pendently, a group of Italians headed by Georgio Simoni and Bruno Brambati of the University of Milan reported encouraging results. Their work was published in major medical journals within the past year. Only a handful of investigators in this country are now using chorionic villus biopsies to diagnose birth defects, but about two dozen research groups have expressed interest in learning the technique.

The greatest advantage of chorionic villus biopsy is that it is done in the first trimester of pregnancy, when it is safer to abort should a woman chose to do so. Although only a few rare biochemical defects can be treated in utero, many investigators think that the field of fetal medicine will burgeon in the near future.

The potential that chorionic villus biopsy offers for improving fetal treatment is its most exciting aspect, according to Yaffee of NICHD. Laird Jackson of Jefferson Medical College agrees. Chorionic villus biopsy, he says, "will significantly change the outlook for the possibility of treatment. It will spur research in the area." (Nearly 200 disorders, many extremely rare, can now be detected in utero.) Schulman suggests that with chorionic villus biopsy it will be possible to start treatment in the first trimester and then to check with amniocentesis in the second trimester to see if the treatment is working.

The new method, however, cannot completely replace amniocentesis because it cannot be used to detect neural tube defects. These serious birth defects occur when the neural tube fails to close early in embryonic life, leaving an opening in the spinal cord or skull. A fetal albumin, called alpha-fetal protein, pours out of the opening into the amniotic fluid where it can be detected. The Food and Drug Administration recently approved a test kit that will enable obstetricians to offer a multistage test for these birth defects, culminating with amniocentesis for those women who have indications from a blood test and sonogram that they may be carrying a fetus with a neural tube defect.

Chorionic villus biopsy is still very much an experimental procedure and many questions about it are still unanswered. For example, to approach the question of safety, it is necessary to know how many fetuses normally spontaneously abort after 8 to 10 weeks of pregnancy. Says Mahoney, "In the first trimester about 20 percent of embryos spontaneously abort. But a lot of those are already dead at 8 weeks. No one knows the loss rate from 8 weeks on." However, Mahoney remarks, "Already people are satisfied that you don't have huge risks with chorionic villus biopsies." A few of the 100 or so embryos that have been diagnosed with the technique later aborted, but whether they would have aborted anyway is impossible to determine.

Another question is whether the embryonic tissue obtained with chorionic villus biopsy is biochemically identical to the fetal cells obtained with amniocentesis. Researchers strongly suspect it is but no one knows for sure. They are currently double-checking their negative diagnoses by doing amniocentesis in the second trimester.

In addition to the scientific questions about the technique there are ethical dilemmas. Who should be offered the method while it is still such a very new experimental procedure and how should physicians learn to perform it? So far, chorionic villus biopsy has only been offered to women with strong family histories of rare genetic diseases such as Tay-Sachs disease, Niemann-Pick disease, or Gaucher's disease.

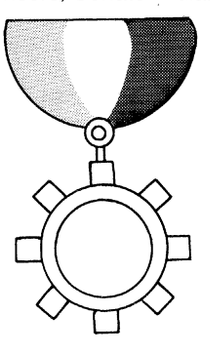
The problem of how to become skilled at the technique is being resolved in different ways at different institutions. At Yale and at Jefferson Medical College, the Institutional Review Boards (IRB's) gave the researchers permission to biopsy women who were planning to have abortions anyway, as long as the women gave informed consent. At Michael Reese Hospital in Chicago, however, the IRB found such experiments unacceptable. There, researchers gained experience by practicing on women who had blighted ova—a condition in which the embryo dies early in pregnancy but, says Eugene Pergament of Michael Reese, "The chorion is the last to go." Blighted ova are common enough that the physicians at Michael Reese see one or two cases a week. When they do chorionic villus biopsies on these women, they frequently can find out why the embryos died. In over 70 percent of the cases, says Pergament, there were chromosomal abnormalities. This information is valuable to the women in planning future pregnancies.

Still, says geneticist Leon Rosenberg of Yale, the list of unanswered questions does not mean that scientists are not optimistic about chorionic villus biopsy. "I am as excited about the potential as anyone. I just think it is very important that we not get stampeded and that we systematically determine the risks and applicability of the method very soon. Potentially [the discovery of chorionic villus biopsy] is a *major* event," he says.—**GINA KOLATA**

Medal of Technology to Debut Next Year

If all goes according to plan, the first recipients of the new National Medal of Technology will be honored next spring. Modeled on the National Medal of Science, which is awarded for scientific achievement, the new medal is meant to give presidential recognition to those responsible for successful applications of science and technology.

In the announcement of Administration plans for the awards, President Reagan was described as eager to give innovators their due. The details, however, have taken some time. The idea for the medal was embodied in the Stevenson-Wydler Technology Act of 1980 which was thus named as a kind of going away present for its chief sponsors, Senator Adlai Steven-



son of Illinois and Representative John W. Wydler of New York, who both retired from Congress that year.

Machinery for selecting the winners is being established in the Department of Commerce. A national evaluation board with members drawn from industry, government, professional organizations, and universities will prepare a list of nominees* in priority order for the Secretary of Commerce who will be responsible for making his own nominations to the President. The process differs from that employed in awards of the National Medal of Science principally in that a presidentially appointed committee makes nominations for the science medal directly to the President.

Another difference is that U.S. com-

*Nominations will be sought from industry, professional organizations and academia, and unsolicited nominations will be accepted from those who follow nominating instructions obtainable by writing to the Assistant Secretary for Productivity, Technology, and Innovation, U.S. Department of Commerce, 14th Street and Constitution Avenue, NW, Washington, D.C. 20230.

panies as well as individuals are eligible for the award. Commerce Secretary Malcolm Baldridge commented that "this medal will honor those who have advanced U.S. competitiveness in world markets, created new jobs, and made technological contributions to industries and people everywhere."

Nominations for the first round of awards—to be limited to no more than 12 on one occasion—will be open until 30 November.

Acid Rain Researchers Get Up to Nitty-Gritty

A joint research project agreed to by Canada and the United States could help take the sour taste out of relations between the two countries on the subject of acid rain. The project is designed to test techniques for tracking acid rain–causing pollutants to their sources. Identifying these sources has been a major cause of contention between the two countries. There is no dispute that acid rain has damaged forests and killed fish and plant life in lakes in eastern Canada and the northeastern United States, but Reagan Administration officials have angered the Canadians by insisting that the sources of pollutants have not been established with scientific certainty.

Under the new project, teams of American and Canadian scientists will monitor the flow of pollutants from two areas which are prime suspects as generators of acid rain, the U.S. Ohio Valley and Canada's Ontario Province.

The tests are to be conducted over a 6-week period starting in mid-September as part of the so-called Captex program, an acronym for the ongoing "cross-Appalachian tracer experiment." Started several years before acid rain became a diplomatic issue, Captex is an effort to resolve questions about long-range transport in the atmosphere. The problem of acid deposition fits in nicely with the long-term aims of Captex.

According to National Oceanic and Atmospheric Administration scientist Kenneth Demerjian, currently on loan to the Environmental Protection Agency, the new project is intended primarily to test the feasibility of tracers and set the stage for a comprehensive field study next year.

Scientists will make three releases of tracer materials during the tests and track the results from planes and ground stations. The release points will be in the areas of Dayton in southwestern Ohio, where a number of soft-coal burning power plants are concentrated, and Sudbury, Ontario, which has a cluster of nickel and copper smelting plants.

In announcing the project, Canada's environment minister, Charles Caccia, said, "The Captex project will help in future refinement of the atmospheric models used in designing optimum emission control strategies in both countries."

In less diplomatic terms, this translates into Canadian hopes that the research results will push the United States toward accepting an international air quality agreement that would require effective measures to staunch acid rain.

Survey Documents Life After the Ph.D.

A survey of the employment plans of a recent crop of research doctorate recipients suggests that a flat economy and tight academic job market continue to be dominating factors. Among new Ph.D.'s generally, the percentage heading for jobs in business and industry is increasing. Job opportunities in academe, which peaked in the late 1960's and plunged in the later 1970's, showed gains of only a few decimal points over the lows of recent years.

The National Research Council survey* was based on questionnaires answered by about 95 percent of the holders of the 31,048 doctorates granted between mid-1981 and mid-1982. The survey leaves some margin for uncertainty, since it includes sets of responses both from those with definite job plans and those still seeking appointments, but the patterns are evident.

In both the life sciences and physical sciences, the trend to industry is clear. Among chemistry Ph.D.'s, for example, those with definite plans to work in industry were up to 37.2 percent compared to 33.6 percent last year and 10.5 percent in 1972. In biochemistry, where nearly 75 percent of new degree holders had postdoctoral fellowships or were seeking them, some 7.1 percent of the others had definite plans to work in industry compared with 4.9 percent the previous year and 2.4 percent in 1972.

In engineering, where a different professional pattern prevails from that in research science, only 2644 doctorates were awarded compared with 4288 in the physical sciences and 5565 in the life sciences. The most noticeable change in the data for engineering was that a larger number of new Ph.D.'s than in recent years were still seeking appointments when the survey was made. No analysis accompanies the survey to indicate why this occurred.

The survey showed that the number of new doctorates plateaued at under 32,000 a year in the late 1970's. Within the total, there have been increases in the number of doctorates granted in the sciences, a sharp decrease in the humanities and lesser declines in some of the social and behavioral sciences and education.

Significant shifts also occurred in the citizenship status and sex of those who earned degrees. An upward trend in the percentage of doctorates granted women began in 1965 when they received 11.8 percent of the total and continued through 1982 when the level reached 32 percent. The percentage of non-U.S. citizens winning doctorates rose only from 12 to over 20 percent between 1960 and 1982, but they have claimed major shares of doctorates in some fields—50.8 percent in engineering, 34 percent in agriculture, 34 percent in computer science, and 36 percent in economics.

One of the strongest trends indicated by the survey data was the growth in the proportion of new Ph.D.'s in the life sciences and physical sciences taking up postdoctoral appointments after earning their degrees. In the biosciences, the total was over 70 percent. The survey shows that postdoctoral training has become virtually obligatory for those contemplating research careers in these disciplines. What it doesn't show is what happens to the postdocs when the fellowships run out.

—John Walsh

*Summary Report 1982, *Doctorate Recipients from United States Universities* (National Research Council, Washington, D.C., 1983).