glacier as it would have done if the break had occurred when the glacier was receding and its edges clear.

If the above hypothesis is right, it is evident that the escaping flood can pass to the north and west of Spokane and distribute itself over the glacier, wearing several channels in the ice to the glacier's edge, some of which deposited their water into San Poil Lake to fill and enlarge the preglacial channel known as Grand Coulee. Through other ice channels, the glacial water was poured over the rim of the glacier to fill, enlarge and widen all the then existing preglacial channels, and, in many instances, to form in the scab lands new channels of large dimensions.

It is the belief of the writer that during the different glaciation periods many floods occurred which were produced in a similar manner. Whenever large volumes of ponded water were released and passed through the well-eroded preglacial channels, they deposited along the main preglacial channels large gravel bars, some of which were miles in length, and from one hundred to two hundred feet in depth. These gravel bars were formed across the outlets of channels entering the main drainage channels, and could not be formed if the water flow in the side channels were simultaneous with the flow in the main channels. If the water flow in the side channels were simultaneous, there would be no opportunity for gravel bars to form across the mouth of the side channel at an elevation higher than its bed. The entrance to the side channel must have been filled by backwater from the main channel, thereby allowing the bars to be deposited across its front in comparatively quiet water.

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BLOOD RELATIONSHIP WITHIN THE ORDER RODENTIA

IN his classic study of phylogeny by means of precipitating antisera Nuttall left untouched the problem of the blood relationship of the rodents. The present serological study of the four species of mice, *Mus musculus, Mus wagneri, Mus faroensis* and the Japanese waltzing mouse of the genus *Mus,* was begun with an attempt to produce precipitating antisera in pigeons, using the serum or muscle extracts of these rodents as antigens. In spite of all modifications in manner of treatment of the birds the study of two hundred pigeons has not given an antiserum which would differentiate these mice. Several antisera have been obtained which reacted up to dilutions of 1:50 and 1:100, but these show a very broad reaction among the rodents and are absolutely non-specific in regard to the differentiation of the four types of mice considered. Similarly Nuttall failed to obtain any precipitin from the serum of a duck and a chicken treated with rabbit serum. Several workers, however, have considered that such an antiserum may be produced.

Recently, acting upon the suggestion of Dr. F. G. Novy and following the work of Uhlenhuth and Weidanz (1909) and R. Trommsdorf (1909), rabbits have been immunized against the serum of *Mus musculus.* By a modification of Nuttall's quantitative method of precipitin titration the blood of *Mus musculus* could readily be differentiated from that of Japanese waltzing mice and *Mus wagneri.* Serologically, the *Mus faroensis,* however, may be regarded at present as identical with *Mus musculus.* For these titrations precipitating antisera from the rabbit were used. These gave definite reactions at dilutions of antigen as high as 1:10,000 and in every instance the end point in the titration of *Mus faroensis* was the same as that of the homologous antigen, *Mus musculus.* Likewise *Mus wagneri* and the Japanese waltzer react to the same point, but this is always at a definitely lower level than the one at which *Mus musculus* and *Mus faroensis* were found positive. For example, in the case of a precipitating antiserum which reacted with *Mus musculus* and *faroensis* at 1:6,500, the Japanese waltzer and *Mus wagneri* consistently remained active only up to 1:4,000, and again with an antiserum active against *Mus musculus* and *Mus faroensis* in dilutions up to 1:10,000, Jap waltzer and *wagneri* were positive only in dilutions up to 1:4,500. With these antisera rat serum was active only in dilutions up to 1:100, a logical group reaction.

It was feared that rabbits might not be suitable animals for the production of rodent antisera, inasmuch as several investigators have considered that they might well contain natural precipitins for other rodents. In an effort to eliminate this factor of error sixty-eight normal rabbits of assorted types and sexes were titrated against both *Mus musculus* and *Rattus norvegicus* at dilutions ranging from 1:4 to 1:5,000 and were found to be consistently negative. In addition all experimental rabbits were tested for the presence of the precipitating antibody in their serum before the treatment was instituted and all final titrations contained controls with normal serum.

At present the pigeon may be considered unsuited for the production of precipitating antisera. The rabbit is free from natural mouse or rat precipitin and is suitable for the production of these antibodies. The four species of mice studied fall into two groups serologically distinct, the one being *Mus musculus* and *Mus faroensis* and the other Japanese waltzer and *Mus*

wagneri. Within either of these groups, as yet, it has not been found possible to make any serological distinction. The study of blood relationship within the order Rodentia is being continued, using both birds and rabbits as antibody producers.

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LUMINESCENCE

I READ with very great interest the article on "The Excitation of Luminescence by the Agitation of Mercury in Glass and Transparent Fused Silica Tubes and Vessels" by W. L. Lemcke in SCIENCE of January 18. At the close of the article it was suggested that it would be of scientific interest to examine the radiations coming from a transparent fused silica vessel with the aid of a spectrograph with quartz prism and lenses. This problem has occupied my time for the past few months. It is my aim to examine, as Lemcke suggests, the effect on the luminescence produced when certain gases and solids are present in the vessel.

Using a standard "Shaker" tube of transparent fused silica and a Hilger E_2 Quartz Spectrograph I was able to record very definitely on a plate the resonance line λ 2537 Å of Hg with exposures as short as forty-five minutes. The tube was 2.5 cms in diameter and had the usual central inner tube. That part of the tube which contained the inner tube and the mercury was 15 cms in length. Only mercury, its vapor and air at very low pressure were present in the tube. A crank on the shaft of a small electric motor gave the tube a horizontal reciprocating motion in front of the slit of the spectrograph, which was distant about 3 cms from the axis of the tube.

A trial exposure of forty-two hours with the same apparatus brought out a great number of lines in the visible region as well as a faint continuous spectrum and a very interesting looking band extending from λ 2537 Å to about λ 2570 Å, where it cut off sharply. Further work is being done on this problem and the results will be published.

Interesting in connection with this problem is the work of Duffieux[1, 2] and of Robertson, MacKinnon and Zinn.[3] The former examined the luminescence produced when an evacuated spherical Pyrex bulb containing a large drop of mercury is rotated, and the latter rolled a drop of mercury on the inside of an evacuated quartz tube in order to produce a continuous mercury spectrum. In both cases the temperature was from 60° to 240° C. I have thus far confined my investigation to temperatures near 30° C.

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1 Duffieux, *Comptes Rendus,* 1927, *184,* p. 1434.

2 Duffieux, *Jour. de Phys. et le Rad.,* 1928, *9,* p. 61.

3 Robertson, MacKinnon and Zinn, *J. O. S. A. and R. S. I.,* 1928, *17,* p. 417.

SPECIAL CORRESPONDENCE

THE DANISH CIRCUMNAVIGATION EXPEDITION

IN May, 1904, the Danish research vessel *Thor,* fishing over deep waters west of the Faroes, found a fully grown larva of the common European fresh-water eel. Up to that time corresponding stages were only known from the Straits of Messina, in the Mediterranean. The find led the young fishery biologist, Johs. Schmidt, into whose hands it came, to devote himself to the problem of the eel, and for twenty-five years he has been engaged upon the task. He is now on his way around the globe with an expedition mainly designed to ascertain the breeding grounds of eels all over the world. Endeavors will, however, also be made to elucidate various other oceanographical questions which have arisen during the past twenty-five years of research.

Thus, as so often before in the history of science, an apparently small discovery has led to far-reaching developments; many problems have been solved, and even more have arisen, in the course of the cruises organized by Professor Johs. Schmidt, of the Carlsberg Laboratory, Copenhagen, in connection with his investigations on the eel. During the past twenty-five years, the following expeditions have been sent out from Denmark, with eel investigations among their principal aims; the cost of these expeditions has been defrayed by the Danish government, by the Carlsberg Foundation, by the East Asiatic Company in Copenhagen and by private persons interested in the work.

Thor, 1905–06, in the Atlantic west of Europe.
Thor, 1908–10, in the Mediterranean.
Margrethe, 1913, Europe, West Indies.
Dana I, 1920–21, Europe, West Indies.
Dana II, 1921–22, Europe, South America, West Indies, Panama, West Indies, U. S. A.

The present *Dana* expedition, which is to occupy two years, left Denmark in June, 1928, and is under the patronage of His Royal Highness Prince Valdemar of Denmark.

The route to be followed is as follows, westward around the globe: First to Spain, Portugal and the Straits of Gibraltar, with the western part of the Mediterranean; then via Madeira to the West Indies and on through the Panama Canal into the Pacific, to Tahiti, the Fiji Islands and New Caledonia; thence to New Zealand and Eastern Australia. In the waters east of Australia, two months will be spent, and the