above title appeared in SCIENCE for August 22, had been discussed long ago by L. Natanson in *Wiedemann's Annalen;* and he adds: "This same explanation [referring to mine], only in a much more complete form, was given by Natanson more than thirteen years ago."

I am glad to learn of the very interesting article which treats of the same subject and which was not known to me.

But the treatment and even the object of L. Natanson's article and of my communication are, contrary to Mr. Wood's opinion, widely different. Natanson treats the subject in an elaborate quantitative manner, leaving practically out of consideration the qualitative side of the phenomenon (*i. e.,* the question how it happens that the slow and quick molecules become separated), while I direct my attention only to its qualitative aspect, having attempted to form a simple idea of the mechanism of the phenomenon.

From a statement in his note I see that Mr. Wood misread the abstract; this made it difficult for him to understand its contents.

PETER FIREMAN.

WASHINGTON, D. C.,
October 16, 1902.

SHORTER ARTICLES.

BACTERIUM TRUTTÆ, A NEW SPECIES OF BACTERIUM PATHOGENIC TO TROUT.

THIS organism was obtained from the blood of diseased brook trout and stands in specific causal relation to the disease. The following characterization will be followed by a more extended description.

It is a pleomorphic form which appears in the blood and local lesions of its host as longer or shorter rods, with occasional spherical forms. The rods grow out infrequently into filaments of 6 μ, but average much less, and may be scarcely 0.5 μ in length. The width is 0.5 to 1.0 μ. On nutrient agar-agar it assumes the form of a spherical or subspherical coccus, with occasional rods, the cocci 0.5 to 1.0 μ in diameter. Microscopically the field gives the impression of cocci, but the rods are not infrequent and reach a maximum length of 1.5 μ. In liquid media rods greatly predominate, often arranged in pairs, of a length from that of the diameter of a coccus up to a maximum of 2.35 μ, and 0.48 to 0.83 μ wide. Many of the single rods, when stained, show a slight constriction indicating their separation into cocci, while many give no sign whatever of such a structure. Agar plates made from the blood contain apparently pure cultures of the organism as colonies chiefly of cocci, which become chiefly rods when transferred to bouillon, or when inoculated into trout. In the latter case they reproduce the disease, appear in the blood and lesions as rods recoverable upon agar as cocci. This pleomorphism in different media and the variety of form in the same culture are not reduced by repeated plating.

The organism is non-motile, does not form spores, and a capsule has not been demonstrated. It stains readily by aqueous solutions of the ordinary aniline dyes, and faintly by Gram's method, but its reaction with this stain is not of much value. It grows aerobically on ordinary nutrient media, luxuriantly on agar of a reaction* neutral or +0.5 to phenolphthalein, and will not grow or but very slightly at +1.5; at —0.5 growth is inhibited and at —1.0 to —1.5 scarcely occurs. On agar slants growth is moderately abundant, of a grayish-white color, with age grayish-brown. On usually the third day a production of a soluble pigment becomes evident, which diffuses itself in the medium and does not reside in the growth itself. It is a brown shade and deepens gradually, becoming very dark brown after two or three weeks, and the growth itself taking on a brown tinge. This pigment is produced in agar, bouillon, Dunham's pepton solution, and coagulated blood serum but not in gelatine or upon potato. It is produced in alkaline, neutral and acid media and is inhibited by extremes of reaction as the growth itself of the organism is inhibited. It is produced at the room temperature. Higher temperatures inhibit the color faster than they do the growth.

Agar plate surface colonies are round, slightly convex, outline well defined, microscopically granular, after two days grumose

* Report Committee of Bacteriologists, Journ. Amer. Pub. Health Assoc., January, 1898.

near the center. Well-developed colonies are translucent and yellowish under the microscope by transmitted light. Colonies not crowded may reach 3 mm. in diameter before ceasing to increase. In bouillon a marked growth is visible after eighteen hours, without pellicle or clouding, the sedimenting white growth clinging to the sides of the tube. After ten or fifteen days the brown pigment makes its appearance, diffusing throughout the medium and the sediment takes on a dirty-brownish color. Gelatine is liquefied, the liquefaction in tubes at first crateriform or funnelform, but may become stratiform, reaching the walls of the tube and extending down horizontally. Occasionally the lower end of the stab liquefies the faster and produces a terminal sac of liquefaction. Blood serum is liquefied, with production after three or four days of the brown color, which becomes much darker with age than in old agar cultures. On ordinary acid potato no growth occurs. On neutral potato a very scanty growth takes place, becoming visible about the third day, not increasing after four or five days and never producing color. It grows abundantly in neutral milk, without coagulation, reaction unchanged or becoming slightly acid, the milk peptonizing and becoming nearly clear in from one to two weeks.

The optimum temperature is not far from 20°C. In the refrigerator between 3° and 6°C., no visible growth occurs, but the organism is not injured. A temperature of 31°C. inhibits somewhat the growth and of 37.5°C. arrests it entirely and the organism is killed by an exposure to it of seventeen hours. Bouillon cultures are sterilized by an exposure to 42°C. for ten minutes. A culture on a sealed agar slant was still alive at the end of seven months. The rate of growth and chromogenic property were markedly inhibited, but both were restored by repeated transfers.

In vacuo, by exhaustion with a Chapman pump and absorption of oxygen by pyrogallic acid and caustic potash a slight multiplication occurs, apparently due to a trace of oxygen at the beginning of the experiment. The growth does not increase and the organism is probably an obligate aerobe. It does not ferment glucose, lactose or saccharose, and does not produce indol, phenol, ammonia (in bouillon), invertin or diastatic ferments. It reduces nitrates to nitrites and finally to ammonia. Cultures in one per cent. glucose bouillon acquire an acidity or increase of acidity of 1.2 per cent to 1.6 per cent. in fifteen days, without production of the brown color; while in lactose or saccharose bouillon a very slight or no development of acidity occurs, and the pigment is produced much as in plain bouillon.

It is pathogenic particularly to the brook trout (*Salvelinus fontinalis*) and has been isolated from the Loch Leven (*Salmo trutta levenensis*) in epidemic, and in a few cases from the lake trout (*Cristivomer namaycush*). It has been found only in domesticated or aquarium fish and never in wild trout from the natural waters. It is not pathogenic to warm-blooded animals, and trout dead of the disease may be eaten after cooking, without harm.

After several months and repeated transfers on artificial media, it may slightly cloud bouillon, and exhibit a more pronounced Brownian movement to a degree suggesting motility. Attempts to stain flagella have had negative results, and the species is placed in *Bacterium* and named *truttæ* for the group of fishes that apparently contains its chief hosts.

M. C. MARSH.

U. S. FISH COMMISSION.

DISCOVERY OF A MUSK OX SKULL (OVIBOS CAVIFRONS LEIDY), IN WEST VIRGINIA, NEAR STEUBENVILLE, OHIO.

AT the fifty-first meeting of the American Association for the Advancement of Science, held in Pittsburgh, June 28 to July 23, 1902, Mr. Sam Huston exhibited a portion of the skull of a musk ox recently found near Steubenville, Ohio, at the same time making a verbal communication relative to the discovery of the specimen. Mr. Huston has lately sent to the writer for publication the following account of the finding of this skull, together with the accompanying sketch of a cross-section of the Ohio River valley at the point where the skull was found: