

small room. If current theory is correct, the kilometer-sized accelerators and colliding beam rings with their teams of dozens of physicists per experiment have no hope of finding monopoles.

Monopoles were originally brought into physics by the man responsible for thinking up a number of other exotica that have now become commonplace, P. A. M. Dirac of Florida State University in Tallahassee. Dirac was concerned with finding an explanation for the quantization of electric charge. All electric charges are observed to come in integral multiples of a fundamental unit, the amount of charge on an electron. In the theory of 50 years ago there was no explanation for that quantization. Dirac found that if magnetic monopoles could exist, the reciprocal relation between them and electric charges quantized both. Dirac was able to calculate the amount of the magnetic charge quantum. This value, one Dirac unit, is what appears in Cabrera's experiment.

According to theorist Qaisar Shafi of the University of Maryland, Dirac "put monopoles into the theory by hand," using them to explain something that was already there. In contrast, monopoles are a prediction of the modern grand unification theories (GUTS) that come out quite naturally, Shafi says, after a lot of already observed phenomena have been put in by hand. The GUTS are trying to unite three quarters of physics, the domains animated by three kinds of force, electromagnetism, the weak interaction and the strong interaction, into one framework that would exhibit them all as different aspects of a single underlying unified interaction of force. The previous partial unification, called Weinberg-Salam theory, which puts together electromagnetism and the weak interaction, does not have monopoles, even though, as Shafi says, you'd think it ought to, being a theory that contains electromagnetism.

Adding the strong interaction, the force that among other things holds atomic nuclei together, necessitates monopoles. They are represented by a particular solution of the mathematics (a soliton or solitary-wave solution) that gives them some odd properties. They would be very massive. One figure is 10^{16} billion electron-volts. This is somewhat more than 10^{16} the mass of a proton or about the mass of an amoeba or paramecium. GUT monopoles would also have internal structure. Dirac's monopoles are simply bundles of matter-energy concentrated in a geometrical point and emanating a magnetic field. GUT monopoles take up space, and they can contain in themselves all the other particles predicted by the theory: quarks, gluons, etc., etc. This means they relate to everything else in the theory or, in Shafi's words, "they know all the fields of the theory."

Indeed, another theorist, Michael S. Turner of the University of Chicago, points out that if the monopole discovery holds

up, it will be the first direct evidence for any or all of the GUTS. A confirmation would also have great cosmological importance, Turner says. It would show that the universe had at one time in the past been at a temperature of 10^{27} kelvins. (The highest temperature for which there is now evidence is 10^{11} .) Only the big bang at 10^{27} kelvins could have produced this kind of monopole. That is also why they cannot be made in accelerators, colliding beams or cosmic rays; there is just not enough energy in those things.

All is not well theoretically, however. Turner also says: "I think it's a very beautiful experiment, but it's very difficult to reconcile with theory." The theory of the galactic magnetic field that is. Free magnetic monopoles should "short out" a magnetic field the way free electric charges short out an electric field. The magnetic field of our galaxy manifestly is not shorted out. Some years ago Eugene N. Parker, also of the University of Chicago, calculated a limit, usually called the Parker bound, that the flux of monopoles could not exceed as long as the galactic field exists. Lately he and Turner have been recalculating the limit based on new information about monopoles derived by theorists. The new information raises the bound a little, but the flux inferred from the Cabrera experiment is still a thousand times this limit.

Something has to give. One could suppose that monopoles don't fly around the galaxy, that they are trapped in the center of the sun, say, and that a few leak out locally to give the observed flux (an idea attributed to Savaf Dimopoulos of Harvard and Frank Wilczek of the University of California at Santa Barbara). But then, what force pulls monopoles out of the trap? "Something is wrong somewhere," Parker says. "There may be some massive misunderstanding that we have about the situation in space. That would be very exciting if it's true." But then he goes on, "I suspect [the Stanford people's] interpretation is wrong, and we'll wind up with nothing. It's something we're compelled to check out."

And that is starting to happen all over the place. It is very important, says Peter Trower of Virginia Polytechnic Institute, who describes himself as "the godfather" of Cabrera's experiment, to find out more about the other properties of the supposed monopoles. Trower would like to put an ionization detector around Cabrera's apparatus to look for electric charge. Most theories do not permit a particle to have both magnetic and electric charge, but at least one, Julian Schwinger's theory of "dyons," explicitly does. There are many other important questions. When waves are made on this scale in physics, they seem to penetrate everywhere. Physicists are pondering the many ramifications of a discovery of monopoles as they wait for the other shoe to drop.

—D.E. Thomsen

Few mentally ill understand drugs

As few as 8 percent of the patients in a typical state psychiatric hospital are well informed about the psychoactive medication they are receiving, and more than half show absolutely no understanding of the drugs or their intended effects, according to research reported in the May *AMERICAN JOURNAL OF PSYCHIATRY*. The findings emerge as the Supreme Court is considering the case of *Mills v. Rogers*, which questions the right of psychiatric inpatients to refuse drug treatment for their disorders.

According to Jeffrey L. Geller, a psychiatrist at Northampton State Hospital in Massachusetts, a survey of the hospital's 281 residents revealed that only 22 knew the drugs they were taking, how often they took them and why. Only 27 patients—or 10.3 percent—knew the therapeutic purpose of the antipsychotic and antidepressant medications. According to Geller, the inpatient population of Northampton is representative of psychiatric patients remaining in the nation's public hospitals following two decades of systematic "deinstitutionalization"; more than 60 percent are schizophrenic, another 17 percent are retarded or demented, and more than half have been hospitalized more than a year. Older patients and long-time inpatients were more likely to lack understanding of their medication, Geller says.

The case of *Mills v. Rogers* stems from a 1975 class action suit in which Rubie Rogers, a patient, sued the Massachusetts commissioner of mental health and Boston State Hospital to stop forced medication. Rogers was concerned about the physical side effects of Haldol, an antipsychotic drug, and the case was based on a patient's constitutional right to privacy (including the right to bodily integrity). Judge Joseph L. Tauro, ruling for Rogers in 1979, concluded that most patients are able to understand the risks and benefits of psychoactive drugs.

Mark Mills, now mental health commissioner in Massachusetts, appealed the case to the Supreme Court, which heard arguments in January. Although the right to privacy is technically at issue in the case, the justices were especially interested in the question of whether or not the typical psychiatric patient is competent to decide about medication. And the decision is apt to turn on that point, according to psychiatrist Paul S. Appelbaum, author of *Clinical Handbook of Psychiatry and the Law*. On that issue, Appelbaum says, Geller's data are unconvincing. The important legal question, he says, is *why* the patients lack understanding of their medication. While these patients, largely chronic schizophrenics, may well be incompetent, the data do not prove it, he says; it may be that they were never told about the drugs

or were told so long ago that they have forgotten.

Geller agrees that his findings do not explicitly contradict the opinion of Judge Tauro. "The study doesn't say whether people are competent or incompetent. It simply asks, what do people know?" Geller says. "And they don't know much." Geller emphasizes, however, that even though up to 45 percent of the patients might be interpreted as having a partial understanding of their medication, there remains the majority of the patients who understand nothing. With that group, he insists, it is clearly a matter of incompetence. These patients, he points out, are incompetent not only to refuse but also to consent to medication, which means that for most—those without guardians—the drugs are being prescribed without the patient's informed consent. Patients are declared incompetent only for refusing drugs, Geller concludes—never for complying.

—W. Herbert

Rally in U.S. for Soviet chemist

Edward D. Lozansky was married last week in the U.S. Capitol building, but his bride, Tatyana, was in the Soviet Union.

Lozansky, who teaches mathematics and physics at American and George Mason Universities in the Washington, D.C. area, left the Soviet Union in 1976. He had been fired from his teaching position at the Moscow Military Academy apparently for citing dissident scientist Andrei D. Sakharov (SN: 12/6/80, p. 356; 2/2/80, p. 67) in his lecture classes. At that time, Lozansky, a Jew, was married to Tatyana—a chemist and daughter of a three star general who is chief of staff of Soviet civil defense. The couple was told that Edward would be allowed to emigrate and that Tatyana and their daughter Tanya later would be allowed to join him if they signed divorce papers. Tatyana and Tanya have yet to be granted exit visas.

Last week's re-marriage by proxy was conducted to call attention to the plight of the Lozanskys. In addition, Tatyana—along with three other Soviet citizens who are married to persons living in the United States and who repeatedly have been denied exit visas—last week began a hunger strike scheduled to last until the participants are released from their country.

Also, Sen. Robert Dole (R-Kan.) and Cong. Jack Kemp (R-N.Y.) have introduced concurrent resolutions to Congress that urge the Soviet Union government "to act immediately to facilitate the emigration" of Tatyana, her daughter and the three other persons separated from their spouses. The resolution goes on to state that Congress "also sends its heartfelt sympathy to the families of the countless other[s]... who have attempted to obtain and been denied exit visas." □

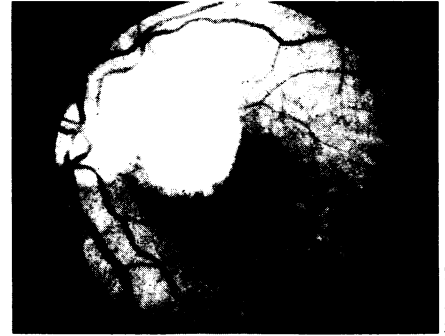
Laser therapy: Light against blindness

Six years ago, a National Eye Institute trial showed that lasers could prevent a major cause of blindness among Americans—that caused by diabetic retinopathy (SN: 4/10/76, p. 232). As a result, lasers have become the standard treatment for this form of blindness. Now another NEI trial has found that lasers can prevent another leading cause of blindness among Americans as well—that triggered by a disease called senile macular degeneration. The preliminary results from the trial were presented last week at a NEI press conference held on the National Institutes of Health campus in Bethesda, Md., and will be published in the June ARCHIVES OF OPHTHALMOLOGY.

Stuart Lee Fine, associate professor of ophthalmology at the Johns Hopkins Medical Institutions in Baltimore and chair-

The macula provides central vision, whereas other areas of the retina provide peripheral vision. Thus, if blood enters the macula, central vision is destroyed.

To qualify for entry into the study, which began in 1978, SMD patients had to have abnormal blood vessels in their eyes that had not yet reached the macula. Patients were randomized to receive either laser treatment or to serve as controls. As of January 31, 1982, 41 of the 244 patients had been followed 18 months or longer, and 105 for at least a year. Preliminary results compiled from all the treatment centers show that the rates of visual loss in the treatment and control groups were not significantly different at six months after patients entered the trial. However, by 18 months after patient entry into the study, 60 percent of untreated eyes compared



Eye with senile macular degeneration before (left) and after (right) treatment.

man of the NEI study, said, "The treatment benefit was so striking that recruitment of new patients was terminated almost two years earlier than anticipated, and all eligible patients are being offered treatment."

Carl Kupfer, director of the NEI, added, "The significance of these findings is so great that, as soon as I learned about them, I asked that they be communicated to the new Director of the National Institutes of Health, Dr. James Wyngaarden." Wyngaarden stated that "this study's results may save more than a million Americans from severe visual loss over the next decade and save as much as \$2.5 billion in tax monies as well."

Lasers prevent diabetic retinopathy blindness by sealing off or destroying blood vessels in the eye before they leak blood into the retina or vitreous humor (gel that fills the center of the eye) and thus destroy vision. The current NEI trial was launched at Johns Hopkins and 11 other medical centers to see whether lasers could also destroy abnormal blood vessels that form in the eyes of 5 to 20 percent of SMD patients. (The other 80 to 95 percent have what is known as "dry" SMD, in which loss of vision is slow and the ability to read is retained.) If unchecked, the blood vessel leakage in this neovascular form of the disease occurs in a particularly critical area of the retina, the macula.

with just 25 percent of treated eyes had lost major vision, a highly significant statistical difference.

About 35 percent of the treated eyes were saved from serious visual loss by laser treatment, according to the researchers.

The NEI is now eager to see lasers become a standard preventive for SMD blindness and is mailing a prepublication copy of the trial results to every ophthalmologist in the United States. It is conveying the study results to primary care physicians and is also attempting to make persons with SMD aware of the symptoms: blurred vision, distorted vision and blank spots in central vision. Persons with these symptoms should see an ophthalmologist immediately, the NEI stresses, since leakage can be treated by laser only if the procedure is performed within a few days of their onset. Retinal surgeons who can use lasers to treat SMD blood vessel leakage, Fine said, can be found in most areas of the United States.

The projected \$2.5 billion in tax savings, Wyngaarden explained, was computed from the number of Americans with SMD who would go blind each year if not given laser treatment and how much it would cost to maintain them with Social Security and Medicare and perhaps with nursing home care as well until they lived out their natural life expectancy. —J. A. Treichel