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."