because of the shrinking U.S. family. In 1962, the average newborn in the United States was the third child, and in 1979, the average U.S. newborn was the second child, says Zajonc, who not only looked at SAT scores but also studied data from the Iowa Basic Skills Test, which is similar to SATs but for children in grades 3 to 12. In scores for this test, he found a decline and subsequent rise consistent with those for the SAT.

Zajonc expects the younger children in the Iowa group, who will be taking SATs between two and 10 years from now, to be part of the continuing upward trend in scores, which he predicts will average between 510 and 515 by the turn of the century. "But because of the rising birth rate after 1980," he says, "a decline [of scores] will follow."

Family size also has a "gigantic" effect on other aspects of a child's education, including grades and whether he or she graduates from high school and goes on to college, says Judith Blake of the University of California at Los Angeles. Analyzing data from two national surveys of 56,000 white fathers, Blake found that next to the father's educational level, family size is the most important predictor of how far a child will progress in school, even more important than the family's socioeconomic status.

"Those [children] from large versus small families," she says, "lose about a year of graded schooling on the average" — mostly in the early grades. These differences between small (defined as one to three children) and large (six or more) families are evident, she says, even when IQ differences are controlled for in the study.

In a separate study of IQ, James V. Higgins of Michigan State University in East Lansing reports that larger families correlate with lower IQs among children. In his analysis of 300 families, Higgins reports that "parents of large families tended to have lower IQs," and concludes that the children, therefore, inherited similar IQ levels. Conversely, he says, "those [parents] with higher IQs tended to produce children with higher IQs."

All the researchers noted that there are, of course, exceptions, but that the large-family versus small-family differences are borne out for large populations. Still, Zajonc points out, an only child may be at a disadvantage in some ways and in fact does *not* obtain the highest SAT scores. "He has no younger siblings who would seek help and instruction from him," says Zajonc, "no opportunity to serve as an intellectual resource."

According to Zajonc, the findings on family size, paired with Zajonc's and others' results showing that those at the top of the birth order have the highest scores, suggest that the optimal situation seems to be a two-child family with a spacing of more than two years between children. —*J. Greenberg*

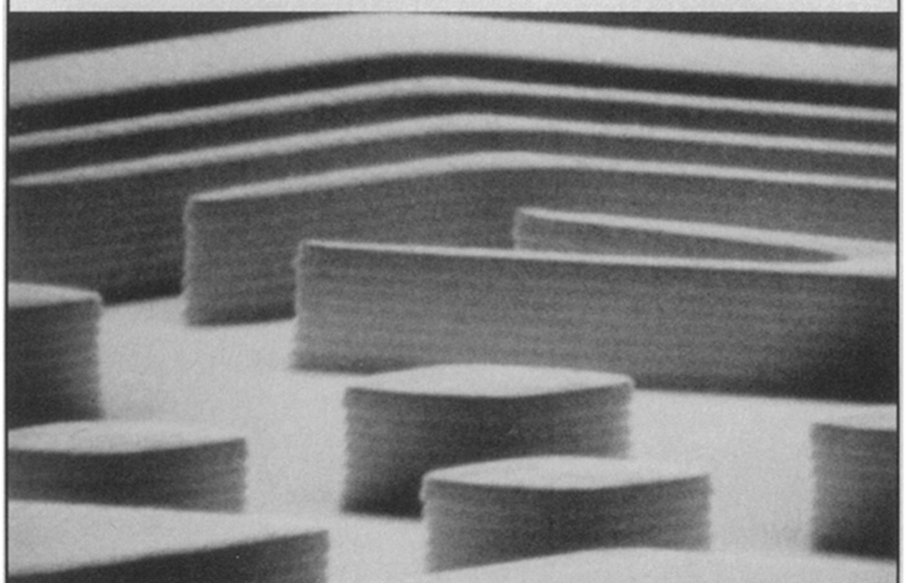
Sex differences found in human brains

The most conspicuous difference between male and female brains is that reported in rodents for an area playing a role in sexual hormone release and sexual behavior. This structure in males is larger and contains more cells than in females. Now Dutch scientists report a similar sex difference in human brains. Although there have been previous reports of shape differences for two other areas of the human brain, the scientists believe theirs is the first evidence of sex differences in cell number for any human brain area.

Brains of 13 men and 18 women were obtained at autopsy and examined by D.F. Swaab and E. Fliers of the Netherlands Institute for Brain Research in Amsterdam. One area, called the sexually dimorphic nucleus of the preoptic area (SDN-POA), was found to be on the average 2.5 times larger in men than in women and to contain 2.2 times as many cells, they report in the May 31 SCIENCE. In both sexes, the volume of this area and the number of cells within it decreased with age.

The sex and age differences observed are specific to the SDN-POA. In the same brains, a nearby area, the suprachiasmatic nucleus, which shows a sexual difference in shape, did not display a sex or age difference in volume or in cell number. The exact role of the SDN-POA and the chemical nature of the sex differences remain unknown. —*J.A. Miller*

Megabit chip builders can't resist this



IBM

These are not poker chips on a gaming table. Magnified 6,300 times, they are details from a photoresist, used in the making of microfine-featured integrated-circuit chips. A new photoresist developed by researchers at IBM's San Jose (Calif.) Research Laboratory allows the etching of these microstructures — some only one-hundredth the width of a human hair. In contrast to the current generation of computer memory chips that typically have minimum features between 2 and 2.5 micrometers wide, the new photoresist permits etching of structures a single micrometer wide.

The key to IBM's new photoresist is its sensitivity to shorter wavelengths of light — those around 300 to 400 nanometers (in the middle ultraviolet). Shorter wavelengths allow finer resolution of chip structures, and hence denser circuitry. This new photoresist was instrumental in IBM's ability to fabricate the experimental 1-megabit (1-million-bit) computer memory chip announced earlier this year (SN: 3/2/85, p. 135).

A photoresist is a light-sensitive chemical used to etch a three-dimensional mask onto the silicon wafers from which computer chips are made. When light is shone onto a chip coated with this new material, the photosensitive molecule (a member of the diazonaphthoquinone family) in those regions struck by light is converted into carboxylic acid. Later, when the coated chip is immersed in a weak-alkaline developer bath, the acid regions dissolve, leaving behind bas-relief structures like those shown here.

If those structures covered part of a metal plating on the chip blank, they would selectively mask the metal destined to become conducting circuitry on the finished chip. Metal uncovered by the etched-away portions could be removed in a subsequent etching process. To finally unmask the metal circuits, the photoresist structures are chemically stripped away. Chip designers can sculpt complicated layers of metal and semiconductor circuitry through repeated maskings with etched photoresists.