MESSRS. MACMILLAN AND CO., LTD., have in the press an English translation of Dr. Cohnheim's "Chemistry of the Proteids," prepared with the author's sanction from the second edition of that work by Dr. Gustav Mann, of the physiological laboratory at Oxford, and author of "Physiological Histology." Dr. Cohnheim's book, which, in its second edition, has been entirely re-modelled, deals with all recent advances made in analysing and synthetising proteids. Several special features have been introduced into the English translation, and some of the chapters have been re-written.

AN English edition of Prof. Weismann's "Evolution Theory," which has been translated, with the author's co-operation, from the second German edition (1904) by Prof. J. Arthur Thomson, of Aberdeen University, and his wife, will be published in two volumes by Mr. Edward Arnold toward the end of this month.

TO commemorate the twenty-fifth anniversary of the founding of the firm of Burroughs, Wellcome and Co., Mr. Henry S. Wellcome is arranging an exhibition of historical objects in connection with the history of medicine, chemistry, pharmacy, and the allied sciences, the object being to illustrate the art and science of healing in all ages. The date of the opening of the exhibition is not yet fixed.

THE Cambridge University Press will publish very shortly in the Cambridge Biological Series "Morphology and Anthropology," by Mr. W. L. H. Duckworth. The volume will present a summary of the anatomical evidence bearing on the problem of man's place in nature. The Cambridge University Press has also in preparation "Studies from the Anthropological Laboratory in the University of Cambridge," by Mr. Duckworth.

THE November number of the *Popular Science Monthly* is devoted entirely to the St. Louis Congress of Arts and Science. The representative administrative board, it will be remembered, adopted the plan proposed by Prof. Münsterberg, of Harvard University, to hold one congress of the arts and sciences which should attempt to promote and demonstrate the unity of science. An appreciation of the work of this international congress, interspersed with portraits of representative men of science from various parts of the world, is contributed by Mr. W. H. Davis, of Lehigh University, one of the secretaries. A selection from the addresses given at the congress completes an interesting number of the magazine.

OUR ASTRONOMICAL COLUMN.

ENCKE'S COMET (1904 *b*).—A telegram from Prof. Max Wolf to the *Astronomische Nachrichten* (No. 3975) states that on October 28 the ephemeris published by M. Kaminsky in No. 3973 of that journal needed corrections of +11s. −2′·4, and, further, that the magnitude of the comet was 12·5.

Visual observations have not, as yet, been fruitful. Prof. E. Millosevich vainly sought for this object on September 15 and October 5.

DESLANDRES'S FORMULA FOR THE LINES IN THE OXYGEN BAND SERIES.—Referring to a note on the results obtained by Mr. O. C. Lester concerning the oxygen bands in the solar spectrum, which appeared in these columns on October 20, Prof. Deslandres directs attention to the fact that a modification of his first formula (viz. $N=a+bn^2$), equivalent to that now proposed by Mr. Lester, was published by him in his original (*Comptes rendus*, August, 1886) and succeeding memoirs on this subject.

Mr. Lester's statement that the first law requires the modification which he proposes is obviously justified, but he appears to have omitted to study the original memoirs, and to have accepted the epitomised and generally known results as being complete. This does not, however, lessen the importance of the valuable experimental results he obtained in measuring the old and new bands on his large dispersion photographs.

ANNUAL REPORT OF THE CAPE OBSERVATORY.—In the report of the Cape Observatory for 1903 Sir David Gill records several important additions to and modifications of the instrumental equipment.

The work of the new transit circle has been greatly facilitated, and the results improved by the adaptation of a Repsold automatic transitting device to the instrument.

The line-of-sight spectroscope which is used in connection with the Victoria telescope has been re-modelled, and an extremely delicate thermostatic arrangement has been fitted so that the temperature of the prism box can be maintained constant, within ±0°·05 F., during a three or four hours' exposure.

In the astrophysical department several stellar spectra have been completely reduced in the region λ 4200 to λ 4580, and those of Canopus and Sirius have been discussed in connection with the corresponding terrestrial origins of their lines. The results of the line-of-sight work have been made more trustworthy by measuring only those lines which, on traversing either the thin or the thick ends of the prisms, show no relative displacement, and α Phœnicis has been shown to have a very large radial velocity. In December this star was apparently receding from us at the rate of 105 km. per second.

A large amount of routine work in connection with the maintenance of an efficient time service and the completion of the Cape zone for the astrographic chart was accomplished during the year. Important operations were also carried out in connection with the geodetic survey of South Africa, whilst the Government survey of the Transvaal and the Orange River Colony and the topographic survey of South Africa have been planned, the former having been commenced.

THE TRANSITION FROM PRIMARY TO SECONDARY SPECTRA.—Some very interesting experimental results, obtained with the idea of determining as definitely as possible the points at which, under various conditions, the primary is replaced by the secondary spectrum in gases, are published by Mr. P. G. Nutting in No. 2, vol. xx., of the *Astrophysical Journal*.

The general method was to determine what current capacity caused the above named change when either the wave-length, the pressure, the nature of the gas, the inductance or the resistance was altered, and this was called the "critical capacity."

Among other results the experiments showed that this critical capacity is a function of the wave-length, and that it increases slightly as the pressure decreases down to about 1 mm. of air, when it suddenly becomes infinite. All the elements tested have the same critical capacity for the same wave-length and pressure, although the critical point is more marked in some elements than in others. The introduction of inductance always relatively weakens the secondary and strengthens the primary spectrum, although no amount of inductance will completely annul the effects of capacity. Resistance acts similarly to inductance. The critical capacity of any vapour in a mixture of vapours was shown to be the same as when no other gases were present.

NEW BUILDINGS OF THE UNIVERSITY OF LIVERPOOL.

The George Holt Physics Laboratory.

THE George Holt Physics Laboratory, which was declared open by Lord Kelvin on November 12, will be valued by the University of Liverpool as a magnificent addition to its fabric, as well as a memorial to one of the wisest and most generous supporters of that college from which the university has been developed.

The laboratory covers an area of 9600 square feet, and has an average height of 55 feet. The architects are Messrs. Willink and Thicknesse, of Liverpool, with whom there is associated Prof. F. M. Simpson, now of University College, London. The external walls, which are very substantial, are built in best common brick with broad courses of red brick and dressings of Storeton stone. The base-

ment floors are asphalte on a bed of concrete resting on the continuous rock which is the foundation of the whole building. All the upper floors are fire-proof; they consist of a bed of concrete which encases a lattice-work of steel girders, and supports a layer of coke breeze, upon which tongued and grooved pitch-pine boards are stuck down with bitumen and nailed. The resulting surface is both noiseless and steady, and the whole building is made very rigid by the girders employed.

In the basement there is a large workshop, fully fitted with machine tools, store-rooms, a room containing a liquid air plant, a furnace room, an accumulator room, a room for the custody and comparison of standards, and a number of research rooms in which extra steadiness, complete darkness, or constancy of temperature can be respectively secured.

On the ground floor, close to the entrance hall and cloak-rooms, are the doors of the large lecture theatre, a smaller class-room, and a large laboratory for elementary students. This floor also contains the preparation room, the apparatus

FIG. 1.—The George Holt Physics Laboratory, Liverpool.

room, and a sitting-room, office, and private laboratory for the professor.

The first floor is set apart for the teaching of senior students. It contains two large students' laboratories, four smaller rooms suitable for optical and acoustical experiments, a students' workshop, a library, and two sitting-rooms for demonstrators.

The second floor consists almost entirely of research rooms of various sizes. Of these some are designed for special purposes, such as spectroscopy, but the majority are planned so as to be adaptable to as great a variety of needs as possible.

A photographic dark room is provided on each floor; that in connection with the preparation room is adapted for the making of lantern slides and enlargements. There is also a small observatory on the roof, containing a four-inch equatorial telescope.

An electrically driven lift, working in the centre of a tower, is available for the conveyance of heavy apparatus from floor to floor. It can also be used to give access for experimental purposes to all points of two vertical walls which extend to the full height of the tower, about 75 feet. In another part of the laboratory access over a horizontal distance, about 90 feet, nearly equal to the whole length of the building, is secured.

The rooms are heated by low pressure hot water, and are ventilated by an exhaust fan in the roof. They are adequately supplied with gas, with sinks to which hot and cold water are led, with electric power from the corporation mains, and with wires from a switch-board in the basement to which the accumulators are connected. The wiring is run in wood casing on the surface of the walls; all pipes are fully exposed, and, wherever a floor or wall is pierced, an opening is left through which further permanent or temporary connections can be made as required.

The apparatus and preparation rooms have galleries round them, so that their whole wall-space is rendered available for cupboards and drawers. Special devices have been adopted for the ready darkening of the lecture theatre, and for the provision of rigid points of attachment above the whole length of the lecture table. The counter-shafting in the workshop is supported so as to be entirely independent of the rest of the building, and thus silence and freedom from vibration are secured.

The erection of the laboratory was rendered possible by the munificence of a small body of donors, Mrs. and Miss Holt, Sir John Brunner, the late Sir Henry Tate, the executors of the late Rev. J. H. Thom, Mr. Alfred Booth, Mr. Holbrook Gaskell, Mr. J. W. Hughes and Mr. John Rankin, who together subscribed the sum of 23,600*l*., which by the addition of interest has increased to 25,900*l*. The cost of the building, with furniture and fittings, is 21,600*l*. A sum of 1200*l*. has already been spent upon machinery and new apparatus, and thus about 3000*l*. is available for the completion and maintenance of its equipment.

It is hoped that the general scheme according to which the laboratory is arranged will prove favourable to simplicity and economy of administration, and will allow teaching and research to flourish side by side, not hampering but supporting each other.

New Medical Buildings of the University of Liverpool.

The new medical buildings opened at Liverpool on November 12 go far to complete the university school of medicine in that city in a thoroughly efficient and modern manner. They provide accommodation chiefly for the subjects of anatomy, surgery, and materia medica, the school of dental surgery and the school offices, and forensic medicine. There are four full floors to the building, and the ground plan is of an L shape. One limb of the L-shaped figure joins the fine Thompson-Yates laboratories opened six years ago for physiology and pathology. The other limb forms a wing ending freely towards the north. In the angle of junction of the two portions of the building are placed large theatres, one on the ground floor for surgery, the other upstairs for human anatomy. The pitch of the benching is steep, and the lighting is extremely good from a series of long windows following the curve of the rounded angle of the building. In the wing, lighted by windows east and west, is a spacious museum for anatomical preparations. Above this is a large room for dissection, especially well lighted from the east. An excellent theatre for operative surgery forms a feature of the surgical equipment.

In addition to the theatres, museum, and dissecting room are rooms for a library, and for smaller classes than those the theatres are intended to accommodate. In the front portion of the building is the medical faculty meeting room for transacting the business of the faculty and of its various committees, also for meetings of the veterinary board which manages the newly started university school of veterinary medicine. Next to the medical faculty meeting room is the spacious room providing an office for the Dean of the faculty. No effort or expense has been spared in making the construction at once durable, well lighted within, and handsome from the exterior. Admirable lighting has been secured throughout, even to the basement rooms, which are particularly good, so as to provide a much needed reading room for students. The erection was begun three years ago, and part of the building has already been in occupation for more than a year. The architects are Messrs. Waterhouse, of London, who have designed

most of the older buildings of the university. The group of medical school buildings now in use have cost altogether about 80,000*l.*, including, with the building opened on Saturday, the Thompson-Yates laboratory and the Johnston laboratory. The Chancellor of the university, Lord Derby, formally inaugurated the new buildings on the same afternoon as Lord Kelvin opened the new university laboratory for physics. With these fresh additions to its accommodation and teaching equipment, and with the fine new laboratories for zoology and for electrical engineering now rapidly nearing completion, the University of Liverpool will rank among the best provided university institutions in the country.

PROF. MENDELÉEFF ON THE CHEMICAL ELEMENTS.

THE last half-volume (eightieth) of the new Russian "Encyclopædic Dictionary" contains a remarkable paper by Prof. Mendeléeff on the chemical elements, of which the following is a slightly abridged translation. Together with the articles on matter and on the periodic law, which Mendeléeff contributed to previous issues of the same dictionary, and a paper, "An Attempt at a Chemical Comprehension of the World's Ether," published in a Russian review, this article represents the fundamental physical and chemical conceptions of the great chemist as they now appear in connection with the discoveries of recent years.

"Human thought," he begins, "has always endeavoured to simplify the immense variety of phenomena and substances in nature by admitting, if not the full unity of the fundamental elements (Democritus, Epicurus), at least the existence of a limited number of elements capable of producing all the variety of substances. In antiquity this tendency often resulted even in confusing the phenomena with the substances (earth, water, air, and fire)." Since the time of Lavoisier such a confusion has become certainly impossible: the substances are sharply separated from the phenomena which are associated with them. Of course, there may be partial returns to the old view. "However," Mendeléeff continues, "the solidity of the now prevailing conception as to the profound difference existing between substances and phenomena is the result of such a mass of coordinated knowledge that it cannot be shattered in the least even if a small portion of the men of science return to the "dynamism" of old which endeavoured to represent matter also as one of the forms of phenomena. Consequently we are bound now to recognise the substances (the masses) and the phenomena (the movements) as two quite separate, independent categories, such as space and time, the substance of which our thought has not yet penetrated, but without which it cannot work. Thus, for example, we are far yet from understanding the cause of gravitation, but with its aid we understand many phenomena, even though up till now it is not quite evident whether attraction acts through the aid of an intervening medium or represents a fundamental force which acts at a distance. Progress in the understanding of nature depends, therefore, not upon our reducing everything to one final conception—to one 'principle of all principles'—but in reducing the great variety of substances and phenomena which act upon our senses to a small number of recognised fundamental conceptions, even though these last be disconnected. One of such conceptions is that of the recognised chemical elements.

"The simplest way of conceiving matter in this case is to consider it as the result of combinations of elements which themselves are matter; and the phenomena as the results of movements which are the property of these elements or their aggregations. It was from this point of view that the conceptions were elaborated as to the distinction, not only between phenomena and substances, but also between simple bodies and elements; because the conception of a simple body implies the idea of an impossibility of transforming certain bodies into other bodies, while the conception of a chemical element is merely determined by the desire of diminishing the number of substances which are required for explaining the great variety of the latter."

Mendeléeff passes next to the so-called "rare" elements. Leaving aside historical details concerning them, he remarks that it is the more necessary to dwell upon them as they complete to a great extent our knowledge of the periodic law. "Our information about them," he continues, "can also, in our opinion, contribute towards explaining the relations between the phenomena and the substances in nature; because for the understanding of a multitude of natural phenomena it is necessary to resort to the conception of the so-called luminiferous ether, which by all means must be considered as a ponderable substance, and consequently must have its place in the system of elements, inasmuch as it reminds us of the properties of helium, argon, and other similar elements. The conception of the ether was resorted to at the outset exclusively for explaining the phenomena of light, which, as is known, can be best understood as the result of vibrations of the ether. However, later on, ether, considered as being distributed throughout the universe, was resorted to in order to explain, not only electrical phenomena, but also gravitation itself. In consequence of that, a very great importance has to be attributed to the ether; and as it cannot be considered as anything but ponderable matter, we are bound to apply to it all the conceptions which we apply to matter in general, including also the chemical relations. But as, at the same time, we are bound to admit that this matter is not only distributed throughout stellar space (in order to explain the light which reaches us from the stars), but also penetrates all other substances; and as also we must admit that the ether has no capacity of entering into chemical reactions, or of undergoing any sort of chemical condensation, therefore the above mentioned elements, helium and argon, which are characterised precisely by the absence of that property of entering into chemical reactions with other substances, show in this respect a certain similarity with the ether.[1]"

Referring further to radium, Mendeléeff remarks that there can be no doubt as to its being a separate element, extremely rare in nature. As to the emanation of helium by radium, and the presence of the helium spectrum in the spectrum of radium, he explains these facts by the occlusion of helium in a compound of radium, and considers that "nothing gives us reason to think that radium should be transformed into helium." "Notwithstanding the extremely small quantities of radium occurring in nature, Madame Curie has succeeded in obtaining a compound of it, and in establishing its kinship with barium, as also in finding its atomic weight to be near 224, which permits us to complete the periodic system of elements by placing radium in the second group, in the 12th row, in which we have already thorium and uranium, the ores of which are possessed of radio-activity.[2]

"As to argon and its congeners—neon, krypton, and xenon—these simple gases, discovered by Ramsay, differ from all the known elements in that, up till now, notwithstanding the most varied attempts, they could not be brought into combination with any other substance, or with each other. This gives them a separate place, quite distinct from all other known elements in the periodic system, and induces us to complete the system by a new separate group, the group zero, which precedes group i., the representatives of which are hydrogen, lithium, sodium, and so on.

"The placing of these elements in a new group is fully supported by the atomic weights which are deduced for these gases on the basis of their densities, if we admit that the molecule of each of them contains but one atom.

[1] "About this resemblance between argon and helium and the substance of the world's ether I have already written in a separate article entitled 'An Attempt at a Chemical Comprehension of the Ether,' in the review *Messenger and Library of Self-Education*, in the first four numbers of 1903. This article was translated into German in the *Prometheus* of 1903 by M. Tshulok, and into English by M. Kamenskiy under the title 'A Chemical Conception of the Ether' (Longmans, Green and Co., London, 1904). I must, however, remark that the German translation is a complete one, but that the editors of the English translation have omitted the introductory general philosophical remarks about the fundamental distinction between substances (masses), forces (energy), and spirit. This omission deprives the article of the realistic meaning which I intended to give it by introducing ether into the system of elements."

[2] "Some later researches lead us to believe that the atomic weight of radium is slightly above the figure found by Madame Curie, but it seems to me that it still remains doubtful whether the conclusion of Madame Curie has to be altered."