rector, Vol. II, Part VIII. On the Collection of Cavern Insects. By Elzéar Abeille de Perrin, University Press, Cambridge, 1877." This apparently rare paper consists of pages 1 to 14, without illustrations. Though numbered VIII, it was evidently published, 1877, before Lucien Carr's paper, which Jillson calls number I, but which was not published until 1883.

These two papers, Lucien Carr's, No. I, and Abeille de Perrin's, No. VIII, as far as I can ascertain, were the only ones ever published in Vol. II of the *Memoirs* of the Kentucky Survey. The same conclusion is expressed by Adelaide R. Haase, on page 305 of "Index of Economic Material in Documents of the States of the United States," Kentucky, 1792–1904, Publication 85, Carnegie Institution of Washington, 1910. I would further say that apparently none of the seven papers announced for Vol. II of the Kentucky Survey as above listed was ever published, at least as there recorded.

ROBERT TRACY JACKSON
MUSEUM OF COMPARATIVE ZOOLOGY,
CAMBRIDGE, MASSACHUSETTS

IONS AND ELECTRICAL CURRENTS IN THE UPPER ATMOSPHERE

IN a paper to be communicated to the American Physical Society it is assumed that the ionization in the upper atmosphere is caused by the ultra-violet light of the sun and that the ion and electron densities at noon at the equator are those required by the theory of wireless wave propagation. From the laws of recombination of the ions and the diffusion and drift of the ions in the earth's magnetic and gravitational fields the distribution of the ions over the earth is worked out. This distribution turns out to be that required by the diamagnetic theory of the solar diurnal variation of the earth's magnetism. The gravitational drift currents are found to flow mainly along the parallels of latitude in the following way: on the daylight hemisphere (1) a current sheet flowing eastward in the levels above 150 km which at the sunrise and sunset longitudes divides into two sheets; (2) one of these flows westward on the day side of the earth underneath (1) in the levels below 150 km, and (3) the other sheet continues eastward in the upper levels around on the night side of the earth. The current is mainly between the fortieth parallels of latitude, north and south, and falls to lower values at the higher latitudes. The total currents in the three sheets are about 10^7, 8×10^6 and 2×10^6 amperes, respectively. The east and west daytime current sheets subtract from each other leaving in effect an eastward current of about 2×10^6 amperes flowing around the earth all the time. This causes a magnetic field agreeing in magnitude and type with that obtained by Bauer in his 1922 analysis of the magnetic field of the earth of external origin.

As a result of the drift currents, the sunset longitude of the earth is at a potential of several hundred volts above that of the sunrise longitude. This electric field combined with the earth's magnetic field causes the ions and electrons on the night side of the earth to drift upward with velocities of order 10^2 cm sec^{-1}. The ions and electrons move into regions of lower pressure and therefore do not recombine as fast as they otherwise would. This removes a difficulty from an earlier calculation which yielded too great a night-time rate of disappearance of the free charges. The upward drift of the ionization causes a rise of the Kennelly-Heaviside layer which is, partially at least, compensated by the fall due to the cooling and contraction of the atmosphere at night, and is complicated by the diffusion of the ions. It is difficult to say how much of the night-time rise of the layer observed in experiments with wireless rays may be genuine rise and how much may be an apparent rise due to delayed group velocities, or to other causes.

E. O. HULBURT
WASHINGTON, D. C.
NAVAL RESEARCH LABORATORY,

MUYBRIDGE ANIMAL PICTURES

PROBABLY there are a good many individuals who for historic, scientific or for artistic purposes would be glad to secure samples of the Muybridge Locomotion Plates published under the auspices of the University of Pennsylvania in 1887. The complete work comprised 781 plates; each plate contains from twelve to thirty-six individual pictures, that is, from one to three series representing as many different photographic angles. A series represents some act of motor coordination, such as taking a step, jumping, striking with a hammer, etc. Recently the writer discovered that the remainders of these plates are in the hands of the Commercial Museum, 34th Street, Philadelphia. Not all the plates are represented in these remainders, but probably there are copies of some 350 or 400 of the subjects. These include men, women and children, nude and draped, and a very large animal series. In the latter the action portrayed is usually that of locomotion. The plates are in excellent condition, having remained in their original wrappers during the forty years of storage. On these plates the pictures are larger and present more detail than in the bound volumes of pictures which were issued by Muybridge. The Muybridge plates are still preeminent in the field which they cover and are of great value for their faithful representation of both

men and animals in the process of carrying out representative actions.

It was while investigating the joint original work of Leland Stanford and Eadweard Muybridge on animal locomotion carried out at Palo Alto in 1878 and 1879 that the writer discovered this wealth of material in the Commercial Museum. He is glad to pass on the information. These duplicate plates should be in the possession of scientists, artists and art schools and those interested in the history of motion pictures. Those desirous of securing them should correspond with Charles R. Toothaker, Curator.

WALTER R. MILES

STANFORD UNIVERSITY

A UNIFIED SYSTEM OF PRESENTING BIBLIOGRAPHIES

IN reading current scientific literature the diversity of bibliographic systems is forcibly brought to one's attention. It would seem that a more uniform and improved system of presenting bibliographies formulated through cooperation of the various scientific journals would be desirable.

A well-selected bibliography is one of the more valuable parts of a majority of scientific articles. To be of the most value to the research worker the references should enable him to trace further information on the particular point in which he is interested with the least expenditure of effort. This calls for a full presentation, including the title of the papers to which reference is made. It also calls for information as to the time when the work referred to was done, and this can be most efficiently supplied in the text of the article being reviewed.

The name-number and name-date systems of referring to bibliographies are both used. It would seem that the advantages of the name-date system justify its use in practically all cases. Its value in keeping before the reader the date of the work referred to in the text and the relation of this to its significance is evident to research men. It is an economy of the readers' time, in a great number of instances preventing the necessity of thumbing back to the bibliography. A number associated with the author's name has no value except in helping locate the reference in the bibliography. This number is different for each different bibliography. A supplementary value of the name-date system is apparent to authors when they wish to add a reference or two to a manuscript which was thought to be ready for publication. This is a frequent occurrence.

The name-date system also logically calls for the grouping of the bibliography in alphabetical order at the end of the article, which has its advantages especially in relocating references. Below are examples, referred to as Bailey and Sherwood (1926), Gortner and Holm (1920), and Mitchell (1924), which include the advantages mentioned above.

Bailey, C. H., and Sherwood, R. C.
1926 Relation of crude protein content of flour to loaf volume.
Cereal Chem. 3: 393–402.

Gortner, R. A., and Holm, G. E.
1920 The origin of the humin formed by the acid hydrolysis of proteins, V.
J. Am. Chem. Soc. 42: 821–7.

Mitchell, H. H.
1924 A method of determining the biological value of protein.
J. Biol. Chem. 58: 873–903.

It will be noted that each of the four items, date, name, title, reference, has the same definite location in each of the references. Locating the reference to the journal itself on a new line in every case is a distinct advantage to the reader and in a large number of cases requires no additional journal space. This same form of noting bibliographic references is also convenient for card index files. Arabic rather than Roman numerals for indicating the volume numbers of journals are very much preferred, since the former are always comprehended at a glance.

J. L. ST. JOHN

DIVISION OF CHEMISTRY,
AGRICULTURAL EXPERIMENT STATION,
STATE COLLEGE OF WASHINGTON

A NEW BLUE CRAYFISH

WHILE traveling through the state of West Virginia during the summer of 1928 with the West Virginia University biological expedition, I collected several specimens of a blue crayfish identified by Dr. Waldo L. Schmitt, curator of marine invertebrates, U. S. National Museum, Washington, D. C., as a blue phase of *Cambarus carolinus dubius* Faxon. The only blue Cambarus hitherto recorded is *Cambarus carolinus monongalensis* Ortman collected by Dr. E. A. Ortman in Pennsylvania and the northern part of West Virginia. The altitude of this subspecies ranges from 800 to 1,200 feet.

My collections of the blue phase of *Cambarus carolinus dubius* Faxon were made from the bank beside Cool Run near Cass, Pocahontas County, West Virginia, at an elevation of 2,400 feet, and Bald Knob, located about two miles from Cass, at an altitude of approximately 3,500 feet. One blue specimen was observed at Spruce Knob, Pendleton County, West Virginia, at the elevation of 4,500 feet.

This blue crayfish will be discussed more fully in a later paper.

CURTIS L. NEWCOMBE

WEST VIRGINIA UNIVERSITY