

of Health, however, declare that electron microscopy alone is insufficient to demonstrate tissue damage.

**Although** a number of the scientific investigations underway seem to show inconclusive results, one new development has turned up recently in the cyclamate question.

Originally, Abbott scientists contended that cyclamates posed no threat because they are not metabolized by the body "Cyclamate is simply excreted as cyclamate," they said.

Then, Japanese researchers reported that some individuals excrete a toxic compound called cyclohexylamine, indicating that the body does break cyclamate down into a metabolite. Work at Dr. Coulston's lab supports this finding, as does recent research by Abbott scientists.

Cyclohexylamine is found in the urine of about 12 percent of persons consuming cyclamates, even at small one or two gram doses, according to Dr. Coulston. When inhaled or applied to the skin, cyclohexylamine, which is used in manufacturing processes and in insecticides, causes dermatitis and may even lead to convulsions. What effect it has when it appears in the body as a breakdown product of cyclamate, however, is not known.

Abbott scientists point out that in 17 years of use, there have been no reported cases of poisoning or death in any individuals who might have been cyclohexylamine excretors.

Because his studies are not yet completed, Dr. Coulston says he can neither exonerate nor condemn cyclamates. However, he urges caution in their use. "Use should be restricted to persons who really need to cut out sugar," he says. "It is possible their use will get out of hand." The greatest potential threat from cyclamates is to children who may drink four or five bottles of diet cola a day, along with artificially sweetened candy and cookies, scientists says. But only one study on children has been reported and that "was not particularly conclusive," according to FDA officials. They expect Dr. Coulston's experiments to be extended to children sometime in the next year.

**While all this** is going on in the United States, the British Government this month lifted its ban against the use of cyclamates in that country. As of Aug. 1, sodium cyclamates in liquid or tablet form were legalized; as of Dec. 1, foods containing artificial sweeteners will be legal.

After reviewing all of the scientific data on the subject, including the finding that some persons do metabolize cyclamate and excrete cyclohexylamine, the British concluded that the evidence was insufficient to warrant a prohibition of artificial sweeteners. ♦

## REACTOR DISPUTE

### Teller Attacks Breeder Safety

As nuclear power reactors are being accepted more and more by utility companies as the electric power source of the future, both Government and industry are pushing development of even more efficient uses of the power in the uranium atom.

**Heading the list** of projects is the so-called fast-breeder reactor (SN: 12/31/66), a sodium-cooled version which is getting major emphasis in the



Power Reactor Development Co.

**The Fermi breeder: too dangerous?**

Atomic Energy Commission's development program.

Last week, nuclear scientist Dr. Edward Teller, in a statement that drew widespread criticism, warned that the fast breeder may be too hazardous and not worth the risk.

Breeders are a long-range development aim. The power reactors being built now use low concentrations of the rare uranium 235 in fuel elements that have to be renewed regularly. The fuel costs in these reactors are fairly high, but engineering of the reactors is much simpler for two reasons: the low concentration of U-235 makes it easier to handle, and the uranium atoms are split by neutrons that are moving fairly slowly.

The inefficient slow reactors will continue to be economical to build up to about 1980, nuclear power experts believe. But about that time, uranium stocks may dwindle, particularly since the fissionable U-235 makes up less than one percent of natural uranium. Another isotope, U-238, makes up almost all the rest of the uranium as it is mined.

Breeders make use of the other 99

percent of natural uranium. U-238 won't fission easily, but when hit by neutrons it changes into plutonium 239, which will. In order to make use of plutonium breeding, the number of neutrons produced in the reactor has to be high—which means higher concentrations of U-235—and the neutrons have to be moving faster than in present-day reactors.

**It is this higher** concentration of U-235 and plutonium that bothers Dr. Teller. Big power units will need one-to-two tons of plutonium in concentrated form.

"I do not like the hazard involved," he says.

Dr. Teller, a leader in the development of the hydrogen bomb who has consistently played down the dangers of fallout and atomic weapons testing, believes that the development of fast breeders may never be justified, in view of the safety problems involved.

He claims in the August NUCLEAR NEWS that sources of uranium probably will be large enough to fuel less ambitious reactors for the foreseeable future. A big and systematic exploration for the element has never been undertaken, he claims. He also suggests that uranium could be taken from seawater economically, if the operation were combined with desalination projects now being developed in many parts of the world.

Breeder advocates in industry and Government dispute that approach. They believe that the safety problem, though serious, can be beaten. And they believe that the more economical use of uranium should be followed up, regardless of the supplies of the element.

Dr. Joseph A. Lieberman, nuclear safety director in the AEC's reactor development division, points to experience with experimental breeders already built, as indications that the safety problem can be solved. The U.S. has two breeders, the Experimental Breeder Reactor-II at the AEC's test station in Idaho, and the Enrico Fermi Power Plant at Monroe, Mich.

**The primary danger** in any reactor is the possibility that a fuel element might get too hot and melt. This could happen if the coolant, which takes heat off the fuel to heat water and drive electric power generators, failed to circulate fast enough.

If a fuel element melted, it could bring a large amount of fissionable material together in a single lump, and the resulting concentration of energy could burst the shielding of the reactor. In that case, radioactive fission products present in the reactor could escape to the air, endangering the surrounding area.

(see p. 202)

A fuel element could melt in any reactor, but with the higher concentration of fissionable material in a breeder, the chance of an explosion is greater.

Last October, a fuel element in the Fermi reactor apparently did melt, but the escape of fission products was minimal. According to Dr. Lieberman, the Fermi accident was an indication that accidents can be contained. Although the experimental Fermi reactor—shut down since the accident—has only about half a ton of fissionable material, compared with the two tons needed for a large power reactor, the concentration factor is about the same. And it is the concentration of fissionable material which makes the difference between a breeder and a present-day reactor, and bothers Dr. Teller. ♦

#### DIETETICS

### Food-Borne Diseases

Although the United States has more wholesome food than most countries, microbiologists are concerned over the fact that fluid milk is the only food now subject to universal bacteriological control.

Changing methods in food preparation and distribution have brought about "unparalleled" interest in the microbial content of our food supply, Dr. E. M. Foster of the University of Wisconsin told the 50th annual meeting of the American Dietetic Association in Chicago last week.

Professor of bacteriology and director of the Food Research Institute in Madison, Dr. Foster is particularly concerned over nonsterile products that require little or no cooking.

"The true incidence of food-borne disease in this country is not known," he says. "Many outbreaks are never investigated and many others are never reported to the public health authorities. Estimates of the true incidence range from several hundred thousand to a few million cases a year."

In addition to the cases of salmonellosis from the *Salmonella* organisms and the deadly poisonings from botulism caused by the *Clostridium botulinus* organism, the less dangerous but annoying diarrhea caused by perfringens poisoning is being identified with increasing frequency. It is usually associated with meat and poultry dishes.

For example, the Communicable Disease Center's Morbidity and Mortality Reports in the past year have identified outbreaks of gastroenteritis and gas gangrene from *C. perfringens*.

One of the outbreaks was in Oregon, where 88 persons became ill after eating a luncheon in which chicken salad was served. Some of the people were ill as long as 36 hours. The salad was

found to be contaminated with *C. perfringens*, and the bacterial counts were as high as 60,000 grams.

The spores of *C. perfringens*, although widely distributed in the soil, do not cause any harm unless bacteria come out of the spores and grow. The colonies of bacteria are anaerobic, or can live without air, as they can without moisture. They do not grow when foods are refrigerated, but when the foods are heated and other bacteria are killed, the spores left at room temperature in liquids allow for contamination.

Although milk has been pasteurized for 50 years because people became alarmed about babies who sickened after drinking the contaminated liquid, other foods cannot be treated so easily. New methods must be found, and many bacteriologists are at work on the problem.

Industry practice and "in-company" standards in this country are high, Dr. Foster says, but the U.S. needs laws that will make its foods even safer than they are. ♦

#### APICULTURE

### Tailor-made Honeybees

Bees are among nature's most useful insects—they make honey and pollinate plants, and their social organization causes conjecture among entomologists, sociologists and psychologists.

Honeybees were brought to the United States from Europe in the early 1600s. There are now some 5 million colonies in the 50 states, producing about 250 million pounds of honey a year and 5 million pounds of beeswax.

The pollen preferences of honeybees are vital, because they handle more than 80 percent of all the pollination done by insects. If there were no honeybees, many plants would disappear.

Their agricultural value, in addition to honey and beeswax, is estimated to average just under \$100 per bee.

However, two of the problems beekeepers face are that honeybees will fly for food only as far as is necessary and are picky; given a choice, they will choose white clover over alfalfa because the former's pollen is easier to reach.

It was, therefore, good news to the 2,000 apiculturists attending the 21st International Apicultural Congress at the University of Maryland in mid-August that honeybees can be specifically bred to pollinate a particular crop.

Dr. Otto Mackensen of the U.S. Department of Agriculture's Apiculture Research Branch, Baton Rouge, La., reported success in breeding honeybees with a preference for alfalfa over other pollen sources. The preference is dependent on many genes and can be in-

herited, which is essential because worker bees live only four to eight weeks after honey gathering begins.

Dr. Mackensen carried out his breeding of honeybees for high and low preference for alfalfa pollen through five generations. In the fourth generation bees of the high line collected 66 percent alfalfa pollen, while those of the low line collected only eight percent.

In the fifth generation, at a location with limited pollen sources other than alfalfa, the high line collected 99 percent alfalfa, compared with 53 percent for the low line. At a location with more pollen sources, the corresponding percentages were 54 and two.

Dr. Mackensen reports that he is now investigating the possibilities of breeding bees with a preference for pollens of other plants.

Dr. Gordon F. Townsend, vice president of the organizing board for the Congress, says the discovery meant that bees could be "tailor-made to do the job you want them to do." Pear blossoms, for instance, have a musty odor and bees will not normally pollinate them if given a choice.

On the less encouraging side were reports of the threat chemicals used as pesticides, defoliant, fertilizers, fungicides and growth regulators have on bee colonies.

Drs. E. L. Atkins Jr. and L. D. Anderson of the University of California's department of entomology, Riverside, have studied the toxicity of such chemicals to honeybees, evaluating nearly 50 different compounds both in the laboratory and in the field. As many as 52,000 colonies a year are decimated in California from chemicals, they say.

To give protection, they recommend covering colonies with burlap or dark plastic material for one or two hours during and after chemical treatment in the early morning, especially when pesticides are applied by airplane. They also found that, with few exceptions, pesticides applied as dusts are more hazardous to honeybees than those applied as sprays, and that fine sprays are less toxic than coarse sprays.

Bumblebees may also be bred to take care of specific pollination tasks within the next few years, Dr. W. P. Stephen of Oregon State University reported to the congress. However, he says, studies in this area have just begun and its "potential fruitfulness is yet to be fully realized."

There has long been disagreement over the nature of many of the so-called "angel" echoes commonly observed by radar from regions of apparently clear atmosphere. Birds, insects and atmospheric refractivity are most commonly mentioned as sources of such echoes.