receptors on the vessels were abnormal. Such receptors, which control the expansion and contraction of cerebral blood vessels, are known not only to receive signals from incoming involuntary nerves but to be influenced by $CO_2$ and other chemicals in the blood.

Meyer and his team decided to test whether these receptors were responsible. They gave migraine patients drugs that are known to be both clinically useful for countering migraine pain and capable of stimulating alpha and beta nerve receptors on cerebral blood vessels. They then measured the patients' cerebral blood flow response to $CO_2$. Their results, reported at this year's AASH meeting, showed that this group of drugs tended to lessen the overreaction to $CO_2$ of the migraine patients. This finding, Meyer and his co-workers conclude, implies that the excessive responsiveness of migraine patients' cerebral blood vessels is due, at least in part, to abnormal alpha and beta receptors on the vessels.

In spite of these discoveries, the method by which abnormal cerebral blood flow leads to head pain during a migraine is not clear. It is possible that when cerebral blood vessels overreact to nerve messages or other chemical stimuli they first constrict quickly, subsequently expanding excessively. This could account for the initial cerebral blood flow decrease and the increased flow during the headache phase. Such an excessive expansion might impinge on pain-carrying nerves, which then send pain messages to pain centers in the brain.

What *is* now known for sure about migraine pain is that enkephalins become depleted at the beginning of the migraine attack but increase to normal levels as the headache subsides (SN: 6/21/80, p. 390). This finding, part of the research of Bruno Anselmi and co-workers at the University of Florence in Florence, Italy, was given the 1980 Harold G. Wolff Award at the AASH meeting and, along with the research of Meyer and colleagues, provides an indication that the researchers are on the right track: "What we found and what Anselmi found are complementary," Meyer told SCIENCE NEWS.

Taken all together these findings suggest that migraine sufferers have abnormal nerve receptors on cerebral blood vessels — abnormal receptors that allow the vessels to react excessively to gases, nerve messages or other stimuli and thereby bring about abnormal cerebral blood flow, usually a decrease, then an increase. The stretched vessels stimulate nerve fibers for pain. And thus when cerebral blood flow is increased, it results in pain stimulation that seems to cause, or at least be accompanied by, a depletion of brain pain-relieving chemicals. The results: excruciating head pain known as a migraine. □



# BOOKS

BOOKS is an editorial service for readers' information. To order any book listed or any U.S. book in print please remit retail price, plus 50¢ handling charge for each book to **Book Order Service,** Science News, 1719 N Street, N.W., Washington, D.C. 20036. All books sent postpaid. Domestic orders only.

**HANDBOOK OF SOVIET MANNED SPACE FLIGHT** — Nicholas L. Johnson. This American Astronautical Society publication examines the evolution of Soviet manned spaceflight from the flight of Yuri Gagarin aboard Vostok I to the June 5, 1980, launch of Soyuz T-2. Each program, Vostok, Voskhod and Soyuz-Salyut, is reviewed from the standpoint of spacecraft design, development and operation. Univelt, Inc, 1980, 461 p., illus., $45, paper, $35.

**HANS BETHE, PROPHET OF ENERGY** — Jeremy Bernstein. Examines what Bernstein feels may be the most significant question today concerning both science and public policy — the problem of energy. Hans Bethe, Nobel Prize winner whose contributions to science have ranged over many fields of modern physics and astrophysics, is profiled. His analysis of the energy problem is presented and policy options are suggested. Originally serialized in *The New Yorker.* Basic, 1980, 212 p., $12.95.

**INDIAN NEW ENGLAND BEFORE THE MAYFLOWER** — Howard S. Russell. A description of New England's Indians as they lived when Europeans first met them. The author has tried to present the natives as neither savages nor heros, but fellow human beings living at a particular time in a particular environment. U Pr of New Eng, 1980, 284 p., illus., $17.50.

**LOSS: Sadness and Depression, Vol III of Attachment and Loss** — John Bowlby. Analyzes the effects of a death in the family on the lives of children and adults. Looks at mourning, the problem of depression and the processes of accommodation and healing. Basic, 1980, 472 p., $22.50.

**MAN ADAPTING** — René Dubos. The dominant theme of this book is that the states of health or disease are the expressions of the success or failure experienced by the organism in its efforts to respond adaptively to environmental challenges. A chapter on curing, helping and consoling has been added to this paperback edition. Originally published in hardback in 1965. Yale U Pr, 1980, 538 p., illus., paper, $7.95.

**MUSHROOMS OF WESTERN NORTH AMERICA** — Robert T. Orr and Dorothy B. Orr. Encompasses the area extending along the Pacific Coast from Southern California east through the Rocky Mountains to the western edge of the Great Plains and north to British Columbia, western Alberta, the Yukon Territory and Alaska. Black and white drawings, color photographs and text aid in distinguishing the major groups, many of the genera as well as the more common species. U of Cal Pr, 1980, 293 p., color/b&w illus., $12.95.

**PARTICLES AND FIELDS: Readings from *Scientific American*** — Introduction by William J. Kaufmann, III. Discusses quantum mechanics, particle physics, quarks, quantum chromodynamics and the search for a unified field theory. W H Freeman, 1980, 139 p., illus., $15, paper, $6.95.

**SOCIOBIOLOGY EXAMINED** — Ashley Montagu, Ed. This outstanding anthropologist and 15 other contributors bring Edward Wilson's theories on sociobiology under close scrutiny. Oxford U Pr, 1980, 355 p., $19.95, paper, $5.95.