University of Pennsylvania, and Robert W. Ehrich, of Harvard University.

The itinerary included parts of France, Spain, Switzerland, southern Germany and Czechoslovakia. Digging was done in three sites, representing various culture levels: thirteen days in the Abri des Merveilles (Dordogne), with three horizons—two Mousterian and one Aurignacian; three days in the cavern of El Pendo (Prov. Santander), Spain, with four horizons—Mousterian, Solutrean, Magdalenian and Azilian; and seven days at Homolka, near Prague, with late Neolithic and early metal cultures.

This gave the students a wide range of experience not only in the art of digging, but also practice in the determination of specimens from various epochs as well as from various phases of a given epoch. It was our good fortune at El Pendo to help in the discovery of two works of art dating from the Magdalenian Epoch—a stag engraved on bone and a horse, likewise engraved on bone.

The actual digging was supplemented by visits to fifty prehistoric sites representing practically every phase of prehistory and by the study of museum and private collections. Coincident with the diggings and the visits to sites and museums, forty-two conferences were given—eleven by the director and thirty-one by foreign specialists and by certain of the students. For these conferences we are indebted to the Abbé Breuil, Harper Kelley, Z. Le Rouzic, G. Chauvet, Étienne Patte, Count Begouen, Louis Begouen and D. Peyrony, in France; Carballo in Spain; D. Viollier and Emil Bächler in Switzerland; F. Birkner and K. Hörmann in Germany; and J. Schranil and J. Skutil in Czechoslovakia. The students who gave conferences were Greenlee, McCown, Merrill and Tax; a former student—Fewkes—also gave conferences.

Toward the end of the term, thanks to the assistance of Russell, Fewkes and Ehrich, it was possible for Mrs. MacCurdy and myself to remain behind in France in order to make a prehistoric pilgrimage through France and Spain with General Charles G. Dawes, our ambassador to Great Britain, who met us in Périgueux on August 23 and remained with us until the end of the month. At the same time there also joined our party Mr. Addison L. Green, chairman of our board of trustees, and his son, Marshall Green. We visited the principal prehistoric sites of the Vézère Valley; then went to northern Spain to see the cavern of Altamira and the prehistoric museum in Santander. In Madrid, we visited the Archeological Museum and the Museum of Natural History; and in Seville, the Archivo de Indias. From Seville, we made a two-day excursion to the museum at Niebla, the dolmen de Soto, and the prehistoric copper mines at Rio Tinto.

During the spring months our school dug jointly with the British School of Archaeology, Jerusalem, at the cave of the valley near Athlit, and south of Haifa, Palestine. This was our second season at this site. Miss Dorothy Garrod, representing the British school, was again in charge; our two representatives were Dr. Martha Hackett, of Mount Holyoke College, and Theodore D. McCown, of the University of California. This second season's excavations yielded some 20,000 specimens dating from the Mousterian, Aurignacian, Mesolithic and later epochs. Joint excavations will be resumed here during the spring of 1931.

In March, 1930, there was published *Bulletin* No. 6 of the School (43 pages), containing the director's report and Miss Dorothy Garrod's paper entitled: "The Paleolithic of Southern Kurdistan," which describes the joint explorations and excavations of our school and the Percy Sladen Fund (British) during the autumn of 1928.

GEORGE GRANT MACCURDY
YALE UNIVERSITY,
NEW HAVEN, CONNECTICUT

SCIENTIFIC APPARATUS AND LABORATORY METHODS

TWO IMPROVEMENTS IN THE TECHNIQUE OF KYMOGRAPH RECORDING

1. THE use of the pressure air gun for applying carbon particles in suspension in the place of smoking to blacken the recording surface.

2. The use of transparent cellophane in place of glazed paper as a recording surface.

(1) In many respects the time-honored procedure of preparing kymograph paper for use by "smoking" is a very unsatisfactory one. The unevenness of the resulting surface, particularly when natural gas is used in the smoking burner, the inconvenience in operation and smudginess of the smoking arrangements, and the inadaptability to other surfaces than glazed paper are perhaps the most serious difficulties. It has been found possible to obviate these and other difficulties by applying a suspension of fine carbon particles in a suitably volatile vehicle, sprayed on to the recording surface with an air gun. The following procedures have been found advisable in the preparation and application of the carbon suspension.

a The vehicle should be sufficiently volatile to just wet the surface slightly. If put on too dry the impact of the jet tends to remove some of the already

deposited particles. It must have a specific gravity approximating that of the carbon particles to be suspended in it in order to prevent rapid settling out. These requirements are rather well met by carbon tetrachloride. The cost of carbon tetrachloride being high, some of the heavier commercial hydrocarbons were used successfully, such as Union Oil Company's Cleaning Naphtha with a Baumé gravity of 55 and an initial and end boiling point of 95 to 145° C., respectively. Gasoline is not satisfactory, as the end point is too high.

b As a source of carbon particles of suitable size, the better brands of lamp black (vegetable black) have been found to be satisfactory. Some ten other kinds of black pigment were tried unsuccessfully. Sixteen grams of vegetable black per liter of fluid are taken, and the mixture shaken vigorously for five or ten minutes. This can be done most conveniently in a mechanical shaker. Grinding in a ball mill or deflocculating in a colloid mill would improve the suspension, but is not a necessity. The suspension is strained through as fine a mesh cloth as possible and stored in pint Mason jars, of the type fitting the pressure gun to be used. When the suspension is stored it must be shaken vigorously prior to use.

c In applying the suspension any well-designed spray gun in which the air issues from an annular orifice surrounding the fluid nozzle would probably be found satisfactory, but the cheaper makes of gun are to be avoided. We have used the "Sharpe" pint-size gun successfully at ten to twenty pounds air pressure. In applying the black it has been found advisable to rotate the drum rapidly on an upright shaft at a distance of 20 to 40 cm from the nozzle of the spray gun. At this distance the naphtha will not wet the surface of the drum excessively, providing the needle valve regulating the mixture of air and fluid is properly set. The spray gun should be shaken occasionally to prevent settling of the carbon. In this manner a thin, uniform coat of carbon particles can be applied quickly and conveniently to the recording surface. Too heavy a layer should be avoided in the interests of diminishing friction of recording levers and of preventing the washing of the carbon in the fixing process after records have been made. An enclosed exhaust booth is a necessity where a large amount of spraying is done. There is nothing critical in the above process and reasonable variations may be individually made.

(2) A very great simplification and improvement in the photographic reproduction of kymograph tracings has been found to be possible by the use of transparent recording material in place of glazed paper. The difficulties of photographic reproduction of varnished kymograph tracings are too well known, and too obvious from the many poor reproductions found in the scientific journals, to need emphasis. We have found it to be simple to avoid these difficulties by direct printing from fixed cellophane records. Colorless, transparent No. 600 cellophane sheets used in place of kymograph paper make a satisfactory recording surface. Cellophane can not conveniently be blackened by smoke and is best prepared for recording by the spray-gun method just described. After records have been made the surface can be fixed by passing the strip through a bath of carbon tetrachloride containing 3 per cent. rosin (the latter put into solution by prolonged mechanical shaking).

The record thus fixed can be used directly for printing positives, in which the graphic records stand out in black against a white background. Direct enlargements up to twenty times have been made retaining sharp delineation, and offer possibilities for closer study of certain phenomena (in our studies particularly isometric tension curves). Direct reduction is also highly successful and is desirable in printing upon lantern slides and in illustrations for publication.

It should also be noted that segments of the original fixed record can themselves be successfully used in making lantern slides by simple mounting between blank glass slides.

Transparent cellophane, No. 600, in strips 7 inches wide, rolled, has been supplied at our request by the E. I. du Pont de Nemours Company, and is priced at such a figure as to make its use more economical than that of glazed paper.

W. F. WICHART
C. H. THIENES
M. B. VISSCHER
UNIVERSITY OF SOUTHERN CALIFORNIA

USE OF ETHYLENE OXIDE FOR THE ERADICATION OF PESTS

THE barberry eradication campaign as well as the campaigns for the control of white pine blister rust through the eradication of currants and gooseberries have shown the need of a chemical substance with high toxicity to the plants, yet which will have no lasting detrimental effect on the soil. The practice of digging barberry bushes leaves a possibility of sprouts being produced from pieces of roots not found in digging. The use of common salt is a more desirable practice from the standpoint of the labor involved and the effectiveness of the killing agent. For use in pastures this method may have some objection. The use of chlorates, arsenates, etc., is excluded in pastures where cattle may be poisoned.