

although like nothing found in Egypt or elsewhere, appear to be exotic and show that the Nilotic usage of stone vessels wrought in decorative materials had taken root at Knossos in the late Neolithic phase.

Among other elements of Cretan culture showing affinities to the early culture of the Nile and of the indigenous inhabitants of the opposite Libyan coasts, are the large stone ossuaries in the beehive form of the Messara plain on the southern border of the island, contrasting with the rectangular habitations of Crete. Stone idols from Hagia Triada curiously recall those found in predynastic Egypt. They show the high head and pointed beard of the Nilotic race, and possibly passed to Crete from Libya. The Cretan mode of head-dress and the type of loin clothing show either a resemblance or a general analogy with that of the Libyans. The Libyan Delta goddess appears to have been, in part at least, incorporated in the Cretan mother goddess, as is shown in the form of bow, arrows, and shield which are the attributes of the former. In

the stone ossuaries, the discovery of palettes of stone similar to those used by the predynastic Egyptians for antimony and malachite to adorn the person are peculiarly significant.

These striking correspondences in forms and usage, and especially in the contracted burials of the vaulted tombs of Messara, the dolichocephalic skulls, and the recurrence of foot-shaped amulets of stone, suggest a settlement of a proto-Libyan element in the southern foreland of Crete. These tombs are of a true beehive type, but they differ from the Mycenaean examples in their entrance system. They represent a sepulchral type which has a wide diffusion in the old Libyan region of North Africa. This proto-Libyan settlement became entirely assimilated in the Old Cretan population, but the engrafting of this artistic element on the indigenous island stock may well have contributed to the later bloom of Minoan culture.

At the conclusion of the lecture, the president of the Institute presented the Huxley Medal to Sir Arthur Evans.

The Flame Spectra of Carbon Monoxide and Water Gas.

TWO papers by Mr. F. R. Weston, recently published in the *Proceedings of the Royal Society* (A, vol. 109, 1925, pp. 176-186 and 523-526), embody the results of researches into the flame spectra of carbon monoxide, hydrogen, water gas, etc., which he has conducted at the Imperial College of Science and Technology under the joint supervision of Profs. W. A. Bone and A. Fowler. The object of the researches was to elucidate certain aspects of the combustion of carbon monoxide, and notably whether or not this gas interacts *directly* with oxygen in flames, a point which has been much disputed amongst chemists during the past forty years, but now seems to be in the way of being definitely cleared up by the spectroscope.

The spectrum of a flame of undiluted carbon monoxide burning in air (or oxygen) at atmospheric pressure is shown to consist of a banded radiation, extending from 5000 Å.U. in the visible region to 2200 Å.U. far in the ultra-violet, upon which a continuous spectrum is superimposed. Both the banded and continuous parts of the spectrum, which are associated with the characteristic colour and actinic properties of a carbon monoxide flame, are most probably due to *direct* interactions between carbon monoxide and oxygen molecules in the flame, without any intervention of steam. At the same time, unless both the carbon monoxide and oxygen are previously dried before combustion, the spectrum shows some characteristic "steam lines," due to interactions between CO and OH₂ molecules in the flame, which proceed simultaneously with, and independently of, the CO and O₂ interactions.

As the carbon monoxide in the burning gas was progressively replaced by hydrogen, both the banded and continuous parts of the spectrum rapidly faded away, until with an equimolecular (that is, 50 CO + 50 H₂ by volume) mixture of the two combustible gases

(water gas) only "steam lines" remained visible in the spectrum, the characteristic CO-radiation and flame-colour having almost entirely disappeared.

When a flame of undiluted carbon dioxide was burnt (undried) in oxygen under reduced pressure, the banded part of the spectrum became more distinct and the continuous part less intense as the pressure was diminished; the "steam lines" were invariably present in the spectrograms. When a flame of carbon monoxide, previously dried by passage through strong sulphuric acid, was burnt at atmospheric pressure in oxygen, similarly dried, the "steam lines" in the resulting spectra had almost disappeared (they were only faintly visible), whereas the intensity of the continuous part of the spectrum remained undiminished.

The conclusion drawn from the experiments is that in the flame of pure (undried) carbon monoxide two sets of independent interactions occur simultaneously, namely: (a) direct interactions between carbon monoxide and oxygen, exciting radiations which give rise to the continuous and banded parts of the spectrum, and to the characteristic blue colour of the flame, and (b) interactions between CO and OH₂ molecules, which originate the "steam lines" in the spectrum. When hydrogen is gradually added to the burning gas the relative proportions of the first-named interactions diminish rather rapidly and proportionately more of the carbon monoxide is burnt by interaction with OH₂-molecules, until when an equimolecular mixture of carbon monoxide and hydrogen is reached, the carbon monoxide-steam interactions occur to the practical exclusion of the carbon monoxide-oxygen interactions. These experiments have afforded the first clear evidence that in an ordinary carbon monoxide flame both sets of interactions are going on independently and simultaneously.

School Natural History Societies.

THE Marlborough College Natural History Society is interesting as a school institution which has had an unbroken existence since 1864, when it was founded under the auspices of the then headmaster, later Dean Bradley of Westminster; it now issues its seventy-third printed report. Marlborough is situated in an unique position for this study, with some primeval forest in Savernake on one side and the

open savannahs of the Downs on the other. Between the two runs the Kennett, here quite a small sluggish stream noted for its excellent trout-fishing, with beds of willows and water meadows by its sides. Near its head waters, from six to seven miles away, lie Silbury Hill and Avebury, the latter with its immense stone circles. The Downs show dolmens and tumuli, most of the latter probably of much later age, and there

are numerous remains in camps, etc., of Roman times. The Report contains an account of excavations on the Wansdyke where it approaches Savernake Forest, and Mr. A. C. Brentall contributes a description of Martinsell, an old camp or cattle enclosure, three to four miles away, on the top of a chalk hill which falls precipitously to some of the richest agricultural ground of Wilts. Flint implements are common everywhere, as shown in an article by J. G. D. Clark, comparing 2000 specimens collected within two years at Marlborough and Seaford.

The permanent value of the whole series of reports lies, however, mainly in their descriptions of the natural history of one of the richest areas of the British Isles. The foundations of these were laid by such men as Preston and Hart-Smith in botany, Warde Fowler and Im Thurn (of British Guiana fame) in ornithology, and, above all, by Edward Meyrick in entomology, the latter not only a genius in his scientific work, but also in his task as a schoolmaster of developing the individuality of his pupils. Of the same type would appear to be Mr. A. G. Lowndes, who has written an illustrated article on that peculiar shrimp-like freshwater Cheirocephalus, a relic of the primary period; he also contributes notes on other freshwater forms that he and his class are studying, while there are references to vacation parties taken to the Isle of Purbeck and to the laboratory of the Marine Biological Association at Plymouth.

Of other work we might refer to meteorological observations carried on for sixty years, to the flowering dates of plants and to the dates of capture of insects, regular features of the report. In these a boy, A. G. P. Michelmore, seems to be prominent, and he, too, is largely responsible for revised lists of several groups of insects within a ten-mile radius of Marlborough; really the record of 663 species of that very difficult group, the Diptera or flies, is extraordinary for a school natural history society.

In this age of systematised school games—organised exercise would be a better term—we particularly welcome a report such as this, showing individuality, sacrifice and keenness in both masters and boys. Nothing gives a greater zest and interest to one's later life than the art of observation of all one's surroundings, both large and small, taught perhaps best in natural history. We are, indeed, happy to see that in this great school there must be opportunities for healthful and profitable recreation apart from the compulsion of "games."

University and Educational Intelligence.

CAMBRIDGE.—Mr. F. B. Smith has been reappointed reader in estate management for five years as from October 1.

The Raymond Horton Smith prize for 1924-25 has been divided between Dr. J. H. Burn, of Emmanuel College, whose thesis was written on the effects of denervation of a limb, and Dr. G. A. Harrison, of Gonville and Caius College, who dealt with insulin and diabetes mellitus.

The University Commissioners have published a list of amendments to their recently proposed statutes. The department of forestry is to be grouped with agriculture in a joint faculty. The Financial Board is to have power at its discretion to require that a departmental imprest account shall be administered by some one other than the head of the department. This might prove to be a valuable controlling factor in the case of any department the finances of which did not at any time appear to be administered in the best interests of the University. A special exception to the statute which requires professors to retire at the

age of sixty-five years is to be made in the case of Sir Humphry Rolleston, Bart., who accepted office at a time when the commissioners had intimated that they proposed to institute a retiring age of seventy years.

The Special Board of Agriculture and Forestry has presented a report of progress for the year 1924-25. The considerable number of students who obtained Imperial and commercial appointments is of great interest. Accounts are appended detailing the expenditure on research of about 38,000*l.* from the Development Fund of the Ministry of Agriculture.

LIVERPOOL.—Some relatives and friends of the late Sir William A. Herdman have founded a memorial scholarship at the University. This is open to graduates of British universities who are prepared to carry on research in marine zoology at Liverpool and at any British marine biological station. The scholarship has a present value of about 50*l.* per annum. Applications should be made to the Registrar before the first day of the summer term.

WE learn from the Paris correspondent of the *Times* that degrees of doctor *honoris causa* have been conferred at the Sorbonne upon the following, among others: Sir Ernest Rutherford, Cambridge; Mr. Noguchi, Rockefeller Institute, New York; Prof. I. P. Pavlov, Leningrad; M. Charles de la Vallée Poussin, Louvain; and Prof. Ettore Pais, Rome.

THE Committee of Award of the Commonwealth Fund announces that it is now prepared to receive applications for the fellowships to be awarded in 1926. The fellowships will normally be tenable at an approved American university for two years and are open to persons of British birth domiciled in England, Scotland, Wales, and Ireland who are graduates of recognised universities and are unmarried and not more than thirty years of age. Women as well as men may apply. Provision amounting to approximately 600*l.* per annum will be made for the total expenditure involved during the tenure of a fellowship. Applications must be forwarded through the authorities of the university or college of which the candidate is or was a member. The form of application can be obtained from the Secretary to the Committee, Mr. R. H. Simpson, 50 Russell Square, London, W.C.1. Applications must reach the Secretary by February 20 next.

THE effect of continuation classes on mill personnel was discussed at a luncheon meeting of the Lancashire Section of the Textile Institute on October 9. Mr. John Crompton, of Messrs. Burgess, Ledward and Co., Ltd., read a paper on this subject, which is published in the October number of the Institute's journal. Mr. Crompton makes out a strong case for the general adoption of the system of continuation classes, concurrent with workshop practice, for which the "Fisher Act" provides. The data on which he bases his arguments are derived chiefly from the experience of his own and other firms in employing boys and girls attending the continuation classes held in the Worsley Technical School, Walkden. He explains in detail how he has met the difficulty arising from machines being vacated by one set of operatives and requiring to be tended by others. He points out that at Rugby, the only town in England where day continuation schools are compulsory for all employees under the age of sixteen years, there is no juvenile unemployment, 90 per cent. of the employers pay wages for school attendance, 75 per cent. of the young persons attend voluntarily evening school activities in addition to the compulsory day classes, and these classes are proving the best method of establishing contact and oversight of a considerable