are quite otherwise. The container is a cylindrical vessel holding the maximum of metal with a minimum of radiating surface and refractory material exposed to corrosive action. The heat is generated in the charge to be melted and consequently there is no loss in the passage through refractory containers as in crucible furnaces. The high-frequency furnace has an immensely steep heat-gradient between the molten metal and the outside of the furnace. The furnace described by Mr. Campbell consists merely of a container or crucible placed inside a flat cylindrical coil. The intermediate space, about one inch in diameter, is filled with zircon or other insulating material contained in a silica or mica sleeve. The crucible need not be more than half an inch thick. As the heat is generated within the metal, the temperature of the crucible is very much lower than that of the metal itself. Consequently, reactions between the metal and crucible walls are reduced to a minimum, and crucibles of material quite inadmissible in other high temperature processes stand up well in the furnace.

According to the author, an ordinary clay crucible, such as is used for gold assays, will make from 10 to 30 heats of nickel-iron alloys containing less than 0·02 per cent. of carbon. A high-frequency furnace mixes the metal very thoroughly. The surface of the molten metal is pronouncedly convex, owing to the violent upward current at the centre of the liquid mass. This is a great advantage for the manufacturer of alloys made from metals which do not mix readily. The frequencies used may be termed "high" or "medium" and have varied from 20,000 to 400 periods per second, the lower figures being applicable to the larger furnaces for melting nickel silver and similar alloys. Furnaces of a capacity of 600 lb. are now working on certain nickel alloys. In cases where it is essential that the alloys should contain a minimum of carbon, it looks as though they will have a great field of application. The author states that the capital cost of equipment is high, but that some cheapening ought to be obtained in the future.

At present the principal application of this method of heating is in the preparation of alloys which are used for the manufacture of continuously loaded cables. Indeed, the discovery of the two principal alloys now used, namely, permalloy and mumetal, was made possible by the use of a high-frequency furnace. These alloys are composed principally of nickel and iron with small percentages of other metals, and the lowest possible amount of carbon. By the use of this alloy the speed of signalling by long-distance submarine cables has been raised from a maximum of 300 letters per minute for that type of cable to 1800 for a continuously loaded cable. This performance was obtained between the Azores and the United States. An installation recently completed near Birmingham has by far the largest melting capacity of any high-frequency metallurgical works yet erected. The equipment consists of forty-two small converter units of from 35 to 40 kilo-volt ampere capacity fitted with furnaces capable of melting 20 lb. of nickel-iron alloys of the highest purity in from 40 to 45 minutes.

Great advantages are also being found for furnaces of this type used in research, owing to the speed with which small heats can be made either *in vacuo* or in air. The author states that in one instance where an investigation was being made into the properties of a series of alloys with a relatively high melting-point, twenty 2-lb. heats were made in eight hours. For some time past the Metallurgical Department of the National Physical Laboratory has included in its equipment a furnace of this type, and great use is being made of it in the preparation of an exceptionally pure series of iron alloys.

## Obituary.

### PROF. H. H. HILDEBRANDSSON.

THE death of Hugo Hildebrand Hildebrandsson at Upsala on July 29 of this year, at the advanced age of eighty-seven years, marks the passing of a meteorologist of exceptional character. He was secretary of the International Meteorological Committee in succession to R. H. Scott from 1900 until 1907, when he himself retired from the direction of the Institute of the University of Upsala, at which he was the first professor of meteorology, to be succeeded by his son-in-law, F. Åkerblom, the present professor. His name is known throughout the meteorological world for his activity in connexion with the study of clouds in all parts of the world, which culminated in the "International Cloud Year" 1896–97, and found further expression in the "International Cloud Atlas" published mainly under his guidance in 1896, with a new edition in 1910.

Hildebrandsson was scarcely less well known for his researches on "centres of action of the atmosphere" in the Transactions of the Royal Swedish Academy, and still further for his collaboration with Teisserenc de Bort, not only in the investigation of the upper air, but also in the publication through Gauthier-Villars of "Les Bases de la météorologie dynamique: Historique —État de nos connaissances," a truly magnificent work left unfinished by the untimely death of Teisserenc de Bort. For the text of that work Hildebrandsson was mainly responsible, though it expressed the joint ambition of both to have full regard to the unity of the atmospheric circulation and treat meteorology as a world study. With that ambition, in 1907, the two friends became the bureau of an International Commission for a *réseau mondial*. Teisserenc de Bort wished it to be telegraphic, but the expense at that time being prohibitive, Hildebrandsson pressed the claims of a climatological *réseau*. The Commission still exists, with Dr. Simpson as president, and in the development of wireless telegraphy Teisserenc de Bort's ambition will be realised.

It was in his attitude towards world meteorology and a *réseau mondial* that Hildebrandsson displayed his special characteristic. Most meteorologists are content to write commentaries on some point or subject of physical or geographical importance in the structure or circulation of the atmosphere; Hildebrandsson wanted to make out the connected story of the atmospheric circulation before embarking upon a commentary. He recognised that writing commentaries runs great risk of marking time so long as

the author has only nebulous ideas about the text upon which he comments, and that the elaboration of the text for meteorology is an inductive enterprise of the most embarrassing character. At the same time, he knew that there is no short cut: no ingenuity can produce a substitute for the inductive co-ordination of the real facts of the circulation. Hence the Meteorological Institute at Upsala, an academic establishment with no responsibility for any *réseau* of stations, became a centre of illumination and learning for the Scandinavian countries, and typical of a college for the meteorology of the globe, a nucleus round which effective knowledge of meteorology may crystallise with a rapidity as surprising and as beautiful as the laboratory experiment which furnishes the analogy.

Like some other meteorologists, Hildebrandsson began as a physicist and he remained a physicist to the end; but it is clear from the records of his work that he recognised the true basis of the science of meteorology to be neither physics nor geography alone, but a combination of the two. NAPIER SHAW.

### MR. THOMAS STEEL.

BY the death of Mr. Thomas Steel in Sydney on August 17 last, Australia has lost an enthusiastic and observant naturalist. His publications include descriptions of Australian land planarians and notes on their habits. Mr. Steel was born in Glasgow in 1858, and after training as a chemist entered the service of a sugar refinery in Greenock. In 1882 he was appointed chemist to the Colonial Sugar Refining Company of Sydney. Much of his spare time was devoted to the study of the fauna of New South Wales and of Victoria, and he accumulated a large collection of excellently preserved specimens, especially of land planarians and Peripatus, many of which he gave to the Australian Museum and others to his zoological friends in Great Britain. Mr. Steel was a prominent member of the Linnean Society of New South Wales, and was president in the years 1905–7.

### PROF. S. J. JOHNSTON.

PROF. S. J. JOHNSTON has not long survived his former chief, Prof. W. A. Haswell. Johnston joined the staff of the Department of Zoology in the University of Sydney in 1906, and soon became known as a stimulating lecturer and demonstrator in the practical classes. His memoir on the Trematodes of Australian frogs gained for him the doctor's degree in 1912. On the retirement of Prof. Haswell in 1918, Johnston was appointed to succeed him, but his health soon failed and he resigned at the beginning of 1922. He died on July 16.

WE regret to announce the following deaths:

Prof. H. Bekker, secretary of the Natural History Society (Rerum Naturae Investigatorum Societas), at the University of Tartu (Dorpat) in Estonia.

Dewan Bahadur Lewis Dominic Swamikannu Pillai, president of the Madras Legislative Council, and author of "An Indian Ephemeris, A.D. 700 to A.D. 1799," and other works on Indian calendar systems and chronology, at sixty years of age.

Capt. H. Riall Sankey, past-president of the Institution of Mechanical Engineers, an authority upon steam and gas engine problems, and consulting engineer of the Marconi Wireless Telegraph Co., Ltd., on October 3, in his seventy-second year.

Sir William Schlich, F.R.S., formerly professor of forestry, University of Oxford, and inspector-general of forests, Government of India, on September 27, at eighty-five years of age.

## Current Topics and Events.

CONGRATULATIONS are due to Prof. W. Carmichael M'Intosh, F.R.S., emeritus professor of natural history in the University of St. Andrews, who celebrates his eighty-seventh birthday this week, having been born on October 10, 1838. Time has dealt kindly with this veteran of science, as all must have noticed who, in London, this summer, came in contact with his engaging and breezy personality. A pioneer of research in fishery problems, he was the first to found a marine biological station in Great Britain. Elected a fellow of the Royal Society in 1877, Prof. M'Intosh received a Royal medal in 1899, at the hands of Lord Lister, then president, in recognition of his labours as a zoologist. Earlier (1869) the Royal Society of Edinburgh awarded him its Neill prize for his paper "On the Structure of the British Nemerteans, and on some New British Annelids." President of the Section of Biology of the British Association, Aberdeen meeting, 1885, he discoursed at some length on the phosphorescence of marine animals. Last year Prof. M'Intosh received the Linnean medal allotted especially to mark the Linnean Society's admiration for the single-hearted devotion and unremitting industry with which he had engaged in the study of the animal inhabitants of the sea. Opportunity was taken to congratulate him on the completion of his great "Monograph of the British Marine Annelids," published by the Ray Society. We understand that Prof. M'Intosh has been a fellow of the Linnean Society for sixty-two years, whilst being second in seniority amongst the whole body of fellows, in point of election.

NEITHER students nor staffs have much enthusiasm for the speech-making incidental to the formal occasions of academic bodies; but few of us, happily, are really immune from the infection of ideas, and the flood of formal oratory serves a variety of purposes, mostly good. The London Medical Schools have just experienced such a flood on the opening of their winter session. Prof. Buckmaster, at St. George's, referred to his own student days half a century ago, when the microscope was not of much service to medicine and practically no students possessed one. Some specialists may be found who declare that the days of the microscope are now over: probably a partial and propagandist view. But ten years are enough to cover the latest revolution in medical outlook, for the rise of physiology to its present dominating position is scarcely older. Sir Charles Sherrington, speaking at the London (Royal Free Hospital School)