trial medicine, with many followers, especially in Germany, but no rival till early in 1700 when the Italian Ramazzini brought out his great book on the "diseases of artificers." That Ramazzini's motive in taking up this almost unknown branch of medicine was primarily humanitarian he makes clear, for he was a man of warm emotions, filled with pity for the wretched lot of the worker, but he was also a scientist and approached the problems with curiosity and a scrupulous search for facts. He attributes miners' diseases to two causes, noxious fumes and particles in the air and the violent exertions and unnatural postures which the work makes necessary. He was also a pioneer in preventive medicine, he insists on ventilating devices and protective clothing, especially in arsenic mines. His book is an epitome of the knowledge of miners' diseases from antiquity to the eighteenth century.

Many interesting writings are brought to light by Dr. Rosen, such as Mattioli's description of chronic mercury poisoning among the miners of Idria in the first half of 1600. It was in Idria that the first recorded law was passed for the prevention of occupational disease, when in 1665 a six-hour day was made legal. Another remarkable description is that of Hoffman of Halle, who gave a clear picture of the pulmonary cancer of the miners in the Erzgebirge of Saxon Switzerland, cancer which we now know to be caused by radioactive ores. It was another German, Scheppler, who first distinguished clearly between miners' asthma, silicosis, and miners' consumption or phthisis, silico-tuberculosis, long before the discovery of the tubercle bacillus. Up to the beginning of the nineteenth century the greatest contribution to the study of miners' diseases, both clinical and pathological, came from Germany and such names as Virchow and Rokitansky are associated with it.

With the rapid increase of coal mining in England in the nineteenth century the English contributions began to take prominence. Coal had been mined as far back as 1217 when Henry the Third granted the Forest Charter, but it was used chiefly by smiths and lime burners and did not come into domestic use till the sixteenth century, after which the use gradually increased, then, with the dawning of the industrial era, underwent very rapid growth. Tin, lead and iron had been mined for centuries, and the Cornish tin mines seem always to have been notoriously deadly, owing, we now know, to the free silica in the ore. As coal pits increased in depth, the "enemies of the miner" began to appear, water, foul air, dust, poisonous fumes, falling timbers and land slides, and, worst of all, explosions of fire damp and dust. These last were spectacular enough to attract public attention and led to Parliamentary commissions of inquiry, with physicians as members. As one would expect, the attention of the English investigators was directed not only to dangerous conditions in the mines, but to the wretched homes of the miners, and we read less about the pathology of the pneumoconioses than about practical methods of clearing the air of the mines and bettering the lives of the men. William Thomson, an English physician, writing in 1858, insisted that the problem of miners' consumption could not be solved by medical means alone, engineering skill was needed and also correction of the social evils which contributed so much to the sickness of those workers. Britain started her admirable system of vital statistics in 1888 and from then on it was possible to demonstrate what mine work meant in terms of life and death, for the average life span of the miner was only 27.7 years, of the farmer, 42.3 years.

The last fifty years have seen great additions to our knowledge of miners' diseases. We have discovered the mode of action of free silica and we have a fairly accurate idea of how many particles of dust of a certain size constitute the danger limit in the air of a mine. Our diagnostic methods have improved enormously, these advances being due primarily to the work of a brilliant group of British physicians in the mines of the Rand, confirmed by Americans in the zinc-lead mines of the Tri-State region and the copper mines of Montana. This work remains for Dr. Rosen to describe in his second volume, as do also the discovery of asbestosis (English), the discovery of the cancer-producing action of radioactive ores (German), and the still controversial discovery of the inhibiting effect of aluminum dust on the formation of silicosis (Canadian).

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ORGANIC CHEMISTRY

Organic Chemistry. By LOUIS F. FIESER and MARY FIESER. 6 × 9½ in. 1091 pp. Bound in blue cloth. Boston: D. C. Heath and Company. 1944. $8.00. Abridged edition, $6.00.

ORGANIC chemistry is a field of vast extent, whose boundaries have been for decades and are still expanding so rapidly in all directions that each year it becomes increasingly difficult, between the covers of a single volume, to give any adequate survey of this immense territory. In fact, it is no longer a single subject, but has become a group of numerous more or less distinct but chemically related subjects. The author of a one-volume text-book in this important branch of scientific human knowledge, therefore, has presented to him the alternative of restricting either the number

of the topics and classes of compounds presented, or the discussion of those which are included.

In the book under review, the authors have been guided by their evident desire to follow the former of the above alternatives and reduce the list of topics rather than the thoroughness of their treatment. This has been achieved mainly by totally ignoring one of the three major divisions of the subject, namely, that of the heterocyclic compounds. A more accurate title for the volume, therefore, would be "Aliphatic (Acyclic) and Carbocyclic Organic Chemistry."

Another sacrifice in the interest of brevity has been the omission in the text of citations to the original literature. In their place, a select list of reading references is given at the close of each chapter. Space has also been economized by the insertion of numerous tables of compounds and of their physical and chemical properties. Apparently one object of this rather severe limitation of the topics, classes and compounds to be considered has been to provide space for what the authors regard as the most novel feature of their book—that is, the inclusion, for optional reading, of a certain number of chapters pointing out the importance of organic chemistry in technology, industry, biology and medicine. Such general reading would probably comprise the chapters on Rubber, Microbiological Processes, Role of Carbohydrates in Biological Processes, Metabolism of Fats, Metabolism of Proteins and Amino Acids, Synthetic Fibers, Synthetic Plastics and Resins, Accessory Dietary Factors and Advances in Chemotherapy.

The underlying plan of the work has been first to make clear to the reader the elements of the subject by a discussion of the chemistry of such relatively simple groups as the aliphatic hydrocarbons, alcohols and acids, and then to lead him forward gradually through more intricate and difficult fields; simultaneously replacing the older empirical theoretical explanations by more modern and more scientific ones.

All organic chemists are familiar with the splendid contributions which Dr. and Mrs. Fieser have been making for many years in the lecture room and laboratory, and as authors. No one is better qualified to prepare an exceptionally fine general treatise in this branch of science, and the result of their labor is a book which, in thoroughness and clarity of presentation, authoritative and up-to-date information, and the fascination of the world it discloses, is unexcelled. It should be in the possession of every one interested in organic chemistry. It is to be hoped that the authors will find time later for a companion volume devoted to the heterocycles.

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SPECIAL ARTICLES

THE URINARY EXCRETION OF PENICILLIN AFTER ORAL ADMINISTRATION TO NORMAL HUMAN SUBJECTS[1]

EARLY studies on the absorption and excretion of penicillin[2] suggested that oral administration was not effective in attaining adequate blood levels that were required for the treatment of severe infections. The destruction of penicillin by the acid gastric contents appeared as a possibility to account for the results obtained.[2,3] Until quite recently only very limited amounts of penicillin have been available and it has been highly desirable to use it in the most efficient manner possible. However, it would appear that the supplies of penicillin will be enormously increased[4] so that it becomes possible to consider less efficient but more convenient means of administering the drug. Certainly oral administration is the method of choice in the majority of instances from the standpoint of both the patient and the attending physician. For this reason it seemed desirable to re-examine the urinary excretion of penicillin after the oral ingestion of relatively large doses in order to ascertain if therapeutically effective quantities might be absorbed from the gastrointestinal tract. The present report describes studies of the urinary excretion of penicillin following its oral ingestion, either alone or along with sodium bicarbonate by normal human subjects.

A solution of the sodium salt of penicillin containing 500 Oxford units per milligram of total solids was employed in these studies. In all cases the subjects were fasting for 3 to 6 hours but not longer than this. All assays were carried out by the cylinder plate technique on suitably diluted urine specimens.[5] Table 1 shows the amount of penicillin excreted in the urine by two males (A and C) and one female (B) following the oral ingestion of 100,000 Oxford units. Two studies were made on subject A. It will be seen that from 8 to 33 per cent. of the quantity taken by mouth was excreted in the urine. The average rate of urinary

[1] From the Ben Venue Laboratories Inc., Bedford, Ohio, and the Department of Biochemistry, School of Medicine, Western Reserve University, Cleveland, Ohio. This article was received on June 3, 1944. It has now been released for publication.

[2] C. H. Rammelkamp and C. S. Keefer, *Jour. Clin. Invest.*, 22: 425, 1943.

[3] C. H. Rammelkamp and J. D. Helm, Jr., *Proc. Soc. Exp. Biol. and Med.*, 54: 324, 1943.

[4] R. D. Coghill, *Chemical and Engineering News*, 22: 588, 1944.

[5] W. H. Schmidt and A. J. Moyer, *Jour. Bact.*, 47: 199, 1944.