

muscle spindle, which in turn sends a signal to the brain to adjust the muscle to match the spindle. But recording activity of the nerve fibers going to muscle spindles has shown that this theory is incorrect.

"Our first goal was to study incoming signals from muscle spindles," says Hagbarth, of University Hospital in Uppsala. He and Vallbo together started the microelectrode recording technique using themselves as subjects. They discovered that movement is initiated not by a servo-mechanism, but more directly by a nerve impulse traveling from the brain to the spinal cord and then to the muscles. Scientists now agree that the nerve fibers going to the muscle spindle, on the other hand, keep the organ adjusted to an appropriate length to continue to sense muscle length changes. Otherwise when the muscle shortens, for example, the spindle would go slack and no longer be useful to sense muscle length.

Clinical research on patients with neurological disorders is just beginning. Hagbarth and Young have studied subjects with different types of tremors. Trembling is the result of spindle activity making muscle fibers contract in groups, rather than at different times. This results in a hand, for instance, jerking up and down instead of remaining steady.

Parkinson's disease and the hereditary condition called benign essential tremor involve the muscle spindles only indirectly, the investigators find. The problem in these cases occurs in the brain or spinal cord. But nervous tremor, the stage fright everyone experiences from time to time, does originate at the spindle. So does trembling from caffeine, low blood sugar and some asthma drugs.

Young explains that adrenaline, released as part of the body's "flight-or-fight" response, changes the mechanical properties of muscle, making it contract more strongly and quickly and become more resistant to fatigue. As a side effect, the spindles are stimulated sooner and more often. Consequently they make groups of nerve cells going to muscle fire more synchronously. "These bursts are good for a quick jump or fast run," Young says. "But it is embarrassing and can be disabling to a musician, marksman or surgeon." Young says that many such professionals now take a drug, propranolol, that blocks adrenaline's action on muscle.

From pinches to tremors, a few secrets of the nervous system have already been detected by the eavesdropping scientists. But they believe the greatest discoveries of the technique are soon to come. With a combination of stimulating and recording from single nerve fibers while observing what the subject feels and does, they hope to understand subtle aspects of perception and reaction at a higher level than is possible from studying animals. □

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**Annual Review of Psychology, Vol 34** — Mark R. Rosenzweig and Lyman W. Porter, Eds. The prefatory chapter for this volume is "Behavioral Medicine: Symbiosis Between Laboratory and Clinic" by Neal E. Miller, Rockefeller University. Annual Reviews, 1983, 623 p., \$27.

**The Atlas of Archaeology** — K. Branigan, Ed. Presents a unique dual chronicle of past civilizations and of archaeology as a science. Focuses on the discoveries at 50 significant sites throughout the world. Each site is treated in two double-page spreads: the first describes how the site was excavated and its major finds, the second, illustrated by artwork reconstructions, describes the way of life of the people, their architecture and artifacts. St Martin, 1983, 240 p., color/b&w illus., \$25.

**Gardening with Native Plants of the Pacific Northwest** — Arthur R. Kruckeberg. In the Pacific Northwest is a great diversity of climate, terrain and natural vegetation. The vegetation includes a rich variety of native plants of ornamental value to enhance the gardens and urban landscapes of the region. This book identifies these plants and describes their natural habitats and methods of propagation and cultivation. U of Wash Pr, 1982, 252 p., illus., \$24.95.


**Maximum Life Span** — Roy L. Walford. Presents the history and future of gerontological research and describes how we can begin preparing for the changes that will occur in our society with the advent of an extended life span. Explains various theories of aging, the aging process itself and tells how individuals can improve their own survival chances. Norton, 1983, 256 p., charts & graphs, \$15.50.

**New Plant Sources for Drugs and Foods from The New York Botanical Garden Herbarium** — Siri von Reis and Frank J. Lipp, Jr. Presents data relating to unusual drug and food plants culled from the N.Y. Botanical Garden Herbarium. The authors express hope that these potentially useful species will be studied and evaluated before their natural environments are disturbed and the plants become extinct. Harvard U Pr, 1982, 363 p., \$25.

**The Politics of Reproductive Ritual** — Karen Erickson Paige and Jeffery M. Paige. Most societies have some behavioral restrictions or emotionally charged beliefs about the major events of the human reproductive cycle. Even in contemporary industrial societies menstruating women, according to the introduction, are widely regarded as irritable and emotionally unstable. This book presents a theory to explain the nature and distribution of reproductive rituals in preindustrial societies and provides a starting point for analysis of beliefs about women and reproduction in industrial societies. Originally published in hardback in 1981. U of Cal Pr, 1983, 380 p., chart & graphs, paper, \$8.95.

**The Youngest Science: Notes of A Medicine-Watcher** — Lewis Thomas. A personal memoir, combining this outstanding physician's meditations on medicine and biology with an account of his own medical career. Recollections of his father's medical practice in the 1920s through Thomas's own medical education and career make this a fascinating account of the development of modern medicine. Viking Pr, 1983, 270 p., \$14.75.

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