SCIENCE NEWS of the week

An Optimistic Twist for Schizophrenics

In the mid-1950s, a group of patients in a Vermont state mental hospital were diagnosed as schizophrenic and their families were told that they would probably never lead productive lives. After all, their doctors noted, they were middle-aged, poorly educated individuals whose social withdrawal, inappropriate emotions, hallucinations and other symptoms had resisted years of attempted treatment.

By the early 1980s, however, the same patients had punched holes in the pessimistic predictions of their psychiatrists. A majority were living in the community and leading much fuller lives than anyone had expected, according to several Yale University researchers whose surprising findings were presented last week in Dallas at the annual meeting of the American Psychiatric Association.

"These were bottom-of-the-barrel patients," says study director Courtenay M. Harding. "Some of them were not expected to ever leave the hospital. But it appears that in many cases schizophrenia may take 10 to 20 years to turn around. Still, we can't predict who will eventually improve and who won't."

About 1 percent of the U.S. population has schizophrenia. The latest manual of psychiatric diagnoses, published in 1980, states that patients with repeated bouts of schizophrenia are likely to get worse, while recovery is rare. Yet the Vermont patients, whose original conditions were rediagnosed using current psychiatric criteria, do not fit this picture, contend Harding and her co-workers.

They located nearly all 269 patients originally labeled as schizophrenic or suffering from some other severe mental disorder. Case records, minus diagnoses, were analyzed and assigned up-to-date psychiatric labels. The investigators selected 118 subjects as having met modern criteria for schizophrenia. Interviews were conducted with 82 of them who were still alive over 20 years after receiving intensive job and psychological rehabilitation upon release from the hospital. (At the time, a national effort to get patients out of state mental hospitals had just begun.) Friends and families of 28 deceased patients were also interviewed. Eight patients refused interviews or could not be located.

One-half to two-thirds of these once "chronic" schizophrenics showed — or had shown before their deaths — varied degrees of productivity and social involvement, says Harding. Most displayed slight or no schizophrenic symptoms, had one or more moderately to very close friends, required little or no help meeting basic needs and led relatively full lives. Only 40 percent of the subjects reported full-time employment in the previous year, but this may have been due primarily to their age, which averaged 61 years at follow-up, points out Harding.

She says that significant improvement on most outcome measures was found for almost 80 percent of the living subjects in the study.

Their adjustment took a variety of forms. Some had a virtually full recovery; others had devised ways to control their symptoms in social situations. A number of subjects were working but were otherwise socially isolated, while some had warm relations with family and friends but did not work.

The Vermont data parallel the findings of four similar long-term studies of schizophrenics reported in the 1970s, says Harding. Researchers in Europe and the United States followed a total of more than 1,100 subjects for up to 37 years and reported that about half of them recovered or improved significantly. The Yale investigators are the first, however, to examine subjects who have been rediagnosed according to the current — and most stringent — definition of schizophrenia.

"The current psychiatric diagnostic system can't predict the long-term outcome of schizophrenics," asserts Harding. Several follow-ups conducted five years after patients have left the hospital indicate that most schizophrenics either deteriorate or do not improve. Much of the Vermont sample was doing poorly five years after leaving the hospital, she says, yet many of the same patients slowly recovered over the next one or two decades.

Other investigators at the meeting were encouraged by the positive findings, but also expressed reservations.

"Schizophrenics may do much better than we suspected all along," says psychiatrist Stephen I. Kramer of the University of North Carolina at Chapel Hill. But, he adds, the Yale researchers were at a disadvantage in having to rediagnose the original patients using only case records. Also, the effect of different treatments and family support on recovery is not clear, continues Kramer. Schizophrenia encompasses a range of disorders, and some, such as those marked by paranoia, may have a better outcome than others, he notes.

"Harding's sample got special [rehabilitation] programs," says psychiatrist Martin Harrow of the Michael Reese Hospital and Medical Center in Chicago. "The results may show the importance of these kinds of programs for recovery. I'm still not sure that there's an upward transition for schizophrenics after 20 years or more."

There are problems in rediagnosing patients, acknowledges Harding, but it is clear that at least half of the severely ill subjects eventually improved. There is reason for optimism about the future for "hard-core" schizophrenics, she says; treatment should foster the slow struggle back to healthy functioning.

"If you're a schizophrenic, you don't have to be a burned-out shell of a person," explains Harding. "You can be a phoenix."

—B. Bower

Family size tied to SAT, IQ scores

When Scholastic Aptitude Test (SAT) scores were nosediving in the late 1970s — dropping in average from 490 in 1963 to 445 in 1980 — a presidential commission placed the blame on everything from drugs, pollution and nuclear testing to parental neglect and poor teacher training. But now that SAT scores are climbing steadily, some researchers are reporting that these factors had nothing to do with the decline in the first place. Rather, they say, both the downward and upward trends are dictated primarily by family size: In general, the smaller the family, the higher the children's intellectual development and scholastic achievement.

And because families have become smaller, the current upswing in scores "will continue for another 16 to 18 years," to be followed by another decline, says Robert B. Zajonc of the University of Michigan in Ann Arbor. He and several other scientists report a number of apparently positive effects that small family size has on children's intellectual development. The results were presented this week in Los Angeles at the annual meeting of the American Association for the Advancement of Science.

The current SAT trend fits with the "confluence model," which Zajonc says he first proposed in 1976 to explain the score decline and used at that time to predict that trend's reversal, which began in 1980. According to the confluence model, "the greater the number of children and the shorter the intervals between successive births, the less mature on the average is the intellectual milieu for each child," Zajonc says.

For example, an only child is exposed mainly to his parents' adult environment —the way they interact and deal with their problems — and to adult language. "In contrast," he notes, "a child in a family of 10, whose oldest sibling is 12, is surrounded by intellectually immature individuals" with less-developed vocabularies.

SAT scores are rising, he says, primarily

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.