

excreted in urine, is studying its metabolic patterns. "THC," he finds, "is metabolized in the liver. It is possible that the active agent is really a metabolite (or breakdown product) of THC rather than THC itself." Preliminary work at Worcester, to be published shortly, and other studies by Swedish researchers, point to the possibility that this is the case.

Other evidence, some of it produced by Dr. Louis S. Harris, working under a \$48,000 NIMH grant at the University of North Carolina in Chapel Hill, shows that THC inhibits microsomal (liver) enzymes that play a role in the metabolism of a number of drugs. This phenomenon could lead to potentially lethal situations. If, for example, a marijuana user also took barbiturates, he might be unable to metabolize those drugs. An accumulation in the blood could be fatal.

"The real point to our work," says Dr. Harris, who with his colleagues is studying THC in animals from rats to dogs and monkeys, "is the belief that it might be therapeutic." He is hoping to build, from basic pharmacological and toxicological experiments, enough information to permit human trials of THC in a year or two. "We just do not know very much about this drug in spite of the fact that it has been in use for centuries," he observes. "We need to know a lot before we can proceed to man with impunity."

Among other problems is the fact that there are few suitable tests for evaluating THC. "It exhibits a mix of both stimulatory and depressant activity on the central nervous system," he

finds, and is "unlike any other class of compounds. Classic tests are not always helpful." Nevertheless, Dr. Harris speculates on the basis of what studies have been done that THC might be valuable in at least three areas. First, it could be an antidepressant. Second, it has potential as an analgesic or pain-killer and might find a place in the arsenal of preoperative medications. And third, "more speculative than the others," it might become an antihypertensive agent. "It definitely lowers blood pressure," he states.

The possibility that marijuana is teratogenic, causing damage to unborn children, is a specter that as yet cannot be put down. One investigator who is beginning to explore this problem is Dr. Henry Pace of the University of Mississippi. "It may cause chromosome breaks with true (unrepairable) damage," he hypothesizes. Dr. Pace has \$52,000 from NIMH, with another \$67,000 slated for 1970, to test THC in a variety of species including rats, hamsters and rabbits. The rats and hamsters will be given THC in various doses at various times, some before gestation, some during, some both times, and their offspring followed through four generations. Similar regimens will apply to rabbits that will smoke pot.

Referring to other, unpublished work, Dr. Pace says there is already some information indicating that THC readily crosses the placenta and enters the fetus. He expects his own work to begin in a couple months. "We're breeding the first animals for initial tests right now." ◇

QUASARS AND PULSARS

Two of a kind

Two of the more startling radio astronomical discoveries of the last decade are quasars and pulsars. The quasars are powerful, concentrated sources of radio waves that in some cases coincide with objects of star-like size. The pulsars are powerful sources of pulsed radio waves. One of the sources has been identified with a pulsing star in the Crab nebula.

Distance estimates proposed by many astronomers put the quasars far out of our galaxy, while the pulsars seem to be in it or near it. Astrophysical theory has come up with a widely accepted model of a pulsar as the remnant of a supernova explosion, but it has been less successful in explaining quasars.

Now a physicist at the Massachusetts Institute of Technology, Dr. Philip Morrison, suggests that quasars and pulsars may be analogous objects, similar in their basic structure but with a tremendous difference in scale that makes them differ widely in details.

"A quasar is to a pulsar as a battleship is to a toy boat," says Dr. Morrison. Or, putting it somewhat differently, "a quasar is to a galaxy as a pulsar is to a star."

A pulsar in current theory is the core of a star that has exploded into a supernova. It is condensed, magnetic, and spins rapidly. It is surrounded by a plasma of charged particles which gives off the optical and radio waves and also serves as a drag to slow the rotation.

A quasar, says Dr. Morrison, is also a condensed, magnetic, spinning object. As evidence of magnetism he notes that intense emissions from quasars are polarized, vibrating in only one plane. Only a magnetic body could produce such polarization, he says. As evidence of condensation and spin, he gives the optical pulsations observed in the quasar 3C345. These come at intervals of about 320 days and last for 10 days. Their regularity argues for a spinning body, says Dr. Morrison; their short duration for a condensed one.

A quasar, Dr. Morrison concludes, is the condensed "relic of a galactic explosion." It has to be a galactic explosion because the power in the quasar pulses is several hundred billion times that of the sun, and only a galactic amount of matter could produce such power. A quasar is also surrounded by a cloud of diffuse matter that slows its rotation, he says.

As an example of the scale difference, Dr. Morrison compares characteristics of 3C345 and the pulsar NP 0532: The pulsar's rotation period

DRAFT

Changes and grad students

At 19 years of age men are more trainable and in better physical shape than they are at 25. This, says a White House spokesman, is why the President wants to start drafting 19-year-olds instead of the oldest available men, as is now done (SN: 5/24, p. 502).

The White House denies that any idea of equity, easing pressure from campuses or the plight of graduate students is involved. But the President's new draft program will help graduate students nevertheless. "Anything that dilutes the pool from which these men are called is going to help," says Mrs. Betty Vetter of the Scientific Manpower Commission.

Under the present oldest-men-first system, graduate students form a disproportionately large part of the available pool since they are no longer eligible for student deferments and they tend to be the oldest men available.

The President's plan is to make the 19-year-olds the prime draftable category and add to them the men whose student deferments expire. Both groups would then be eligible during one year only; individuals who survived the year uncalled would be safe thereafter.

The President would like to draft the 19-year-olds by a lottery that would draw dates of the year. Those whose birthdays were drawn would be drafted. The present law forbids such a lottery, and to establish it the President has to get Congress to remove from the law the sentence prohibiting it.

If Congress does not act—and House Majority Leader Carl Albert (D-Okla.) thinks it will not—the President will establish his prime pool of 19-year-olds anyway. They will then be drafted in order of their birthdays so as to take the oldest first and comply with the letter of current law.

is about three-hundredths second; the quasar's 30 million seconds. The pulsar's mass is less than that of the sun; the quasar's a few billion times the sun. The pulsar's spin should last about 3,000 years; the quasar's 30 million.

Dr. Morrison suggests that there may exist a whole series of objects with this kind of central, condensed, spinning magnetic mass, that differ in size and scale. The sequence could include active galactic nuclei, the nuclei of Seyfert galaxies, compact and N-type galaxies, and the radio-silent quasistellar objects (SN: 5/9/66, p. 245), in addition to quasars and pulsars.

SUPERSONIC TRANSPORT

Moving at last

Like a hesitant bather, the Nixon Administration has finally decided to get into the water. Overriding chilling objections of pressing social needs and sonic boom, President Nixon this week gave the go-ahead for construction of two prototypes of the \$4.5 billion supersonic transport. Able to hold 300 passengers and fly at 1,800 miles an hour, the SST is to be built by the Boeing Co.

After battling around a number of plans for financing the plane (SN: 5/17, p. 473), the Administration finally settled on the old expedient of simply asking Congress for the money—about \$662 million (plus a \$99 million carryover) for the next five years. The President wants \$96 million for this fiscal year and about \$600 million to complete two prototypes by 1972. More than \$500 million in Federal funds have already been spent on the project, and the total Government contribution is expected to hit \$1.3 billion.

The SST is not expected to be in full operation until 1978, several years behind the British, French and Russians, who are already testing their SST's.

The Nixon decision was, in part, prompted by their lead. "I want the United States to lead the world in air transport," the President has declared.

Aside from the objection that the money would be better spent on social problems, sonic boom is the most-hurled argument against the SST. Until it is overcome, declared Secretary of Transportation John A. Volpe, the SST will be prohibited from making overland flights.

It is conceivable that the SST could be prohibited from making any flights, should Congress not approve the money. Sen. Henry M. Jackson (D-Wash.), in whose state the plane will be built, expects a fight over the funds similar to the recent battle over the Sentinel ABM system (SN: 8/16, p. 127).

NORTHWEST PASSAGE

Oil, ice and ecology

The Northwest Passage was first crossed 116 years ago by Robert McClure, who had to leave his ship trapped in the ice and cross 200 miles by sled to meet a rescue party coming from the other direction. Roald Amundsen made the first passage entirely by ship, but it also took three seasons, beginning in 1903. Not until 1954 was the first single-season transit accomplished, by the Canadian ship Labrador.

Now a commercial vessel, the specially modified Humble Oil Co. icebreaker-tanker Manhattan, has cracked her way westward across the Arctic to the northern coast of Alaska. The state, for better or for worse, is clearly on the verge of a new era: an age of resource exploitation.

The death knell for a quieter, simpler Alaska was sounded in early 1968 when Atlantic Richfield, in partnership with Humble, announced the biggest oil strike in North American history. Conservative estimates of the bounty beneath Prudhoe Bay on Alaska's North Slope range between 5 billion to 10 billion barrels of oil. Others go much higher.

It was to test the possibility of ship transport for the oil that the S.S. Manhattan, already the largest ship in the U.S. commercial fleet, was quickly converted into an icebreaker and directed westward into the passage north of Canada's Baffin Island (SN: 8/23, p. 153).

She emerged in triumph from the mouth of Prince of Wales Strait last week, and by week's end was the guest of honor at a round of ceremonies at Prudhoe Bay and at Point Barrow, 150 miles to the northwest. The Manhattan headed back through the strait this week and will spend the next 30 days running tests in Melville Sound in the middle of

the Northwest Passage before continuing home to Philadelphia.

The ship has shown that a commercial vessel could make her way through the passage, but it is too early to claim that transit through the route by giant tankers has been proved an economic feasibility.

"They spent so much time learning to navigate the ship and getting out of the difficulties they got into a few times that they really were able to run very few tests of any length," says a Humble spokesman.

The scientists on board were disappointed, says Walter I. Wittman, an Arctic ice forecaster for the U.S. Naval Oceanographic Office. But he says they understood that the goal of the westward half of the voyage was primarily to get through the passage, not to conduct studies.

The 30-day period in Melville Sound is to be the real data-gathering stage of the mission. Scientists interested in such things as sea-ice physics will have more time for their investigations. And the engineers and technicians on board will be able to evaluate the ship's performance.

Basically the tests will consist of running the ship through uniform ice thicknesses at various speeds, while gathering data on variables such as the pressures exerted on the ship. The goal here will be to measure the ship's operating efficiency, to determine the most economical speeds for breaking through particular thicknesses of ice. This kind of information is needed to evaluate the long-term outlook for the tanker traffic across the Canadian Arctic to Alaska.

One thing already shown by the voyage is that "the Manhattan is the best icebreaker that has ever been built,"



Photos: Humble Oil Co.

Triumphant Manhattan: Now for 30 days of performance tests and ice studies.