vertase," by Maxwell Schubert, and "Activity Coefficients of High Valence Ions and a Simple Method of Handling the General Solution of the Debye Theory of Electrolytes," by Victor K. La Mer.

THE National Park Service announces plans for the fourth summer school for the training of naturalists, nature guides and teachers of natural history, to be opened on June 25 in the Yosemite National Park. The work was inaugurated by the California Fish and Game Commission and is also participated in by the Yosemite Natural History Association. The school has a faculty of seven, under the leadership of Ansel F. Hall, chief naturalist.

THE Whiting Corporation, Harvey, Ill., has established in the Mellon Institute of Industrial Research an industrial fellowship, whose holder, Dr. Edward E. Marbaker, will conduct research on cast iron. The results of these investigations will be published for the general benefit of the foundry industry.

JEFFERSON MEDICAL COLLEGE has given notice in Orphans Court of an intention to claim a $67,000 trust fund left by Dr. James Ewing Mears to Harvard University for the study of eugenics, which that university rejected a year ago.

PROFESSOR R. P. COWLES has presented to the department of zoology of the Johns Hopkins University his collection of gastropod shells, marine and terrestrial. These shells were collected at the Marine Biological Station in the Philippine Islands, located at Puerta Galera, on the Island of Mindoro.

THE United Engineering Society has received a bequest of $1,000 through the will of the late Oberlin Smith, president of The American Society of Mechanical Engineers in 1890.

WITH the aid of students now in residence, the Brooks research fund, designed to aid students in botany and zoology at the Johns Hopkins University, has now passed the ten thousand dollar mark.

ADDITIONAL funds have been received by the Fitzwilliam Museum, of the University of Cambridge, completing the fund of £100,000 required for the proposed extension.

THE widow of the late Professor Emanuel Kayser, paleontologist and geologist, of Munich, desires to sell his library. It has about 11,000 pamphlets and 500 to 600 books. Those interested should address his daughter, Frau Cilly Engelmann, Weissenburgstrasse 3, Marburg, Germany.

THE Comitè National Belge de l'Eclairage has accepted the task entrusted to it by the International Commission on Lighting of establishing in Brussels an international research department on the distribution of electrical illumination with the view of drawing up a series of standards.

THE British National Institute of Industrial Psychology, London, which was founded seven years ago for the application of the human sciences to the everyday needs of industry, has received an anonymous gift of £4,000 towards the cost of new premises.

THE Martin Johnson African Expedition Corporation, through its president, Daniel E. Pomeroy, has presented to the American Museum of Natural History 200,000 feet of film taken by Mr. and Mrs. Martin Johnson during their four years in Africa. The museum has placed the 8,000 feet of this film, which made up the motion picture "Simba," in a vacuum sealed container, which will not be opened for fifty years, when it is believed that a majority of the animals now constituting the wild life of Africa will have disappeared.

UNIVERSITY AND EDUCATIONAL NOTES

PRINCETON UNIVERSITY has received a quarter of a million dollars in pledges toward the alumni fund to raise teachers' salaries as the result of the first month of the canvassing for a $2,000,000 endowment.

BEQUESTS of the late James Ward Packard include $20,000 to Lehigh University. After Mrs. Packard's death one third of the residuary estate will go to the university.

THE University of Buffalo has received a gift of $100,000 from Mr. Darwin D. Martin to establish the Martin professorship of mathematics.

GEORGETOWN UNIVERSITY has received $250,000 from Mr. and Mrs. Thomas J. Maloney, of Waldwick, N. J., for the Chemo-Medical Research Institute to be built on the university grounds.

DR. ARTHUR L. TATUM, of the University of Chicago, has been appointed professor of pharmacology at the University of Wisconsin, in association with Dr. A. S. Loevenhart. He will assume his duties at Madison on September 15.

PROFESSOR H. B. WALKER, head of the department of agricultural engineering at Kansas State Agricultural College, has resigned to accept a similar position with the agricultural branch of the University of California at Davis.

AT Yale University, Professor William R. Longley, professor of mathematics, has been appointed to the Colgate professorship in place of Professor Luquiens. The following assistant professors were promoted to the rank of associate professors: Dr. Oystein Ore,

mathematics; Dr. Stuart R. Brinkley, chemistry; Roscoe H. Suttie, civil engineering; Archer E. Knowlton, electrical engineering; Everett O. Waters, mechanical engineering; Arthur Phillips, metallurgy, and Dr. Blair Saxton, chemistry. Instructors who were promoted to assistant professorships are: Dr. Robert De W. Coghill, chemistry; Lauren E. Seeley, mechanical engineering; Dr. Richard F. Flint, geology; Dr. Lucius T. Moore, mathematics; Dr. Jesse W. Beams, physics. Dr. Dirk Brouwer has been appointed research assistant in mathematical astronomy.

AMONG those who will give courses at the summer quarter of Stanford University are: Dr. Harry Clark, associate member of the Rockefeller Institute, in physics; Dr. Alfred Errera, of the University of Brussels, and Dr. Carl Einar Hille, of Princeton University, in mathematics; Dr. J. J. Runner, assistant professor at the University of Iowa, in geology, and Professor Edward A. Bott, of the University of Toronto, in psychology.

DR. ROBERT ROBINSON, professor of organic chemistry at the University of Manchester, has been appointed to the chair of organic chemistry in University College, London.

DR. GEORGES FONTÉS has been appointed professor of biological chemistry at Strasbourg, and Dr. Arnt Kohlrausch, of Greifswald, professor of physiology at Tübingen.

DISCUSSION AND CORRESPONDENCE

A PERIODIC CLASSIFICATION OF THE HARDNESS AND MELTING-POINTS OF THE ELEMENTS

IT is possible to classify the elements according to hardness and melting-point, and this classification fits with considerable precision into an eighteen-period table based on spectroscopic similarities.

The table (see Fig. 1) represents the elements arranged according to atomic number, with those of similar spectra in columns. The columns under H and He represent the first stage in the building-up of the electron structures of the atom, that of building on the two "s" electrons; the six following columns add the "p" electrons, while the long group from Sc to Zn all contain elements to which the "d" electrons are being added. Thus at the end of each column we have the complete shells; the "s" shells under He, the "p" shells under the rare gases, and the "d" shell under Zn. Lanthanum and the 14 Rare Earths come under Y. These represent the "f" electron being built on.

Let us first consider the melting-points. If we examine the table, we find some striking characteristics. In the first place, all the elements with high-melting points are at one end of the table, while those with low melting points are at the other. Then let us examine the columns. For each column under Sc, Ti, V, Cr, Mn, Fe, Co, Ni, the melting-points increase down the column. Under Cu all are nearly equal. Under Zn, B, C, there are minima at Hg, Ga, Sn, respectively. The N column has a maximum at As. The melting-points under O, F, Ne, all increase down the column. It is interesting to note that the permanent gases conform to this periodicity as well as the non-gases. The alkali metals decrease in melting-point down the column. Under Be there is a minimum at Mg. The only discrepancy is Ti, whose melting-point is slightly above what we should expect.

Another interesting characteristic is that the whole first long period row (Sc–Cu) have similar melting-points, falling off slightly at either end. The same is true for the next two rows.

Turning to the subject of hardness, we find that this in general varies as the height of the melting-point. It is of course difficult to obtain accurate values for absolute hardness but considering some recently obtained by A. Mallock,[1] and others, we note that all the hard metals are bunched, as are the soft ones. The maxima and minima are in the same places, and the runs follow the same sequences as do the melting-points. The discrepancies are, V, and Pd; but Mallock claims the V was not obtainable pure in the proper form for the test, and Rydberg[2] claims that

[1] A. Mallock, *Nature*, Feb. 19, 1927, p. 276.

[2] Rydberg, *Zeits. f. Physikalische Chemie*, 33 (1900) 353–9.

																	H	He
																	Li	Be
											B	C	N	O	F	Ne	Na	Mg
											Al	Si	P	S	Cl	A	K	Ca
	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	Rb	Sr
	Y	Zr	Cb	Mo	Ma	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	Cs	Ba
La and 14)		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	85	Rn	87	Ra
Rare Earths)		Th	Ux	U	93													

FIG. 1. Table of the elements, arranged with regard to spectroscopic similarities, in order of atomic number. Inspection will show how hardness and melting-point fit in, the harder ones being at the middle of the (left) long period.