Ionizing Radiation (National Academy of Sciences, Washington, D.C., 1972).
2. L. Fishbein, W. G. Flamm, H. L. Falk, *Chemical Mutagens* (Academic Press, New York, 1970).
3. H. Druckrey, R. Preussmann, D. Schmähl, M. Müller, *Naturwissenschaften* **48**, 165 (1961).

Inspiration

We were "inspired" by John Worrall's letter (26 Jan., p. 329), in which he talks of the "hissing" of trees disturbed by dissecting needles. A few years earlier we had stumbled upon this phenomenon while looking for inner bark color in order to differentiate certain species of oak. This experience reminded one of us, Daniel Smiley, of hearing a sucking sound from hickory while trail clearing in the 1930's. It had seemed curious to us, and we spent several hours perforating the bark of various species of trees and characterizing the responses. We checked with several of our plant physiologist friends and perused many current plant physiology texts to learn that the phenomenon simply did not exist. We put our notes away with some embarrassment. During our investigations, walkers had stared at us with something beyond mild curiosity, and had even started asking questions which we found difficult to answer.

Now we would like to augment the somewhat sparse record on this subject with several observations. First, we suggest that "hissing" is not quite the right word. It implies (as per the dictionary) exhalation and a simplicity of sound which demeans that produced by trees in the act of inspiration. The true sound, a tremulous and high-pitched burbling, can be well matched by pursing the lips and sucking in air at the corner of the mouth.

We also worry about the efficacy of using a dissecting needle. In our attack on the problem we used knives, awls, drills, ice picks, punches, and other devices and learned that a rude and somewhat conical opening was usually the most productive, probably because it tore the vessels rather than just displacing them.

Several specimens each of *Fraxinus americana, Acer rubrum, Acer saccharum, Nyssa sylvatica, Carya ovata, Quercus prinus, Quercus borealis, Pinus strobus, Pinus rigida,* and *Tsuga canadensis* were persecuted on the fall afternoon of 16 October 1972, when the temperature was around 65°F, and on 20 to 24 March 1973, several clear days with temperatures ranging from 40° to 55°F. Most trees examined were from 10 to 20 meters tall, with diameters at breast height of from 25 to 50 centimeters.

Three to five perforations at breast height were made in each tree, and, with the exception of the conifers and maples, sounds of inspiring air were heard in all species. Specifically, we noted a rapid ticking, clicking, and often the tremulous and high-pitched burbling comparable to that produced by pursing the lips and sucking in air at the corner of the mouth. Usually, the sound was vigorous at first, and then within 10 to 20 seconds it diminished to nothing. The white ash was the loudest and most persistent. One tree examined on 16 October, with only 10 percent of its leaves remaining, continued to inspire for 5 minutes and several seconds. The northern red oak was also notable; one tree that had shed only 5 percent of

its leaves made sounds for 3 minutes. In March, with all leaves gone, red oak produced sounds of from 4- to 7-second duration in five different holes. The chestnut oak, more typical of drier sites, produced much more feeble sounds that rarely lasted for more than 15 seconds. The chestnut oak, like the red oak, sweet gum, and shag bark hickory, produced inspirational sounds in the absence of leaves in March, when air temperatures were in the 50's. The white ash, on the other hand, a noisy tree in the fall, was fully inactive in March.

At low temperatures, trees with few leaves produced less (or no) sound. In some cases, trees had both noisy and quiet sectors. We disturbed the tissue sufficiently to ensure that vessels were broken. This suggests a multiplicity of moisture supply routes within a single tree. It also indicates that a single woodpecker or population of boring insects will not "short-circuit" an entire forest.

CARL J. GEORGE
Department of Biological Sciences, Union College, Schenectady, New York 12308
DANIEL SMILEY
The Mohonk Trust, Mohonk, New Paltz, New York 12561

Methadone Treatment and Drug Experimentation

At least one aspect of methadone treatment has not been discussed widely, although it warrants further investigation; that is, when a chemical solution is tried as a remedy for a chemical problem [to paraphrase H. L. Lennard, L. J. Epstein, M. S. Rosenthal, and A. Bernstein, (Letters, 16 Mar., p. 1079)] the chemical strategy as a solution for all sorts of problems may generalize and several drugs may be explored.

This concept is illustrated by our observation that long-term heroin users, supposedly inflexible in their choice of a drug, suddenly experience a rebirth of drug experimentation when they attempt the shift from illegal narcotic use to methadone maintenance.

The first stage in the addict's pattern usually begins with a sporadic, inconsistent use of methadone, with heroin at times used interchangeably with methadone. This stage subsides within several months, after an optimal methadone dosage level is found. This is followed by a second stage—shooting heroin "over" methadone, that is, using both drugs simultaneously to achieve a euphoric effect. Then a third stage occurs, characterized by greater experimentation and considerably more curiosity-seeking and risk-taking—that is, "backing up" methadone with barbiturates and ethanol, apparently to support the effects of methadone by adding the impact of barbiturates and alcohol. Reportedly, the synergism of these chemicals in combination produces a qualitatively different "high" than that experienced from other drugs alone or combined—an effect especially euphoric for heroin addicts. This stage generally diminishes when such nonchemical strategies as psychosocial rehabilitation take hold. The fourth stage is marked by the heavy use of marihuana (for some addicts, the first time it has been heavily used); as in an earlier time, when "cured" addicts shifted to alcohol abuse, the use of marihuana frequently becomes a well-integrated part of daily living, persisting for a long time. These stages are not necessarily fixed in the order cited nor are they delineated only by the combinations noted above.

Such stages in drug use after an addict enrolls in a methadone maintenance program have all the appearances of phases in experimentation or testing. But perhaps such periods of assessing drug effects should not be too surprising, since the act of voluntarily seeking admission to a methadone maintenance program itself already may be indicative of a decision to experiment with different types of chemicals—a cognitive choice to explore further dimensions in the chemical strategy as a means of handling everyday problems.

It would appear that, for a long-term user of narcotic drugs, the introduction of a methadone program is a manifestation of a direct challenge to cognitively fixed behavior and that subsequent behavior is characterized by a cycle of experimentation with new drugs in new combinations. Any future debate about treatment should include documentation of frequency and types of drugs chosen throughout the therapeutic course.

JACK W. FUDGE
Drug Dependence Treatment Center, Veterans Administration Hospital, Dallas, Texas 75216
WALTER E. PENK
Veterans Administration Hospital, Dallas