stock. Their poisons are believed to be due to resins among other extractive matter. Particularly potent is *D. toxicarium*, though paradoxically enough its fruit pulp and that of certain other *Dichapetalum* species is edible. Its seeds are sold as rat poison in Freetown, Sierra Leone.

Obnoxious to insects is the bright yellow and partly water-soluble gum exuding from the cashew (*Anacardium occidentale*), and this adds to its value in bookbinding. The oil from the nutshells was proved in 1938 to be destructive to mosquito larvæ, and has been demonstrated to have distinctly toxic effects on certain grain weevils and moth larvæ.

Among fatty oils are the thick greenish oil from the seeds of the herb, *Gynandropsis pentaphylla*, used against human parasites (hair-lice) and as a piscicide, the bitter purgative oil from the seeds, and probably latex of the Mexican poppy, *Argemone mexicana*, which is used by certain pagan Nigerian tribes for warding off termite attack.

Conspicuous among aromatic insecticides are the essential oils of the Labiatæ. Of these the strongly scented *Hyptis spicigera*, *Leucas martinicensis* and *Ocimum americanum* are burned in rooms to get rid of mosquitoes, and layers of the *Hyptis* are placed below bundles of millet to keep away termites.

Although African growers have available a variety of materials of insecticidal value, Dr. Irvine does not suggest that these materials are necessarily alternatives to modern synthetic insecticides. In making a choice, many factors, such as local availability, persistence, ease of application and cost-effectiveness ratio, need to be taken into account. These plant products should be considered as useful supplements in the struggle against tropical pests. There is much scope for interesting research into the action of these vegetable pesticides, either alone or in combination, as well as into the chemistry of their active principles.

D. I. MENDELEIEFF AND THE PERIODIC SYSTEM

DMITRY IVANOVICH MENDELEIEFF (1834–1907), the discoverer of the periodic system of the elements and one of the greatest chemists of modern time, was also a very great Russian, and it is inevitable that in the U.S.S.R. much time and energy have been devoted to his life and work and to establishing his place in the history of science.

Mendeleieff was closely connected with education, research in pure and applied chemistry, mining and economic development of Russia. He was also one of the founders in 1868 of the Russian Chemical Society. The first Mendeleieff Congress met in December 1907, the year of his death. In its scope and purpose this congress was similar to a meeting of the British Association. Subsequent Mendeleieff Congresses took place in 1911, 1922, 1925, 1928, 1932 and 1934. The last of these in 1934 was the jubilee congress in celebration of the centenary of Mendeleieff's birth. For this congress the Academy of Sciences published "Selected Works of D. I. Mendeleieff"; but in 1937 it began publishing the complete works in fourteen volumes, of which a number has already appeared. Recent literature on Mendeleieff and on the periodic system in the U.S.S.R. is very extensive. Six books dealing with Mendeleieff and the periodic system reviewed here are of a particular interest to scientists and historians of science. One of these books is published in English, the remaining in Russian.

The first three are concerned with the life and work of Mendeleieff and the last three with the periodic system of the elements. The book written by Prof. B. G. Kuznetzov[1] is a first-class account of the life and work of M. V. Lomonosov (1711–65), N. I. Lobachevsky (1793–1856) and D. I. Mendeleieff (1834–1907). A more popular account is given by Pisarzhevsky, somewhat lengthy in the Russian text[2] and condensed in the English text[3]. The English edition is a nicely bound volume containing numerous well-produced illustrations, available at a very reasonable price.

Mendeleieff's greatest contribution to science, the periodic system, and its derivatives, has, since its discovery in 1869, played a very important part in the development of chemistry and physics. In 1944 the Russian All-Union Chemical Society, in conjunction with the Chemical Section of the Academy of Sciences, celebrated the seventy-fifth anniversary of the discovery of the Periodic Law (1869) and of the foundation of the Russian Chemical Society (1868). The papers read at these meetings were published as a volume in 1947[4]. The first part of this book (pp. 11–114) is devoted to the periodic law and contains five articles: (*a*) the periodic law of D. I. Mendeleieff and its creator, by the late A. A. Baikov; (*b*) the periodic system as the foundation of modern chemistry, by S. A. Shchukarev; (*c*) the periodic law of Mendeleieff and its significance in natural history, by the late A. E. Fersman; (*d*) the transformation of the elements and the periodic law, by V. G. Khlopin; and (*e*) the physical meaning of the periodic system, by A. F. Yoffe. The second part (pp. 115–265) is by V. V. Kozlov and A. I. Lazarev and deals with the history of the Russian Chemical Society. It includes biographical sketches of Russian chemists and contains numerous portraits and other illustrations. Unfortunately, it is not provided with an index.

A most spectacular achievement of the past decade has been the systematic study and classification of Mendeleieff's archives. A large number of 'scraps of paper' containing rough notes or simply scribbles, rough manuscripts of articles, printed copies with the author's correction and amplification notes, rough copies of letters and other materials—all this, when arranged and interpreted, provides a very valuable contribution to the history of the creation of the periodic system. The task of classifying and interpreting this material has been accomplished by Mendeleieff's daughter, the late M. D. Mendeleieff, T. S. Kudryavtzeva and B. M. Kedrov.

The first book dealing with this material was published in 1950[5]. In it only three documents are given and discussed: (1) the manuscript of the earliest form of the periodic table, scribbled over and altered; (2) the manuscript of the second form of the periodic table, the one which was sent to the printers in February 1869 and published in Russian and in French (March 1, 1869); (3) the original Russian text of Mendeleieff's article (dated July 1871), later translated into German and published in the *Annalen der Chemie und Pharmacie* (Supp. Vol. 8, pp. 133–229; 1872). The reproduction of these items is followed by a detailed account by B. M. Kedrov.

Plans have been made for the complete publication of the newly discovered material in three volumes: Vol. 1, covering the period 1869–71[6]; Vol. 2,

period 1860–68; Vol. 3, period 1872–1906. Of these, only Vol. 1 has so far appeared. It was published in 1953 and is a very substantial book of 866 pages, full of photo-reproductions of the original documents, explanatory tables and notes. It contains the three documents published in the previous book[5], but more fully annotated and analysed, and a mass of other documents—various sketches of the periodic table (including rough sketches of the spiral form), notes on various topics connected with the periodic system, manuscripts of articles, amended articles, letters, programmes of lectures, and so on. All these documents and their interpretation and annotation are valuable material for the historians of science.

A short review of this kind does not allow of detailed discussion; but the main process of Mendeleieff's creative activity with regard to the discovery of the periodic system may be summarized as follows. After lecturing on organic chemistry and chemical technology at the University of St. Petersburg from 1861, Mendeleieff at the age of thirty-three was appointed to the chair of inorganic or general chemistry in 1867. The preparation of this new course of lectures led him to write his text-book, "The Principles of Chemistry". He knew about some attempts at classification of the elements; but he had not seen the works of A. E. Béguyer de Chancourtois and J. A. R. Newlands. "When I began to write my text-book," Mendeleieff told Brauner, "I felt that I needed a system which would allow me to classify chemical elements. I had discovered that all existing systems were artificial and therefore useless for my purpose. I was anxious to establish a natural system. With this purpose in mind I wrote the signs of the elements on little slips of cardboard together with their atomic weights, and after this I began grouping them in different ways according to their similarities, but this did not satisfy me, until finally I placed the cards one after the other in order of the increasing weights of the element. Having placed in the table the first row: H = 1, Li = 7, Be = 11, C = 12, N = 14, O = 16, F = 19, I discovered that the following elements form a second row below the first row, beginning with lithium. Further I found, that in this new row—Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35·5—sodium repeats every property of lithium, and the same applies to all other elements. Similar repetition occurs in the third row, after a certain period, and continues in all rows" (5, p. 141). This may be a simplified account of his approach to the problem, because the 'scraps of paper' show a much more elaborate scheme of arrangements and groupings of the elements. It is interesting to note that the first two sketches of the periodic table were variants of the 'long chart', with vertical columns corresponding to periods, while later, struggling with the presence of two sets of similar elements in the long periods, Mendeleieff deliberately telescoped the 'long chart' into the 'short chart'. Subsequent history of the periodic table has shown, however, that the 'long chart' is in a better agreement with the modern view of atomic structure and is more suitable for certain branches of science.

S. I. Tomkeieff

[1] Lomonosov, Lobachevsky, Mendeleieff. By B. G. Kuznetzov. [Russian text.] Pp. 332. (Moscow: Acad. Sci. U.S.S.R., 1945.) 22 r. [10s.] [Mendeleieff, pp. 189–332.]

[2] Dmitry Ivanovich Mendeleieff. By O. Pisarzhevsky. [Russian text.] Pp. 471. (Molodaya Gvardia, 1949.) 8 r. [3s. 6d.].

[3] Dmitry Ivanovich Mendeleyev. His life and work. By O. N. Pisarzhevsky. [English text.] Pp. 102. (Moscow: Foreign Languages Publishing House, 1954.) [2s.]

[4] Seventy-five Years of the Periodic Law of D. I. Mendeleieff and of the Russian Chemical Society. Edited by S. I. Volfkovich and V. S. Kiselev. [Russian text.] Pp. 265. (Moscow: Acad. Sci. U.S.S.R., 1947.) 16 r.

[5] D. I. Mendeleieff. New Materials relating to the History of the Discovery of the Periodic Law. Edited by N. A. Figurovsky. [Russian text.] Pp. 145. (Moscow: Acad. Sci. U.S.S.R., 1950.) 10 r. 35 k. [9s.].

[6] D. I. Mendeleieff. Scientific Archive. Edited by A. V. Topchiev. Vol. 1, Periodic Law. The Natural System of Elements. Manuscripts and Tables. 1869–1871. [Russian text.]. Pp. 866. (Moscow: Acad. Sci. U.S.S.R., 1953.) 42 r. 40 k. [36s.].

The price given in shillings refers to that payable in London.

APPARENT TRANSFORMATION OF COLLAGEN FIBRILS INTO 'ELASTIN'

By Prof. D. Burton, Dr. D. A. Hall, Dr. M. K. Keech, Dr. R. Reed, Miss H. Saxl, Prof. R. E. Tunbridge, O.B.E., and Miss M. J. Wood

University of Leeds

The present communication deals with certain electron microscopical, histological and biochemical observations which appear to indicate a possible transformation of collagen fibrils into elastin-like material. This work forms part of a general study of the properties of connective tissue undertaken in the University of Leeds by the Nuffield Gerontological Unit (Dr. D. A. Hall, Miss H. Saxl) and the Departments of Medicine (Dr. M. K. Keech, Prof. R. E. Tunbridge) and Leather Industries (Prof. D. Burton, Dr. R. Reed, Miss M. J. Wood).

On the basis of electron-microscope[1] and biochemical studies[2], it has been suggested that the material common to all forms of elastic tissue is a complex system, consisting of two types of long-chain molecules, one a mucoprotein, the other a polypeptide chain, coated by a dense cement material—the so-called elastomucin. Morphologically, under the electron microscope, elastin-like fibrils are uniformly dense, ill-defined in shape, with no specific structural feature, in contradistinction to the fibrils of collagen, which have characteristic cross-striations (Fig. 1).

Electron-Microscope Studies

As a source of collagen fibrils for possible conversion to elastin, use has been made of preparations obtained by the modification of Neuman's method, described by Keech[3]. These preparations have been obtained from abdominal skin of patients of various ages, ranging from nine to eighty-two years. Although Neuman[4] claims that this material is the purest and least degraded form of collagen available, there is no evidence that the extraction procedure does not affect the intra-fibrillar constituents, especially polysaccharide. However, it would appear that the ground substance has been removed, and any effects observed arise from the collagen fibrils themselves, and not from any extraneous source. For com-