

## Miscellany

The State Department has cut the professional staff of its Science Office in Washington from four members to two, according to the Federation of American Scientists, and has reduced the number of science attachés at U. S. diplomatic offices in Western Europe from nine to four.

The June 1953 Strasbourg meeting of the Executive Committee of the International Council of Scientific Unions, we understand, has asked the Committee on Cosmic Rays of the International Union of Pure and Applied Physics to assume the role of specially appointed commission of the IUPAP to make plans—so far as regards physics—for the forthcoming international geodesic year (1957–1958).

The Naval Research Advisory Committee, established in 1946, advises the Secretary of the Navy, the Chief of Naval Operations, and the Chief of Naval Research on scientific research and its utilization by the Navy. Augustus B. Kinzel, formerly the Committee's vice-chairman, is the new chairman, succeeding Arthur H. Compton, and John A. Hutcheson is the new vice-chairman. Dr. Kinzel, president of the Union Carbide and Carbon Laboratories, is also vice-president and director of the American Institute of Mining and Metallurgical Engineers. Dr. Hutcheson, a member of the Committee since 1947, is vice-president of the Research Laboratories of the Westinghouse Electric Corporation. Other members of the Committee are A. V. Astin, Luis de Florez, R. E. Dyer, J. C. Hunsaker, Paul F. Lee, I. I. Rabi, William R. Sears, E. H. Smith, H. N. Stephens, J. W. Sterling, and George D. Stoddard.

A directory of the optical industry (which will include lists of companies and organizations, optical items and suppliers, personnel in the industry, and useful optical data) is in the process of being compiled from answers to a questionnaire circulated by the Optical Publishing Company of Huntington, Long Island, New York. Its editors have indicated that they want the *Directory* to be as complete as possible and will therefore be glad to hear from organizations or individuals who may have been omitted from their mailing.

## Research Notes

The high-frequency auditory response of "a fresh caught, wild, adult bottlenosed porpoise" is considered in a paper by W. E. Schevill of Woods Hole and Barbara Lawrence of Harvard, which appears in the September issue of *The Journal of the Acoustical Society of America*. Since cetaceans in general are known to produce underwater sounds, many people have hypothesized that these sounds are used for echo-location and navigation, as in the case of bats. In this work no evidence to support the echo-location theory was found, although much information was gained concerning the audibility of sounds by the porpoise. Unfortunately, the pool that composed the experimental vessel "had a deplorably high background, chiefly caused by snapping

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shrimp", and this prevented determining the porpoise's minimum threshold. The porpoise was taught to acknowledge acoustic signals by surfacing for her reward—a fish. Tones from 0.15 to 153 kc were tried and all elicited some response. 100 percent audibility was found from the lower limit to 120 kc ("the occasional negatives being clearly attributable to psychology rather than to acoustics"), and declined to 13 percent at 153 kc. The emission spectrum of the porpoise was not investigated comprehensively, but it was found that, although most of its sounds are in the low frequency region, some components were 8 to 12 db above the shrimp background at 196 kc, the upper limit of the apparatus used.

**Fission induced in uranium** by negative pi- and mu-mesons is the subject of a paper in the September 1st issue of *The Physical Review*. The endings of pi-minus and mu-minus meson tracks in nuclear emulsions exposed at the University of Chicago's cyclotron were studied, and several fission events were found. The large difference in nuclear excitation between the two particles is believed to be responsible for the greater number of pi-minus fissions observed.

**Brookhaven's Cosmotron** is making V-particles again, this time by the interaction of 1.5 Bev negative pi-mesons in a hydrogen-filled diffusion cloud chamber. So far two events have been obtained that show a pi-minus track ending with the familiar "V" caused by the decay of the  $V_1^0$  into a proton and a pi-minus meson a short distance away. In order to conserve energy and momentum at least one other neutral particle must also have been created at the end of the incident meson track; the mass of such a single particle would be about 1350 electron masses. Since no decay was observed in a path of 23 cm the particle's lifetime must be greater than  $4 \times 10^{-10}$  sec. The work is described in a Letter to the Editor in the September 1st *Physical Review*.

**Responses** from single photoreceptors, a topic that can be studied only with eyes that have very simple retinas, are discussed in a review article by D. D. Michaels entitled "The Electrical Responses of the Eye, Part I" which appears in the September issue of the *American Journal of Optometry and Archives of American Academy of Optometry*. Electrical phenomena following illumination of the photosensitive ends of single optic nerve fibers vary with the duration, intensity, and wavelength of the light used, and an accumulation of data on these characteristics are summarized. One interesting point is that curves of the intensity of visual response of the photoreceptors, plotted as a function of wavelength of the stimulating light, differ for fibers coming from different sections of the eye. Part II of the article, devoted to optic nerve responses of complex eyes, appeared in the October issue of the same journal.

**The electric charges of raindrops** falling during thunderstorms have been measured by Ross Gunn and Charles Devin, Jr. of the U. S. Weather Bureau, who found an average free charge of 0.022 esu per drop for

positively charged rain and 0.031 esu per drop for negatively charged rain. The ratio of the negative free charge to the positive free charge brought down in this way was 1.2, with the ratio of the number of drops in each category being 0.88. The apparatus that was used consisted of an insulated cup connected to an oscillograph through an appropriate amplifier; the surface electric field and the precipitation rate were measured simultaneously using an induction-type meter and a tipping bucket rain gage. From this work the explanation for the existence of charged drops based on corona currents from sharply pointed terrestrial objects (grass or trees) seems unlikely, since in such a case the drop charges should all be of the same sign as that of the free charge on the earth's surface. As the authors state, "the convected current to the earth frequently exceeds the conduction currents by a large factor, and, therefore, the charged rain may determine the electric field at the surface", rather than the other way around. These experiments are described in the August 1953 issue of the *Journal of Meteorology*.

**A temperature difference** between the sun's pole and equator has been predicted on the basis of the thermohydrodynamic solar theory of Bjerknæs. Until recently no such measurements had been made, the principal reason being a lack of precision of the order of  $400^\circ$  or  $500^\circ$  with the usual temperature determination methods. The actual difference might be only about  $100^\circ$  or so, and therefore more precise techniques are required. Das and Abhyankar of the Kodaikanal Observatory, India, have evaluated the equivalent widths of the  $\lambda$  4227 line of neutral calcium and the  $\lambda$  3933 line of  $\text{Ca}^+$  at both the pole and equator of the sun, and used this information to calculate the temperature difference. This quantity was found to be about  $90^\circ$ , the polar temperature being the higher one. These results are described in the September 12 issue of *Nature*.

## Equipment and Techniques

**Printed circuits** made by etching metal-clad plastic sheets are described in an article in the September 1953 issue of *Mechanical Engineering*. This method, which offers many significant advantages over older techniques such as fusing silver-ink patterns on ceramics, uses extremely thin copper sheets which are bonded to a thermosetting laminated plastic. Other metals, brass, aluminum, and silver, are sometimes used as well. The etching solutions are ferric chloride for copper and brass, hydrochloric acid for aluminum, and nitric acid for silver; the process takes about two minutes for 0.0014-inch copper. For complicated circuits both sides of the plastic layer can be employed. Circuit components are attached by drilling holes through the conductor and the plastic, inserting the appropriate leads, and soldering them in place.

**An ion-resonance mass spectrometer** designed to meet process instrumentation requirements in the gas, petroleum, pharmaceutical, and chemical fields has been developed by the General Electric Engineering Labora-