There is little doubt that it is the work of Sir George Cayley, Bart. (1774–1857), who was the first to attempt to explain mathematically the fundamental principles of mechanical flight. The flying machine represented is a manually propelled (assisted) glider. It is a large monoplane, the plane being curved, with the operator sitting in a boat-shaped structure below and working by means of levers two large rectangular oars or paddles which were probably intended to function on the non-return valve principle by means of flaps. An interesting feature is the combined rudder and elevator arrangement which consists of surfaces fixed at right angles to one another, the whole, it appears, universally pivoted—a device which has been attributed to Alphonse Penaud at a much later date. Research is being undertaken to discover the full significance of the design, but the disc has been placed on exhibition.

The National Physical Laboratory

THE report of the Laboratory for the year 1934 is a well-illustrated and indexed quarto volume of 260 pages. Each of the eight departments of the Laboratory gives a short account of its principal activities in an interesting and thoroughly readable form. The increase in activity in industry has produced a corresponding increase in the work carried out by the Laboratory, particularly in that relating to shipbuilding, and it has been necessary to call for overtime and to increase the staff. The movement for the abatement of noise has resulted in demands on the Sound Department from the Ministries of Health and of Transport. The deaths of Sir Arthur Schuster, Sir Horace Lamb, Sir Alfred Ewing and Dr. W. Rosenhain have deprived the Laboratory of four of its friends and supporters, but the changes of staff have been slight. The lectures on the work of the Laboratory given at a number of provincial centres have been much appreciated, and are to be continued. The new buildings for photometry will probably be brought into use this year, new high-speed wind tunnels are already in operation and the Lithgow installation for testing propeller blades will be available next year. The comparison of standards of measurement of all kinds with those of other countries has been continued with satisfactory results. The sound-isolating properties of walls and partitions of many types have been investigated and field tests of actual buildings can now be carried out. The work on refrigeration and preservation of food of all kinds has been continued for the Food Investigation Board, and that on protection from and dosage of X-rays and radium, for the Medical Research Council. The lubricating value of the oils derived from the distillation of coal is being investigated, and the production and working of the extremely light alloys of magnesium are being tested. Rapid advances are being made in our knowledge of the structure of the ionosphere, on which so many of the phenomena of wireless communication depend.

The Grand Coulee Dam

THE Columbia River in the United States is second in size only to the Mississippi. Owing to the fact that its source is high in a region of melting snows in the mountains of western Canada and Montana, its discharge is more continuous than that of all the arid regions of the west and the middle west combined. In an article in the *Scientific American* of April, Grace Kirkpatrick gives an interesting account of the Grand Coulee (Grand Valley) dam which engineers are now busily constructing. In prehistoric times the Columbia River, then much larger than it is to-day, was dammed by a glacier, and the torrents of water which poured through the high cliffs bordering the river flowed down and formed the Grand Coulee. The walls of the valley are in some places 1,000 feet high. The upper 20 miles of the river are being closed with dams at each end to form a huge reservoir. The Columbia River sweeps across the State of Washington and forms for many miles the border between Washington and Oregon. On the plateau above its canyon-like banks are millions of arid acres known as the Columbia Basin which if suitably irrigated would be one of the most fertile lands in the world. The dam is being built in two units—the high dam and the low dam. The latter is exclusively a power development while the high dam will be used for power, irrigation, storage and navigation development. The dam will raise the waters of the Columbia so that they can be pumped into the reservoir of the Grand Coulee and will then flow over the parched acres of the Columbia Basin. The blocking of the river will create the largest artificial lake in the world. It is 151 miles long and will extend into Canada. The spillway in the centre of the high dam will be 1,800 feet long and no less than 325 feet high.

Costs of Electric Lighting since 1910

THE lowering of the cost of the electric light during the last twenty-five years, mainly due to scientific research and improved engineering methods, is fully appreciated by few. In 1910, carbon filament lamps, which had held the foremost place since the inception of the incandescent lamp, were rapidly being replaced by tantalum and tungsten lamps giving almost twice as much light for the same electric power. In the same year, by means of the new 'squirted' filament lamp, the light-giving efficiency was more than doubled. In 1912 the drawn tungsten filament nearly trebled the efficiency. All these lamps were vacuum lamps. In 1916 the invention of the gas-filled lamp trebled the efficiency, and the latest type of gas-filled lamp, the 'coiled coil' lamp, has nearly quadrupled the light efficiency, giving 11·25 lumens (approximately 0·9 candle) per watt. Many consumers are now getting their electric light at a cost of 0·5*d.* per unit who had to pay 6*d.* or more per unit in 1910. Electrical engineers and scientific workers may well be proud of lowering the cost to one fiftieth of what it was in 1910.

Metallurgical Research

THE lecture given by Dr. H. Moore, director of the British Non-Ferrous Metals Research Association, before the London Section of the Institute of Metals

on November 8, 1934, published in the March issue of the Institute's *Journal*, constituted an extremely valuable review of the more immediate past and future of metallurgical development. Under the title of "Recent Trends and Future Developments in Metallurgical Research", Dr. Moore surveyed the application of physical and physico-chemical methods to the study of metals and alloys, with particular reference to the industrial application of the results of research. In the period under review—the past decade—the output of metallurgical research has undoubtedly been unparalleled; but in Dr. Moore's view the main bulk of this large output has been concerned with the exploitation of fundamental concepts which had been developed more than ten years ago. Research in progress at the present time is reviewed under six main heads: melting and solidification, working of metals, heat treatment, mechanical properties, corrosion, and electro-deposition, and the directions in which work may be expected to proceed in the near future are outlined. The impression gained from this exceptionally interesting and virile address is one of boundless fields of research, offering fascinating possibilities in the extension of the use of metals for a very wide range of purposes for the benefit of civilisation.

Science and Humanism

IN the quest for a unity underlying the rich variety of the universe, philosophers are in constant danger of limiting themselves to unreal abstractions and verbal dialectic. Both those who call themselves pragmatists, as dealing with things rather than with words, and those who prefer the fuller name of humanists, find that science, the most objective of human experiences, has a large contribution to make to our general body of thought. As is pointed out by A. Rey in "Les Mathématiques en Grèce" (*Actualités Scientifiques*, 217. Paris: Hermann et Cie., 1935) the study of the history of science may be recommended on two grounds. It may make scientific thought more accessible to philosophers, and may do something to break down, among scientific workers themselves, that narrow specialisation which is so prevalent to-day. Among the ancient Greeks, as also in the Renaissance, both ages of humanism and free inquiry, science had a considerable place, though not an exclusive one. The humanism of to-day has at its disposal an embarrassing array of tempting dishes; the difficulty is to make a well-balanced selection from them, and to get the whole range of mental vitamins without suffering from hyper-vitaminosis.

Description and Identification of Species

IN spite of the three quarters of a million species of animals which have been described binomially, it is remarkable how little there is of organised plan in the descriptions, taken as a whole. Some authors of new species are content with a few lines of characterisation, others seem to describe, not a species, but the total characters of an individual specimen. It is partly that species are not fixed, and that few writers, even on the same group, would agree upon the characters to be selected as criteria of specific rank, partly that the critical characters within different groups appear to be so diverse, that no common plan would fit more than a relatively few. Dr. Séverin Icard has made a bold attempt to standardise descriptions of species by advocating a method which he calls "la méthode des nombres signalétiques" (*Revue de Path. comp. Hyg. gen.*, Nov. 1934). It looks quite simple. Shortly, it is that, in regular order, parts of the specimen to be identified or described are examined, and the result for each part is represented by a number. The key to the parts to be examined for a particular group, and to the number corresponding to a particular character, say, legs yellow, is to be found in a set of "Tables de correspondance". Thus the special character of each part has its own particular number, a short-hand way of writing a description which normally would contain at least a few words for each part.

Species Formula

IN describing a beetle, for example, Dr. Icard chooses seven characters, always read in the same order—colour of thorax, colour of elytra, form of thorax, form of elytra, form of feet and tarsi, form of antennæ, form of head. Each character, in a particular specimen, is represented by a number—the *nombre signalétique* or descriptive number, so that the total description of the specimen as regards specific characters may be represented by a series of numbers—the *formule signalétique* or specific formula. We wish to identify a beetle; we translate one by one its characters into the appropriate number; then having composed our specific formula we search for this particular formula in another book of words, "Le Répertoire général", and if we find the formula there we shall also find opposite it the name of the species which possesses this characteristic association of characters. It is an attractive idea that the plant and animal worlds should be so completely tabulated that a set of symbols would identify any of their members, and if the method would enforce upon describers of species definiteness in characterisation and brevity, it might be well worth a trial.

Suggested Biological Survey for Union of South Africa

IN the *South African Journal of Science* (Nov. 1934, p. 396), Dr. R. Bigalke makes a plea for the inauguration of a biological survey in the Union. During 1911–33 the Provinces spent £607,674 in connexion with fish and game preservation and the destruction of vermin, and the suggestion is that a biological survey would furnish scientific information for the more efficient use of such expenditure. The survey would be a unit of the Department of Agriculture, and it would set in the forefront of its aims the solution of pressing economic problems, such as the biology and control of predatory animals, of noxious rodents, or rabies transmitters, and the relation of wild birds to agriculture. Before such