of difficulty in consequence of the changing thermal character of the air column between stations at different levels. Perhaps the diurnal variation of pressure affords the best line of approach. A proper formula regularly applied to observations at the top ought to give a diurnal variation of pressure at the base comparable with that obtained from direct observations at the bottom. What M. Vallot calls the "classical" method would certainly not do so. There is an interesting paper by Buchan on experiences at Ben Nevis which bears upon the subject.

NAPIER SHAW.

Sponge-spicules.

PROF. DENDY'S memoir (in *Acta Zoologica*, 1921, pp. 95–152, 50 figures) on the evolution of the tetraxonid sponge-spicule will appeal equally to those interested in problems of evolution or in sponge-spicules from the point of view of form and of their great taxonomic value. It is not only possible to arrange these spicules in an apparently phylogenetic series with a degree of completeness which is perhaps unparalleled in any other group of the animal kingdom, but the structure of the spicule itself, and the different forms which it assumes, are relatively so simple and definite that the problem of accounting for them in terms of physiological or physico-chemical processes seems far more capable of solution than similar problems among the higher animals. Prof. Dendy describes the forms of spicules of the primitive Plakinidæ, showing that they can all be derived from the tetract, and discusses concisely the evolution of megascleres (tetract, diact, and monact) and microscleres (polyact and diact) and the development of spines leading to the pseudopolyact forms. He also puts forward provisional conclusions as to the development of a spicule. Two kinds of cells—initial cells and silicoblasts—are concerned in spicule formation; the former cells secrete the organic material (spiculin) which forms the axial thread or protorhabd around which the silicoblasts collect and deposit silica. A growing spicule may come to be completely enveloped by a silicoblast, which has accordingly been regarded by nearly all observers as the mother-cell in which the spicule originates. In many cases the number of initial cells increases by cell-division as the spicule grows, and the development of spines and other outgrowths on the primary spicule is effected by the establishment of secondary growing points at the places where spiculin is deposited by initial cells. The causes which determine the form of the spicule are briefly considered, and though some of the characters of spicules are adaptive the vast majority are non-adaptive; for adaptation in spicule-form, where such exists, no satisfactory explanation seems to be forthcoming. To say that some "instinct" directs an amœboid silicoblast containing a spicule towards the gemmule or towards the surface of a sponge is, as the author remarks, not an explanation.

Iron Production in India.

THE *Journal of Indian Industries and Labour* for November last (vol. 1, part 4) contains, amongst other interesting matter, a summary of the present position of iron production in India which deserves the serious attention of all engaged in iron and steel industries. The large and rapidly developing coalfields, the enormous deposits of high-grade hæmatite iron ore, ample supplies of limestone and of refractory materials, abundant and low-priced labour, all combine to place India in the position of a very serious potential competitor in the world's markets. Two firms are producing iron to-day—the Bengal Iron Co., with works at Kulti, on the Barakar River, comprising five blast furnaces, each with an output of 450 tons of pig-iron per twenty-four hours, and the Tata Iron and Steel Works at Jamshedpur, in Singbhum, with three blast furnaces having a capacity of 900 tons of pig-iron per diem; the latter firm also possesses a steel works with seven furnaces capable of producing 17,500 tons of ingots per month, whilst extensions to both the blast-furnace plant and the steel works are in course of erection and a plate-mill has just been completed. A number of new works are being projected; the Indian Iron and Steel Co. is building blast furnaces for an output of 600 tons of pig-iron per diem at Hirapur, the Eastern Iron Co. is building blast furnaces close to the Jharia coalfield, whilst the United Steel Corporation of Asia is to establish works producing both iron and steel at Manoharpur; this last works intends to use coal from the new Karanpura coalfield. The Kirtyanand Iron and Steel Works, near Sitarampur, does not at present propose to make pig-iron, but is confining itself to the production of iron and steel castings. In connection with the Tata works a group of subsidiary concerns have been, and are being, formed at Jamshedpur to work up the iron and steel produced by these works; they comprise the Calcutta Monifieth Works (for producing machinery for jute manufacture), Enamelled Ironware, Ltd., the Tinplate Co. of India (which will supply the Burma Oil Co. and other Indian oil companies), the Agricultural Implements Co., the Indian Steel Wire Products, Ltd., the Enfield Co., and the Hume Pipe and Construction Co.

University and Educational Intelligence.

CAMBRIDGE.—The governing body of Emmanuel College offers to a research student commencing residence at the college in October next a studentship of the annual value of 150*l.*, which shall be tenable for two years and renewable, but only in exceptional circumstances, for a third year. The studentship will be awarded at the beginning of October, and applications should be sent so as to reach the Master of Emmanuel (the Master's Lodge, Emmanuel College, Cambridge) not later than September 18.

The following grants from the Gordon-Wigan Fund are reported:—For plant-breeding experiments, 50*l.*; for museum cases, 35*l.*; for apparatus for studying marine organisms, 35*l.*; for the preparation of rock slices, 20*l.*; and for the preparation of sections of fossil plants, 10*l.*

The annual report of the General Board of Studies for the academic year 1920–21 refers to a distinct relief in the congestion in the scientific departments on account of the completion of new buildings. Fresh accommodation for chemistry and engineering has improved the position of affairs in those departments, and is easing it also in other departments. Several laboratories are faced with serious deficits on the year's working, and complaints are made of the effect of the 100 per cent. tax charged on certain things only procurable abroad. Valuable loans are announced of sound-ranging apparatus from the War Office and of radium from the Medical Research Council.

LONDON.—The three following courses of free public lectures are announced:—"The Crystallisation of Metals," by Col. N. T. Belaiew, at the Royal School of Mines, South Kensington, S.W.7, on Tuesdays, February 21 and 28 and March 7 and 14, at 5.30; "Some Recent Developments in Pharmacology," by Dr. H. H. Dale, at the London (Royal Free Hospital) School of Medicine for Women, Hunter Street, W.C.1, on Wednesdays, February 22 and March 1, 8, and 15, at 5; and "Certain Aspects of Fresh-water Algal Biology," by Prof. F. E. Fritch, at the East London College, on Wednesdays, February 15 and 22 and March 1, 8, 15, and 22, at 4.

OXFORD.—An examination for a natural science scholarship at Keble College is to be held on March 14. The annual value is 80*l.*, with 20*l.* extra for laboratory fees. Applications should be made to Dr. Hatchett Jackson, Keble College, Oxford.

PROF. T. MATHER is retiring from the chair of electrical engineering in the City and Guilds (Engineering) College at the end of the present session after more than thirty-seven years' service in the college, first as assistant to the late Prof. Ayrton and then as his successor.

THE Association of Heads of Departments in Pure and Applied Science in Technical Institutions has forwarded a letter to the London County Council Education Committee directing attention to some anomalies arising from the revised scales of salaries following on the Burnham Report. It is pointed out that on the new scales the salaries of an assistant will rise automatically to a maximum which approximates to that of the head of a department, a state of affairs which gives an assistant little incentive to work for higher appointments involving additional responsibilities and qualifications.

A PAMPHLET entitled, "The Handicap," has been issued by the University of Glasgow as an appeal for support in an attempt to develop what may be termed the social, as opposed to the academic, side of university training in Glasgow. Benefactors in the past have contributed generously for the provision of professorships, scholarships, and laboratories—as much as 180,000*l.* has been given for such purposes during the past five years—but few have thought of providing for the well-being of the student outside the classroom. A notable exception was Dr. John M'Intyre, who, in 1889, presented a Students' Union to the university, but in spite of extensions, this building cannot accommodate more than 500 of the 3300 men students now in Glasgow. Another step towards the provision of a liberal education might be achieved by an extension of the hostel system in the hope of capturing some of the spirit of the older residential universities. At the present time hostel accommodation can be found for 40 men and 50 women, while 1016 men and 310 women students have to find such lodgings as are available in the city. It is for providing hostels and contributing in other ways to the welfare of the student that the appeal is being launched; grants and gifts amounting to some 40,000*l.* have already been promised, but it is considered that 150,000*l.* is really required. Contributions, which should be forwarded to Dr. A. E. Clapperton, secretary of the University Court, Glasgow, are therefore earnestly solicited, and it is hoped that a generous response will be forthcoming, particularly from the graduates and alumni of the university.

Calendar of Industrial Pioneers.

February 10, 1886. Edward Williams died.—First forge and mill master at the Dowlais Iron Works, South Wales, where under Menelaus he rolled the first steel rails from an ingot supplied by Bessemer, Williams was afterwards connected with the Cleveland iron trade at Middlesbrough, and for ten years was manager to Bölckow and Vaughan. He assisted in founding the Iron and Steel Institute, and in 1879–81 served as president.

February 10, 1912. Louis Delaunay Belleville died.—From the Ecole Polytechnique and the Ecole Navale Delaunay Belleville in 1867 entered the Belleville Engineering Works in Paris, and there brought out his well-known water-tube boiler for steamships. First fitted in French despatch vessels and cruisers it was afterwards extensively adopted in the French, Russian, and British Navies, allowing of the use of very high steam-pressures. Its use in our own Navy led to a vigorous controversy, and the Belleville boiler has since been superseded by others of simpler construction.

February 11, 1907. Léon Serpollet died.—A great French automobilist and a pioneer of the modern steam car, Serpollet brought out an improved form of flash boiler which in 1887 he used in a steam-propelled tri-car. Four years later he was the first to obtain authority to run his cars in the streets of Paris. His statue stands in the Rue Brunel.

February 12, 1874. Sir Francis Pettit Smith died.—The most prominent among the many inventors of screw propellers, Smith began life as a farmer. His patent was taken out in May, 1836, and during the next two years his screw was tried in the *Francis Smith* and the *Archimedes*. The success of the latter led Brunel to adopt screw propulsion for his trans-Atlantic liner, the *Great Britain*, while the Admiralty ordered the building of the H.M.S. *Rattler*, the first screw-driven man-o'-war. In 1845 the screw was adopted for all war-vessels. Smith remained Adviser to the Admiralty for a few years, and from 1860 until his death was curator of the Patent Office Museum.

February 13, 1824. Pierre Louis Guinaud died.—An improver of the manufacture of optical glass, Guinaud was a Swiss clockmaker. He was the first on the Continent to make flint-glass discs suitable for achromatic telescopes, and his success led to his co-operation for some years with Fraunhofer at Munich. Guinaud's methods were communicated by his son to Bontemps, who about 1848 was engaged by Chance, of Birmingham.

February 13, 1913. John Fritz died.—One of the great pioneers of the American steel industry, Fritz was born in Pennsylvania in 1822, his father being a native of Germany. He was intimately connected with the introduction of the Bessemer process into America, in 1857 erected the first three-high mill ever seen, and three years later became general superintendent of the Bethlehem Company. The John Fritz medal of the United Engineering Societies was founded in 1902.

February 14, 1831. Henry Maudslay died.—The founder of the firm of Maudslay, Sons, and Field, which during last century held a pre-eminent place among the builders of machinery for steamships, Maudslay, after working under Bramah, set up for himself in London, and in 1810 opened the works at Westminster Bridge Road. He patented a "table engine," built some of the earliest marine engines, constructed measuring machines, and improved machine tools. Many well-known mechanical engineers were trained in his shops. E. C. S.