natural sciences

Man heats his planet

Manmade heat may cause regional climatic changes in the future, according to research meteorologist James T. Peterson of the National Oceanic and Atmospheric Administration. Already, heat generated by automobiles, home heating, industrial processes and electrical power generation has lengthened the frost-free growing season by a month in Washington, D.C., in comparison to adjacent rural areas. Waste heat may also be affecting pollution dispersion, precipitation amount and human comfort in urban complexes.

Computers, programmed with mathematical models of the atmosphere, have been used to predict climatic changes. Various models indicate that when man's generation of heat equals one percent of the naturally absorbed solar energy, the average global temperature will increase about one degree C.

From 1950 to 1968, the annual amount of global energy used increased two and a half times. A forecast of future energy-use for the year 2000 foresees a further 10-fold increase. This amount is still less than one-tenth of a percent of the sun's energy reaching the earth. Yet, by the year 2000, Peterson says, the effects of thermal pollution on climate will spread over entire regions. Areas most likely to be affected are the Eastern Seaboard, Great Lakes, Florida, California and parts of western Europe.

Americans eating more fish

Six years ago, when the Catholic Church relaxed its rule of Friday meat abstinence, U S. fisheries feared fish consumption would drastically decrease. Yet today, Americans are eating more fish than before the Friday rule was changed.

In 1967, a year after the Church's decision, the U.S. per capita consumption of edible fishery products was 10.6 pounds—0.3 of a pound lower than in 1966. Two years later, per capita consumption rose to 11 pounds per person. In 1972 fish consumption reached the record high of 12.2 per capita set in 1927.

According to the National Marine Fisheries Service (NMFS) a component of the National Oceanic and Atmospheric Administration, the rise of fish consumption is due to the increase in both fresh and frozen fish sales but more significantly due to the increase of canned fish sales. The per capita consumption of fresh and frozen fish in 1972 was 6.9 while the figure for canned fish alone was 4.9. Tuna, "the secretary's friend," is the most popular of all canned fishery products.

Americans are still buying more fish on Friday than on any other day of the week, and the Lenten Season remains the busiest time of the year for fish processors and dealers.

Sea grass for livestock

Livestock may be finding a flowering sea plant known as turtle grass (*Thalassia testudinum*) in their feed soon. According to the Department of Commerce's FISHERY BULLETIN, turtle grass can be harvested twice yearly without any damage to the plant's ability to grow back.

Turtle grass is about 13 percent protein—richer than wheat grain. Experiments with sheep have found that when turtle grass (in pellet form) replaces 10 percent of the alfalfa in sheep ration, significant increases in weight gain and feed utilization occurs.

Turtle grass covers about 4 million acres of seaboard off the coast of Florida and far greater areas around the Caribbean and South Pacific Islands.

physical sciences

Antiprotons in the cosmic rays

One way of seeking evidence of antimatter in the universe is to look for it in the cosmic rays that reach the earth. So far no such evidence for antimatter has been found, but that does not certainly indicate that none is there. The observations may not be delicate enough.

One form of antimatter to look for is antiprotons. But if antiprotons were found, some or all them could be the result of interactions between the cosmic-ray *protons* and interstellar hydrogen.

In the June 18 PHYSICAL REVIEW LETTERS T. K. Gaisser and R. H. Maurer of the Franklin Institute present theoretical calculations setting a limit on this interstellar antiproton production. At any energy, they report, there should be no more than 4.6 antiprotons per 10,000 protons arriving at the upper atmosphere. At the 2-billion to 10-billion electron-volt energies of particular interest the limit ranges between 4 and 100 per million. Observation so far is able to say that there are no more than six antiprotons per thousand protons. If some should actually be found, and their numbers lie between the two limits, astrophysicists could conclude that antiprotons were coming either from some aggregation of antimatter in the universe or from some astrophysical process that produces antimatter.

Importance of a rare meson decay

The ways in which the meson called K-zero-long (K_L^0) decays radioactively have for some time now presented particle physicists with a dilemma that brings into question some very basic principles of physics. At issue particularly is a mode of decay in which the K_L^0 turns into two muons.

Experimenters have had trouble discovering this mode of decay. It should occur very rarely, but nevertheless its occurrence is demanded by theoretical attempts to understand the weak subatomic interaction, which governs this kind of decay. If the two-muon decay does not happen it also brings into question the principle of conservation of matter and energy: The numbers of K_L^0's taking the different modes of decay open to that meson do not add up properly, and it appears that some of them are vanishing without a trace.

Up to now the experimental box score has been one experiment that reported not finding the two-muon decay and one that reported finding it, leaving still a good deal of doubt about the question. Now there is another positive result. It comes from an experiment at Brookhaven National Laboratory by a group from BNL, CERN and New York University (W. C. Carithers, et al). They report in the June 25 PHYSICAL REVIEW LETTERS that they find the two-muon result occurs 11 times in a billion decays.

The planetary system of Barnard's star

Observations of the motion of Barnard's star from 1916 to 1919 and from 1938 to the present have convinced Peter van de Kamp of the Sproul Observatory that the star has at least one and possibly two planetary companions. Van de Kamp first proposed a Jupiter-like planet revolving in a highly eccentric orbit. Later he said that the data would equally support two planets with periods of 26 and 12 years.

In a forthcoming issue of ICARUS David C. Black and Graham C. J. Suffolk of NASA's Ames Research Center contradict van de Kamp's uncertainty. They say his own data require at least two planets of approximately Jupiter's mass in 26- and 12-year orbits inclined to each other at 50 degrees.