"Underground chemists," writes Baum, a reporter for *Chemical and Engineering News*, "are playing a deadly cat-and-mouse game with law enforcement authorities." The chemists tinker with the chemical structures of a wide variety of illegal "controlled substances" in order to produce new "technically legal" drugs with the same narcotic effects—but also the same dangers. As fast as the U.S. Drug Enforcement Agency can outlaw a specific designer drug, the chemists modify their illicit recipes to produce a similar, legal "analog" compound that squeaks past the regulations.

The stakes in this game are high, Baum observes. A conviction for producing a "Schedule 1" controlled substance (one with no medical uses and a high abuse potential) carries a stiff fine and prison sentence. But these "bucket chemists" can make fortunes off their creations. One common designer drug is 3-methyl-fentanyl, a derivative of fentanyl (marketed under the trade name Sublimaze), which U.S. physicians have used as an anesthetic since the 1970s. By investing $2,000 in glassware and chemicals, a skilled chemist can synthesize one kilogram of the drug, a quantity worth millions of dollars on the street.

Seeking quick profits, underground manufacturers frequently turn out "sloppy" batches, with fatal consequences for drug users. Roughly 3,000 times more potent than morphine, 3-methyl-fentanyl has caused at least 100 deaths in California to date. Another narcotic, MPPP (an analog of meperidine, or Demerol) is only three times as potent as morphine but easier than fentanyl derivatives to produce. It can become contaminated with a highly toxic chemical known as MPTP, which causes irreversible Parkinson's disease. Many drug abusers who bought the drug as "synthetic heroin" now suffer permanent neurological damage.

So far, drug enforcement officials have had only limited success in their fight against designer drugs. "How," asks Baum, "does one design a law to make illegal a compound that has not yet been synthesized?" Another problem is that conventional blood and urine tests do not reveal most designer drugs, thus hindering the detection of drug users.

Two years ago, Congress began closing legal loopholes open to drug designers by passing the Comprehensive Crime Control Act, Baum reports. It enables the U.S. attorney general to designate certain drugs as controlled substances within 30 days—a process that used to take years. Currently, Congress is reviewing an even more comprehensive "Designer Drug" Enforcement Act, which would give federal officials more authority to crack down on the bucket chemists.

## *Myopia in Focus*

"What Causes Nearsightedness?" by Gina Kolata, in *Science* (Sept. 20, 1985), 1333 H St. N.W., Washington, D.C. 20005.

In 1930, approximately 14 percent of the American population was nearsighted, or "myopic," as their eye doctors told them. Today, that proportion has roughly doubled and is increasing at an estimated rate of one percent every three years.

Why are peoples' eyes getting worse? There are two theories: One

blames bad genes, the other too much close work. Each faction of ophthalmologists offers its "definitive" studies, but according to Kolata, a reporter for *Science*, recent evidence weighs in favor of the close-work hypothesis.

Myopia occurs, Kolata notes, when an eyeball becomes elongated, placing the retina (back of the eye) beyond the point where the eye's lens can focus sharply on an image. When a person does close work—reading, sewing, drawing, using a computer—his eyes must "accommodate," or curve the lens, in order to focus. Too much close work, the theory goes, puts too much strain on the eye, which can increase its internal pressure (pushing the retina back) or else weaken its ability to accommodate. Several population studies seem to back up this notion. In 1883, a scientist ranked Dutch military recruits by their former occupations and observed that the prevalence of nearsightedness rose as the men became more educated: from 2.5 percent among farmers and fishermen to 12 percent among craftsmen doing close handiwork and 32 percent among scholars. A research project in Alaska found that young, literate Eskimos were more often myopic than their illiterate elders. It is also known that lawyers and graduate students have myopia rates approaching 50 percent.

Only within the last few years, the authors observe, have researchers been able to develop animal models to study the condition. Francis Young, a psychologist at Washington State University, has raised a colony of nearsighted monkeys. When their distance vision is limited to 14 to 20 inches (forcing full-time accommodation) for a year, many monkeys become nearsighted—a significant fact, since they are not normally myopic. Two other researchers, Elio Raviola and Torsten Wiesel, of Harvard and Rockefeller universities, respectively, discovered that sealing shut a monkey's eyes also stimulated myopia. However, the nearsightedness only develops if the monkeys are in the presence of light. Darkness halts the myopia. Thus, the researchers believe that perceiving fuzzy images through the monkey's eyelid is the cause.

Nearsightedness cannot be cured, Kolata reports, although some ophthalmologists are trying to retard its onset in children who are developing the condition. One treatment involves "atropine" eyedrops, which relax the eyes' ciliary muscles. Another employs bifocals. Both methods aim for similar goals: to take the strain of visual accommodation out of close work.

## *How Does an Embryo Grow?*

"The Molecular Basis of Development" by Walter J. Gehring, in *Scientific American* (Oct. 1985), 415 Madison Ave., New York, N.Y. 10017.

The development of a fertilized egg—a single, minute cell—into a complex and variegated creature is one of nature's great mysteries. How exactly does it happen?

Biologists have known since the 1950s that the architecture of a developing organism is encoded in the helical strands of its deoxyribonucleic acid (DNA), the storehouse for its genetic information. But the method by