combination invariably renders it again moist before explosion occurs.

It has been currently supposed that the presence of sharp solid fragments, such as those of glass, exerts a lowering effect upon the temperature of explosion of hydrogen and oxygen. This supposition has been practically tested and found wanting in accuracy. Neither glass fragments nor sea-sand were found to reduce the temperature below the limits above stated. A remarkable result, however, was obtained when pieces of platinum foil and wire were introduced into the explosion bulb. It was found impossible in their presence to bring about an explosion, even when the temperature of the bath was raised to 715°. Quiet combination invariably ensued.

The size of the explosion vessel appears to be immaterial, except when reduced to very small dimensions, such as 4·5 mm. diameter, as in the case of the smallest bulb tested, when the range of molecular forces is approached. In six experiments with this small bulb no explosion occurred; in others the explosion did not occur in the vessel, but the quiet combustion there initiated was transmitted along the leading tube, through the tube containing the brass gauze discs, and eventually occasioned an explosion in the wash-bottle, disastrous to the latter.

In the cases of other explosive mixtures the admixture was effected, in the proper proportion, in a three litre flask, from which the gases were driven first through a wash-bottle, and subsequently through a test-tube, arranged likewise as a small safety wash-bottle, to prevent the explosion reaching the larger one.

Carbon monoxide and oxygen, in the proportion to form carbon dioxide, were found to suffer, for the most part, silent combination in the apparatus, and the wide limits of the observed temperatures of explosion, 636° to 814°, in those cases when explosion did ensue, were found to be due to more or less of such silent combination.

Gaseous mixtures of hydrocarbons and oxygen were found, however, with the exception perhaps of marsh gas and oxygen, to exhibit practically no quiet combination; and these mixtures have afforded most trustworthy and constant temperatures of explosion.

Marsh gas was found to explode, as a rule, with oxygen at temperatures varying from 656° to 678°, but occasionally quiet and complete combustion occurred. Other hydrocarbons never failed to yield an explosion.

Ethane detonated with oxygen in three experiments at 622°, 605°, and 622° respectively. A mixture of ethylene and oxygen exploded at 577°, 590°, and 577° in three consecutive experiments. Acetylene prepared by Gattermann's method, which in Prof. Meyer's experience yields it in a purer state than the more recent convenient method discovered by Maquenne, explodes with oxygen with exceptional violence, the wash-bottle being destroyed in every experiment. The temperature of this explosion was very constant, 510°, 515°, and 509° being successively observed. Propane mixed with five times its volume of oxygen likewise exhibits a very constant temperature of ignition, 548°, 545°, and 548° being indicated in three determinations. Propylene exploded with four and a half times its volume of oxygen at 497°, 511°, and 499°. Isobutane mixed with six and a half times its volume of oxygen detonated at 549°, 550°, and 545°; and isobutylene at 546°, 548°, and 537°. Finally, coal gas mixed with thrice its volume of oxygen was found to explode in three experiments at the remarkably constant temperatures of 649°, 647°, and 647°. It was found impossible, however, to induce a mixture of coal gas and air to explode under these experimental conditions.

It will be clearly seen from the above experiments with gaseous mixtures of hydrocarbon and oxygen, that the temperature of explosion falls as the content of carbon increases. Thus the mean temperatures for methane, ethane and propane are 667°, 616°, and 547° respectively. Further, the temperature also falls with the degree of saturation, or in other words, the less saturated the hydrocarbons become the more readily do they ignite in contact with oxygen. Thus ethane, ethylene and acetylene explode with oxygen at 616°, 580° and 511°; propane and propylene at 547° and 504°; and isobutane and isobutylene at 548° and 543°. It will also be observed, however, as would be expected, that these differences due to difference of saturation diminish as the series are ascended.

A. E. TUTTON.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—Mr. Austen Leigh, Provost of King's, the Vice-Chancellor, has been appointed a member of the Geographical Committee, in the place of Dr. Ferrers, resigned. The award of the Geographical Studentship of £100 will be made towards the end of the Lent Term.

The first award of the Walsingham Medal, founded by the Lord High Steward for the encouragement of biological research, has been made to Mr. E. W. MacBride, Fellow of St. John's, for his monographs in zoology.

MR. ARTHUR WILLEY, at present giving a course of lectures in Columbia College, New York, has been elected to the vacant Balfour Studentship by the Special Board of Biological and Geological Studies of the University of Cambridge. It is understood that the investigation prescribed for him will be that of the embryology of *Nautilus pompilius*, for which purpose he will proceed to the South Seas.

SCIENTIFIC SERIALS.

The Quarterly Journal of Microscopical Science for September, 1893, contains studies on the comparative anatomy of sponges: V. Observations on the structure and classification of the *Calcarea Heterocœla*, by Dr. Arthur Dendy (plates 10–14). In this paper the author gives a general account of the anatomy, histology, and classification of the *Calcarea Heterocœla*, from the point of view of one who has for a long time past been engaged in an independent study of the group, and he brings together all that is known on the subject. While on the classification of the group he departs somewhat widely from the lines laid down by previous writers, yet the necessity of doing so was forced upon him by a study of nearly fifty Australian species. The author finds neither the canal system nor the skeleton affords a reliable guide for classification, and a compromise is the only satisfactory way out of the difficulty. The families adopted are: (1) Leucasidæ, (2) Sycettidæ, (3) Grantidæ, (4) Heteropidæ, (5) Amphoriscidæ. —On some points in the origin of the reproductive elements in Apus and Branchipus, by J. E. S. Moore (plates 15 and 16). Calls attention to some important details in the spermatogenesis of Branchipus and in the ovigenesis in Apus. In the former, the observations bear out the general law as to the similarity of the male and female cells, their specific peculiarities being physiological in origin, without morphological import. The divisional phenomena of these cells are intimately related to a protoplasmic structure, which might be fitly described as "Schaumplasma," and one of the initial impulses towards metamorphosis is a fusion of some of the intra-nuclear globules; while a considerable portion of the complicated karyokinetic figures, with their centrosomes, pseudosomes, and dictyosomes, appear to be the logical as well as the actual consequence of the continuance of this process. Some time before and always during the course of the chromatic changes bodies answering to the centrosomes in all details except in their numbers, which is much greater, make their appearance; these the author provisionally names "pseudosomes." The term "dictyosomes" is given to bodies which make their appearance connected one to another and to the inner group of chromosomes by fine strands, and which remain uncoloured by reagents, and are more or less related to the cell periphery. (In connection with these, Farmer's notes and figures of like bodies in the Pollen mother-cells is of interest. (See *Ann. of Bot.* September, 1893).—Notes on the Peripatus of Dominica, by E. C. Pollard (plate 17). Miss Pollard's species is apparently very nearly related to *P. edwardsii*, but differs in the number of ambulatory appendages, there being 29 to 34 pairs in *P. edwardsii*, while in *P. dominicæ*, sp. nov., there are from 25 to 30.—Studies on the Protochordata, by Arthur Wiley, B.Sc. (plates 18–20). II. The development of the neuro-hypophysial system in *Ciona intestinalis* and *Clavelina lepadiformis*, with an account of the origin of the sense-organs in *Ascidia mentula*. III. On the position of the mouth in the larvæ of the Ascidians and Amphioxus, and its relations to the Neuroporus.

Symons's Monthly Meteorological Magazine, November. Mr. Symons gives a summary of all the rainfall observations known to have been taken in Persia; the only places at which such appear to have been made are Ooromiah, in the north-