THE thirteenth annual summer term of the American School of Prehistoric Research will open in Prague on June 28, and close in Berlin on August 21. Dr. V. J. Fewkes, who last year conducted the expedition to Yugoslavia sponsored jointly by the school, the Fogg Art Museum of Harvard University and Peabody Museum of Harvard, will again be in charge as associate director for the summer term. The program will consist of a study of museum collections, field excursions, conferences, excavations (including field technique) and examinations. Requests for further information should be addressed to Dr. George Grant MacCurdy, director, Old Lyme, Connecticut.

THE department of biology of the College of the Pacific at Stockton, California, will open a Marine Biological Station on the Pacific Coast. Courses in elementary and advanced biology will be offered during the regular summer session. Students may spend three additional weeks at the station to carry out research in invertebrate zoology. Facilities will be offered for intensive laboratory work in biology and zoology. Student living quarters will be established close to the station at a low rate, and the cost of board will probably not exceed the amount charged at the college. It is hoped eventually to establish a permanent Pacific Biological Marine Station with courses continuous throughout the year.

Museum News states that the Adler Planetarium and Astronomical Museum, on Northerly Island, Chicago, will complete the lower floor and install additional ventilating machines in the next two months in order to take care of crowds expected at the time of the World's Fair this summer. In order to make the additions the planetarium is closed for the two months. During the fair lectures will be given every hour instead of twice a day.

Nature reports that Sir Dugald Clerk, who died on November 12, bequeathed £3,000 to the Institution of Civil Engineers; £2,000 to the Royal Society; £1,000 to the Royal Institution; £1,000 to the Royal Society of Arts; £1,000 to the Institution of Mechanical Engineers; £1,000 to the University of Glasgow; £1,000 to the University of Leeds; £1,000 to the University of St. Andrews; £1,000 to the University of Manchester; £1,000 to the University of Liverpool. The residue of the property is to be divided into thirty-one parts; three of these parts are to go to the Institution of Civil Engineers; two to the Royal Society; one to the Royal Institution; one to the Royal Society of Arts; one to the Institution of Mechanical Engineers; one each to the Universities of Glasgow, Leeds, St. Andrews, Manchester and London.

DISCUSSION

NATURE SANCTUARIES—A MEANS OF SAVING NATURAL BIOTIC COMMUNITIES

ONE of the characteristic things about organisms is their fluctuations in abundance from time to time. A community is an assemblage of plants and animals—a living thing which after a period of stress will never be exactly the same again. A nature sanctuary is a community or community fragment covering a certain area within which the fluctuations in abundance and other natural changes are allowed to go on unmodified and uncontrolled. Such areas afford opportunity for the study of the dynamics of natural biotic communities.

Outside of modern ecology there has been little or no tendency towards the development of specialists in the entire life of natural communities. The trend of research and education is toward specialization on particular objects or particular organisms. Perhaps one reason why nature study has been unsuccessful is because it is not the study of nature but of single natural objects or groups of objects which constitute a small part of any natural assemblage of organisms. Often this has resulted in the emotional protection of animals singled out by popular prejudice. In general, from a philosophical and practical view-point, the unmodified assemblage of organisms is commonly more valuable than the isolated rare species. However, because the significance of the unmodified assemblage is popularly ignored, the whole is commonly sacrificed in the supposed interest of the rare species. Usually neither need be sacrificed in any large natural area.

The nature sanctuaries are surrounded by areas in a less natural state, called buffer areas of partial protection. In a buffer area the vegetation is only slightly modified by man. It is a region of partial protection of nature and is zoned to afford suitable range for roaming animals under full protection. Since nature sanctuaries are areas in which natural forces are allowed free play, they may be classified with regard to the organisms now missing from the primeval community which once occupied the same area.

(1) First-class nature sanctuaries include areas of original vegetation containing all the animals which are historically known to have occurred there. (2) Second-class nature sanctuaries include (a) second growth areas approaching maturity with animals as in the first-class type and (b) areas of original vegetation from which not more than two important species of animals are missing. (3) Third-class nature

sanctuaries include areas modified to a greater degree than second-class ones.

(1) *Research reserves* of the National Park Service are essentially nature sanctuaries. They recognize two additional divisions of a park: (a) a greater part of the park open to the public and traversed by trails and roads, and (b) an area of development, hotels, etc. (2) *Natural areas* in the U. S. Forest Service sense are partial nature sanctuaries but primarily floral. (3) *Primitive areas* and *wilderness areas* in the U. S. Forest Service sense are primitive only in human transportation and conditions of living. Vegetation may be cut over and various animals wanting. (4) *Research area* and experimental area usually imply modification (except in the National Parks).

Except in desert and tundra, first-class nature sanctuaries are not available outside the national forest and national parks, and in rare instances in state and provincial parks. Buffer areas may serve as recreation areas, game reserves, etc. They are areas of partial protection not always available on all sides of natural areas. Reserve areas in the national parks and national forests are probably too small to serve as true nature sanctuaries. They have not been selected with reference to animals, and no buffer area of protection within which animals will not be disturbed is ordinarily set aside.

Nature sanctuaries are essential if any of the original nature in North America is to be saved for future generations for scientific observation of, among other things, the important phenomena of fluctuation in abundance of plants and animals, their social life, etc. Due to lack of knowledge of these fluctuations custodians view each change in abundance with alarm and desire to apply remedies immediately; hence, constant pressure must be exerted on government agencies to prevent the current popular idea of "control" and "improvement" from entering into the management of national parks, provincial and state parks and other reserves containing natural areas suitable as nature sanctuaries with buffer territories. The experiment of leaving areas essentially alone, which was so successful in a few of our parks, is worthy of repetition. In general much control activity is useless because it is applied to animals at their maximum abundance and barely hasten the natural decline.

The Ecological Society of America urges a subdivision of all but the small reserves into sanctuaries, buffer areas of partial protection and areas of development for human use where this is one of the aims of the reserves. A further aim of the society is to promote adequate scientific observation bearing on the fluctuations in abundance, to stimulate cooperation between the controlling agencies in charge of game and vegetation reservations in order that more logical units be developed and better methods of administration adopted.[1]

VICTOR E. SHELFORD
Chairman of the Committee for the Study of Plant and Animal Communities, Ecological Society of America.

THE WATER CONTENT OF MEDUSAE

MY accuracy has been questioned by Bateman,[1] who writes that "Gortner's statement that medusae contain 99.8 per cent. water is contradicted."

The statements which he criticizes are as follows:

> As I write these lines there lie before me two sheets of paper. One is the photograph of a large Medusa (jellyfish) from the Atlantic Gulf Stream which was photographed immediately after being removed from the water and being placed upon the open pages of a magazine. The Medusa, as removed from the water, weighed in excess of 500 grams. In the photograph one can read the distorted print through the more or less transparent outer portion of the umbrella, but the central portion of the Medusa which measured approximately 10×12 cm was sufficiently dense and opaque to prevent the print underneath from showing in the photograph.
>
> The other sheet of paper is the opened pages of the magazine upon which the Medusa had been allowed to dry after being photographed. These pages simply appear as though they had been wetted and then dried. No noticeable film is discernible on the surface of the pages. The print is clear-cut, and even exposing these pages to ultra-violet light results in extremely slight fluorescence. The weight of these pages exceeds by less than 0.45 gram the weight of the pages before the Medusa was dried upon them. Less than 0.10 per cent. of dried residue from the large Medusa including the salts, etc., in the adherent sea water and all of the inorganic constituents of the living organism![2]

In the discussion to this paper (p. 702) I pointed out that I was dependent upon the statement of the collector as to the weight of the living medusa, but that I had myself confirmed the dry weight, also that on other occasions I had personally made somewhat similar observations. In another connection I have stated that "in some instances, as in the case of the jellyfish, only an insignificant fraction of the organism is composed of organic material, as little as 1 per cent. of the jellyfish being organic matter."[3]

Bateman's flat contradiction of my statement rests, in so far as I can ascertain, on his acceptance of the data of Krukenberg[4] (who reports 4.60 per cent.

[1] Full details of nature sanctuary plans will appear in the society's official organ, *Ecology*, early in 1933.

[1] J. B. Bateman, "The Osmotic Properties of Medusae," *Jour. Exper. Biol.*, 9: 124–127. 1932.

[2] R. A. Gortner, *Trans. Faraday Society*, 26: 678–704. 1930.

[3] R. A. Gortner, "Outlines of Biochemistry," N. Y. (1929). *Cf.* pp. 227–8.

[4] C. F. W. Krukenberg, *Zool. Anzeiger*, 3: 306. 1880.