Jensen: Environment *is* a factor in IQ

It's been eight years since Arthur R. Jensen's controversial research on the relationship between IQ scores and genetics was published in the HARVARD EDUCATIONAL REVIEW. In the 123-page article he argued that genetic factors are more important than environmental ones in determining IQ—a conclusion that triggered charges of racism and a whole new chapter in the nature versus nurture dispute.

Now the University of California at Berkeley psychologist reports he has detected an apparent, steady decline in IQ among rural Georgia black students, as they get older. But this "cumulative deficit in IQ" among 5 to 18 year olds, Jensen says, is almost totally due to *environmental* factors of living in depressed, disadvantaged conditions lower than those of whites in the same area.

"This means that the black-white difference at least in certain parts of the country does have an environmental cause," Jensen told SCIENCE NEWS. "Years ago we had no idea whether there were any environmental causes at all. Environmentalists presumed they [such causes] existed, but there were no studies performed that vigorously demonstrated this."

The findings do not reverse Jensen's previous conclusions that genetic factors may play a big role in determining original IQ scores at a young age, he says. But the latest results *do* mean that IQ discrepancies between whites and blacks "can't be attributed only to genetics," he says. And, Jensen readily concedes that he "didn't expect" to find such a large environmental factor in the Georgia study. In fact, his hypothesis going into the survey leaned towards "thinking maybe they [environmental influences] didn't exist."

A major reason for the psychologist's skepticism was his 1974 study of some 3,000 grade schoolers in Berkeley, in which he found no cumulative difference in IQ as the youngsters progressed from kindergarten through the sixth grades. IQ scores of the younger students were compared to the updated scores of their older brothers and sisters, most of whom had original IQ's comparable to their younger siblings when tested years before.

Since there was no decline in IQ among blacks or whites, Jensen concluded that environment did not affect scores. But he also believed that Berkeley—an area of liberal education and lifestyles—may not have been the most appropriate place to search for such an effect. "I thought that if it [an environmentally caused IQ deficit] didn't exist in a rural, depressed community, then it probably didn't exist," he says.

So, Jensen essentially duplicated his Berkeley study in a rural Georgia town (he declined to specify the community), where the standard of living was low for all, but particularly for blacks. Among the 653 youngsters tested, "blacks showed significant and substantial decrements in both verbal and nonverbal IQ's as a linear function of age . . . from about 5 to 16 years of age," he reports in the May DEVELOPMENTAL PSYCHOLOGY. While the mean IQ of the white children remained at around 102 throughout those years, the scores of the blacks dropped about one point per year and computed to a mean of 71.

Jensen attributes this "enormous difference" from the average IQ for blacks (around 85) nationally and in Berkeley to the environmental disadvantages of being a rural, southern black. "I can't say exactly what those factors are," he says. "They may have to do with nutrition, general health and a disadvantaged home environment." Still, Jensen says he believes that the original, overall IQ difference between blacks and whites (the white average is just under 102) may be partially due to genetics. But, he cautions, "this is not a proven thing."

Harvard psychologist R. J. Herrnstein agrees that Jensen's results "strongly suggest environmental factors." But he adds that the large drop in black IQ could also be due to "imperfect standardization of the test." IQ standards geared toward the white norm of 100 are perhaps inappropriately applied to many of those with nonwhite backgrounds, he suggests. □

Parents' aloofness slows twins' progress

Verbal and intellectual development among twin boys is slower than that of nontwin boys of the same age, University of Calgary researchers have determined after a study of 136 two-and-a-half-year-old males. However, the difficulties are linked more to how twins are treated by their parents rather than any congenital condition.

The researchers report that twins experience fewer verbal interchanges of all kinds with their parents and receive fewer demonstrations of affection—even after allowing for differences in parents' education levels. And in comparing verbal and other activity measures to 92 twins and 44 single boys, they found consistently better performances by the nontwins. Moreover, the test results suggest that "the prenatal and perinatal environment is a less important influence on language development than is the postnatal environment."

Hugh Lytton and Dorice Conway of the university's educational psychology department and Reginald Suavé of the faculty of medicine conclude in a recent JOURNAL OF PERSONALITY AND SOCIAL PSYCHOLOGY that "it is the parents' reduced speech that contributes to the twins' lower verbal facility, rather than a lower facility evoking lesser parent response." As to why such parents are less involved, the scientists suggest that "the greater pressure on twin parents' time is primarily responsible.

"It's generally a question of [the parents of twins] being much more harassed," they say. At the same time, twins form a coherent unit, giving the impression that they do not need as much attention as many other children. But, Lytton has found, a reduction in parental interest "means an impoverishment of the children's environment."

The twins chosen for the sample represented essentially all the male sets born in Calgary over a two-year period. Only boys were chosen in order to eliminate the sex variable. Single boys were selected from child health clinics. All the singles chosen had siblings within three years of their age. In a variety of tests and in-home observations, children were rated in vocabulary, positive and negative actions, attachment, independence, compliance, maturity of speech and internalization of standards—the degree to which they had adopted the parents' rules, without having to be reminded. Parents were rated on the consistency with which they enforced rules; use of reasoning; warmth; use of psychological rewards (praise and approval); use of material rewards (candy or toys); verbal-psychological punishment (criticizing, threatening, temporary withdrawal of love); encouragement of independence, and support of certain types of dependent behavior.

The most important parental difference in the results, say the researchers, was that the mothers and fathers of nontwins simply spoke more to their children than twin parents did to theirs. Singleton parents also engaged in more control behavior generally. They used more commands and prohibitions, more reasoning and more suggestions, and such mothers were more consistent in enforcing the rules they had laid down. Parents of nontwins in addition demonstrated more affection toward their youngsters and displayed more "positive actions."

Among the children, twins tended to speak less, as measured in rate per minute and as a percentage of all their actions. Their speech was also rated as less mature. Twins scored lower in internalization of their parents' behavior standards. The researchers found that the singletons' vocabulary IQ was significantly higher only where mothers did not attend college; the opposite was true when mother had attended college. Finally, singletons engaged in more total actions than did twins.

"We must conclude that twinship . . . has a considerable impact—possibly a greater one than social class—on chil-

dren's socialization experiences and development," say Lytton, Conway and Suavé.

The Calgary results "give us strong reason to conclude that the socialization practices by parents which go with twinship are chiefly responsible for these effects," they say. □

Chemistry of still-green fossil leaves

Thirty million years ago some green leaves from elm trees in Oregon were rapidly buried under volcanic ash. Some of those leaves are still a vivid green today. Researchers at the New York Botanical Gardens are analyzing the chemical composition of the very well-preserved leaves to learn how flowering plants have evolved. So far they find the chemical profile of the prehistoric leaves surprisingly similar to that of modern leaves.

The Oregon leaves are not the oldest leaves that have been studied: Green leaves, at least 60 million years old, were reported previously in Germany. However, no one pursued the chemistry beyond identifying chlorophyll, the green pigment with which plants capture light. "Our work carried that much farther to the point of finding flavonoids, fatty acids, steroids and various other compounds," Karl J. Niklas explains to SCIENCE NEWS.

The biochemistry of plants may provide as much information about evolution as do the bones of dinosaurs. Plants, much more than animals, vary in the chemicals they contain. "Plants are very special as a group of organisms, they produce very, very high concentrations of diverse and, in many cases, diagnostic metabolites," Niklas says.

Niklas, working with David E. Giannasi, analyzed the chemistry of a dozen of the preserved leaves from three trees of the elm family. When they pulverized the leaves, extracted them in solvents and analyzed the extracts with sensitive chemical techniques, the investigators detected about 50 different compounds. Almost all of those chemicals are also present in leaves of the nearest living relatives to the prehistoric trees. The results for the tree *Zelkova oregoniana*, whose descendants are now native only to Asia, are published in the May 20 SCIENCE.

Niklas and Giannasi are particularly interested in the chemicals called flavonoids. Among modern plants, this class contains more than 600 members. The most complex flavonoids are found only in the evolutionarily advanced flowering plants, while the lower ferns and mosses have only simpler types, and algae have no flavonoids at all. Flavonoids seem to have numerous functions in the plants, such as attracting insects with bright colors, regulating growth, capturing light and protecting the plant with bitter tastes. Two flavonoids were detected in the preserved *Zelkova* leaves, one called kaempferol and the other a closely related compound. "This appears to be the oldest occurrence of flavonoids in fossil sediments reported," the researchers say.

Although the preserved leaves avoided most of the reactions that turn plants into coal, Niklas and Giannasi found some chemical changes had occurred. But the sediments containing the leaves seem not to have been covered by hot lava flows.

An amateur paleontologist, Bake Young, in 1968 first discovered the leaves Niklas and Giannasi are analyzing. This summer Young plans to lead the scientists to the site near Succor Creek to collect more specimens. Niklas and Giannasi hope to also find such well-preserved leaves in other locations. "We now have a handle on chemical evolution within flowering plants," Niklas says. "We may also get an idea of geographic points of origin." □

Pioneer 11: Looking good for Saturn

On Dec. 3, 1974, when Pioneer 11 became only the second spacecraft ever to approach the planet Jupiter, its mentors already had another goal in mind. Aided by the huge world's gravitational pull, the probe passed under the planet, whipped up the far side at more than 170,000 kilometers per hour and reemerged "over the shoulder" of Jupiter to head back across the solar system for a 1979 rendezvous with Saturn. It had not been designed for such a trek, but the attempt was felt to be worthwhile.

Last week, on June 10, Pioneer 11 reached Jupiter's orbit a second time, this time on the "Saturn-bound leg" of its journey. With nearly two-thirds of its flight time behind it, a check of the probe reveals that the afterthought mission is likely to become a successful reality.

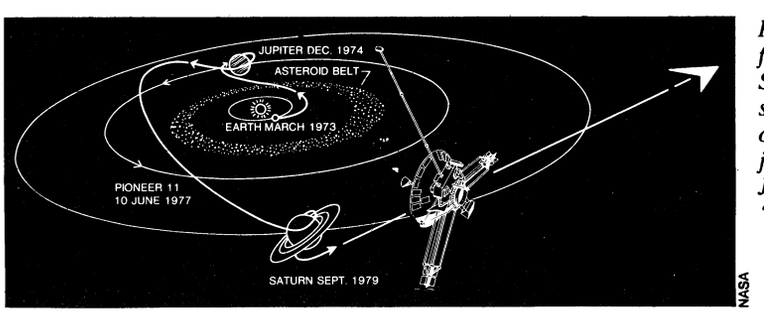
A key concern has been the amount of power that will be available by the time the craft reaches Saturn. Pioneer 11, like Pioneer 10 (which was not rerouted to Saturn), is powered by radioisotope thermoelectric generators (RTGS), whose electrical output diminishes with time. At launch, the RTG's were providing 166 watts of power, and engineers later predicted that 105 watts would be needed to do the job at Saturn. Believing that the devices would "degrade" at a constant rate, the engineers calculated that exactly 105 would be available—not a watt to spare. Instead, says project manager Charles Hall, the degradation rate seems to be slowing down year by year, so that 122 watts will be available at Saturn. There should also be 15 to 20 pounds of propellant left in the spacecraft's attitude-control system; the mission is expected to need only 6.

Only two of Pioneer 11's dozen scientific instruments have stopped working. An asteroid-meteoroid detector was turned off when its photocells grew too cloudy for use. A plasma analyzer for studying the solar wind and its interaction with planetary magnetic fields malfunctioned four months after the Jupiter encounter. Remaining, however, are the camera system (which doubles as a polarimeter and a zodiacal-light detector), two kinds of magnetometers, an infrared heat monitor, an ultraviolet photometer that can look for helium and for auroral effects, and a variety of charged-particle, cosmic-ray and radiation sensors.

There is also a device to count micrometeoroids, or space dust, which might seem useful in studying Saturn's rings, but it may have little to contribute in that role since it makes a measurement only once every 80 seconds. The spacecraft is expected to traverse the plane of the rings in less than half a second, so it would take extreme good fortune to produce a reading at just the right instant. The cameras are also unlikely to be able to "see" larger chunks, since the probe will be moving too rapidly by the time it is close enough to make them out. But there is a plan to seek variations in the light reflected from the rings as an indication of the particle size distribution. This fall, Hall says, the decision will be made whether to send the probe outside or inside the visible ring structure.

Meanwhile, the long trip from Jupiter to Saturn has been productive in its own right. The "slingshot" trajectory between the worlds has carried Pioneer 11 about 16° above the plane of the ecliptic (SN: 12/11/76, p. 373), making it the first spacecraft ever to provide earthlings with a look "down" on the solar system.

Date of the Saturn encounter: Sept. 1, 1979. □



Pioneer 11, first Saturn-bound spacecraft, owes the journey to Jupiter "slingshot."