intense international economic competition? After all, America's chief manufacturing rivals are not Germany or France but such Asian nations as Japan, where workers typically log six-day weeks and sometimes work even on Sundays. Schor finds that the Japanese model is not necessarily an ideal to emulate, not with the frequent reports of *karoshi*—"death by overwork"—among the salarymen. Recent studies, moreover, suggest that reducing work hours can actually increase productivity. In one Minneapolis firm, employees who worked 36-hour weeks for 40-hour pay produced more, thanks to lower absenteeism and increased morale. Similarly, a Texas insurance company saw sales dramatically rise despite—or because of—a shortening of work hours. Yet the "overwork ethic" will end only, Schor believes, with a different vision of society, one in which management varies its strategies and workers value free time as highly as increased wages. But such a change, she concedes, involves "altering a way of life and a way of thinking."

Science & Technology

IN THE PALACES OF MEMORY: How We Build the Worlds Inside Our Heads. *By George Johnson. Knopf. 255 pp. $22.95*

Each of us remembers millions of things, important or trivial. Yet scientists cannot explain how we do so—how we can recall, say, that Voltaire lived in the 18th century or why, when we order a hamburger, we know it won't taste like tuna fish. Now, however, biologists, psychologists, physicists, and philosophers are knocking down disciplinary barriers to create a science of memory—one that will account for how both neurons *and* people behave.

To portray this "science in the making," Johnson, a science journalist at the *New York Times*, compares the work of a biologist, a physicist, and a philosopher. Gary Lynch, a neurobiologist at the University of California, hypothesizes that when a neuron in the brain is stimulated, channels in its cell membrane open and calcium flows in. This stimulates an enzyme which breaks down the cytoskeleton (the cell's frame), allowing buried receptors to surface and possibly to form a new synapse that encodes memory. Leon Cooper, who won the Nobel Prize in 1972 for his theory of superconductivity, uses computer simulations to show that memory depends on the specific speed and intensity with which neurons fire in response to stimulation. Patricia Churchland, a philosopher tired of arid speculations about the nature of knowledge, went to medical school to discover how real human brains work. Her model of memory is a "Rube Goldberg machine," an evolutionary neural patchwork that translates sensory data into mental constructs which, because they can then be remembered, help ensure survival.

In addition to being unproved, these hypotheses have something else in common: They fly in the face of "received wisdom." Most ordinary people—and also such philosophers as John Searle—believe the human mind cannot be reduced to a biological machine. Yet it is hardly surprising that Lynch, Cooper, and Churchland all contend that mental states and brain states are one and the same. When the elusive consciousness of memory reduces to a matter of stimuli, neurons, and even computers, then scientists—and would-be scientists—are ready to get down to work.

THE CULTURE OF PAIN. *By David Morris. Univ. of Calif. 342 pp. $29.95*

The writer C. S. Lewis was often accused of being a reactionary, yet he offered an eloquent one-word defense of the modern world: anaesthesia. Try to imagine what life was like before surgeons used ether or chloroform, he said, when doctors sawed through the limbs of fully conscious patients—as they did well into the 19th century. The conquest of acute pain, with "wonder drugs" ranging from simple aspirin to morphine, is considered the glory of modern medicine.

It may come as a surprise then to learn that 90 million Americans suffer from a "newer" kind of pain, from *chronic* pain, and that they spend almost $90 billion annually trying to relieve their suffering. To understand this "invisible crisis at the center of contemporary life," Morris, the author of *Alexander Pope: The Genius of Sense*, ventured into hospitals and pain clinics; more importantly, he examined history

itself to identify the startlingly different responses to pain in other eras.

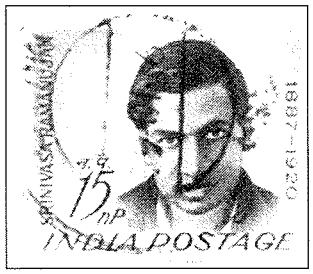
Stoics in antiquity considered pain ennobling, as did Christian flagellants in the Middle Ages. Romantics from John Keats to Friedrich Nietzsche believed pain the source of great art. Such attitudes lie worlds away from today's medical diagnoses. Physicians now are handicapped, Morris argues, by subscribing to the "myth of two pains," one physical, the other mental. Such a division is proven inadequate at every turn, by amputees who feel burning sensations in lost limbs, by lobotomized sufferers no longer bothered by pain, by patients registering relief from placeboes, and by sadomasochists who relish every hurt.

Pain today, Morris writes, "is now officially emptied of meaning and merely buzzing mindlessly along the nerves." Physical suffering is thus stripped of the cultural significance by which people once dealt with more pain despite having fewer medical resources. *The Culture of Pain* is, however, more than a historical investigation. It joins Arthur Kleinman's *The Illness Narratives* (1988) and Eric Cassell's *The Nature of Suffering* (1991) as an appeal to physicians to end the distinction between illness and disease, between persons and bodies, and to create a new approach which treats pain not as a symptom of various diseases but as the thing itself that must be diagnosed and healed.

THE MAN WHO KNEW INFINITY: A Life of the Genius Ramanujan. *By Robert Kanigel. Scribners. 438 pp. $27.95*

In 1913 a desperately poor Indian clerk in Madras wrote to Cambridge's leading mathematician, G. H. Hardy. Srinivasa Ramanujan was then a 23-year-old autodidact, untrained in such mundane matters as standard notation or rigorous proofs. But the bizarre mathematical formulas his letter contained had to be true, Hardy reasoned, since no one would have had the imagination to concoct them.

Thus began what Kanigel, who teaches literary journalism at Johns Hopkins University, calls one of the more romantic collaborations in the history of mathematics. Hardy brought Ramanujan to England and Cambridge, and together in 1916 they devised the general formula



for finding all possible ways of adding up integers to obtain a certain number—a formula that advanced the study of, among other matters, molecular combination. Mathematics was no dry, technical discipline to Ramanujan; it was instinct with life. Hardy once happened to comment that the taxi which had brought him to Ramanujan's lodgings was #1729—"rather a duller number." "No, Hardy," Ramanujan immediately exclaimed. "It is a very interesting number. It is the smallest number expressible as the sum of two cubes in two different ways." ($1{,}729 = 1^3 + 12^3 = 9^3 + 10^3$.)

Through Hardy's unstinting efforts, Ramanujan received professional renown in Britain, including election to the Royal Society. But while their association was an exceptional meeting of the minds, it was little else. Hardy never included Ramanujan in his Bloomsbury circle, never even realized that Ramanujan ate alone in his room because his strict Hindu diet made virtually everything served at High Table untouchable. Just barely in his thirties, Ramanujan—homesick, overworked, and suffering from tuberculosis—returned to his own country in 1919 to die. He is now considered the "Einstein of India."

Mathematicians to this day are still "proving" Ramanujan right, and his work continues to be studied for its applications in plastics and atomic research. But how Ramanujan came upon his insights, without the aid of computers, without proofs, and initially with only a few out-of-date 19th-century texts, remains a mystery. His own explanation appears perplexingly unhelpful: "An equation for me has no meaning, unless it expresses a thought of God." Yet his casual acceptance of the amalgamations and odd associations in Hinduism, Kanigel suggests, did allow Ramanujan's mind to make the bizarre leaps and analogies that led to his startling discoveries in number theory.