SCIENCE & TECHNOLOGY

This was too much for 12th-century Europe, Stiefel writes. The *physici* were attacked as heretical or, at best, ignored. Science remained subordinate to theology for another 400 years. Ironically, she adds, the translation of Aristotle's scientific works may have helped defeat this early conceptual revolution. His writings seemed to provide answers to all questions, thereby furthering scholasticism (concerned with applying Aristotle's philosophy to the tenets of Christianity) rather than original inquiry.

Broken Hearts

"Emotional Causes of Sudden Death" by Joel E. Dimsdale, in *The American Journal of Psychiatry* (Dec. 1977), 1700 18th St., N.W., Washington, D.C. 20009.

A 71-year-old woman arrived by ambulance at a hospital emergency room with her stricken 61-year-old sister, who was pronounced dead on arrival. The elder woman collapsed at the news, developed a heart attack, and died.

According to Dimsdale, a Harvard psychiatrist, the annals of medicine and folklore are filled with stories of people who, in situations of hopelessness and intense emotion or after violating some taboo or being "hexed," abruptly die. Many theories purport to explain how otherwise healthy people can suddenly succumb to momentary stress. What has been lacking in studies of the phenomenon, Dimsdale contends, is collaboration between cardiologists and psychologists.

Cardiac arrhythmia (irregularity of heartbeat) can be induced in healthy patients asked to recall emotionally upsetting situations; stress on a diseased heart at a certain stage in the cardiac cycle may well trigger a fatal arrhythmia. (What may be the earliest recorded case of this kind occurs in the New Testament's Acts of the Apostles, which tells how the high priest Ananias fell down dead when St. Peter remarked, "You have not lied to man but to God.")

That there is a link between the emotional and physical causes of death seems certain. However, abrupt, psychosomatic heart failure remains unlikely. What is surprising, Dimsdale writes, is not that these incidents occur, but that in a country plagued by heart disease, hypertension, and nervous stress, they occur so infrequently.

It's All in the Head

"The Brain's Own Opiates" by Solomon H. Snyder, in *Chemistry and Engineering* (Nov. 28, 1977), P.O. Box 3337, Columbus, Ohio 43210.

Painkilling opiates such as morphine are effective at extremely low dosages because they zero in on specific areas in the human brain. These sites, called "opiate receptors," were first identified in 1973 by the author, a professor of pharmacology and psychiatry at Johns Hopkins. According to Snyder, the familiar "pinpoint pupils" in the eyes of heroin addicts may be explained by the concentration of opiate recep-

tors in areas of the brain that control pupillary dilation.

But why should the brain contain receptors for substances the body itself does not produce? In fact, the human body does produce such substances. During the past four years, researchers have discovered opiate-like substances 5 to 50 times more powerful than morphine. These chemicals, called enkephalins (Greek for "in the head") occur naturally in the human brain and offer scientists the hope of developing relatively nonaddictive painkillers.

Experiments show that electrical stimulation of certain sectors of the brain relieves pain in fully conscious patients. That is, the brain is stimulated to release its own painkillers. (Acupuncture seems to have a similar effect.) When enkephalin was finally isolated in 1975, it was found to occur in the same areas as opiate receptors—in the nerve cells that process information related to pain, pleasure, and the emotions.

In short, says Snyder, opiates are simply drugs that mimic enkephalins. This suggests new ways of studying brain functions—particularly sensory perception. By blocking (or enhancing) enkephalin production, it may be possible to regulate emotional disorders. Tests are already being conducted with schizophrenic patients.

To Dea Now Nat To Be?

"How Artificial Is Intelligence?" by William R. Bennet, Jr., in *American Scientist* (Nov.-Dec. 1977), 345 Whitney Ave., New Haven, Conn. 06511.

In 1927, physicist and mathematician Sir Arthur Eddington proposed a modern version of an ancient philosphical conundrum: Could an army of monkeys drumming on typewriters eventually produce all the books in the British Museum? In 1960, to illustrate the magnitude of the problem, comedian Bob Newhart claimed he was working on the random reproduction of a single line from *Hamlet.* He later announced that one of his imaginary monkeys had typed out the line "To be or not to be, that is the *gesornenplatz.*" Scientists were quick to question his methods: It would take an uncoaxed monkey some 10^{36} years to hit on the first nine mono-syllables of Hamlet's soliloquy.

Bennet, who teaches applied science at Yale, proposed some modifications to give the "monkeys," in their computerized incarnation, a fighting chance. He devised a typewriter weighted in favor of the characters most frequently occurring in the third act of Hamlet. Thus, Bennet's "monkey," striking at random, would be more likely to hit E's than O's, O's than T's and so on. When the computer-typewriter was further adjusted so as to include "second-" and "third-order" correlations—to favor, for example, QU over QX and QUE over QUX—performance improved dramatically. Some 50 percent of the letter groups struck by Bennet's third-order "monkey" were words. After only one night's clacking, the computer typewriter chanced upon a truly random *gesornenplatz* approximation: "TO DEA NOW NAT TO BE WILL AND THEM BE DOES DOESORNS CALAWROUTROULD."