This process was so effective that, until a comparatively recent period, all brass was made in Europe by the ancient process, and even until a few years before 1861 it was thus made at Pemberton's Works in Birmingham. It was called "calamine brass," and was generally believed to be superior in mechanical properties to brass made by using metallic zinc.

The survival of this ancient process affords a striking example of the conservatism characteristic of British metallurgy, as brass had been made in England by Emerson, using metallic zinc, in 1781. This, so far as I have been able to ascertain, was the first to be made in Europe by melting copper and zinc together.

In Roman alloys the percentage of zinc was very variable, ranging from about 11 to 28 per cent. For ornamental purposes and scale armour they had an excellent alloy, of which the following are examples. Several rosettes and studs which had formed the mounts of a casket were unearthed in the excavations at the Roman city of Silchester in 1900.

Both the rosette and stud are of practically the same alloy. Now, of all the copper-zinc alloys, those which contain from 15 to 20 per cent. of zinc possess the greatest ductility.

This Roman brass is therefore one of the most ductile of the whole series of brasses. It is, besides, identical in composition with Tournay's alloy (copper, 82·5 per cent.; zinc, 17·5 per cent.), which, on account of this property and its rich colour, is used for the manufacture of all French jewellery made from thin sheets in imitation of gold. Hence the brass of which the rosettes are made is notably of the composition which is best fitted for making such ornaments, and is that which would be employed at the present day.

I have also examined the scales forming part of a suit of Roman scale armour dug up in the excavations of a Roman camp near Melrose, and found them to be of practically the same composition as the above.

The chief use of brass by the Romans, apart from the various coinages, appears to have been for fibulæ and other personal ornaments and for decorative metal-work, and for these, as we have already seen, they had invented a metal perfectly suitable, both as to its workable qualities and its beauty.

That they were the first inventors of brass is, I think, without doubt, as the alloy is not found in Greece or the Greek colonies or elsewhere until the time of the Roman Empire.

In the eleventh century great care was bestowed on the purification of the copper intended to be used in the manufacture of calamine brass for objects of art, more especially for the removal of lead, as it had been found that brass contaminated with that metal could not be satisfactorily gilt.

As regards the brass which was made in this country by the ancient method, *i.e.* "calamine brass," and that made with spelter, the former, according to Dr. Percy, was preferred for the manufacture of buttons and articles to be gilt, as it was said to take the gold better in "water-gilding." It was also preferred for other purposes. It is difficult to see why there should be any difference between the two brasses unless the spelter of those days was more impure than at present, possibly containing more lead and iron. Prejudice against the metal made by a new process may, however, have been one of the causes of the opposition which was raised to its use.

With the disappearance of the calamine brass, one of the last links in the chain connecting the modern metallurgy of copper and its alloys with antiquity is broken. An important link, however, still remains in the *cire perdu* process of casting bronze, a process in which it can scarcely be said that we are any further advanced than the Greek founders of some centuries before our era.

Further, it must not be overlooked that the principles on which copper-refining is based were carried out in practice in the time of Pliny.

The influence of copper, and particularly of bronze, from the age of Bronze to that of Imperial Rome, is an element which has played a greater part in the civilisation of Europe than that of any other metal. This is often lost sight of in this age of iron and steel. It hence seemed to me that it might be of interest and possibly of profit to present to the members of our Institute an account of the achievements which our fellow-workers in bygone ages were able to accomplish without the elaborate appliances and scientific knowledge of our own times.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

LONDON.—Further gifts to the University are announced in connection with the scheme for removing the headquarters to a site behind the British Museum, to which we referred last week. The Duke of Bedford has offered 25,000*l* and a reduction off the price of the site of 50,000*l*., and an anonymous friend of the University has offered 70,000*l*., making a total amount, with the gifts announced last week, of 305,000*l*. Although Lord Rosebery's name has been published as representing the University on the board of trustees which has been formed in connection with the scheme, the approval of the Senate has not been given to the proposals. Strong exception was taken to the Chancellor's action at the meeting of the Senate of March 20, when the Vice-Chancellor (Sir William Collins) tendered his resignation in view of what had taken place. At the unanimous wish of the Senate, he afterwards consented to remain in office. Lord Rosebery's explanatory letter was subsequently published, in which he states that by consenting to act as trustee he was committing no one, not even himself, to anything except to his being trustee for certain sums collected for the benefit of the University. From official correspondence which has been communicated to the Press, it appears that both the Prime Minister and the Chancellor of the Exchequer approved the proposed site.

Prof. F. G. Donnan, F.R.S., was appointed by the Senate to the University chair of general chemistry at University College, in succession to Sir William Ramsay, the appointment to take effect from the opening of next session, in October. The Senate elected Dr. L. N. G. Filon, F.R.S., to the Goldsmid chair of applied mathematics and mechanics, tenable at University College, such appointment to take effect from the beginning of next session, in October. Dr. Filon succeeds Prof. Karl Pearson, who resigned the chair in question on his appointment to the Galton chair of eugenics.

At the same meeting of the Senate, E. C. Snow, an internal student of University College, was granted the D.Sc. degree for a thesis entitled "The Intensity of Natural Selection in Man," and other papers.

Additional grants from the London County Council, amounting to 28,000*l*. during the sessions 1911–12 to 1913–14, were formally announced to the Senate.

IT is announced in *Science* that Prof. R. Ramsay Wright, vice-president of the University of Toronto and dean of the faculty of arts, will retire from active service on September 30. He has filled the chair of biology for the last thirty-eight years.

THE Board of Agriculture has again made an increased grant of 1300*l.* to Wye College, and has promised a grant of 262*l.* (for six months) for the cost of investigations on hops, on the life-history of the parasitic stomach worms (Strongyli) of sheep, and on the disease of "struck" of sheep, whilst the institution of a fresh grant of 1000*l.* towards the expense of an advisory staff in entomology and mycology—more particularly for fruit-growers—has also been officially intimated to the college authorities.

THE treasurer of Columbia University has reported to the trustees, says *Science*, that he has received about 310,000*l.* from the executors of the estate of the late Mr. George Crocker. Accordingly, the work of cancer research, for which Mr. Crocker gave this sum as an endowment, will begin at once. The research fund will be entrusted for administration to a board of managers, to consist of representatives of the trustees and of the medical faculty, together with a director of cancer research to be appointed.

THE Cambridge University Press has published a report by Mr. E. R. Burdon on a visit, undertaken in accordance with a resolution of the Forestry Committee of the University of Cambridge, for the purpose of studying the research work and educational methods of the forestry departments and forestry schools in those countries in connection with the study of timber and other forest products. An excellent description is provided of the departments of the Products Branch of the United States Forest Service, including particularly the Forest Products Laboratory at Madison, Wis., and the Office of Wood Utilisation, Chicago. The forestry schools of Yale, Harvard, Michigan, and Toronto Universities were visited by Mr. Burdon, and the particulars here brought together should prove of great service in this country.

IN an article in the Bulletin of the Society for the Promotion of Engineering Education for the present month, Profs. W. S. Franklin and Barry MacNutt deal with the teaching of elementary physics. They confine their attention in this case wholly to lectures and text-book work, though they recognise fully the paramount value of laboratory practice. Commenting upon the answers of 164 freshman engineering students—who had taken elementary mechanics for half a year—to a series of simple questions, the writers come to the conclusion that the great majority of young men cannot realise the meaning of simple English when it is impersonal and non-anthropomorphic, and a large proportion of the failures to answer the questions were due to the inability of the men to read the questions intelligibly. The object of elementary physics, the authors urge, should be to develop "rational insights." It is not the duty to a teacher of elementary physics to give his students a survey of the science.

THE report of the Board of Education for the year 1910–11 is now available (Cd. 6116). From it we find that though there were 768,358 students in attendance at evening and similar schools in 1909–10, as compared with 752,356 in 1908–9, nearly 18 per cent. of the students enrolled failed to complete the small minimum of attendances required in order to enable grants to be paid towards their instruction. In the administrative counties (excluding London) each student received, on an average, 45 hours of instruction. There was reason to expect the average would be lower in rural than in urban areas; only in eight cases, however, was the average below 30 hours, and in three cases it was 60 or more. The total amount of advanced instruction of the kind provided in technical institutions is still disappointingly small. There were 49 technical institutions at which courses were recognised as eligible for grant in 1909–10. In the case of 37 institutions for which alone the statistics are complete, there were 3032 students enrolled, of whom 2664 qualified for grant, and 1806 of these took full courses of instruction. There is still a tendency, the report states, to admit students to technical institutions before they have had an adequate course of general education.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 21.—Sir Archibald Geikie, K.C.B., president, in the chair.—Lord **Rayleigh**: The self-induction of electric currents in a thin anchor-ring.—Hon. R. J. **Strutt**: The after-luminosity of electric discharge in hydrogen observed by Hertz. Hertz observed that if Leyden-jar discharges were passed through hydrogen at a pressure of, say 100 mm., the gas remains luminous for a small fraction of a second afterwards. It is concluded that Hertz's effect is due to the presence of sulphuretted hydrogen in the hydrogen employed. It is conjectured that sulphuretted hydrogen is decomposed by the discharge, that sulphur vapour emerges in a specially active state, and that it then unites with hydrogen, the blue glow accompanying this process. Prof. J. H. **Poynting**: The changes in the dimensions of a steel wire when twisted, and on the pressure of distortional waves in steel. In a former paper (Proc. Roy. Soc., A, vol. lxxxii., 1909) the author described experiments showing that when a loaded wire is twisted it lengthens by an amount proportional to the square of the angle of twist. In this paper it is shown that if the wire is previously straightened by heating it under tension, the lengthening is, within errors of measurement, the same for all loads which could be applied, so that, as was supposed, the only function of the load in the earlier experiments is to straighten the wire. In all wires examined so far, the lowering is symmetrical about a point a fraction of a turn always in the counter-clockwise direction from the condition of no twist.—H. S. **Patterson**, R. S. **Cripps**, and R. **Whytlaw-Gray**: The orthobaric densities and critical constants of xenon. Using a carefully purified sample of xenon prepared from 150 c.c. of the gas lent by Sir William Ramsay, measurements were made of the orthobaric densities between the temperature limits of 16 and −66·8° C. The variation of the mean density of liquid and saturated vapour with temperature was found to follow closely Cailletet and Mathias's law, and the results are expressed by the equation $D_t = 1{\cdot}205 - 0{\cdot}003055t$, where D_t = mean density at $t°$ C. The slope of the diameter is abnormally large, and is practically identical with the value for the argon diameter recently found by Onnes. The constants $T_c = 16{\cdot}6°$ C. and $P_c = 58{\cdot}2$ atms. were found, and the following were calculated from the results:—critical density, 1·115 grms. per c.c.; density of liquid close to boiling point, 3·063 grms. per c.c.; atomic volume close to boiling point, 42·7 grms. per c.c.—W. A. **Harwood** and Dr. J. E. **Petavel**: Experimental work on a new standard of light. The source of light consists of a strip of platinum heated by an electric current. The thermopiles measure the radiation passing through (*a*) a plate of black fluorspar, (*b*) a water-trough. The thermopiles are connected in opposition. As the current through the strip is increased, the intensity of the luminous radiation increases more rapidly than the intensity of the radiation of longer wave-length. Therefore, for a given thickness of the absorbing media and distance of the thermopiles, there will be one definite temperature at which the reading of a