

10 had passed farther from the planet and followed a different course, its successor's future was less than certain—but the hardy probe survived. The dread flood of protons grew until 150 million of them were hitting every square centimeter of Pioneer 11 every second; they caused false commands, erroneous readings and altered current flows, and the instrument that was mapping the planet's heat distribution by infrared lost about 40 percent of its data in the period immediately following the encounter. But most of the data were there. And oh, Jupiter.

Reds, oranges, blues, yellows, whites and the poles. In their first look at the ends of Jupiter, Gehrels and his colleagues confirmed their expectations that the strikingly regular stripes girding the planet's equatorial region are simply missing. Instead, smaller mottlings and individual convection cells form random designs, with none of the large white regions of high, cool clouds that mark the lower latitudes. In the polar regions, says Gehrels, the cloud tops are lower, giving observers a chance to see farther down into the atmosphere. Although weeks and months of careful processing are required to be more certain, it is even possible, the images suggest, that the poles include regions of "blue sky," occluded only by light concentrations of aerosols, representing virtual "windows" into the ball of hydrogen that is Jupiter. Also, says Caltech's Guido Munch, it appears on preliminary evidence that the poles are a few degrees cooler than the rest of the planet. This would hardly surprise a typical earthling, but Munch's infrared scans from Pioneer 10 showed that Jupiter's mean temperatures seem to be the same on the day and night sides of the planet, probably because more than two-thirds of its heat comes from within.

One of the major features photographed by Pioneer 10, the wide, white south tropical zone that contains the famous great red spot, has changed in the intervening year. But, said Gehrels last week, it was atypically wide when Pioneer 10 saw it and ought more to resemble the narrower feature known from any earth-based photos. Sure enough, Pioneer 11's images revealed that its northern edge is breaking up, interrupted now with large, dark blotches of lower, warmer clouds.

Such findings are intoxicating experiences for the scientists who work with them, and most of the Pioneer 11 researchers seemed as excited with their new results as they were last year with those of its predecessor. The study of Pioneer 10's data will continue for years, and the findings of Pioneer 11 are less than a week old. And there's always Saturn. . . . □

December 7, 1974

## Israeli science: Push Toward Applied

*Science News Editor Kendrick Frazier is on a science reporting trip to Israel. This is the first of several reports.*

The room where passengers claim their luggage at the Tel Aviv airport looks like most other airports, except for the presence of a soldier standing in the middle of the room with a sub-machine gun. A short drive south to Rehovot takes one past more machine-gun-armed soldiers, most of them looking incongruously relaxed and unconcerned.

Once on the campus of the Weizmann Institute of Science, Israel's leading center of advanced study, the scene is quiet and peaceful, with nicely landscaped modern buildings and the sweet smell of lush vegetation. But the serenity is deceptive. Israel has always held scientists and learning in high regard. That shows no signs of changing. But two forces, one a severe economic crunch, the other a recognition of a need for more applied, as opposed to basic, research have begun to alter the course of science in Israel.

The economic pinch is hitting hard. "Quite a severe financial crisis has affected all the institutes in Israel," says physicist Gvirol Goldring, chairman of the Weizmann Institute's scientific council. The Weizmann Institute is about 20 percent short of necessary funds, for example, and it is working to find ways of employing many of its scientists in other places, such as private industry. "We've come to realize with a shock that this is our problem," says Goldring. "It's a test for us. At the moment we feel only the pain of it, the fears and the doubts. But I think we will come out of it much stronger, and wiser."

The perceived need to reorient research more to the applied end of the spectrum is more a long-term goal. It is part of a realization that although Israel has excelled in basic research, it has not done as well in applying that research to national needs. Nor has it sufficiently encouraged research and development by private industry.

Israel devotes 2.4 percent of its gross national product to research and development, the same as do the United States and Great Britain, and far higher than France, Japan, Germany and Sweden. Its numbers of scientists and engineers and numbers of students as a proportion of the population compare favorably with other countries.

Forty-five percent of all the research and development in Israel is performed by the government's defense laboratories. Thirty percent is done by universities (mainly basic research), 12 percent by industry and 10 percent

by civilian-oriented government laboratories.

Eliezer Tal, director of Israel's National Council for Research and Development (NCRD), acknowledges that the amount devoted to defense research is large but, in view of the threat to Israel from the Arab countries, he considers it essential. Nevertheless, he says, "we have to look for a better way to use defense research for civil purposes."

The 30 percent figure for university research, most of it basic, catches Tal's eye. "We have to question whether it is not too big for a small country."

Israel has had a cherished tradition for intellectual inquiry. Its extensive endeavors in basic research result partly, in Tal's view, from the respectful Jewish attitude toward learning. The government's attitude in the past has been to leave the scientists alone and let them do what they want to, says Tal, a cell biologist, but now that may have to be modified.

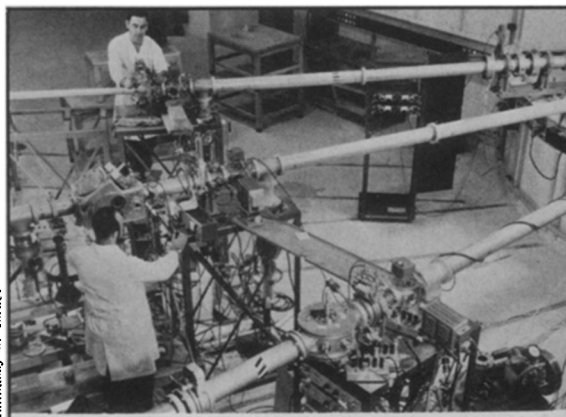
He emphasizes that he does not advocate reductions in basic research in Israel, but only that any increases go to applied research. "We should also concentrate on getting new scientists to go into applied research. Gradually, in five to eight years, we can get a better balance."

The other figure of concern, this time for being too small, is the 11 percent of R&D in Israel performed by industry.

The Israeli government has a 50-50 matching grants program for certain kinds of industrial research, and it has instituted an industrial research and development incentives program whose funding is up 40 percent since last year and which Tal hopes will not be affected by budget cuts hitting universities and government laboratories.

The president of the Weizmann Institute, Israel Dostrovsky, acknowledges that Israel has not done as good a job as it should in promoting applied research. He speaks of the phase lag be-

*Nuclear physics experiments in Israel.*



Embassy of Israel

tween basic research and applications based on it and of the need to narrow that gap.

"Basic research and academic institutions can flourish without central planning," he notes. "But with research directed to national needs, we need more centralized planning."

This is one reason Tal is looking forward to a possible reinstatement of a ministerial committee for science and technology, chaired by the prime minister. Such a committee was disbanded four years ago for internal political reasons, but now its reincarnation is being discussed. "The problems are such that we need it," he says.

Another problem the Israeli scientific community is facing is finding jobs for scientists immigrating to Israel. About 350 scientists from the Soviet Union alone immigrated to Israel last year. But there is a surplus of scientists in Israel even without immigration, and finding jobs for the newcomers is difficult. A special Center for the Absorption of Scientists (CAS) has been set up in Jerusalem to assist. Tal says he believes the center will be exempt from any budget cuts. □

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## Two hearts are better than one

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Christiaan Barnard, performer of the first heart transplant, has done another first—implanted a second heart in the chest of a 58-year-old man to ease the strain on the patient's own diseased heart. One day after surgery, the patient was reported to be in satisfactory condition with both hearts beating at their own pace.

Barnard explained at a news conference following the five-hour operation at Groote Schuur Hospital in Cape Town, South Africa that though the right side of the patient's heart was normal, the left side had been practically destroyed by multiple heart attacks. The surgeons and his medical team bypassed the left ventricle of the patient's heart, cutting away about a third of the ventricle, and inserted a new left ventricle to relieve pressure on the older one. They then placed the new heart next to the right of the diseased heart with the atria and aortas from the two hearts stitched together. Each heart has its own pacemaker. According to Barnard, what the patient's older heart can't take care of, the new heart handles.

Barnard and his medical team are now watching for signs of rejection. "The beautiful thing," Barnard said at the conference, "is that if the new heart is rejected we can remove it, and the patient still has his own heart to keep him going." □

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## Hoopla, skepticism greet new engine

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Can a pair of small town inventors still shake the foundations of the automobile industry—creating a simple modification for conventional engines that can make almost any car get two or three times better mileage, plus lasting longer and giving off less pollution? Well, maybe.

The LaForce brothers, Edward and Robert, from Ambridge, Vt., caused a good deal of excitement in Washington last week by making claims like these before the Senate Commerce Committee. To back up their claims they conducted two highly publicized road tests, comparing the performance of a standard six-cylinder Hornet (which got about 19 miles per gallon in the tests) to one modified with their new technique (which got around 30 miles per gallon). Federal Energy Administrator John C. Sawhill told the committee the LaForce modification "seems to represent an important breakthrough." In private, associates of the brothers told the press that laboratory (dynamometer) tests showed the modified Hornet could get 44 miles to the gallon and that they were hoping for 100—someday.

Two modifications are involved: large, hard-to-burn fuel particles are separated through centrifugal motion in a funnel-shaped chamber, and valve timing has been modified to promote efficient burning. Recycled exhaust heat is used to break down remaining large particles.

Ralph Stahman, chief of EPA's Technology Assessment and Evaluation Branch told SCIENCE NEWS the LaForce brothers submitted an earlier version of their engine for official testing and that the results were "at best, so-so." He expressed skepticism about the currently publicized tests: on a steady 30-mile-an-hour test run, the standard Hornet should have performed much better than it did, he said, while the dynamometer test was unrealistic since

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## Giving acupuncture the needle

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Incredibly enough, within a span of less than four years since American scientists brought news of acupuncture back from China, the ancient art has confounded the medical world, wooed many disbelievers into being stuck like pin cushions and, most importantly, relieved many people of pain or disability. Long considered to be a pseudoscience by Westerners, acupuncture in recent times has achieved wide public acceptance and has gained the respect of many scientists who now believe that the technique of inserting needles into

it was conducted with negligible friction load. As for the valve-timing changes, a General Motors spokesman told SCIENCE NEWS that such modifications usually involve a substantial penalty in lost power.

An official EPA test of the new LaForce engine has been scheduled. □

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## Continent building: A theory rocked

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Rocks as old as any yet found on earth have been discovered in a quiet river valley in southwestern Minnesota. Although the granitic and gneissic rocks are about the same age as similar ones found in Greenland two years ago (SN: 10/9/72, p. 374), the major investigator, Samuel S. Goldich, calls the discovery a breakthrough in geologic research.

Goldich, of Northern Illinois University in Dekalb, and Carl E. Hedge of the U.S. Geological Survey in Denver reported the finding in the Nov. 29 NATURE. Using rubidium-strontium and uranium-lead dating methods, the team calculated the rocks to be about 3.8 billion years old, plus or minus 100 million years. This makes the Minnesota and Greenland rocks 300 million years older than any other dated terrestrial rocks. Older moon rocks have been reported.

The significance of the research, Goldich says, lies in the find's location. Outcroppings of the rocks were found in a narrow band along the Minnesota River, exposed by glacial activity during the last ice age. The discovery of rocks this old in Minnesota may "cause the revision of the whole idea of how and when the continents formed," Goldich says. Until now, he says, the central core of North American continental formation was considered to be in Canada. But those rocks are a billion years younger. This implies that the central core may have been in a different, more southerly location, perhaps running from Minnesota to Wyoming. □

various nerve centers to relieve pain has an aura of scientific validity.

Scientists at the National Institutes of Health have recently thrown a wrench into the works of acupuncture supporters by demonstrating under controlled conditions that acupuncture is ineffective in increasing tolerance to electrically induced pain. Interestingly, tolerance to the same electrical stimulus was markedly elevated under hypnosis.

"It must be emphasized," says Choh-luh Li, senior author of the study,