The work under review is one of extremes. It ascends to heights of excellence and brilliant achievement, and then breaks down, where one would least expect it, in errors and fallacies which seem inexcusable in one so gifted. It is greatly to be regretted that a book involving so much original work, and containing so much that is really valuable, should be marred by blemishes which prevent it from being regarded as an authority. Nevertheless, if the judicious reader will pardon these blemishes, the larger part of this treatise constitutes a monumental work of great erudition, and of elaborate and industrious research.

FRANK W. VERY

The International Rules of Zoological Nomenclature, with Appendix and Summaries of Opinions No. 1 to No. 56. T. O. SMALLWOOD, 3216 N St., Washington, D. C., September, 1915. 4to. 28 pp.

The ninth International Congress of Zoology met at Monaco, March, 1913. The full report was issued by the Imprimerie Oberthur, Rennes, France, 1914. Owing to the disturbances in Europe this report is practically inaccessible to students, and no separate copies of the rules in English appear to be available, nor does any provision seem to have been made for the republication of the rules separately. Hence the publisher of this pamphlet, with the approval of the secretary of the International Commission and the careful supervision of some of the American members, has provided what may be regarded as a trustworthy edition which may be obtained as above indicated.

A partial reprint of the rules without the opinions has been issued in French by M. Maurice Cossmann in the *Revue critique de Paléozoologie* for July and August, 1914, and in this connection a word of caution seems to be required. On page 14 of the separate copy of this rendition of the rules we read as follows under the following caption:

Autres Décisions du Congrès se Rapportant à la Nomenclature

A. Des exceptions à la loi de priorité pourront être admises:

1°. Quand un nom de Genre ou d'espèce devrait être transporté à un autre Genre ou à une autre espèce existants;

2°. Quand un nom a été employé pour un Genre pendant 50 ans, jusqu'à 1890, dans les travaux scientifiques, tels que monographies, catalogues scientifiques, etc.;

3°. Quand le nom le plus ancien, conformément à la loi de priorité, n'a pas été admis pendant 20 ans dans la systématique scientifique.

Note.—Chaque exception doit être soumise à la Commission internationale de Nomenclature qui examine chaque cas et le soumettra au prochain congrès international.

As the title of the pamphlet reads "Règles internationales . . . Adoptées par les Congrès," etc., it would seem that the reader might readily suppose that the paragraphs quoted from M. Cossmann's reprint (but not appearing in the English version) had been affirmatively decided by the congress. This, however, is not the case. Paragraphs *A*2 and *A*3 were submitted, it is true, but were definitely rejected, though no indication of this appears in the French reprint. Paragraphs *A* and *A*1 are qualified by the note under paragraph *A*3, each case to be submitted to the commission and decided on its merits.

WM. H. DALL

SPECIAL ARTICLES

THE LIGHT-SENSIBILITY OF COPPER-OXIDE

THE fact that selenium changes its electrical conductivity under the influence of light was discovered by May in 1873. Since that time the property of light-sensibility has been looked for in many substances and it has been found that sulphur, shellac, paraffin, anthracene and several other substances possess this property to a slight extent. The most noteworthy addition to the list was made by Jaeger who discovered the light-sensibility of stibnite (native Sb_2S_3) in 1907. Since a careful study of the behavior of these substances is bound, ultimately, to shed light on the mechanism of metallic conduction, it seemed worth while to continue the search for other substances which show marked light-sensitiveness. Recently the

writer found that copper-oxide (Cu_2O, presumably) shows the effect quite unmistakably.

Without going into details here as to the mode of production of copper-oxide cells or bridges, it may be stated that copper-oxide has a much lower specific resistance than either selenium or stibnite and is much the more transparent toward red light (layers having a thickness of more than 1 mm. are still slightly translucent). The fundamental facts which have been established for this new light-sensitive substance are:

1. The conduction is electronic and not electrolytic.

2. The increase in conductivity, occasioned by light, is distinctly different from that produced by a heating effect.

3. The conductivity increases with the applied voltage, *i. e.,* Ohm's law is not obeyed (voltage effect).

4. The region of increased conductivity spreads slightly to portions of the material not illuminated (transmitted effect).

5. The region of highest sensibility lies in the ultra-violet near $\lambda = 2800$ A. U.

6. Cooling in liquid air increases the percentage change in conductivity and displaces the sensibility maximum in the red toward shorter wave-lengths.

7. The relation between the radiant energy absorbed (E) and the resultant change in conductivity (C) is very approximately of the form $C = KE^{\beta}$ where K is a constant and β lies near 0.5.

While the percentage change in conductivity upon illumination is much less than that of selenium and stibnite, the comparatively high conductivity of copper-oxide makes the absolute increase quite large. The best cell which the writer has thus far constructed has a resistance of 15,200 ohms at 17° C. for 1 volt. The change in conductivity occasioned by the light from a 40-watt tungsten lamp at 20 cm. is about 15 per cent. The area exposed to radiation is about 12 mm.[2] If this cell be connected to a 2-volt cell and a galvanometer (forming part of a simple potentiometer) a sensitive device for detecting radiant energy is produced. Exposing the cell to daylight in a moderately lighted room throws the galvanometer spot of light violently off the scale. Monochromatic radiations which are quite too feeble to affect a sensitive radio-micrometer, bring about large deflections when allowed to fall on the copper-oxide cell. If the cell be connected to a telephone receiver and battery and if an intermittent light beam of definite frequency be allowed to fall on the cell, a clear, musical note is heard.

The preceding discussion is to be looked upon as being of a preliminary nature. A systematic search for light-sensibility is being undertaken and a complete account of the work will appear later.

A. H. Pfund

Johns Hopkins University,
November, 1915

Radioactivity of Underground Waters in Providence and the Vicinity

Some idea of the distribution of radium salts near the surface of the earth may be obtained from a study of the relative amounts of radium emanation dissolved in underground waters. Within the last ten years a number of the better known springs and wells in America, Europe and Japan have been examined for emanation content. Some of the activities obtained have been tabulated by Schlunt and Moore[1] also by Dole.[2]

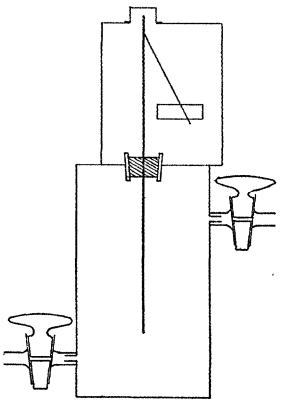

Fig. 1.

1 U. S. Geological Survey Bulletin 395, 1909.

2 U. S. Geological Survey, "Mineral Resources of the U. S., 1913," Part II., pp. 393–440.