would indeed be of great value in a great institution like the American Museum and would amply repay the labor of preparing such an exhibit, for the material for such a hall could easily be selected from the duplicate specimens without making any considerable drain on the exhibit halls proper, which should be devoted to the ethnographic exhibit. But to adopt this as the type and standard of installation for the entire department seems, when one considers the greatness of the collections and the size of the building of this institution, utterly incongruous. In view of the commanding position which this institution holds in America, its example is bound to have a very great influence on all of our public institutions, and one has the right to expect from it work of the highest scientific value, and to expect that through its exhibition halls it shall appeal primarily to the intelligent scientific world.

GEORGE A. DORSEY

THE FORMATION OF LAKE SUPERIOR COPPER

TO THE EDITOR OF SCIENCE: The report of the meeting of the Geological Society of Washington and of the paper from the Geophysical Laboratory of the Carnegie Institution on the artificial production of silver and copper in your number of March 8, 1907, leads me to think I should, in justice, publish extracts from a letter received by me from Dr. G. Fernekes, of the Houghton College of Mines, left undated, but received some weeks ago. In a paper on the theory of copper deposition (annual for 1903, p. 249, etc.) emphasis was laid on the probable importance of chloride solutions in copper formations. Then when I read of Stokes's work in *Economic Geology* (Vol. I., p. 644) I suggested to Dr. Fernekes that he extend it to what seemed to me probable conditions of copper formation. He has been engaged in experiments, including an extensive series of tests of mine waters and minerals, along this line, not yet finished, concerning which I will not pretend to report in full, but just quote one extract to show the kind of results he is getting. An apparatus like that of Stokes's was used. Of course the experiment is not precisely the same as the experiment made in the Geophysical Laboratory, and there is no direct question of priority involved, but they are closely parallel and entirely independent. It is up to me to say this as a 'mutual friend.'

ALFRED C. LANE

I have therefore again tried the action of $FeCl_3$ on $CuCl_2$. When these two salts react on each other in an almost neutral solution, free acid is given off according to the following reaction:

$$2FeCl_3 + CuCl_2 \rightleftarrows Cu + 2FeCl_3$$

$$FeCl_3 + 2H_2O \rightleftarrows Fe(OH)Cl + 2HCl$$

If we constantly neutralize this acid by some alkali such as $Ca(OH)_2$ we can change the above reversible reaction into one which will proceed but in one direction, namely, from left to right as above. On trying this I was pleased to see that every trace of copper was precipitated from the solution and of course calcium chloride was formed as a by-product. I immediately upon this tried calcium silicate as a neutralizing agent, and was delighted in seeing all the copper precipitated. Natural wollastonite was the calcium silicate employed. The by-product in this case was, of course, besides calcium chloride, silica (quartz). The whole thing is now cleared up. That is, three factors were active in bringing about the deposition: copper chloride (or copper silicate and HCl); calcium and sodium silicates, as neutralizing agents; and then minerals with ferrous iron in them.

* * * As to the aluminum: the same happened to it as to the iron. After all the copper was precipitated and the solution was neutral it was thrown out as an extremely basic salt. A trace of chlorine is detectable in most of the minerals around here. How beautifully we will check up with Pumpelly's observations.—The mineral now gone; and the greenstone, etc. * * *

* * * Will send you once more corrected sheet of analyses and further notes as to tests of Cu and Ni thereon.

Yours,

(Signed) G. FERNEKES

RADIUM IN BIOLOGICAL RESEARCH

A Radioactive Microscopic Slide.—In the course of experiments on the effects of the rays of radium on plants it became desirable to observe directly the reaction of the living protoplast to these rays. For this purpose the principle of Lieber's radium-coating was applied in the preparation of a radioactive