admirable monetary system was much agitated; but the counsel of the timid prevailed, and the wretched system which we had inherited mainly from England, but which is not in harmony with the English, was allowed to fasten itself upon the industrial interests of the country. The report on the subject by John Quincy Adams, already referred to, is a monument of exhaustive research and philosophical discussion. Nowhere is the decimal system praised so highly as in this report. In it he says of this system that, "considered merely as a labour-saving machine, it is a new power, offered to man, incomparably greater than that which he has acquired by the new agency which he has given to steam. It is in design the greatest *invention* of human ingenuity, since that of printing." This is high praise, and it is difficult to understand how the author of this and much more like it, could lack the courage to recommend that his country should at once put itself in the way of sharing the benefits of so remarkable a reformation. The spirit of conservatism, which came from his ancestors along with the yard and the pound, led him to advise that it was better to await the action of other nations, especially Great Britain.

At the close of the last century, in different parts of the world, the word *pound* was applied to 391 different units of weight, and the word foot to 292 different units of length. Not only were no two of these identical, but in only a few cases were their relative values known with anything like precision. In the wonderful march of the nineteenth century, most of these have been swept away; until now, of the enlightened nations of the earth, only the English-speaking people cling to what Lord Kelvin has so felicitously characterised as our "brain-wearying and intellect-wasting system of weights and measures."

I must now return to a very brief consideration of the indirect influence of precise measurement upon the welfare of man. Thus far the development of exact standards has been considered in relation to man's convenience, as facilitating the transaction of business, by diminishing the uncertainty and labour involved in commerce and trade. But indirectly it has been even more powerful. The use of correct standards of weight and measure has been regarded from the beginning as necessary to and indicative of integrity and fair dealing, among nations as well as individuals. Ultimate standards of reference, even in the earliest history of metrology, were carefully guarded and usually considered a part of the paraphernalia or accessories of the king or ruler. Although these standards were, until a comparatively recent period, very rude in their construction, they represented in a large measure the integrity of the nation, and to depart from or modify them was regarded as akin to a crime. According to Josephus, when Cain had settled in the land of Nod, and built a city, he invented weights and measures. In the law as given to Moses it is declared, "Thou shalt not have in thine house divers measures, a great and a small." The renowned Chinese Emperor, Yeo, who flourished 4000 years ago, kept the weights and measures which were used in the markets in a part of his own palace. In many countries standards were deposited in temples, and priests were their custodians. One of the principal objects sought to be secured by the Magna Charta was uniformity of weights and measures throughout the kingdom, and the one small spot in the world to-day whose neutrality is secured by the joint agreement of all civilised nations, including even the United States and Great Britain, is a bit of land near Paris, where stands the building in which the international prototype metre and kilogramme are preserved.

But in a far greater degree has precise measurement influenced the character, condition and destiny of man through its relation to the development of modern science. Volumes might be written about this, although not much is necessary before an audience to many of whom it is almost a daily lesson, and before another, smaller, audience of those who have contributed so largely during the past quarter of a century to the advancement of science and the improvement of the art of measuring.

Precision in measures demands and produces precision in language, and exact language makes exact thinking possible.

One cannot but admire the genius which enabled some of the philosophers of a few centuries ago to triumph over the obstacles growing out of the lack of exactness both in language and experiment. When Newton was converting his theory of the spheroidal form of the earth into established fact, he could only ascertain the possible effect of change of temperature upon the period of a pendulum by means of comparisons of the length of an iron bar when exposed to the sun's rays on a hot summer's day, with its length on a frosty morning in winter. Even in the earlier Transactions of the Royal Society of London, one may find time measured in *misereres* and temperature in inches, In the wonderful progress that has characterised the present age, by which business methods and social life have been well-nigh revolutionised, exact science has been the dominant factor. It is impossible here even to mention the many interesting devices by means of which during the last half century the precision of measurements has been enormously increased. They are to be seen in nearly every laboratory, and are familiar to you all. Their invention has made possible many brilliant and useful discoveries in science, and it is gratifying to know that on this line our own country has been and is well to the front. Many proofs of this might be given, but among the most notable contributions of modern times to the science and art of delicate and precise measurement, one cannot fail to note the splendid work of Rowland in his measurement of light wave-lengths, of Langley in his solar researches, and of Michelson in his determination of the metre in terms of the ether vibration. The glory of the nineteenth century is exact experiment and honest logic, and precision in measurement has done much to make both possible.

In the matter of the metrology of the affairs of daily life, however, it is humiliating to confess that we are still skulking in the rear. Our sixty millions of intelligent citizens are far less intelligent, and less fit for the responsibilities that rest upon them, than they might be, were they not continually wearying their brains and wasting their intellects in constant struggle with the difficulties inherent in the system of metrology to which we so blindly cling. I yield to no one in my appreciation of the accurate learning and profound scholarship of the gentlemen of the Faculty of the institution before which I have the honour of appearing to-day, but I unhesitatingly affirm that not one of them, not even all of them together, can correctly set forth the system of weights and measures in common use at the present time in this country. Let us hope that this burden will be lifted in the near future, and that the pound and yard with their innumerable and irrational derivatives, relics of the dawn of civilisation, will be replaced by the beautifully simple kilogramme and metre. We can then rest with the pleasing assurance that when the next cataclysm shall have passed, and the archæologist of the future shall be burrowing among the ruins of the present age, he will not be misled by the crudeness of our metrology to catalogue us along with earlier civilisations, At best he will exhume much which we could wish to remain for ever buried, but let us hope that the evidence of integrity and simplicity in commercial transactions, of delicacy and precision in scientific investigations, and especially of honest and independent thinking, will be such that he will be compelled to put us down as a race in which, to apply the eloquent words of Buckle, "the greatness of men has no connection with the splendour of their titles, or the dignity of their birth; it is not concerned with their quarterings, their escutcheons, their descents, their dexter-chiefs, their sinister-chiefs, their chevrons, their bends, their azures, their gules, and the other trumperies of their heraldry; but it depends upon the largeness of their minds, the powers of their intellect, and the fulness of their knowledge."

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 1.—M. Lœwy in the chair.—The mass of Mercury and the acceleration of the mean movement of Encke's comet, according to the recent work of M. O. Backlund. A note by M. O. Callandreau.—On the automatic transmitter of steering directions, by Lieut. H. Bersier. The alternating current from a Ruhmkorff's coil passes from the pivot of a compass through the aluminium pointer, and leaps from the extremity of this needle to one of six vertical plates placed at intervals round the inside of the compass-box. This alternating current has no effect on the magnet, but serves to work six corresponding relays, and hence to cause the illumination of corresponding signal lamps placed in various parts of a vessel, and to set in motion the steering apparatus. The least deviation from the set course is automatically and immediately corrected in this way. The course is altered by simply rotating

the drum carrying the plates.—A description of a bundle of descending cerebral fibres disappearing in the olivary bodies (cerebro-olivary bundle), by M. V. Luys.—Influence of low temperatures on the laws of crystallisation, by M. Raoul Pictet. The author shows the essential difference in the manner in which the crystallising body loses heat at the moment of solidification in the two cases where the substance is (1) adiathermanous and (2) diathermanous. All substances become diathermanous below −70°, and hence the true temperature of crystallisation is only obtained when the surrounding medium is maintained at a temperature very slightly below the solidifying point. Hence an explanation of the anomalies occurring in determinations of the crystallisation point of such substances as chloroform.—On the development of the latent image in photography by alkaline peroxides, by M. G. A. Le Roy. Aqueous solutions of alkaline peroxides or alkaline solutions of hydroxyl can be used as developers, but are inferior to the ordinary reagents.—Action of hydrogen phosphide on potassammonium and sodammonium, by M. A. Joannis. When hydrogen phosphide is passed into a solution of potass-ammonium or sodammonium in liquefied ammonia, it is absorbed with the production of the solid white substances PH_2K and PH_2Na. Heat destroys these compounds in accordance with the equation $3PH_2K = 2PH_3 + PK_3$. Water decomposes them with liberation of hydrogen phosphide. Nitrous oxide does not yield any substance corresponding with the salts of hydrazoic acid.—Researches on mercuric picrate, by M. Raoul Varet. The preparation and properties of mercuric picrate are described. Thermal data are given in detail, and from them it is seen that the picrate ranges itself along with the acetate rather than with the other soluble salts, the chloride and cyanide. Picric acid displaces hydrocyanic acid from its potassium combination with disengagement of + 10·7 Cal., whereas hydrocyanic acid completely replaces picric acid in the mercuric salt with liberation of + 12·2 Cal.—Action of picric acid and picrates on metallic cyanides. The isopurpurates. A note by M. Raoul Varet. When picric acid can replace hydrocyanic acid in its compounds with evolution of heat, isopurpurates are formed; when, as with the mercuric salt, the hydrocyanic acid replaces picric acid with evolution of heat, isopurpurates are not formed.—The antiseptic properties of the vapours of formaldehyde, by M. A. Trillat. The vapours of formaldehyde, produced by the incomplete combustion of methyl alcohol, have proved very efficacious in destroying germs in sick rooms, and have no action on metals or instruments, and but little action on dyed fabrics.—Observations on flours, by M. Balland.—On the anterior extremity of the dorsal cord in the superior vertebrates, by M. G. Saint-Remy.—Evolution of the sexual elements in the composite Ascidians, by M. Antoine Pizon.—On one of the Chytridineæ parasitic on the vine, by M. A. Prunet.—On the calcareous tuffs of the col de Lautaret (Hautes-Alpes), by M. W. Kilian. From this preliminary study of the Lautaret tuffs, it may be concluded: (1) That these tuffs are relatively recent, their disposition indicating that the present aspect of the surface is much the same as that obtaining at the time of their formation. They are more or less mixed with moraine deposits. (2) The vegetable débris contained in these tuffs, notably the cones and branches of *Pinus sylvestris*, indicate the existence at the epoch of their formation of a forest vegetation which has since abandoned these altitudes.—On the presence of carboniferous earth in the Sahara, by M. F. Foureau.—Thermometric observations on the summit of Ararat, by M. Venukoff. M. Gimmer visited the summit of Ararat on August 16, 1894, and found two thermometers left by M. Pastoukoff the preceding year in a tin-plate box. The maximum registered + 17·25° C., the minimum −40° C. Another minimum instrument, attached in the open air to a vertical object, indicated −38° C. At the time of the visit, the temperature of the air in the shade was + 3° C.—On an aerostatic ascension effected in Russia, by M. Venukoff.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Complete Poetical Works of Constance Naden (Bickers).—Electric Transmission of Energy: G. Kapp, 4th edition (Whittaker).—Fruit Culture for Profit: C. B. Whitehead (S.P.C.K.).—Our Secret Friends and Foes: Prof. P. F. Frankland, new edition (S.P.C.K.).—Edible and Poisonous Mushrooms: Dr. M. C. Cooke (S.P.C.K.).—The Country Month by Month: Owen and Boulger, October (Bliss).—Alpine Climates for Consumption: Dr. H. J. Hardwicke (Churchill).—What is Heat?: F. Hovenden (Whittingham).—Life in Ancient Egypt: A. Erman, translated by H. M. Tirard (Macmillan).—A Text-Book of Inorganic Chemistry: G. S. Newth (Longmans).—Watts' Dictionary of Chemistry: M. M. P. Muir and H. F. Morley, Vol. 4 (Longmans).—Popular Astronomy: C. Flammarion, translated by J. E. Gore (Chatto).—Visions of the Interior of the Earth, &c: the Prince of Mantua, &c. (Simpkin).—Historical Progress and Ideal Socialism: Prof. J. S. Nicholson (Black).—Lectures on Human and Animal Psychology: W. Wundt, translated by J. E. Creighton and E. B. Titchener (Sonnenschein).—A Laboratory Manual of Physics and Applied Electricity: arranged and edited by Prof. E. L. Nichols, Vol. 2 (Macmillan).—An Elementary Manual of Zoology designed for the use of Forest Officers in India: E. C. Cotes (Calcutta).

PAMPHLETS.—Regeln für die Wissenschaftliche Benennung der Thiere, &c. (Leipzig, Engelmann).—Bahnbestimmung des Kometen 1851 III. (Brorsen): Dr. R. Spitaler (Wien).—Philosophical Transactions of the Royal Society of London: Experimental Investigations on the Effective Temperature of the Sun, made at Daramona, Streete, co. Westmeath: W. E. Wilson and P. L. Gray (K. Paul).—Äussere Einflüsse als Entwicklungsreize: Prof. A. Weismann (Jena, Fischer).—English Institutions and the American Indian: Dr. J. A. James (Baltimore).

SERIALS.—English Illustrated Magazine, October (198 Strand).—Longman's Magazine, October (Longmans).—Century Magazine, October (Unwin).—Chambers's Journal, October (Chambers).—American Naturalist, September (Philadelphia).—Natural History of Plants: Kerner and Oliver. Part 6 (Blackie).—Contemporary Review, October (Isbister).—Humanitarian, October (Hutchinson).—Phonographic Quarterly Review, October (Pitman).—Journal of the Royal Agricultural Society of England, Vol. v. Part 3, No. 19 (Murray).—Journal of the Scottish Meteorological Society, third series, No. x. (Blackwood).—Geographical Journal, October (Stanford).—National Review, October (Arnold).—Natural Science, October (Macmillan).—Fortnightly Review, October (Chapman).—Mind, October (Williams).—Geological Magazine, October (K. Paul).—Journal of the Royal Statistical Society, September (Stanford).—Asclepiad, No. 41. Vol. xi. (Longmans).—Medical Magazine, October (Southwood).—Astronomische Mittheilungen von der Königlichen-Sternwarte zu Göttingen, Dritter Theil (Göttingen).—Journal of the Chemical Society, October (Gurney).—Annals of Scottish Natural History, October (Edinburgh, Douglas). Himmel und Erde, October (Berlin, Paetel).—Science Progress, October (Scientific Press, Ltd.).

CONTENTS