However, a knowledge of French still proves helpful in understanding the meaning of a text that was originally in that language.

Several of the chapters summarize a decade or two of their authors' work. For example, Beecher manages to compress into ten pages the basis for his conclusions on the quantitative measurement of pain in man, on which he has carried out studies since the late 1940's. These studies have culminated in the development of the "submaximal effort tourniquet method," in which a subject squeezes a hand exerciser 20 times after a tourniquet has been inflated around his upper arm and the time is measured at which he designates the pain as (i) slight, (ii) moderately distressing, (iii) very distressing, and (iv) unbearable. This simple maneuver proves to simulate the duration and severity of pain from surgical wounds and cancer well enough to permit quantification of the practical analgesic effects of drugs.

The first chapter is perhaps one of the most important because its 21 pages give Melzak and Wall adequate scope to develop and defend their now widely publicized "gate control theory of pain." In passing it may be noted that this important basic research was supported by the U.S. Department of Defense—a source from which support unhappily is no longer available to us.

In a chapter entitled "Neuropsychiatric aspects of pain" Serafetinides attempts to summarize the main findings on both the organic neurologic and the psychogenic types of pain in man as published in English in the decade ending in 1967. Szasz devotes his pages to a description of the man who habitually complains of pain that is undiagnosable and gives rise to "unrelievable suffering." He gives us little help in differentiating such a person from one whose suffering is related to occult organic disease.

Moving to the evaluation of analgesics in animals, we have the late R. K.-S. Lim's final word on this subject. Lim contends that "vocalization is the most specific central indicator of pain in animals." He adduces evidence that the antipyretic analgesics, such as aspirin, exert their effect at the periphery whereas the narcotic analgesics act centrally. His most convincing experiments involve cross-perfusion of a vasoisolated spleen with nerves intact. The vocalization response in the recipient dog to the painful procedure of intrasplenic injection of bradykinin is stopped when aspirin is injected into the circulation of the donor, but not when it is injected into that of the recipient. The converse is true for morphine. In the former situation, the drug can affect only the peripheral nerves in the spleen, whereas in the latter the drug action must be more central.

Geller and Axelrod recommend for evaluation of analgesics the tactic of Galambos whereby an animal, usually a monkey, learns that by pressing a lever he can decrease stepwise the intensity of electric shocks given him. The animal's response at the lever indicates the level of shock he is willing to tolerate.

Charpentier has studied the behavior of freely moving rats subjected to noxious electrical stimuli and automatically records their four main responses of startle, flight, squeak, and biting the electrodes. He has analyzed the effects on these responses of drugs and of bilateral focal intracranial lesions at six selected sites.

The principal chapters dealing with the biochemical basis of analgesia are on the relationship of chemical structure to morphinomimetic activity, by P. A. J. Janssen; on the analgesic and anticonvulsant activity of derivatives of dibenzazepine, by W. Theobald *et al.*; on the possible role of serotonin in pain, by Herold and Cahn; and on the relations between the analgesic activity of the compounds Bay 1470 and morphine, by Hoffmeister.

The section on the psychopharmacology of analgesics includes four chapters all dealing with psychotropic drugs and pain. In another chapter Herz and Metyš discuss the inhibition of nociceptive responses in animals by cholinomimetric agents which do not commonly alter the perception of pain in man. Wilhelmi and his colleagues from the Geigy Research Laboratories provide a summary of their 20 years of work on the analgesic and antiinflammatory properties of the agents originally called antipyretics.

The fifth section contains four chapters from as many nations on the electrical activity of the brain and the influence of drugs thereon. Essays from England, Italy, and Switzerland deal with analgesics, and one from the United States with local anesthetics.

In the final section Noordenbos leads off with an explanation of the physiological correlates of clinical syndromes of pain. Huguenard and Boissier in separate essays deal with "neuroleptanalgesia," "the state produced by combining a drug like chlorpromazine with a short-acting analgesic." With such combinations major surgery can be carried out with the patient remaining awake and cooperative. White presents a succinct description of the neurosurgical operations for relief of pain in the torso or extremities, emphasizing the indications for and the advantages and the problems associated with sympathectomy, posterior rhizotomy, and cordotomy. Garcin deals with the peculiarly vexing problem of pain provoked by lesions of the central nervous system and refers to nearly all of the principal writers on the subject.

The Paris symposium was the first time authorities in so many disciplines concerned with pain had met together. This volume records what they would have liked to say had they been given enough time. Happily each was given an adequate number of pages to provide those outside his specific field with a working knowledge of what the sister discipline has to offer.

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Properties of Ores

The Ore Minerals and Their Intergrowths. PAUL RAMDOHR. Translated from the third German edition. With additions and corrections by the author. Pergamon, New York, 1969. xviii, 1174 pp., illus. $54.

Paul Ramdohr's *Die Erzmineralien und ihre Verwachsungen* has gone through three editions and is well known and widely used in the English-speaking world. But many students of the ore minerals have found the German editions difficult and have looked forward to an English translation of the latest edition. This has now been provided by a team of more than 30 translators organized by C. Amstutz.

For the uninitiated, the subject matter in the Ramdohr books is presented in three main sections: A genetic classification of ore deposits (80 pages in the translation); a discussion of ore textures and their genetic significance (200 pages); and a systematic description of the ore minerals, particularly their physical chemistry and paragenetic position and their characteristics in polished section (900 pages).

The English translation includes more than 750 photographs which complement the text and illustrate fea-

tures, such as textures and mineral associations, described in the book. The quality of the translation is generally good, sometimes awkward where the translation has been excessively literal, but rarely incomprehensible.

The section of the genetic classification is heavily slanted toward the igneous origin of ores and ignores the recent work on sedimentary origins. There is little effective use of physical chemistry in the discussion. Except for the part on metamorphism, which is more worthwhile although qualitative, the material in this section is not significantly different from similar material in textbooks of economic geology published 25 years ago.

The true worth of the book appears in the section on ore textures. The author is the outstanding man in this field, and in writing this section he has drawn heavily on a specialized experience and personal observations made over a span of 45 years. The section is illustrated with more than 250 figures, consisting mainly of well-documented photographs of textures described in the text.

The additions, corrections, and other changes that have been made for the English edition lie mainly in the areas of the author's greatest competence and special interests. Some of the material in the book is therefore now at least 12 to 15 years out of date. This is particularly evident in the final section, which sets out to give a systematic description of the ore and gangue minerals. The discussions of physical chemistry and paragenetic position take little account of recent experimental work. For example, the phase diagram for the system Cu_2S-CuS (which is one of the few phase diagrams found in the book) was derived in 1941. The opportunity was not taken to systematically update the powder x-ray data, and the data of Harcourt (1942) are still given for some common minerals. No use is made of known relations, in some mineral groups and series, between chemical constitution and lattice dimensions to define composition. On the other hand, the author's continuing study of ores in polished section and his interest in developing improved polishing techniques have resulted in more than a hundred new and replacement photographs in this section.

This book is not a modern text in mineral deposits geology. I find it disappointing that the prominent scientists listed as translators did not do more to modernize the subject matter in these areas in which they themselves are so well qualified. On the other hand, no one with a serious interest in ore minerals can afford to be without the book. It is and will remain the classic reference work in ore microscopy and is a tribute to one of the world's greatest ore microscopists.

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