test the electrical conductivity of conductors in different orientations with respect to the earth's motion in space. True, all these experiments were performed at or near sea level; and in view of the difference in Professor Miller's results as between Cleveland and Mt. Wilson, it is certainly desirable that some or all of these other experiments should be performed at as great an altitude as possible; for no final conclusion in the matter can be reached until all the different lines of experiment give concordant results.

Of these other lines of experiment, the simplest and most practical would seem to be those of Rayleigh and of Brace (*Phil. Mag.*, December, 1902, p. 678; *ibid.*, vol. 7, 1904, p. 317). It ought to be possible to test this point with an apparatus compact enough to be carried up to a height in an airplane.

The Trouton-Noble experiment is still so uncertain in theory that we do not know exactly what to look for. (Kennard, *Bulletin* of the National Research Council, vol. 4, part 6, December, 1922, No. 24.) Its experimental prosecution may well be delayed until its theory is clear.

PAUL R. HEYL

BUREAU OF STANDARDS

THE DISAPPEARANCE OF HELIUM IN GEISSLER TUBES

THE recent comment by S. C. Lind and D. C. Bardwell in the March 27 number of SCIENCE, entitled "Mercury and Ionized Helium," in which experiments are described which appear to show that helium and mercury do not interact as a result of alpha particle bombardment, suggests our calling attention to some interesting phenomena associated with the disappearance of helium in Geissler tube discharges which produce the spectra of the first negative Deslandres group of carbon, and the so-called comet-tail bands.

Using tubes of the Wood type of four millimeters bore with pressures of twenty millimeters of helium and a small partial pressure of 10^{-4} mm of residual compounds of carbon from activated charcoal, on several occasions during energetic excitation of the above mentioned spectra, together with the brighter lines of helium, the latter has been observed entirely to disappear. The tube changes in color from pink to blue, and the Ängstrom bands and triplet band system, described by Merton and Johnson, are developed. The disappearance of helium in its usual form under these conditions is inferred from the complete disappearance of its spectrum and a marked reduction of gas pressure within the tube, as exhibited by the length of the dark space.

Conditions hardly permit of the hypothesis of occlusion in the ordinary sense, since subsequent baking the tube to the softening point of pyrex glass does not recover the helium spectrum. Neither can one ascribe the phenomenon to diffusion through the glass walls, since the tube is not heated much above 50° C. by the discharge which causes the extinction of the helium spectrum. One is reminded of some early work of Berthelot, *Ann. Chem. Phys.* (VII), 11, p. 219, 1897, on the apparent disappearance of helium when associated with carbon compounds.

HARVEY B. LEMON

RYERSON PHYSICAL LABORATORY,
UNIVERSITY OF CHICAGO

THE CLASSIFIED CONTINUATION CARD CATALOGUE OF THE BIBLIOGRAPHY OF FISHES

IN the *Anatomical Record* of December 25, 1924, Vol. 29, pp. 128–129, I published under the above title a preliminary abstract of a paper which I read on January 1, 1925, before a joint meeting of the American Society of Zoologists and the American Ecological Society. The purpose in publishing this abstract and in reading this paper was to give notice that the "Bibliography of Fishes" is being kept up to date, to ask "fish men" to send in their articles for immediate carding and to ask all interested in any subject wherein fishes touch the life of man to come to the American Museum to get their references brought as near to the actual date as is humanly possible. In order to secure the widest possible notification of this purpose to scientific men in America I am publishing in SCIENCE this note on the plans and work now under way.

A large number of the letters and reviews received since the publication of the "Bibliography of Fishes" have expressed the strong hope that the bibliography, which includes the literature to and ending with 1914, might be continued. My own feeling is that having learned how to do bibliographical work, I owe it to science in general and to ichthyology in particular to keep the "Bibliography of Fishes" up to date in the form of a classified card catalogue. For a year and a half this work has been carried on in tentative fashion and it has been demonstrated that it can be done without any outside assistance and without any outside expense to the museum—*i.e.*, it is being done as a part of the regular routine work of the department.

The sources of additional reference for the "Bibliography of Fishes" are primarily those papers which have appeared since the close of the bibliography (1914). These references come in to us in three separate ways: First, in the current bibliographies which generally appear about two years later than the literature which they record. Of these the "Zoological Record" has been checked up to date, and I plan shortly to begin on the "Archiv für Naturgeschichte." When that is done the continuation (post 1914) of the "Royal Society Catalogue," the "Concilium Bibliographicum" and other like annual works will all be

checked against our alphabetical card catalogue, the missing cards put in it and duplicates made and distributed in the index-catalogue.

In the second place bibliographies in recent books and in extensive papers dealing with particular subjects or structures will be checked, since in such sources are found many valuable references old and new which do not get into the annual bibliographies. In this way we expect to get some 25 or 30 per cent. more titles than are to be found in the annual issues of the "Zoological Record."

In the third place we receive here a considerable number of separates, which are checked, carded, indexed and the cards distributed as soon as they come in, and thus our catalogue is about two years ahead of the "Zoological Record" and the other annual bibliographies. The greater the number of such separates which come in, the more nearly up to date our card catalogue will be, and this is the point in this appeal for the early sending in of such separates. These references once carded become available for all who may call at the museum.

Now readers of this article are already asking, "What about publication of this card catalogue?" This is not a question that I can answer. It will be years before material will be accumulated in sufficient amount for another volume. Whenever that time comes, it will be for the president and trustees of the museum to decide the question of publication.

The results of my work can not be sent out by letter, but to any one calling at the department the recent references in his particular subject will be put before him on five minutes notice. And such use, it may be remarked parenthetically, is being made of our catalogue at intervals nowadays.

Readers of SCIENCE *who are students of fishes, will you send me your separates promptly that they may promptly be made available for others? I want everything wherein fishes touch the life of man.*

E. W. GUDGER
AMERICAN MUSEUM OF NATURAL HISTORY,
NEW YORK CITY

SPECIAL ARTICLES

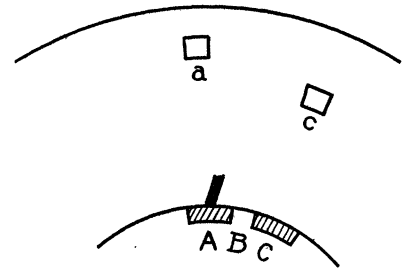
THE LIFE OF METASTABLE HELIUM AND MERCURY

KANNENSTINE (*The Astrophysical Journal,* 55, 345 (1922); 59, 108 (1923)) and Marshall (*Astrophysical Journal,* 60, 243 (1924)) have reported that in mercury and helium which has just been excited by a discharge, it is temporarily possible to cause an arc to strike at a very low voltage. This voltage is said to be critical and equal to the difference between the ionizing potential of the gas and its resonance potential; *i.e.,* 24.6 − 19.8 = 3.8 volts for helium, and 10.4 − 4.7 = 5.4 volts for mercury. Their interpretation of these results is that a large supply of excited atoms is formed during the primary arc, whose reversion to normal is impossible except by collisions of the second kind *with impurities* or with the walls and electrodes. The length of time during which it is possible to maintain these post-arc currents with low voltages is taken as a measure of the life of the metastable excited atoms.

These results were predicted by Franck and Reiche (*Zeitschrift für Physik,* 1, 154 (1920)) from considerations which are rendered doubtful by recent work on collisions of the second kind.

The author has therefore repeated the work of Kannenstine and Marshall, using more sensitive methods. A commutator was used which applied a high voltage (30–40 v.) to an arc tube for a short time (Period A). This voltage was then disconnected for an interval (Period B) which was long enough to allow all transient phenomena due to inductance and capacitance to die out. During a third interval (Period C) a second known voltage, V, was applied through a microammeter. This meter thus read the time average of a current which was zero except during Period C. It was then found that when V was very low (+1 volt) or negative, the current during Period C was negative and small (10–20 microamperes). As V increased from 1–6 volts, the current increased continuously and reached a definite saturation value of 4–5 milliamperes at 8 volts. No further increase was detected until V = 20 volts. The negative currents, together with the *complete absence of any critical potential,* led to the hypothesis that these post-arc currents are due, not to ionization of excited atoms, but to the persistence of actual ions in the arc space.

To test this hypothesis, a perforated disc was mounted on the same shaft as the commutator. The arrangement is shown schematically in the figure. During a portion of Period A, the arc is visible



through the opening *a*. Similarly, during part of Period C, it is visible through *c*. Experimental conditions were then adjusted so that the current flowing during Period C was 1/4 to 1/3 that flowing during Period A. It was then found that though intense