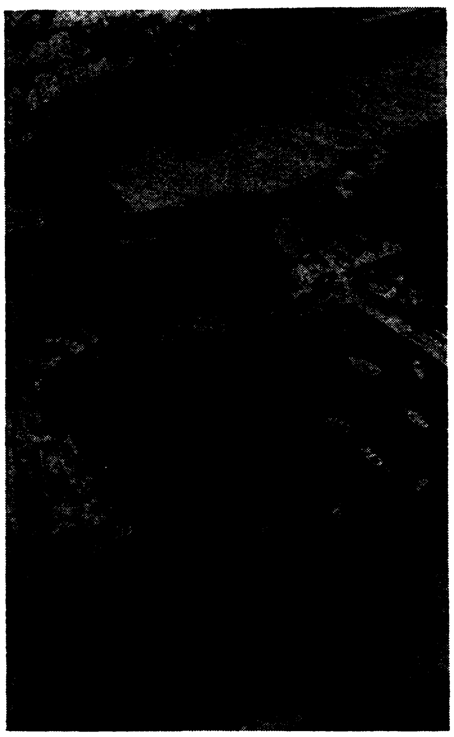
on the mass of a molecule and its velocity. This means that the lighter U-235 molecules move faster than the heavier U-238 isotope. Under a slight pressure, they will be more likely to move through a membrane so they can be drawn off. As in the centrifuge, the process is repeated until the needed concentration of U-235 is obtained.

The centrifuge's advantage as a clandestine source of fission material is offset by the fact that bomb uranium has to be highly enriched—about 90 percent U-235. It is this high refinement that gives the centrifuge system the most trouble; the size this requirement imposes on them strains existing materials technology. On the other hand, nuclear power stations can use uranium in which the U-235 content is only a few percent. In this range the centrifuge system might become valuable.

Oil, Oil Everywhere

The water pollution problem posed by the breakup of the oil tanker Torrey Canyon on a rock near Lands End, England, is apparently unprecedented.

Although some floating oil washed up onto beaches during World War II from torpedoed ships, it was never anything like the 118,000 tons of raw petroleum that poured squarely onto



UPI

Oil blackens Porthleven harbor.

English beaches from the sinking tanker.

Had it happened on a United States beach, we would probably be as ill-prepared as the British, according to a spokesman for the U.S. Army Corps of Engineers Coastal Engineering Research Center.

Eventually, the oil will probably either evaporate or disappear naturally, he noted, but there seems to be no way to calculate how long this will take. The problem has apparently never been foreseen. "I don't know of any report in print," he said.

In the meantime, attempts to fire-bomb the floating oil and burn it up were proving as unsuccessful as local efforts to dissolve it with detergents.

While oil released from the tanker's holds caught fire when the hulk was bombed by the Royal Air Force, it went out after consuming the oil's lighter components, leaving the blackest, stickiest, messiest part of the oil to float up onto the resort beaches in the area.

Nurture, not Nature In Schizophrenia

A Norwegian scientist is placing schizophrenia squarely back in the hands of psychologists. But there is no indication it will stick.

In one of the largest twin studies ever undertaken on this mental disease and its origins, Dr. Einar Kringlen of the University of Oslo has found environment more to blame than heredity.

If his interpretation is correct, says Dr. Kringlen, then the "so-called solution of the schizophrenia riddle will not come from any biochemical breakthrough," and expensive research "will most likely be worthless."

Dr. Kringlen's results, reported to an international conference on schizophrenia at Rochester University in New York last week, challenge those scientists searching for an inherited biochemical defect in schizophrenics. There are many, and at this point, the contest looks like an equal match.

Schizophrenia occurs in every population at a rate of about one percent. It "remains the central core of what we consider madness or unreason," according to Dr. John Romano, chairman of psychiatry at Rochester, and "constitutes modern psychiatry's greatest challenge."

The term schizophrenia covers a wide variety of diseases. No one knows for sure whether its many forms are even related. Some may be environmentally induced, by a bad home for instance; others may be genetic in origin.

Most recently, Tulane University researchers produced evidence that acute schizophrenia is an autoimmune disease, in which the brain manufactures antibodies against its own cells (SN: 2/11).

Still other recent work has attributed the disease not to genes, not to a bad home, but to poor conditions in the womb.

Dr. Kringlen does not rule out heredity as a cause, since his study of identical twins—who share the same genes—clearly indicates a genetic factor. But the factor was weaker than previous reports have claimed, he says.

If schizophrenia were entirely determined by heredity, then identical twins would have to show 100 percent concordance—that is, one twin could not be schizophrenic and the other normal. Instead, Dr. Kringlen found the twins to be concordant in only 25 to 39 percent of the cases.

The rate was higher than that found with fraternal twins—whose genes are not the same. They were both psychotic in 10 percent of the cases. Nevertheless, the difference is not great enough to make a strong case for heredity, Dr. Kringlen believes. That leaves environment as the more potent cause of madness, in his opinion.

His second major finding poses problems no matter which theory the scientist favors. "A normal twin," says Dr. Kringlen, "may be paired with any type of schizophrenia." Reason would dictate that whether a bad home or genes cause the illness, twins would fall somewhere in the same ballpark, a borderline psychotic with a neurotic, for instance. But that was not the case.

Moreover, birth order, birth weight, difficult birth, physical strength in early childhood and psychomotor development were, on the whole, of "practically no significance for later schizophrenic development," he concludes.

There was, however, a link between childhood personality and psychosis. In both identical and fraternal twins, the schizophrenic twin had been most often the lonely, reserved, submissive, dependent and obsessive one. What made him that way? Probably environment, says Dr. Kringlen.

Cryogenic Detector

As has been known for some 50 years, superconducting materials show no apparent resistance to the flow of an electrical current when cooled to temperatures near absolute zero—459.7 degrees below zero F.

Another, more fundamental property of superconductivity, discovered several years ago, is that each piece of superconductor behaves as if it were a single giant atom. This recently recognized property is related to the behavior of the electrons in the superconductor. These electrons all move in a precisely ordered way relative to one another, as do electrons within an atom.

By taking advantage of this characteristic, a superconducing detector capable of operating in the range of frequency from audio—about 10,000 cycles per second—through the radio and microwave bands to the far infrared—about 10 million cycles per second—has been developed and successfully operated in laboratory tests. This covers a range far broader than previously available with any other single detector known.

The device, now still in the stage of laboratory development, is likely to find its first use with radio telescopes, in the opinion of its discoverers, Drs. Arnold H. Silver and James E. Zimmerman of Ford Motor Company's Scientific Laboratory in Dearborn, Mich.

In addition to the radio astronomers' need for its great sensitivity, one reason they are apt to be the first to test the device under actual operating conditions is that they are accustomed to working with detectors that have to be cooled to very low temperatures, as are masers.

The detector is made by connecting two separate pieces of a superconductor with a very narrow—about one-millionth of an inch—superconducting link. The structure then becomes the equivalent of a giant, diatomic molecule.

When a direct current voltage is applied across two such weakly connected superconductors, the electrical current that flows through the diatomic connection is not constant; it oscillates at a frequency directly proportional to the applied voltage.

Because the electrons in the superconductors all move together in a precisely related way, the oscillating current is largely and easily measured. The relationship between voltage and frequency is such that for one-millionth of a volt, the frequency of the oscillation is approximately 500 megacycles per second, which is in the ultra high region.

When connected to an appropriate antenna, this oscillation becomes a transmitter of electromagnetic radiation at very small but yet detectable power levels.

As a detector, the weakly connected superconducting oscillator is used to pick up the incoming wave and convert it to some convenient frequency where it can be amplified by conventional electronics.

A related application of the oscillator-detector is as a wide-range spectrometer for measurements on the absorption or emission of electromagnetic radiation by various materials. In this manner, the device can very sensitively detect the characteristic resonances of many substances in the frequency range below the infrared.

Drs. Silver and Zimmerman reported details on the superconducting point contact oscillating detector they developed to the American Physical Society meeting in Chicago last week.

Hormone Insecticide

Sex lures, overcrowding, starvation and sterilization by high-intensity light have all been named as biological weapons in man's fight against insects. Toxic chemicals as insecticides are out of fashion because of their harmful side effects on man.

Biological pest killers are ascendant. And the next addition to the biological arsenal, possibly the most near-perfect yet, may be an insecticide that keeps insects from growing up and procreating. Scientists have isolated and structurally identified a juvenile insect hormone, one of two hormones that regulate the growth and development of all insects.

Normally, juvenile hormone is secreted from a tiny gland at the base of the brain in insect larvae and its production stops when adulthood is reached. If this hormone could be incorporated into an insecticide and kept continually present in the insect's blood stream, it would prevent sexual development. Juvenile hormone can penetrate the unbroken skin of larvae or can be taken in with the food. It is possible, therefore, for an insecticide compound to be sprayed on plants.

However, no immediate plans for pursuing the hormone's possible applications as an insecticide have been made because it has not been synthesized successfully. Studies of juvenile hormone were begun by Dr. Herbert A. Roller and colleagues in 1962. In four years they were able to extract only ten-millionths of an ounce of the hormone from giant silk worm moths. "We are now in the process of synthesizing this hormone," Dr. Roller says. "No insecticide studies are possible until synthesis is complete."

Dr. Roller counducted his research with two colleagues at the University of Wisconsin, Drs. Karl H. Dahm and Barry M. Trost, and with Dr. Charles C. Sweeley of the University of Pittsburgh.

In addition to its potential applications in controlling insect pests, identification of the hormone could bring new insight into the workings of all hormones, Dr. Roller believes. Knowledge gained from studies of hormone structure "may be generally applicable to questions of hormonal mechanisms in other animals, including man," he said.