Assiniboia, Saskatchewan, Alberta, and Athabasca, and across British Columbia to the neighbourhood of Port Simpson. In aid of this enterprise a concise report on the resources of the line of country between Quebec and Winnipeg has been drawn up by Dr. H. M. Ami, of the Geological Survey of Canada (Sessional Paper, No. 143). The physical geography, geology, soils and economic minerals, and the natural history generally are described.

IN some notes on the geology of the Hawaiian Islands (*Amer. Journ. Science,* October), Mr. J. C. Branner directs attention to the striking series of canyons in the volcanic rocks on the northern coast of Hawaii. There are bluffs with an elevation of a thousand feet, and enormous gorges that extend inland with almost perpendicular walls, some of which are said to be 2000 feet in height. The gorges are nearly or quite as deep near their upper ends as at the lower ends, and they have flat bottoms. They were formed as V-shaped gorges on the land, and have sunk until their lower ends were occupied by the sea, forming deep fjords which were soon filled by material derived partly from the sea and partly from streams. Other interesting features are dealt with by Mr. Branner.

A FULL account of the life and work of the late Prof. Cornu is contained in the *Revue générale des Sciences* for October 30. The appreciation is from the pen of M. C. Raveau.

THE lecture on the periodic system of the elements delivered by Sir William Ramsay at the recent meeting of the German Association at Cassel (see NATURE, October 15, p. 586) has been published in pamphlet form by the firm of J. A. Barth, Leipzig.

AMONG articles dealing with scientific subjects contained in the November reviews and magazines, we notice two dealing with recent experiments on radium. One is by Mr. J. B. Burke on the radio-activity of matter, and is contained in the *Monthly Review,* the other, on the riddle of radium, is by Mr. A. S. M. Hutchinson, and is published in *Pearson's Magazine.* The latter magazine gives considerable prominence to science this month, for in addition to the article mentioned, there is one on "Our Descent from Monkeys," by Mr. S. S. Buckman, illustrated by photographs showing habits and characteristics that link man to monkey forms, and also descriptive accounts of the Waimangu geyser, New Zealand, and the habits of woodcocks.

A PAPER read by Mr. Edmund McClure at the Church Congress held at Bristol last month is a satisfactory indication of the sympathetic attitude which the churches now show towards scientific research. Mr. McClure's paper was entitled "The Aids which Science gives to the Religious Mind," and in it, after referring to Mendeléeff's periodic law and the recent work of Sir W. Crookes and Sir W. Ramsay, he asks:—"Does not the religious mind, which lives and moves in the sphere of the unseen, find an aid in such an extension of the reach of the mental eye?" It is encouraging to know that scientific work and thought can inspire reflections on the relation between the visible and invisible universes.

MESSRS. TOWNSON AND MERCER, of Camomile Street, London, have submitted to us for examination a form of extensimeter designed by the Rev. G. B. Lavelle, of Waterford. The method of measuring linear expansion upon which the construction of the apparatus depends, is already well known in physical laboratories, and the apparatus is an elaborate form of one described in elementary books on practical physics. The instrument consists of a brass cylinder half a metre long, with side tubes for the ingress and egress of steam. The half-metre metal rod of which the linear expansion is to be determined rests on the bottom of the cylinder, and its other end passes through a hole in a movable metal cap to the cylinder. Temperatures are measured by thermometers introduced through india-rubber stoppers in the side tubes, and the spherometer is supported on a brass plate with a hole in the centre, the plate being so supported that it and the spherometer can be moved away from any issuing steam. A dry cell and electric bell are supplied with the apparatus to provide for greater accuracy in determining the instant of contact between the spherometer and the metal rod, but this seems an unnecessary elaboration.

HIGH vacua for distillation under reduced pressure can be rapidly produced by filling the apparatus with carbon dioxide and condensing this with liquid air. Liquid carbon dioxide cannot be used, as it contains 0·75 per cent. by volume of dissolved air, but carbon dioxide snow gave good results; the dissolved air, like that dissolved in water, contains an excess of oxygen, the proportion being 24·1 per cent. by volume. The most convenient method is to prepare the gas from marble and hydrochloric acid, and to exhaust to 30 mm. by means of a water-pump; this operation is repeated four times, and on cooling with liquid air a vacuum of 0·1 mm. is produced. The lowest pressure recorded was 0·026 mm. when rubber connections were used, but in a vessel made wholly of glass the vacuum required for the production of kathode rays could be obtained. Ernst Erdmann, in describing this method in a recent number of the *Berichte,* adds that in London liquid air costs less than fivepence per kilo.

THE additions to the Zoological Society's Gardens during the past week include a Ring-tailed Lemur (*Lemur catta*) from Madagascar, presented by Lady Campbell; a Grey Seal (*Halichoerus grypus*) from the West Coast of Ireland, two Meyer's Parrots (*Poeocephalus meyeri*) from South-east Africa, two Yellow-billed Cardinals (*Paroaria capitata*) from Chili, five Bungoma River Turtle (*Emyda granosa*), three Roofed Tortoises (*Kachuga tectum*), three Indian Eryx (*Eryx johni*), four Conical Eryx (*Eryx conicus*) from India, a Four-lined Snake (*Coluber quatuorlineatus*), South European, deposited; a Polar Bear (*Ursus maritimus*) from Nova Zembla, purchased.

OUR ASTRONOMICAL COLUMN.

REVISION OF ROWLAND'S WAVE-LENGTHS.—In view of the extreme importance to workers in astrophysics of having a perfectly trustworthy system of standard wave-lengths, Prof. Hartmann reviews, in No. 3, vol. xviii., of the *Astrophysical Journal,* the methods used by Rowland in constructing his wave-length tables, and points out their sources of error. He shows that Rowland made the metallic arc wave-lengths given in his "New Table of Standard Wave-lengths" coincide with those of the solar spectrum by applying purely empirical corrections which cannot now be found. In a series of tables Prof. Hartmann also shows that differences, amounting in some cases to 0·03 unit, exist between the solar and metallic wave-lengths, and suggests that further experiments should be performed, on similar lines to those pursued by Michelson and Fabry and Perot, for the purpose of determining a general factor—the F of Fabry and Perot —by which the whole of Rowland's table might be reduced to a rationalised standard from the equation $\lambda = (F \text{ and } P)F_o$, where (F and P) is the absolute wave-length found by the French observers, and F_o is the factor mentioned above. This would produce an errorless wave-length on Rowland's scale for each of the thirty-three lines measured by Fabry and Perot, which would vary but little from Rowland's values, and yet be free from their systematic errors.

Prof. Hartmann has already done this for the part of the spectrum on which Fabry and Perot worked, and has obtained a correction, C, which, when applied to the values given in Rowland's "Preliminary Table," rids them of the errors discussed by him. Not having the necessary facilities for pursuing this important work himself, Prof. Hartmann appeals to those spectroscopists who have them to complete the work commenced by Michelson, Jewell, and Fabry and Perot for the whole of Rowland's tables.

PARALLAX OF β CASSIOPEIÆ.—In a note to No. 3910 of the *Astronomische Nachrichten*, Herr S. Kóstinksky, of Pulkowa, discusses the results of three separate determinations of the parallax of β Cassiopeiæ. The first of these was obtained by Prof. Pritchard, using the photographic method, at Oxford in 1888, and gave the value $\pi = +0''.15 \pm 0''.02$; the second, obtained by Herr Kóstinksky himself, using the transit instrument in the prime vertical, gave a mean value of $\pi = +0''.14 \pm 0''.03$, whilst the third was recently obtained by Mr. A. S. Flint, of the Washburn Observatory, from meridian-passage observations, and produced as the mean result $\pi = +0''.10 \pm 0''.03$.

On considering these three values, obtained by three different methods, Herr Kóstinksky arrives at the conclusion that the absolute value of the parallax of β Cassiopeiæ is with great probability very near to $+0''.1$, and rather a little greater than less.

ASTRONOMY IN SCHOOLS.—Mr. W. W. Payne contributes an interesting article to No. 108 (October) of *Popular Astronomy*, in which he strongly advocates the introduction of practical yet simple astronomical observations into the ordinary higher grade school's curriculum. He points out the absurdity of the general opinion that large instruments and expensive equipments are necessary in order to render observational astronomy a truly educative subject, and shows that a large amount of real training of the observational powers might be given with a small telescope. As examples of the type of observation he would suggest, he mentions the recognition of the brighter stars by name, and the keeping of methodical records of their light and colour characteristics and their occasional changes. Then, with quite a small telescope, a large amount of useful work—from an educative point of view—might be performed in observing and methodically recording the characteristics of some of the finer examples of multiple stars.

UNIVERSITIES: THEIR AIMS, DUTIES, AND IDEALS.[1]

VARIETY OF TYPES OF UNIVERSITIES.

ONE remark of a general kind must be made before proceeding to a synthesis of the purposes of universities. It is a platitude, yet not unimportant, to the effect that they will not be (and cannot be expected to be) uniform in character. Old universities have their traditions, sometimes the growth of centuries; and though they have to review their ideals from time to time and to revise their practice to meet the challenges and the demands made by the growing needs of the nation, changes are made only gradually, and the main character tends to persist through the changes. On the other hand, new universities arise in response to new demands of diverse kinds, and their character is bound to be shaped by their origin, their circumstances, and their growth. In the later Middle Ages, the philosophy of the schoolmen yielded before the onset of the study of the humanities—a study which has largely determined the character of our oldest universities. The physical sciences, by their growth during the last century, have modified the range of education and have influenced profoundly some of the older universities, while they have had no small share in dominating the form of newer foundations. The needs of applied sciences and practical sciences in our own day are stirring ideals of education widely removed from those that reposed upon the humanities, and they are leading to the establishment of learned institutions of types hitherto unknown. Sometimes between one university and another, sometimes within the limits of a single university, there will be what is almost a struggle among the subjects in their historical assignment to courses of study. Fundamental questions are being asked. Should the study of modern languages displace that of the ancient languages? Will applied science diminish the attention paid to pure science? Will practical needs direct the study of applied science? Must the acquisition of so-called useless knowledge be renounced in favour of so-called useful knowledge? Can it still be possible to maintain the process of a liberal education in the presence of the demands for technical instruction and commercial instruction? These and many other questions will arise in practically every university. They must be answered when they arise, and the answers will vary, perhaps from time to time, certainly from body to body. Yet diversity of character, of circumstances, and of practice, will not exclude a certain community of spirit and a certain similarity of obligation.

WHAT IS A UNIVERSITY?

What is a university? Is it a building, or a set of buildings? Is it a federation of schools? Is it an aggregation of faculties? Is it a corporation of individuals, formally devoted to a common purpose? Is it an examining body with power to grant degrees? In each of these senses, and doubtless in several others, the word university has been vaguely used at different times and of different bodies. In its earliest use in regard to the kind of institution under consideration, a university appears to have been a sort of scholastic guild; there were societies of masters, as there were societies of students, and each of these was called a university. There were two places where these guilds grew into greater importance than elsewhere at the close of the twelfth century; one was Paris, mainly a university of masters, the other was Bologna, mainly a university of students. Indeed, so supremely important were these two universities, even while they were so distinctively different in character, that most of the older European universities have conformed to one or other of these types in many (if not in most) essential features. Thus Oxford and Cambridge are modelled on the master university of Paris; it is the graduates who have the power of electing the acting chief of the university. On the other hand, the ancient Scottish universities are modelled on the student university of Bologna; it is the undergraduates who have the power of electing the acting chief of the university. There have been variations in the detailed developments of the different universities. Most of them had several faculties, though not all of them had the same faculties. Thus Salerno, at the zenith of its fame towards the end of the eleventh century, was simply a medical school (having, it may be mentioned, several women among its teachers and writers). Bologna had a faculty of law only; Paris had faculties of theology and arts; Saragossa had one of arts only. The notion that a university was a school in which all branches of knowledge are represented was one that sprang up later, and had a considerable vogue; this Literary Society will readily recall Dr. Johnson's description of a university as "a school where everything may be learnt." The conception of a university as a centre for the cultivation of universal knowledge and the teaching of universal knowledge undoubtedly propounds a stimulating ideal, and the realisation of the ideal is as nearly imperative in modern times as anything almost impossible can be. At any rate, I know of no instance in which that conception of a university is justified by actual facts; and there is on record one instance in which the conception was completely falsified by actual facts, in that no teaching of any kind of knowledge whatever was done—the old university of London, now modified into a university that not merely examines, but also teaches.

CHARACTERISTICS.

What, then, should be taken as the working conception of an ideal university? To my mind, it is a corporation of teachers and students, banded together for the pursuit of learning and the increase of knowledge, duly housed, and fitly endowed to meet the demands raised in the achievement of its purposes. In the prosecution of its academic

[1] Part of an address to the Southport Literary and Philosophical Society, delivered on September 17 by Prof. A. R. Forsyth, F.R.S.