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COVER: The X-24B, the newest version of the lifting body, began flight tests last month. The wingless configuration has high lift-to-drag ratios at hypersonic speeds. It may be the shape of future military aircraft that can cruise above Mach 5. See page 171. (Photo: NASA)

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Energy: Once more, with feeling

The Administration's latest energy initiative, unfolding for the last two weeks, will almost certainly force a showdown with environmentalists over a wide range of issues, from the Alaska pipeline to revision of the Clean Air Act, and may already have begun a new confrontation between this country and Middle Eastern oil producing states.

After holding a special Cabinet meeting on energy, attended by Environmental Protection Agency Administrator Russell Train and the director of the White House Energy Policy Office, John Love, President Nixon told reporters he will push for immediate Congressional action on the Alaska pipeline, deep-water ports, deregulation of natural gas prices and the Administration-backed strip-mining bill—all vigorously opposed by environmentalists. In addition, the President announced other, executive actions to ease the short-term fuel crisis, including relaxation of emission standards, and possibly opening Naval fuel reserves to civilian use.

Critics immediately charged that the Administration was lowering air pollution standards rather than imposing mandatory allocation of clean fuels for political reasons. Love told reporters the country would need large quantities of imported, high-sulfur oil to get through the coming winter. Train, however, broke with the White House by saying clean air standards should be relaxed only if mandatory fuel allocations were imposed to ensure a supply of low-sulfur fuels to areas needing them most to prevent hazardous breathing conditions. So far, the President has heeded the advice of Love not to implement mandatory allocations, relying rather on voluntary cooperation by the oil companies.

The voluntary program, however, has

come under sharp fire from consumers, particularly in the Midwest. Minnesota Civil Defense director F. James Erchul told SCIENCE NEWS his state has had "very little success" in getting the oil companies to allocate adequate supplies of fuel to farmers. Getting enough propane to dry harvested crops has been a particular problem, he said, and an expected 25 percent shortfall of the fuel could mean much of this year's bumper corn and soybean crops might rot in the field.

To burn imported, high-sulfur oil or use the abundant, inexpensive supplies of high-sulfur coal, states must ask EPA to exempt them from the ambient air quality standards of the Clean Air Act. The procedure has been used before, and the Administration has already requested states to slow down implementation of the act's secondary standards ("general welfare"); but Nixon's most recent announcement will probably signal the first sanctioned breach of primary air quality standards ("health and safety").

For longer term solutions to the energy crisis, the President announced that he, Train and Love will soon meet with members of the Atomic Energy Commission to plan a strategy to invigorate the sagging nuclear power program, now foundering on numerous lawsuits brought by environmentalists. Dismissing the "old wives' tales and horror stories that are told about nuclear plants and all the rest," Nixon said he had the support of Train to push forward "to develop nuclear energy in much more exciting ways."

Meanwhile, a new potential crisis over supplies of imported oil appeared to be developing. Saudi Arabia's minister of petroleum declared the existing, hard-fought trade agreements reached with American oil companies (SN: 5/19/73, p. 342) to be "dead,"

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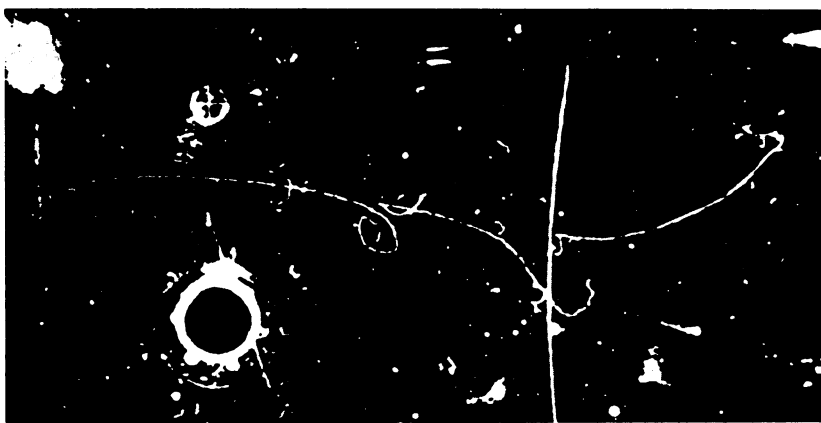
Two steps toward a unified field theory

An old dream of physicists is to devise a unified field theory, a theory that would encompass all four of the known physical forces or interactions into one framework. It would provide a single mathematical expression from which all the phenomena of gravitation, electromagnetism, and the strong and weak forces of the subatomic world could be derived. It is thus a kind of modern-day philosopher's stone.

A union of two of the forces would be a start on the way to a totally unified theory. Albert Einstein spent years of effort in the latter part of his life on an unsuccessful attempt to unify gravitation and electromagnetism. In recent years it has seemed more advantageous to start with the electromagnetic and the weak interactions. Mathematical and physical similarities between these two kinds of fields indicate that a relation may more easily be found than in some other cases. Among physicists working on such theories, Steven Weinberg of Massachusetts Institute of Technology and Abdus Salam of the International Center for Theoretical Physics in Trieste are prominent. Two recent experimental events lend support to the quest. One provides direct evidence in favor of unifying theories; the other *can* be taken in favor of them.

The first event, from the CERN laboratory in Geneva, is causing great excitement among particle physicists. It comes from neutrino experiments done in the laboratory's large bubble chamber called Gargamelle. The evidence is found in one out of 800,000 photos analyzed, and it consists of the track of an electron that begins abruptly in the middle of the plate. The track is interpreted as the result of an interaction between an electron and an antineutrino of the muon variety (which would be invisible in the bubble chamber).

Such an interaction is prohibited by the older theory of the weak



CERN Courier

Track of electron struck by antineutrino begins above big circle at left.

interaction, which holds that particles can interact weakly only if they exchange a unit of electric charge. Thus for instance, an interaction such as neutrino plus neutron yields proton and electron is allowed since here the neutrino and neutron exchange a unit of negative charge so that the neutron becomes a proton (with a positive charge of 1) and the neutrino becomes an electron. In the interaction observed at CERN (antineutrino plus electron yields antineutrino plus electron), no exchange of charge occurs. Such interactions, forbidden by the old theory, are required by the unifying theories such as Weinberg's. Thus the observation may be taken as evidence in support of them.

But one event does not make a certainty. More have to be found. Physicists at CERN, at the National Accelerator Laboratory in Batavia, Ill., and most likely at other places where neutrino experiments are in progress are sorting through their records to see if they can find other instances of weak interactions taking place without charge exchange.

The other recent experimental event involves the possible detection of evidence for the existence of the intermediate vector boson. The intermediate vector boson is the particle that theory requires as the carrier of the weak interaction. It would carry the effect of the weak interaction from one particle to another, and so

would be exchanged between particles whenever a weak interaction took place. The old theory called for two bosons, one negatively charged and one positively (so as to be able to transfer the charge between parties to the interaction). The new theories call also for a neutral one to provide for the interactions without charge exchange. Weinberg's theory predicts the mass of the boson to be around 38 billion electron-volts—about 40 times the mass of the proton.

Evidence for a particle of this mass is found in a kink in the cosmic-ray spectrum found by a group from Leeds University in England, Walter Kellermann, Gordon Brooke and John Baruch. The kink appears in spectra taken near sea level at Haverah Park, England, but not in spectra taken from mountain tops or satellites. Thus it has to be due to something that happens when cosmic rays strike the atomic nuclei in the atmosphere. The Leeds group thinks this is the production of a new particle that might be the intermediate vector boson.

The Leeds group propose calling their particle the mandela after Nelson and Winnie Mandela, black activists in prison in South Africa. It is not the first time that a scientific name has been chosen for political reasons, but if the name sticks, it would be the first particle to bear a personal name.

and Libya's oil minister frankly admitted his country's recent take-over of all foreign oil companies was "a move toward implementing the principle of using oil as a political weapon."

President Nixon responded that "radical elements" in Arab oil producing states would "lose their market" if expropriation continues, but critics pointed out that the United States, acting alone, is in no position to stage a

boycott and that such off-the-cuff threats could only make matters worse.

Repercussions of the Administration's latest gambits can be expected soon. Sen. Edmund Muskie (D-Me.) has already called upon Love to justify before a Senate subcommittee lowering the clean air standards and the lack of mandatory fuel allocations. On a larger scale, full hearings on revision of the Clean Air Act will begin soon, and

SCIENCE NEWS has learned that already a concerted drive is developing to ease air quality standards and restrict the act's provisions to major urban areas.

As Train observed earlier, the public is beginning to feel the pinch of the Clean Air Act, but not yet able to see the results. Environmentalism thus probably faces a very tough fight in the months ahead. □