stormy return of the *Putnam* to Salem. Like Lindbergh's flight to Paris, aside from a piece of good navigating ability, it was probably a piece of good luck as well, that made possible the spectacular arrival. One might gain the impression that Bowditch's happy landfall was made possible by the accuracy of his newly developed "lunars," which, of course, is much overdoing it. Such a criticism is perhaps trivial for a book of much dramatic value, of distinctly human interest in things scientific, and perhaps on the whole as delightfully written as any fictional biography of the day. One can but wish equally competent authors would explore the fruitful and relatively untouched field of science for recreating in the literature of the day great personages of the past.

H. T. STETSON

HARVARD ASTRONOMICAL LABORATORY

REPORTS

AMERICAN SCHOOL OF PREHISTORIC RESEARCH

IN certain respects the work accomplished by the American School of Prehistoric Research in 1927 marks a departure from preceding years. In addition to the regular program there were four prospecting parties in the field. Moreover, during the term, the group of students was successfully turned over twice to former students of the school.

RECONNAISSANCE

Southern France.—The prospecting trip by the director and Mrs. MacCurdy was in southern France: the cavern of Aldène at Fauzan near Olonzac (Hérault); the Grottes des Fées on the Pic d'Ambouls near Nant (Aveyron); and the much discussed site known as Glozel near Vichy (Allier). Aldène is one more of the many caverns in southern France on the walls of which Paleolithic man left examples of his art; these were discovered in February, 1927. It has also yielded remains of Neolithic man including fine examples of pottery. The Grottes des Fées near Nant may also have been the abode of man in both Paleolithic and Neolithic times, but as yet only Neolithic remains have been discovered. As for Glozel, the prehistoric problems it has forced upon the attention during the past three years are now up for solution before an International Committee.[1]

Rumania.—One of our students, Dr. V. J. Fewkes, of the University of Pennsylvania, spent a part of June exploring a group of caves in the vicinity of Steierdorf, Rumania.

Austria.—Under the auspices of the school, a party in charge of Dr. Kurt Ehrenberg, of the University of Vienna, explored the newly discovered *Schreiberwand* cavern on the Dachstein mountain near Salzburg.

Greece.—After the close of the summer term, two of the students spent a month in Greece with a view to the checking up of prehistoric collections and sites.

[1] This committee has since reported against the authenticity of the Glozel specimens.

SEVENTH SUMMER TERM

The seventh summer term of the school opened in London on June 27 and closed in Cologne on September 15. The special fields covered were southern England; a section of the Somme valley in the region of Amiens; Paris and St. Germain; Brittany; the region of Civray (Vienne), where the members of the school dug for a week as the guests of Mr. James T. Russell, Jr., a former student of the school; Charente; Dordogne with a season of digging at Castel-Merle near St. Léon-sur-Vézère and local excursions to important prehistoric sites and museums; an excursion to the caverns of Ariège and Haute-Garonne on the invitation of Count Begouen; Altamira, northern Spain; Neuchâtel, Zurich, St. Gallen, and Bâle, Switzerland. Attendance at the annual meeting of the German Anthropological Association marked the close of the term.

SUMMARY

Of the eleven students taking part, about half were unable to remain for the entire term; these were permitted to join for short periods. In addition to the student body, permission was granted thirty-four other persons interested in our work to take part in our program—especially in Brittany and the Dordogne.

Of the fifty conferences given, twenty were by the director and thirty by twenty-eight specialists. To the latter, the director desires to express his deep sense of appreciation. Sixty-three important prehistoric sites and thirty-five museums and special collections were examined. As a result of the twenty-five days of digging, collections were sent to seven contributing institutions. At the end of the season five students remained in the Old World for further study and field work.

PROSPECTS AND NEEDS

The school has demonstrated its ability to give a limited number of students intensive training in prehistoric archeology during the summers. It should be able to follow up these short periods of intensive training by taking the initiative in the location and development of new projects either alone or in cooperation with other existing institutions. During the

past summer, invitations have come to us from members of Oxford University and the British School in Jerusalem to cooperate with them jointly in prehistoric exploring expeditions both in Iraq and in Palestine. Such a program renders highly desirable not only permanent headquarters for the school but also adequate endowment and if need be special funds for special projects.

With a permanent base, preferably at home, serving as a laboratory and repository for apparatus, books and specimens, branch bases could be established, or existing ones made use of, on the other side as the occasion demanded. With adequate endowment, professorships and lectureships might be maintained, at least one of which should be for distinguished foreign specialists. We already have the promise from an able foreign prehistorian and ethnologist that he will come to America and offer gratis a course of lectures as soon as such a center shall have been established. Surely we can not afford to be so lacking in appreciation of such a generous offer as to fail to take advantage of it.

BULLETINS

During the year two bulletins have been published by the school: Bulletin 2 containing the minutes of the first meeting of incorporators and trustees, the certificate of incorporation, and the by-laws of the school; and Bulletin 3 containing the report of the director on the work of the sixth season (22 pp. and 26 figures).

GEORGE GRANT MACCURDY

YALE UNIVERSITY

SPECIAL ARTICLES

ON THE DISTRIBUTION OF CRITICAL TEMPERATURES FOR SPAWNING AND FOR CILIARY ACTIVITY IN BIVALVE MOLLUSCS*

I

ORTON[1] classifies marine animals into three groups: (a) those which breed at a definite temperature, which is a constant for the species throughout its range; (b) those which breed at a particular temperature change, which may be at either the maximum or the minimum for the locality; (c) those which breed the year round.

Observations of the spawning temperatures of lamellibranch molluscs show that they fall within the first of these groups. Data gathered from the literature and collected by myself during some ten years of study of the marine lamellibranch larvae of our coastal waters show that of those bivalve molluscs which have been investigated each has its critical temperature for spawning. No species other than the American oyster has been studied extensively enough to determine the duration of the latent period after the critical temperature is reached before spawning begins. Since spawning occurs on a rising temperature in all forms thus far studied, it follows that the actual "trigger" temperature for these species is probably slightly below that of the water in which the first larvae are found.

The following species with their spawning temperatures represent those molluscs the larvae of which I have found, together with spawning temperatures gathered from the literature.

4– 5° C. An as yet unidentified larva which appears in Barnegat Bay early in March.

10–12° C. *Mytilus edulis*, *Mya arenaria*, *Astarte*, *Venericardium*, *Nucula*.

15–16° C. *Ostrea edulis* (Orton[1]), *Ostrea lurida*, *Pecten irradians* (61.5° F. Belding[2a]), *Teredo navalis*.

20° C. *Ostrea virginica* (J. Nelson[3], Townsend[4], Moore[5], Stafford[6], T. Nelson[7b], Churchill[8], Prytherch[9]).

24–25° C. *Venus mercenaria* (76° F. Belding[2b]; 25° C., my finding). *Mytilus recurvus*.

One is impressed by the fact that these spawning temperatures fall into groups which differ by approximately 5° C. Setchell[10] studying the temperature limits for growth and fructification of marine algae, marine spermatophytes, and land plants has been led to assign as critical temperatures for the initiation of these processes: 5°, 10°, 15°, 20°, and 25° C. Crozier[11] has brought together a large amount of data on the temperature characteristics of vital processes of the most diverse sorts, and from these and other

* Publication No. 11, N. J. Oyster Investigation Laboratory.

1 Mar. Biol. Assoc. XII, 339, 1920.

2 Report upon the Scallop Fishery of Mass., 1910; (b) Report upon the Quaghog and Oyster Fisheries of Mass., Boston, 1912.

3 Report N. J. Exp. Sta. for 1890, 314; Contr. to Canad. Biol. for 1915–16, 53.

4 Report U. S. F. C. for 1889–91, 343.

5 Doc. 610, U. S. F. C., 1907.

6 The Canadian Oyster, Ottawa, 1913.

7 (a) Report N. J. Expt. Sta. for 1920, 317; (b) Bulletin 351, N. J. Exp. Sta., New Brunswick, 1921; (c) *Proc. Soc. Exp. Biol. and Med.* XXI, 90, 1923; (d) SCIENCE, LXIV, 72, 1926.

8 App. VIII, Report U. S. F. C. for 1919.

9 App. XI, Report U. S. F. C. for 1923.

10 *Am. J. Bot.* XII, 178, 1925.

11 *J. Gen. Physiol.* IX, 525, 1926.