Egyptians and Assyrians, as well as the art of the Jews and Gnostics about the Christian era, and the later pagan structures down to the fourth century A.D.

The monuments actually found in Palestine are few though important. The discovery at Tell el Amarna of about 150 letters written by Phœnicians, Philistines and Amorites—and in one case by a Hittite prince—to the kings of Egypt, proves, however, the use of cuneiform on clay tablets by the Syrians as early as 1500 B.C., and one such letter has been recovered in the ruins of Lachish. The oldest monuments referring to Syria and Palestine are found at *Tell Loh*, on the Lower Euphrates, and date from 2700 B.C. Next to these are the *Karnak* lists of Thothmes III. about 1600 B.C., recording the names of 119 towns in Palestine conquered after the defeat of the Hittites at Megiddo These lists show that the town names which occur in the Bible are mainly Canaanite and were not of Hebrew origin. The Canaanite language of this period was practically the same as the Assyrian, excepting that of the Hittites, which was akin to the Akkadian. In the next century the Tell el Amarna tablets show that the Canaanites had walled cities, temples, chariots, and a fully developed native art. They record the defeat of the Egyptians in the north by Hittites and Amorites, and the invasion of the south by the Abiri, in whom Drs. Zimmern and Winckler recognise the Hebrews, the period coinciding with the Old Testament date for Joshua's conquest.

An inscription of Mineptah, discovered in 1896, speaks of the Israelites as already inhabiting Palestine about 1300 B.C., and agrees with the preceding. Other Egyptian records refer to the conquests of Rameses II. in Galilee and in Syria, when the Hittites retained their independence; and in the time of Rehoboam, Shishak has left a list of his conquests of 133 towns in Palestine, including the names of many towns noticed in the Bible.

The Hittite texts found at Hamath, Carchemish and Merash, as well as in Asia Minor, belonged to temples, and accompany sculptures of religious origin. They are still imperfectly understood, but the character of the languages, the Mongol origin of the people, and the equality of their civilisation to that of their neighbours, have been established, while their history is recovered from Egyptian and Assyrian notices. The Amorites were a Semitic people akin to the Assyrians, and their language and civilisation are known from their own records, while they are represented at Karnak with Semitic features.

The oldest alphabetic text is that of the Moabite stone about 900 B.C. found at Dibon, east of the Dead Sea, on a pillar of basalt, and recording the victories of King Mesha over the Hebrews, as mentioned in the Bible. Several Bible towns are noticed, with the name of King Omri, and the language, though approaching Hebrew very closely, gives us a Moabite dialect akin to the Syrian, which is preserved in texts at Samalla, in the extreme north of Syria, dating from 800 B.C. The Phœnician inscriptions found at Jaffa, Acre, Tyre, Sidon, Gebal and in Cyprus do not date earlier than 600 B.C., and show us a distinct dialect less like Hebrew than the Moabite. The most important of these early texts is the Siloam inscription in the rock-cut aqueduct above the pool, found by a Jewish boy in 1880. It refers only to the cutting of the aqueduct (in the time of Hezekiah), but it gives us the alphabet of the Hebrews and a language the same as that of Isaiah's contemporary writings. It is the only true Hebrew record yet found on monuments, and confirms the Old Testament account of Hezekiah's work.

The Assyrian records refer to the capture of Damascus by Tiglath Pileser III. in 732 B.C., and of Samaria in 722 B.C., as well as to Sennacherib's attack on Jerusalem in 702 B.C. The latter record witnesses also the civilisation of the Hebrews under Hezekiah, whose name occurs as well as those of Jehu, Azariah, Menahem, Ahaz, Pekah, and Hosea, who, with Manasseh, gave tribute to Assyrian kings.

About the Christian era Greek texts occur in Palestine, the most important being that of Herod's Temple at Jerusalem, forbidding strangers to enter, and those of Siah in Bashan, where also Herod erected a temple to a pagan deity. Such texts are very numerous in Decapolis, where a Greek population appears to have settled in the time of Christ.

The geographical results of exploration are also important for critical purposes. Out of about 500 towns in Palestine noticed in the Old Testament, 400 retain their ancient names, and about 150 of these were unknown before the survey of the country in 1872-82. The result of these discoveries has been to show that the topography of the Bible is accurate, and that the writers must have had an intimate knowledge of the land. Among the most interesting Old Testament sites may be mentioned Lachish, Debir, Megiddo, Mahanaim, Gezer, and Adullam as newly identified; and of New Testament sites, Bethabara, Ænon, and Sychar, all noticed in the fourth Gospel.

The existing Hebrew remains are few as compared with Roman, Arab, and Norman ruins of later ages. They include tombs, aqueducts, and fortress walls, with seals, weights, and coins. The most important are the walls of the outer court of Herod's great temple at Jerusalem, with his palace at Herodium, and buildings at Cæsarea and Samaria. The curious semi-Greek palace of Hyrcanus at Tyrus in Gilead dates from 176 B.C. In Upper Galilee and east of Jordan there are many rude stone monuments—dolmens and standing stones—probably of Canaanite origin, as are the small bronze and pottery idols found in the ruins of Lachish. Sculptured bas-reliefs are, however, not found in Palestine proper, having been probably destroyed by the Hebrews.

This slight sketch may suffice to show the advance in knowledge due to exploration during the last thirty years. The result has been a great change in educated opinion as to the antiquity of civilisation among the Hebrews and Jews, and as to the historic reliability of the Bible records. Further exploration, especially by excavation, may be expected to produce yet more interesting results, and deserves general support, as all classes of thinkers agree in the desirability of increasing actual knowledge of the past. It is no longer possible to regard the Hebrews as an ignorant and savage people, or to consider their sacred writings as belonging necessarily to the later times of subjection under the Persians. Internal criticism is checked and controlled by the results of exploration, and by the recovery of independent historical notices.

## *UNIVERSITY AND EDUCATIONAL INTELLIGENCE.*

CAMBRIDGE.—The Walsingham Medal, given by the Lord High Steward, for original research in botany, geology, zoology, or physiology, is open to all graduates of the University under the standing of M.A. Monographs for the ensuing year are to be sent to Prof. Newton, Magdalene College, by October 10, 1898.

An examination for the Sheepshanks Astronomical Exhibition will be held in Trinity College on November 19 and 20. In addition to papers on astronomy, there will be an oral and practical examination at the Observatory. Candidates must be undergraduates, and, if successful, must become members of Trinity College.

Mr. G. H. A. Wilson, fifth wrangler 1895, has been elected to a fellowship at Clare College.

PROF. JAMES M. CRAFTS, professor of organic chemistry in the Massachusetts Institute of Technology, will succeed the late General Francis A. Walker as the president of the Institute.

THE *London Technical Education Gazette* announces that a course on practical chemistry, dealing with the "manipulation of gases," will be conducted by Mr. M. W. Travers, at University College, on Fridays, at 5.30 p.m., commencing on Friday, November 12. This course will be of great value to those engaged in gas testing, and will deal with methods not hitherto published. A research course for teachers on "The effect of repeated heating on the magnetic permeability and electrical conductivity of iron and steel," is being conducted by Principal Tomlinson, F.R.S., at the South-west London Polytechnic, Manresa Road, Chelsea, on Saturday mornings from 10 to 1, with facilities for continuing experiments, if desired, from 2 to 5. Teachers are admitted free; there are still a few vacant places in the class. Any teachers who wish to join should apply at once to Principal Tomlinson.

THE first volume of the Report of the United States Commissioner of Education, for the year 1895-96, has been received. Though largely concerned with elementary schools, the report contains several noteworthy articles on the higher branches of education. A detailed account is given of the Education Bill of 1896, and the discussions which led to its withdrawal. Current statistics of education in Great Britain form the subject of a special chapter. Some of the features of the educational systems of Germany, Austria, and Switzerland are reported upon, the statistics which the report gives as to higher education in the German-speaking part of Europe being very valuable. It appears from the extensive tables contained in the



© 1897 Nature Publishing Group

report that there are 75 higher seats of learning in Germany, Austria proper, and Switzerland, having altogether 5963 professors, 67,062 students, and 6628 foreign students. There is in Germany one professor for 12·1 students, and an average of 78·4 professors and 926·3 students (of whom 67·2 are foreigners) to one seat of learning. Austria has one professor for 11·7 students, and an average of 80·5 professors and 949·4 students (of whom 91·1 are foreigners) to one higher seat of learning. Switzerland has one professor for 5·9 students, and an average of 96·2 professors and 569·6 students (of whom 208·3 are foreigners) to one higher seat of learning. Among other subjects of articles in the report are: the comparative study of popular education among civilised nations; education in France; education in Mexico and Central America; commercial education in Europe, particularly in Austria, France, and Germany; and the correlation of studies.

ONE of the most gratifying signs of educational progress is the increasing efficiency of technical institutions in the provinces as well as in London. These schools are not only far better equipped than they were a few years ago, but in many cases the members of the teaching staffs are better qualified to impart instruction. The prospectuses and calendars which come before us from time to time testify to a real development of facilities for education in science and technology, and we are glad to observe the advances which technical schools are making all over the country. A prospectus just received from the Technical College, Huddersfield, furnishes an instance of valuable work being done in a large technical college outside London. This college provides full courses, both theoretical and practical, and of an advanced type, in physics, chemistry, biology, art, engineering, weaving and dyeing. There are also separate departments for mathematics, languages ancient and modern, and commercial subjects; whilst a mining section is in process of formation. Of especial importance is the fact that the college library consists of some 10,000 volumes, an annual sum of 160*l.* being devoted towards the purchase and binding of books, periodicals, &c. At the present time an extension, calculated to cost about 13,000*l.*, is being carried out. Improved accommodation will thus be provided for chemistry and physics, and engineering; a room 105 feet by 27 feet has also been set aside for a museum for biology and mineralogy. The number of students of both sexes for the last two or three years averages about twelve hundred. Students can at present take up at the college all the subjects required by the London University for a degree in art or science, and they will be able to continue to their D.Sc. work when the new chemical and physical laboratories are completed. In all departments we notice that practical work is carried on as well as lectures. Dr. S. G. Rawson, the principal, appears to be developing the college on the right lines, and Huddersfield will doubtless benefit by the work he is doing. Financially the college is also in a satisfactory condition. We think both council and staff are to be congratulated upon the care and energy which has been displayed in building up so strong and useful an institution.

## SOCIETIES AND ACADEMIES.

### LONDON.

**Physical Society**, October 29.—Mr. Shelford Bidwell, President, in the chair.—Prof. Stroud exhibited and described the Barr and Stroud "range-finder." The problem of finding the distance of a given object at sea, or in the field, is complicated by shortness of the trigonometrical "base," and by restrictions of time. As a rule, the apparatus must be self-contained, and "snap-shot" readings are obligatory, *i.e.* the range has to be determined from a single instrument and from a single observation. At 3000 yards the errors must not exceed 3 per cent. In foggy weather, or when viewing a nebulous object, this degree of precision is difficult to attain, but under favourable circumstances the authors have determined ranges, at that distance, within 1 per cent. of accuracy. At shorter ranges measurement is more exact; thus an object at about 2000 yards may be estimated to within about 12 yards. Prof. Stroud gave some account of the history and of the general methods employed in these instruments. Two images of the distant object, preferably of a line such as a flag-staff, are received respectively upon two mirrors, two lenses, or two prisms, placed one at each end of a fixed support. From each of these, the light is then directed towards the middle of the instrument, where the two images, after further reflection, are viewed by one eye-piece. The optical system has finally to be adjusted so that the two images, as now seen in the eye-piece, lie in the same straight line. In the instrument designed by the authors this coincidence is attained by translating a small prism parallel to the axis of the supporting rod. The extent of this translation is a measure of the range. Both eyes are used: the right for bringing the two images into alignment; the left for "finding" the object through a small field-glass, and for reading the scale of distances. At night, sightings have to be taken from "points" of light, and as these are unsuited for measurement, the authors convert them into "lines" by the use of cylindrical lenses. Various devices are introduced to prevent overlapping of the images. The instrument is about five feet long, and tubular in form; it is made of copper, so as to have high thermal conductivity to reduce differential heating. Within the outer tube is the interior supporting rod, designed to equalise so far as possible the effects of interior radiations. Several forms of "separating" prisms were exhibited, the best for the purpose consists of two "reflecting" prisms; these receive the two rays and direct both of them into a third prism, whose angle lies in the space between the angles of the others. Mr. Barr drew attention to the gimbal arrangement and the three struts that keep the supporting rod centred in the tube. To give some idea of the precision and scope of the range-finder, he observed that they were there using the equivalent of a 25-feet "circle," and their measurements were comparable to the measurement of 20 secs. of angle on such a circle. The instrument is handled by ordinary seamen, and stands rough usage on board ship for years without injury.—Prof. Stroud then exhibited "a folometer and spherometer." He explained that in determining curvatures and focal lengths, some telemetric method was necessary, and that, owing to want of parallelism of the beam, and duplication of images, a short-focus telescope was always an inefficient telemeter. For the measurement of inaccessible lengths it was therefore better to use some simple form of "range-finder." Such an apparatus could be made with a set of small mirrors arranged in such a manner as to direct two images of the distant object into an eye-piece, with a fixed prism in the path of one of the incident beams. By sliding this instrument along the optical bench one position could always be found at which the two images, as seen through the eye-piece, were in coincidence. He also described a method for determining curvature by interposing a plate of plane glass between the curved mirror and a source of light.—Mr. Ackermann exhibited two experiments. (1) The blowing-out of a candle-flame by the air from a deflating soap-bubble. The bubble was blown at the mouth of an inverted beaker by breathing into a hole cut out at the top. This hole was then presented to the flame, and the flame was immediately quenched. But if the bubble was blown from ordinary air, with bellows, the flame was merely deflected without being extinguished. (2) It was shown that a miniature boat, provided with a false stern, consisting of a linen diaphragm, could be propelled by filling the hollow stern-space with ether, or with some liquid similarly miscible with water. The motion is due to the continuous release of surface-tension behind the boat. Prof. Boys said that when he tried, some years ago, to blow out a candle with a soap-bubble filled with common air, he found the operation very difficult—so difficult that, having once succeeded, he never repeated the attempt. It had not occurred to him, as it had to Mr. Ackermann, that the $CO_2$ present in the breath played a part in the quenching. With regard to the second experiment, he had seen a small boat propelled by dissolving camphor astern, but he thought the use of a liquid for that purpose was a novelty.—The President proposed votes of thanks, and the meeting was adjourned until November 12.

### PARIS.

**Academy of Sciences**, October 26.—M. A. Chatin in the chair.—Apparatus for measuring the altitudes attained by balloons. Verification of the results furnished by barometers, by M. L. Cailletet. The dial of the aneroid is placed exactly in the focus of a photographic camera, to which such a mechanism is fitted that every two minutes two photographs are taken simultaneously, one of the barometer and another of the earth. From the focal length of the photographic objective, the distance of any two points on the earth, and the distance of these two points on the negative, the calculation of the true height is easily calculated. The apparatus worked perfectly in a preliminary balloon ascent made by MM. Hermite and Besancon.—Report on a memoir of M. Hadamard, entitled



© 1897 Nature Publishing Group