

years of age, the experimental children are still maintaining a 20-to-30 point IQ advantage over the controls. Heber summarized the project and discussed his most recent findings at last month's annual meeting of the Vermont Conference on the Primary Prevention of Psychopathology.

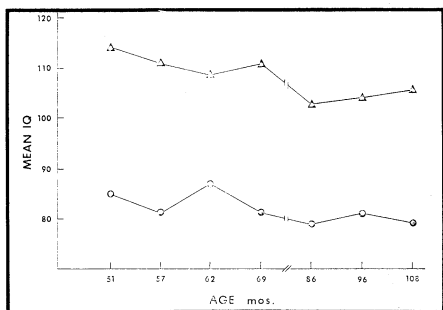
The project began in the early 1960s with questions about so-called sociocultural mental retardation. That is, mental retardation (IQ below 75) that exists in the absence of any identifiable nervous system disorder and is found to run in families from economically depressed areas. In order to find out more about this type of mental retardation, the researchers conducted a series of surveys in a section of Milwaukee characterized by census data as having the city's lowest median family income and education level and the highest population density and rate of unemployment. Though this area contained less than three percent of the city's population, it accounted for about 33 percent of the total number of children classified as educable mentally retarded.

Since most children born in the "slums" do develop normal intelligence, the researchers concluded that something other than economic conditions must be responsible for the high rates of mental retardation. Survey data revealed that mothers with IQs below 80 (less than half of those tested) accounted for almost 80 percent of the children with IQs below 80. Says Heber: "Our simple casual observation suggested that the mentally retarded mother in the 'slum' creates a social environment for her offspring which is distinctly different from that created by the 'slum-dwelling' mother of normal intelligence."

To test this hypothesis, Heber began a long-term intervention program in the survey area. During a period of more than one year, 40 newborn infants and their mothers (with IQs below 75) were selected and put in either experimental or control groups. All subjects were black, and the fathers were absent in many cases.

The experimental families began an intense rehabilitation program with two primary emphases: the education and vocational rehabilitation of the mothers and a personalized enrichment program for the newborns that began in the first weeks of life. In addition to vocational help, the mothers received some remedial education and training in homemaking and child-care skills.

The infant program began in the home, but when the children reached about three months of age it continued in a special education center on a year-round basis, five days a week, seven hours a day until the children were eligible to enter first grade at age six. The general goal of the education program was to provide an environment and a set of experiences that would allow the children to develop to their fullest potential intellectually, socially, emotionally and physically. The



IQ advantage maintained after 9 years.

program emphasized language development and cognitive skills.

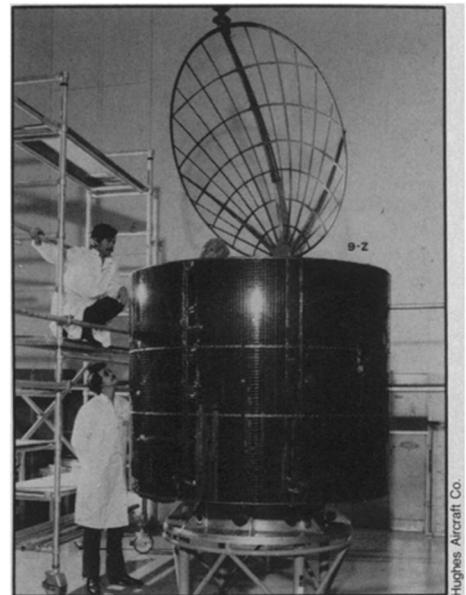
In order to assess the effects of the program, the children were tested often on a variety of measures—medical evaluations, general intelligence tests, experimental learning tasks, measures of mother-child interaction and a number of measures of language development. Both groups took identical tests on a schedule keyed to birth dates. No significant differences were found on medical or physical evaluations, but on every other measure the experimental children did much better. Differences in problem-solving ability and language development were especially significant.

Standardized IQ tests, such as the Binet, were used throughout the study and into the follow-up period. Results from the nine-year level have just been evaluated. Heber cautions, however, that these results should not be over-interpreted. Without a doubt, he says, repeated practice on the Binet (for both groups) has had some undetermined effect on the results. What is important, he says, is the continued difference in performance between the two groups. From 24 to 72 months, the experimental group maintained a 20-to-30-point advantage over the control group (120.7 compared with 87.2 at six years of age). The levels of IQ performance have been substantiated by an independent testing service. At nine years of age, three years after entering school, the experimental group is still performing in the normal range and maintaining more than a 20-point IQ advantage.

After entering school, the performance of both groups dropped. For the experimental group, this can possibly be explained as the result of a change in the treatment they received. While attending the intervention center, they were given breakfast, lunch and an afternoon snack. Some now report going to school hungry. Based on the comments of teachers, these children are also having behavioral and social difficulty in school. Often, explains Heber, these difficulties can be translated to mean "the child talks too much." The experimental children display the same behavioral problems as the controls, but, in addition, they are able to confront their teachers and classmates verbally. Whether this will be seen as an asset or a liability to the children is yet to be determined.

"Nevertheless," concludes Heber, "the performance of our experimental children three years into follow-up is such that it is difficult to conceive of their ever approaching the [lower] performance standards of the control group . . . our data, to this point in time, do nothing to inhibit the hope that it may indeed prove possible to prevent the high frequency of mental retardation among children reared by parents of limited intellectual competence under circumstances of severe economic deprivation." □

New portable phone and new satellite



Communications satellite for Indonesia.

Telephone communication may soon be easier for hurried urban dwellers in the United States and for remote islanders of Indonesia, because of two recent developments. A Philadelphia firm, International Mobile Machines (IMM), Inc., has patented and demonstrated a three-pound portable phone, and a Hughes Aircraft Company satellite was scheduled for launch this week to provide communications service to Southeast Asia.

The new portable phone is designed to fill a gap between the CB radio, which is lightweight and convenient but not compatible with the telephone system, and the conventional mobile telephone unit, which is heavy and takes up as much as half the trunk space of a car. The new unit is as portable as a CB, but interfaces with the telephone system through a control center, which must be within 5 to 10 miles of the user. The manufacturers foresee use by such diverse subscribers as doctors, journalists, construction companies and people in inaccessible rural areas.

Called an UltraPhone, the IMM device employs a frequency scanner to respond to calls coming in on one of several dif-

ferent frequencies. This system requires fewer channels than an assigned frequency unit. An incoming call is recognized by a unique two-tone code; outgoing calls are placed using a push button format.

Indonesia's new "Palapa" satellite represents an important experiment in the improvement of telecommunications for developing countries. The country has a unique communications problem—it is the world's largest archipelago, with 130-million inhabitants spread over 13,000 islands. Today there are only 250,000 telephones in the whole country, mostly concentrated in urban areas.

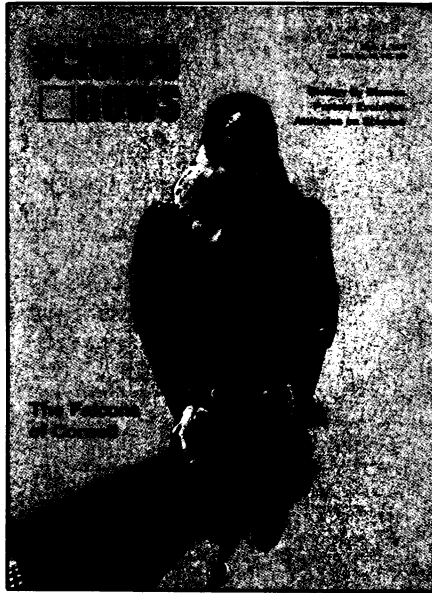
Beginning August 17, Indonesia's 31st Independence Day, commercial telephone and television service is scheduled to begin via the Palapa satellite, and within two years the total number of phones in the country is expected to more than double to 650,000. The satellite has 12 transponders, each capable of carrying 500 two-way telephone conversations, one color television channel, or various combinations of data and teletype transmission. Already a second satellite is scheduled for launch in 1977.

The \$71 million project should produce a number of immediate benefits. A national educational television network is planned that will extend elementary education to 85 percent of Indonesia's 7-to-12-year-old students. Domestic industry will grow as remote crews are sent to explore the nation's vast natural resources, while remaining in touch with their home bases. And benefits to other countries in the area should also result as Indonesia leases some of the satellite's capacity to its neighbors. □

Falcons— A happy ending

The years of patient research and husbandry by Cornell University ornithologists are at last paying off, as dozens of peregrine falcons were released this week in six states to repopulate habitats where the species had been entirely wiped out. Pesticides and auto exhaust had killed off the peregrines east of the Mississippi by the early 1960s, but environmental action has now made the area once more habitable.

The falcon work was pioneered by Thomas J. Cade and his associates at Cornell University (SN: 9/8/73, p. 158), where new techniques had to be discovered for breeding the birds in captivity and then training them to survive on their own. Care was taken to simulate natural nesting sites and allow the birds to form lifetime mating pairs. Conditioning the falcons for life in the wild was accomplished through a refined version of the ancient art of falconry, in which a human trainer oversees the young predator's long period of trial and error in hunting.



Previous releases of smaller numbers of birds illustrated other problems involved in reestablishing the lost population. The first birds released were shot by people who disliked the whole idea; so, with one

exception, the locations of this year's releases will not be announced. Also, locations will be chosen with some care to protect the young falcons from their natural enemies—last year two of the freed birds were killed by Great Horned Owls.

But previous trials have indicated that the ornithologists were correct in their theory that was critical to the success of the mission—that the birds would not migrate north of their birthplace and would not head south with the onset of winter. Should they have flown to Latin American countries where pesticides are still used indiscriminately, their survival would again have been jeopardized. Instead, the falcons seem to head toward the East Coast during winter months to prey on migrating waterfowl.

Some 30 peregrines will be released this year, in New York, New Hampshire, Pennsylvania, New Jersey, Maryland and Colorado, where they will join about a dozen birds that have survived previous releases. By next year, Cade's breeding facility (nicknamed Peregrine Palace) is expected to hatch close to 100 falcons for return to the wild. □

Switched-on membranes: Internal clocks

Flowers open and close, oysters wake and sleep, dogs scratch at the back door for afternoon walks, each following a circadian rhythm or internal biological clock. Humans have circadian rhythms, too, for sleeping, eating and other body functions—rhythms that can be disrupted by air travel, night shifts and irregular hours. An active search for the biochemical basis of internal timekeeping has been prompted by both scientific curiosity and a desire to control these uncomfortable disruptions in human cycles. A significant clue to that biochemical question has now been reported.

Biologists from the University of California at Santa Barbara, Marina Adamich, Philip C. Laris and Beatrice M. Sweeney, report evidence of membrane changes linked with circadian timekeeping in the June 17 NATURE. They chose a single-celled marine dinoflagellate called *Gonyaulax polyedra* for their experimental organism. Although, as a cause of red tide it has a bad reputation, (and is nearly unpronounceable, besides) it turned out to be a good choice for a number of reasons: Its bioluminescence (the famous, eerie glow, offshore at night), photosynthesis and cell division are all governed by circadian cycles. It is easy to grow in the laboratory. And as a unicellular organism, its internal clock cannot be linked to other cells or tissues.

Previous theories predicted that ions passing back and forth through membranes in a feedback cycle might generate regular, self-sustained oscillations and thus "timekeeping." Physical membrane changes had been seen in *Gonyaulax* and



Gonyaulax polyedra: Membrane testing.

other organisms, but Sweeney's group is the first to actually demonstrate chemical potential changes that fluctuate with circadian cycles.

The team grew *Gonyaulax* in an alternating 12 hour, light-dark schedule—then switched the cells to constant low intensity light during the experimental measurement period so the light changes themselves could not exert oscillating effects. They couldn't, for a number of reasons, measure changes in potassium ion concentrations across the cell membrane directly with electrodes. They used, instead, an ion carrier dye, valinomycin, that fluoresces when potassium concentrations are high in the cell's liquid medium. By adding potassium, measuring dye fluorescence changes, then comparing the results when the same amount of potassium is added during different times in the cell's circadian cycle, the team established that there are membrane potential changes during circadian timekeeping—a step toward someday controlling internal clocks. □