

Images of Israel

Wariness at a border kibbutz, scientists as soldiers, excavations and Unesco, midpoint development, windmills on the Galilee, and tubeless desalination. Notes from a reporter's journey through Israel.

by Kendrick Frazier

The Kibbutz Kfar Ruppin, 20 miles south of the Sea of Galilee, overlooks the Israeli-Jordanian border. Directly beneath its hillside grounds, a barbed-wire fence and a mine field separate it from the narrow, meandering Jordan River, which marks the actual border. Inside the kibbutz workshop, a physicist demonstrates with obvious pride the workshop's products: simple and inexpensive instruments demonstrating fundamental scientific principles, for use by science students in Israeli schools. For a moment, it's easy to forget that you are on the Israeli border, only five miles from the Israeli town of Beit She'an, which achieved instant worldwide notoriety a few weeks earlier when attacking terrorists were killed, and their bodies thrown out an apartment window and burned. But the uneasiness returns when the physicist turns from being teacher to armed escort: Before showing us the grounds he slings a rifle over his shoulder, and it stays with him the rest of the time.

* * * *

The need for constant military vigilance is a tremendous drain on Israel, and it affects science as well as all other areas of national life. Scientific work is frequently interrupted by short-term military service. Scientists are continually shuttling back and forth between their laboratories and their military units, a few months with each at a time. The editor of the Israeli monthly scientific journal *MADA*, Kapai Pines, says he has spent six of the last sixteen months on military call up. Everyone agrees that this all serves to reduce scientific productivity, but it is stated merely as a fact not a complaint.

The role of scientist as soldier reached some sort of peak during the Yom Kippur War of October 1973. Scientists and students, along with most other able-bodied males, rushed to the front, and within a few days many laboratories at the Weizmann Institute of Science were almost entirely depleted.

At Technion, Israel's institute of

technology, which produces two-thirds of the engineers in Israel, 80 percent of the students and a large part of the faculty donned their uniforms. It wasn't unusual for a Technion teacher to find himself under the command of one of his students in the field.

At one point, three professors from Technion's faculty of chemistry undertook a two-day lecture tour to provide front-line soldiers with "intellectual nourishment." While their audience sat on empty ammunition boxes, the three professors discoursed on lasers, fluid crystals and infrared radiation.

One Ph.D. student from the Weizmann Institute sent a postcard from the front, both sides covered with chemical formulas, on which he wrote: "Firing has just stopped for awhile so I hasten to send you this brief report so that you can continue the work on the experiment concerning the mechanism of muscle contraction, which was being carried out just before I was called up."

Shortly after hostilities ended the board of governors of the Weizmann Institute—12 of them scientists—held their regular meeting at Rehovot and decided to conclude by visiting the soldiers at Israel's enclave on the west bank of the Suez Canal.

"Only perhaps in Israel," one of the participants in that tour wrote later, "would the visit of a dozen scientists—albeit three of them Nobel laureates—send shock waves of excitement through the veterans of a recent tough and bloody war."

"Only perhaps in Israel would soldiers jump from tanks and half-tracks to shake hands with scientific researchers and then eagerly initiate improvised road-side seminars on the more abstruse aspects of physics, chemistry and biology."

* * * *

Israel is a nation in the middle. Culturally and geographically, it and the rest of the Middle East are at the juncture of three continents. Politically, it is surrounded by enemies and knows its fate is in part determined by the ac-

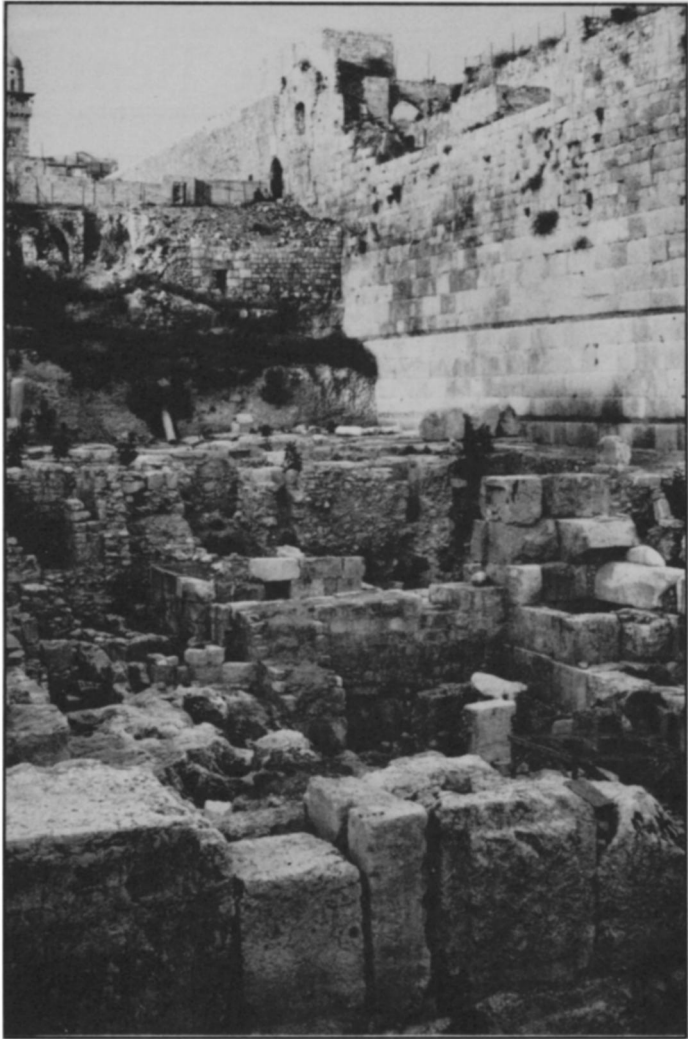
tions of the two major superpowers, the United States and the Soviet Union. Its capital, Jerusalem, is holy to not one but all three major monotheistic religions. And along the spectrum of national development Israel is also somewhere right near the middle. Sometimes it plays this to its own advantage, as indicated by the words of a prominent applied scientist at Technion, the institute of technology at Haifa, where research efforts are under way to improve Israel's industrial output: "When we need money," he says, "we say we are a developing country. When we want to sell something we say we are developed."

* * * *

The action in November by the United Nations Educational, Scientific and Cultural Organization that in effect bans Israel from participating in UNESCO programs has been greeted with anger and dismay in Israel. Scholars and public figures in many parts of the world have similarly condemned the UNESCO resolutions as blatantly political. When our group met with the President of Israel, Ephraim Katzir, in December, he referred to the UNESCO action as a source of "really great unhappiness" in Israel.

The specific grounds cited by UNESCO in its action was Israel's allegedly "altering the historical features of the city of Jerusalem and undertaking excavations which constitute a danger to its monuments."

Since 1968 Israel has been conducting an extensive project of archaeological excavations in Jerusalem immediately south and west of the walls of the Temple Mount. Temple Mount is the site of the First Temple built by King Solomon and destroyed by the Babylonians in 586 B.C. and of the Second Temple completed by the Jews about 515 B.C. and destroyed by the Romans in 70 A.D. The character of the area under excavation was molded decisively by the building activities of Herod the Great toward the end of the 1st century B.C. Herod greatly extended the precincts of the Temple Mount.



Portion of archaeological excavations outside the western wall of Temple Mount in Jerusalem.

The famous Western Wall, a spiritually powerful symbol to the Jews, forms part of Herod's massive ramparts supporting his extension of the temple.

Our visiting group of science writers visited the excavations in December, not to try to judge the UNESCO claim (the subject wasn't even brought up) but to receive a two-hour briefing on the archaeological work. If there is any validity to the UNESCO accusation, however, it wasn't immediately obvious from our brief look.

Several dozen scientists visiting the Weizmann Institute who have had more time to explore have signed a letter declaring they thus recognize "the absurdity of the claim that the excavations carried out in the Holy City have changed its character."

A group of 41 philosophers, sociologists, scientists, industrialists and legal experts from the United States, Europe and Israel, meeting in Israel in an International Symposium on Ethics in an Age of Pervasive Technology, asked UNESCO on Dec. 24 to reconsider its position "and once more live up to its role of promoting the cause of scientific and cultural understanding among nations."

* * * *

Peter S. Rudman, a physics professor at Technion, foresees a day when the dominant feature on the Israeli landscape will be windmills. Rudman has done an extensive study of the economics of wind power in Israel, including its "wind energy reserves," and concludes that "based on essentially present-day technology, we do have the wind energy conversion potential to satisfy all of Israel's energy requirements through the 1980's."

Rudman's interest in wind power is based on more than cost-effectiveness and suitable quantities of energy output. He is worried about the military vulnerability of Israel's present "dangerously concentrated" power generating capacity. Israel's generating capacity of 1,500 megawatts is produced by only three power plants—at Haifa, Tel Aviv and Ashdod. He fears one or more are logical targets for enemy attack. "Since impenetrable defense is improbable, it will be surprising if in some near future war Israel will not be disastrously deprived of one-third, two-thirds or more of its electrical generating capacity."

Rudman's solution is to decentralize. Windmills are the key. "Wind energy conversion on a significant scale is

highly dispersed with literally thousands of generating sites. Such wide dispersion minimizes vulnerability." Wind and solar power are also the only energy sources available to Israel without dependence on foreign supply.

Rudman envisions the construction of from hundreds to several thousand modern windmill towers, 50 to 100 meters high, with either single or multiple rotors, in areas of "high quality winds" in the Upper Galilee, along the Carmel coastal range and at Eilat. Initially each tower might produce 100 kilowatts, "but with experience" Rudman believes a 1 megawatt-per-tower figure should be attainable.

His windmill ideas are part of a broader proposal for eventually converting Israel to a hydrogen economy. He suggests the concept be tested using an Israeli kibbutz as a model community. The windmills would drive electric generators which would in turn power an electrolytic unit for producing hydrogen and oxygen. Part of the hydrogen would be used to provide the community's electrical energy requirements by a hydrogen/oxygen fuel cell.

* * * *

One major obstacle to large-scale desalination has been high cost of materials, especially the copper tubing used in the condensers. One now-discarded plan for a nuclear-electric-desalting plant for Israel would have required 20,000 miles of costly three-quarter-inch copper tubing.

Engineering professor A. Kogan of the Technion in Haifa has now made encouraging experimental progress toward a novel solution: His concept of direct-contact distillation does without tubes altogether.

In his multistage flash countercurrent unit, an open channel of heated sea water flows next to an open channel of cold distilled water. The condensation is done by direct contact of the vapor with the cold stream of distilled water. No metal surfaces intervene.

Tubes are required only at the end of the cycle to recover heat from the distilled water and transfer it to new brine. But for the tubes in this heat exchanger, Kogan uses not copper but newly developed varieties of very thin plastic. "It is not a very good conductor, but it is so thin it still conducts," he says. "There are now some plastics 1,500 to 2,000 times cheaper than copper which still have the strength to hold up to heat."

Kogan's direct-contact distillation concept is now in the advanced pilot-project stage. The pilot plant is now being enlarged to 40 stages, capable of producing 50,000 gallons a day of distilled water. This is the last stage before the plant is ready for industrial use. Before it goes industrial, it will be enlarged an additional 20 times. □