

Intelligence: Genetic or environmental?

Little, if no difference, in intelligence and academic achievement test scores exists between minority and white students when social and environmental factors are taken into account, according to two studies reported at the APA meeting. "This new evidence from two separate and independent studies is the strongest ever presented documenting that environmental and social factors affect test scores," said Edward J. Casavantes of the U. S. Commission on Civil Rights and chairman of an APA symposium on the effects of social and cultural variables on intelligence scores of racial and ethnic groups. Presenting their findings were Drs. Jane R. Mercer of the University of California in Riverside and George W. Mayeske of the Office of Education.

"Many social scientists have always felt that there were no basic intellectual differences between racial and ethnic groups, but until now there has been an absence of scientific data," said Casavantes. But these studies "identify the nature of the environmental factors that influence achievement and intelligence test scores and also outline the degree to which these factors affect test scores among different ethnic groups."

Finding a disproportionate number of black and Chicano children in Riverside classes for the mentally retarded, Dr. Mercer looked for

causes. She discovered that the black and Chicano students whose families were like those of the average middle-class whites had I.Q.'s equal to the whites. Also the I.Q. tests being used were 20 to 30 percent based on cultural background. When this background was accounted for, she found, the average I.Q. for all three groups was essentially the same.

Dr. Mercer's study was conducted locally, but Dr. Mayeske's analysis of school achievement tests was nationwide. He also found that minority and white achievement scores were almost identical when environmental and social factors were statistically canceled out. "The differences among the racial-ethnic groups approach zero as more and more considerations are taken into account," he reported. He concluded, "We intended to study the effect of race on test scores and ended by studying the effect of racism on test scores."

Some of the socioeconomic factors involved in both studies were the amount of space in homes, a mother who expected her children to go beyond high school, a father with more than nine years of schooling, a family that spoke English all or most of the time, a family that owned its own home, a rural or urban setting, geographic location (North or West as opposed to the South) and the overall effect of social class.

station and by docking a Soyuz with a Skylab-type station. No definite plans were made because the decision ultimately is a political one: Presently there are no approved NASA budget funds for such a mission between 1973 and 1977.

Three working groups from each country agreed on numerous details including coordinate systems and units, general location of docking equipment, manual control of docking, lights on the passive and active craft and communications systems and frequencies. It was agreed that on future craft the atmospheric system would be similar to that in the current Russian craft: normal air at one atmosphere of pressure (SN: 7/17/71, p. 39). Some details of the structure of the docking system were discussed, but the major decision, the exact design, will be discussed in Moscow at the next meeting in November. The universal design will probably be a ring and a leaf system in which four finger-like projections interlock, and latches secure the ring. □

The moon's interior

The moon may be more like the earth than most scientists had originally thought—at least in its heat-flow rate and gross structure. After a three-week look at the Apollo 15 returns, scientists last week reported their very preliminary findings—subsequent to change, as always, as more data are analyzed.

The first results from the heat-flow probes at the Apollo 15 Hadley/Apenine site indicate that heat escapes upward through the lunar material at a rate at least one-fifth that noted on the earth. This is about the same ratio as the radii of the moon and the earth (one-fourth). "One would have expected that, if he had assumed that the moon had the same isotopic composition of the earth," explains Dr. Marcus G. Langseth of Columbia's Lamont-Doherty Geological Observatory. But the chemical evidence from at least two Apollo sites had seemed to indicate that this was not the case.

The heat flow at the Hadley site is determined by obtaining the temperature gradient—the rate of increase in temperature with depth inside the moon—and the thermal conductivity of the material. The temperature probes from 90 centimeters to 150 centimeters show that temperature increases about 1.7 degrees C. per meter of depth. "That's a pretty substantial gradient," says Dr. Langseth. It can be explained in part, however, by the low thermal conductivity of the material: At its minimum value the material is an efficient heat insulator. If the lunar regolith is composed of loose, blocky material as many scientists believe it is, it could account for the low conductivity. For this reason, he says, one cannot extrapolate the temperature increases with depth. Below the regolith region is probably a more consolidated material where the gradient would drop off.

But the information may point to similarities in the composition of the moon and earth. Speculates Dr. Langseth: "If the heat flow from Hadley Rille is representative, and that's a big if, and if that heat flow . . . is equal to the total heat production inside the moon [or the moon is at a steady state] . . . and if the same condition exists on earth, then this minimum heat value would say that at least the abundance of radionuclides per unit volume inside the moon is comparable to that inside the earth." If the moon is undifferentiated (and there is now much evidence to the contrary), then the temperatures inside the moon would reach melting levels at depths greater than 500 kilometers. If the moon is differentiated, then the heat-generating elements would be moved closer to the surface, and there

DOCKING DISCUSSIONS

When Soyuz meets Skylab

When the United States committed itself in 1961 to race the Russians to the moon, few would have dreamed that 10 years later the two countries would be making plans for possible rendezvous and docking of joint spacecraft. They now are.

Last week the National Aeronautics and Space Administration released a 21-page summary of the approved minutes of the latest meeting between the two nations, held in June at the Manned Spacecraft Center in Houston. The general topic was compatibility of methods and means for rendezvous and docking. Although the major emphasis was on ways of assuring compatibility in future space systems (such as shuttles and space stations), more immediate plans were proffered: the testing of a still-to-be-determined system by docking an Apollo-type craft with the manned Salyut space

could still be relatively cold temperatures (below the melting point) at greater depths.

The seismometers now at three geophysical stations (Apollos 12, 14 and 15) are also yielding some unusual data. At apogee each month, when the moon is closest to the earth and the tidal strain is the greatest, moonquakes occur. Dr. Gary Latham, also of Lamont-Doherty, has identified about 10 active zones, but the most active has now been located about 1,140 kilometers south of the Apollo 12 and 14 stations and about 600 kilometers west of the crater Tycho. What may be more significant, in Dr. Latham's view, is that these quakes appear to be coming from a depth of 700 to 800 kilometers. This means that "the moon must be rigid enough at those depths to support these stresses," he says. (On earth, the deepest known quakes occur at 720 kilometers and they are rare.) A rigid moon would also corroborate the heat-flow model of a cooler moon at great depths and heating near the surfaces.

Seismic velocity changes from these quakes also indicate, says Dr. Latham, that the moon has a crust down to depths of 25 kilometers. "There is either a gradual or a sharp increase in velocities from 25 kilometers down to 60 kilometers," he says. At depths of about 60 kilometers, he sees velocities that reach 9 kilometers per second. In the earth such velocities are not achieved at depths less than 400 to 500 kilometers. The velocity pattern in the moon is difficult to explain, but it could possibly be due to the presence of peridotite. On earth, peridotite is believed to originate at great depths in the mantle. If further data support these findings, the moon may have a mantle-type structure as well as a crust.

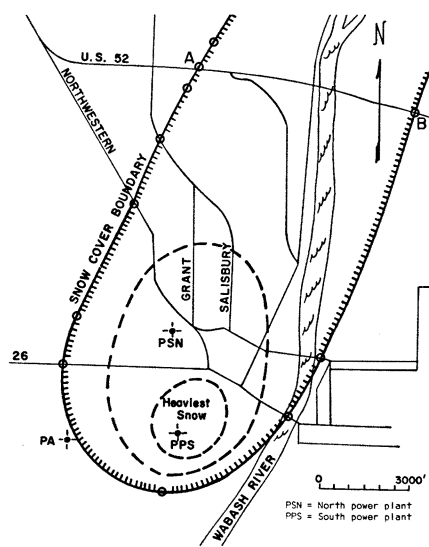
Another important discovery, says Dr. Latham, is that the moon has swarms of moonquakes—a series of small periodic quakes that on earth are quite shallow and are related to volcanic activity. By enhancing data received in April, Dr. Latham noted a swarm of 30 events over two and one-half days. They occurred at regular intervals of about two hours and culminated in the largest moonquake yet recorded.

What triggers these swarms and where they are occurring have not yet been determined. Dr. Latham suggests that they could result from the continued adjustment of the out-of-balance masses on the moon, such as mass concentrations known to exist in the large circular basins, or from mountains such as the Apennines.

Two magnetometers, one left on the surface at the Apollo 15 site and the other in the orbiting subsatellite, will obtain data that can be correlated with these findings. □

MAN-INDUCED SNOWFALL

Up went the ash, down came snow



E. M. Agee

Snow patterns and power plants.

Men have been deliberately seeding clouds for some time to produce rain, and a project under way in Colorado involves cloud seeding to produce snow. But man's activities may also sometimes accidentally produce precipitation.

The principle behind cloud seeding with silver iodide crystals is to provide nuclei around which water vapor in a cloud can condense. Evidence is accumulating that under proper atmospheric conditions particles discharged into the air by factories and power plants can play the same role as silver iodide and produce inadvertent rain.

On Jan. 11 of this year, favorable weather conditions and solid particles from the Purdue University power plants apparently combined to create a freak snowfall in Lafayette, Ind.

Dr. Ernest M. Agee of Purdue noticed that morning that throughout the city were patches of snow that varied in amount from place to place. He and two other Purdue scientists promptly surveyed the city to determine the extent of the snow. They found that the heaviest snow cover, about a quarter of an inch, occurred downwind from the larger of the university's two power plants. The boundaries where snow cover disappeared entirely described a roughly parabolic curve enclosing both power plants, and the boundaries of snow cover of one-eighth inch or more were an oval enclosing the plants.

These snowfall patterns alone were strong evidence of a relationship between plant emissions and precipitation. In addition, Dr. Agee reports in the *BULLETIN OF THE AMERICAN METEOROLOGICAL SOCIETY*, meteorological conditions were favorable for induced snowfall. A super-cooled fog had begun to blanket the area at 4 a.m. Addi-

tion of particles to such a fog would provide nuclei around which the water vapor of the fog could condense into snow. He hypothesizes that solid particle emissions from burning coal at the university power plants provided the nuclei. The plants were operating throughout the morning studied, and snow began to fall at 6:45 a.m. Previous studies of the chemical composition of fly ash from the type of coal used in the university power plants indicate the presence of several chemicals, such as aluminum oxide, that may have been effective nuclei.

There had been some precipitation elsewhere associated with a weak warm front that passed through Lafayette, but evidence indicates it was not responsible for Lafayette's snow.

To further confirm the hypothesis that the snowfall was locally induced, the scientists reasoned that other possible sources of industrial plant discharge might be surrounded by similar snowfall patterns. cursory examination of snow cover around two factories in the area showed patterns similar to that at the university, with the snow cover encircling the factories and the heaviest snow concentrated downwind. The simultaneous occurrence of locally induced snowfall under similar conditions, he concludes, "lends support to the hypothesis that the snowfall was artificially induced by local influences."

Dr. Agee says he knows of only one other recorded accidental snowfall, in Oak Ridge, Tenn., in the early 1960's.

REVIEW ORDERED

AEC delays nuclear plants

The Atomic Energy Commission last week ordered reviews of construction permits and operating licenses for 96 nuclear power stations throughout the nation, with the main thrust to be re-consideration of thermal effects. The review will effectively prevent construction or, in the case of plants already built, operation of the nuclear plants until there is assurance thermal effects are either harmless or controllable. A Federal Court of Appeals decision on July 23 sharply criticized AEC for its environmental policies; last week's action, in response to this criticism, reversed AEC's earlier policy of concerning itself only with radiation hazards.

The plants affected by the AEC decision have a total scheduled capacity of 100 million kilowatts. This represents about one-quarter of the nation's present generating capacity, and the delays could seriously aggravate the current energy crisis. □