyspnœa and held their mouths open in the effort to breathe. Others emitted a frothy, slimy exudate from the mouth and nostrils. Even then it was difficult to observe any other symptoms and the attempt to secure a series of observations on the temperature of the sick animals for comparison with that of several normal ones of the same sort could not be carried out successfully.

A great number of those which died were sent to the laboratory for autopsy and it is interesting that several turtles sent from the New York Aquarium were found to have died from the same disease. Careful autopsies were made upon all these animals and cultures and smears taken from the lungs and upper respiratory tract and usually also from the heart's blood. Other snakes and some rabbits, rats and mice were inoculated with the cultures derived from these cases.

Cases of pneumonia were studied at autopsy in the following animals, often in many individuals of the same species: *Iguana tuberculata, Zamenis lamelliformis* (Texas rattlesnake), *Trachyurus rugosus* (stump-tailed lizard), *Crotalus atrox* (Florida rattlesnake), *Ancistrodon contortrix* (copperhead), *Varanus gouldi* (Australian monitor), *Spilotes corais* (blacksnake), *Tupinambis teguexin* (yellow tegu), *Pityophis sayi* (bull snake), *Alligator mississippiensis, Anaconda, Chelonia imbricata* (hawksbill turtle), *Eutœnia sirtalis* (garter snake), *Coluber guttatus, Thalassochelys caretta* (loggerhead turtle), *Heloderma suspectum* (gila monster), *Ophibolus getulus* (king snake), *Chrysemys elegans* (Cumberland turtle), *Chrysemys picta* (painted turtle), *Tropidonotus fasciatus* (water snake), *Heterodon platyrrhinus,* and *Zamenis flagelliformis.*

The autopsies on these animals as a rule revealed a partial consolidation of the tubular spongy lung, various diverticula of the main bronchial cavity with their air cells being filled with an opaque blood-stained grayish exudate with occasional hæmorrhages in the surrounding tissue. In one instance (*Varanus*) there was also an acute pericarditis with yellowish effusion upon the surface of the heart.

Smears from the consolidated portions of such lungs showed the presence of great numbers of rather small gram negative bacilli, sometimes with a slight admixture of gram positive diplococcoid organisms but usually in practically pure culture.

Microscopically, the condition was fairly uniform in all. In *Crotalus atrox* many of the wide air cells were distended with compact masses of cellular exudate composed chiefly of leucocytes which are large with round vesic-

ular nucleus and indefinite granules. There were many red corpuscles and more especially nuclei of laked red corpuscles mingled with these, but little fibrin. In this exudate and especially in the crevices between masses of exudate great clouds of gram negative bacilli could be seen. The same description applies to the lungs of *Ancistrodon, Zamenis, Pityophis, Chelonia imbricata,* et cetera.

The lungs of the anacondas presented a slightly different appearance, for the gram negative bacilli tend to be collected in masses in the alveoli and densely surrounded by leucocytes and red corpuscles in a disintegrated condition so as to form round balls. The large leucocytes are filled with conspicuous granules which stain purple with the Gram stain and with Wright's stain and are probably to be regarded as basophilic granules.

So, too, the lungs of *Tupinambis teguexin* showed round nodules or masses of cells clustered round a central clump of gram negative bacilli.

In the lungs of *Heloderma* the exudate in the alveoli was composed of a dense pink staining granular coagulated material with abundant clumps of gram negative bacilli usually enclosed in phagocytes.

The lung of *Chrysemys picta* presented a dense exudate of closely packed leucocytes with nuclei of red corpuscles and with great numbers of diffusely scattered gram negative bacilli. In this case the alveolar walls were much thickened and infiltrated with fluid and with leucocytes.

No especial alteration of the bronchial walls nor of the coarser supporting tissue of the lungs could be observed. The abdominal organs were in all cases apparently normal, and as a rule the animals were in a good state of nutrition.

Cultures made from heart's blood and lungs gave in practically every case luxuriant growths of a small gram negative bacillus when incubated at 23° C. Only in the case of *Thalassochelys Caretta* and one alligator were the bacilli somewhat larger.

Five of these strains were grown in broths containing various sugars for comparison with results shown in the following table.

Growth produced sediment in all tubes except those with maltose inoculated with 2 and 4 where there was pellicle formation.

From the above table it will be seen that Nos. 1 and 3 agree in acid and gas formation when grown in the specified sugars, while 2, 4 and 5 differ among themselves and also differ from 1 and 3 in their powers of sugar fermentation and gas formation. When grown on gelatin liquefaction was produced by 4 and 5 but not by 1, 2 and 3. 4 also produced gas.

From several normal garter snakes studied as controls the cultures of heart's blood and lungs were sterile except in two cases in which occasional colonies of a quite different thick gram negative bacillus were found.

A rabbit was immunized with four injections of culture 4, and eight days after the last injection the serum of this rabbit agglutinated the homologous strain completely in a dilution of 1–60 but showed no agglutination with nine other strains.

Intratracheal injections of cultures 4 and 6 were made in garter snakes and two species of *Chrysemys* and were followed by pneumonia exactly resembling that in the animals from which the cultures were taken. The

	Maltose		Levulose		Dextrose		Xylose		Saccharose		Lactose		Mannit	
	Acid	Gas	Acid	Gas	Acid	Gas	Acid	Gas	Acid	Gas	Acid	Gas	Acid	Gas
1	++	+	++	+	++	+	++	+	0	0	0	0	++	++
2	++	0	++	0	++	0	0	0	++	0	0	0	++	0
3	++	+	++	+	++	+	++	+	0	0	0	0	++	+
4	0	0	++	0	++	0	0	0	0	0	0	0	++	0
5	++	+	++	+	++	+	++	+	++	+	0	+	++	+

organism was recovered in pure culture from the lungs of these inoculated animals. The bacillus is also highly virulent for rabbits, killing them often within twenty-four hours.

No exact identification of the organism or organisms concerned in this epidemic can be offered, although in general they are very closely related to the rabbit septicæmia group. The bacteriological studies, for which I am greatly indebted to Mrs. Julia T. Parker, were not carried to completion but they show that although the gram negative bacilli found in all the cases were morphologically identical, they differed somewhat in their fermentation reactions and did not, except in the case of the homologous strain, agglutinate with the one specific serum produced in a rabbit. The latter result may be because of an unfortunate choice of one aberrant strain for the production of the serum or it may be because the various strains occurred in different species of reptile.

Since this was a well-defined epidemic of pneumonia affecting a variety of reptiles it seems probable that the original infecting organism may have acquired slightly different biological characters in its growth in different species.

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THE OHIO ACADEMY OF SCIENCE

THE thirty-first annual meeting of the Ohio Academy of Science was held at Western Reserve University and Case School of Applied Science, Cleveland, March 25 and 26, 1921, under the presidency of Mr. W. H. Alexander, of the United States Weather Bureau, Columbus. Fifty-nine members were registered as in attendance; forty-seven new members were elected.

An excursion, organized in connection with the meeting, was carried out by the Section for Geology on May 28, 29, and 30. The itinerary (Wilmington, Clarksville, Fort Ancient, Oregonia, Dayton) was planned for the study of the Richmond formations of southwestern Ohio. The party of fifteen geologists was under the guidance of Drs. August Foerste and W. H. Shideler.

The trustees reported a gift of two hundred and fifty dollars from Mr. Emerson McMillin, of New York City, in furtherance of the research work of the Academy.

The death of one member was reported: Mr. Thomas Piwonka, of Cleveland. Mr. Piwonka was born of Bohemian stock in New York City, September 10, 1854; he died May 9, 1920. His membership in the Academy began in 1893. The obituary notice, prepared by Professor J. E. Hyde, closes with these words: "His life work was law, but in spare moments he was a naturalist with particular interest in geology, botany and microscopy. His passing removes one more (very few are left!) of that generation of men interested in the natural history of their locality, with the collector's keen instinct, to which paleontology is profoundly indebted. With them is passing a phase of our culture."

Another of the older members of the academy, Professor G. Frederick Wright, of Oberlin, died on April 20, less than a month after the meeting. His name appears on the program; but he was too ill to be present, and the paper was read by another. He had been a member since 1892.

Officers were elected as follows: *President,* R. C. Osburn, Ohio State University; *Vice-presidents:* Zoology, J. E. Kindred, Western Reserve University; Botany, E. N. Transeau, Ohio State University; Geology, J. E. Hyde, Western Reserve University; Physics, W. G. Hormell, Ohio Wesleyan University; Medical Sciences, F. C. Waite, Western Reserve University; Psychology, Rudolph Pintner, Ohio State University (since removed to Teachers College, Columbia University); *Secretary,* E. L. Rice, Ohio Wesleyan University; *Treasurer,* A. E. Waller, Ohio State University.

The scientific program was as follows:

PRESIDENTIAL ADDRESS

Thunderstorms: especially those of Ohio: Mr. W. H. ALEXANDER, U. S. Weather Bureau, Columbus.

PUBLIC LECTURES

Hookworm and human efficiency: PROFESSOR CHARLES A. KOFOID, University of California.

Scientific work at the Ohio Bureau of Juvenile Research: DR. HENRY H. GODDARD, Ohio Bureau of Juvenile Research, Columbus.

PAPERS

The new Cleveland Museum of Natural History: PAUL M. REA.

The state park situation in Ohio: J. ERNEST CARMAN.

Chronological view of men of science: J. A. CULLER.