lead of the undrugged assistant in their reactions to the drug, suggesting that people need outside cues to identify their emotions. But Schachter doubts that such an experiment would be permitted today.

Most of its advocates, says Hunt, claim that deception has little or no ill effect on subjects and that it is justified by the results. Many subjects agree: 84 percent of Milgram's former subjects had no regrets over the 1963 experiment. But critics such as psychologist Thomas Murray contend that, even if deception causes no obvious damage, it "does wrong to the person it deprives of free choice."

But deception's proponents, like Princeton's John M. Darley, claim that "psychologists have an ethical responsibility to do research about processes that are socially important . . . which means that sometimes they have to keep their subjects in the dark."

No Easy Oil Substitutes

"Chemical Producers Look Beyond Petroleum" by Henry DeYoung, in *High Technology* (Sept.-Oct. 1982), 38 Commercial Wharf, Boston, Mass. 02110.

Despite the recent dip in oil prices, the $175 billion U.S. chemical industry continues to search for petroleum substitutes. According to DeYoung, senior editor of *High Technology*, uncertainty over the future price of oil and other economic factors are slowing progress.

The chemical industry has used oil and gas as raw materials because they are rich in carbon, the basic building block of petrochemicals. Coal has the same potential but must first be converted to usable form. The Fischer-Tropsch coal conversion process that fueled Nazi Germany's war effort is the sole existing large-scale technology; only South Africa, rich in coal and without domestic oil deposits, has found it economical. In addition to producing 30 to 40 percent of South Africa's gasoline, coal conversion plants churn out 91,000 tons of ammonia and 92,000 tons of sulfur annually. Next year, a Tennessee company will open a new plant using a specialized technique to convert coal to acetic anhydride, a chemical used in film, plastics, and textiles.

But DeYoung cites difficulties that impede other such efforts: Expensive new technologies may not be competitive if oil prices stabilize; hard-to-transport coal must be available in large quantities (20,000 tons per day for an average plant); environmental regulations are strict.

Biomass conversion—breaking down plants and other organic matter—lags slightly behind coal technology. Some producers already ferment corn to produce ethanol; University of California researchers have developed a similar process for wood chips that will theoretically yield 10 million barrels of "biomass oil" annually.

The most promising area of biomass conversion—using recombinant DNA to synthesize enzymes to speed decomposition—is still in its infancy. Novo Biochemical is building a $40 million plant in North Carolina to produce enzymes for corn fermentation. By the late 1980s, it may be economical to convert the resultant ethanol into ethylene, then into such chemicals as vinyl chloride and acrylonite. But bioen-

gineers today do little industrial chemical research; they concentrate on more profitable experimental production of expensive drugs, such as interferon and insulin.

DeYoung says that production of chemicals through biotechnology is at least 10 years away. Barring a sudden breakthrough, the chemical industry will use few oil substitutes before the 1990s.

Behind Allergies

"Allergy" by Paul D. Buisseret, in *Scientific American* (Aug. 1982), 415 Madison Ave., New York, N.Y. 10017.

Allergy victims often curse the pollen, cats, or other allergens that trigger their suffering. But according to Buisseret, a Louisiana State University medical professor, allergies are better blamed on malfunctions in the body's immune system.

White blood cells called *T* or *B* lymphocytes begin the biochemical process that ends in sneezing, sniffles, or itching. The cells mistakenly react to the allergen just as they would to a disease-causing bacterium or other harmful material. In immediate hypersensitivity, the most common kind of allergic response, *B* lymphocytes quickly release millions of antibody molecules into the bloodstream—specific antibodies that are normally secreted only in response to tropical parasitic worms. (Delayed-reaction allergies involve other antibodies.)

The antibodies themselves cause no distress. They simply attach themselves to "mast" cells located mostly in the membranes of the eyes, nose, and mouth, and in the skin, respiratory system, and intestines. But when the allergy sufferer next encounters the allergen, the response is immediate. By-passing the white blood cells, the allergen travels directly to the antibody-mast cell combination, which releases about 1,000 tiny granules that trigger that allergic response.

Why certain substances cause this "immunity gone wrong" and others do not remains a mystery. Nor are scientists certain why allergies plague some people and not others. Allergies do tend to run in families but seem to be activated by environmental factors. A Swedish study, for example, suggested that 18 percent of the population is genetically programmed for allergy, but fewer than half of these suffer the effects. A 1976 study of 72 children allergic to cow's milk suggests that one environmental factor, bottle-feeding, plays a crucial role in activating the allergy. Sixty percent of the children had at least one allergic parent and had been bottle fed; 26 percent had a family history of the allergy but had been breast fed; the remaining 14 percent had no such history but had been bottle fed.

Treatments for allergies "are all more or less imperfect," Buisseret notes. Injecting patients with small doses of the allergen sometimes "desensitizes" them but can be dangerous—and the reason it works is unknown. Aspirin combats intestinal allergies, again for unknown reasons. Scientists will not find a real cure for allergies until they discover what causes the trigger-happy immune response.