Louise: Birth of a new technology

It's a girl — normal and healthy. That is the report on the "test tube" baby, conceived outside her mother's body and then transferred to the womb. Louise Brown, 5 pounds 12 ounces, was delivered by Caesarian section on July 25 at Oldham General Hospital in England.

While the details of the fertilization procedure remain under wraps, at news conferences last week Patrick Steptoe and Robert Edwards cleared up some questions (SN: 7/22/78, p. 51). For instance, critics had asked how the physicians were certain that Louise is not the result of a natural fertilization coinciding with the laboratory procedure. According to newspaper reports, Steptoe surgically removed Lesley Brown's fallopian tubes last year. Therefore there was no natural channel for the egg to travel from ovary to uterus. Steptoe did not disclose how the egg was removed from Lesley Brown, but only said it was a "minor operation" that could be completed in 8.5 seconds.

The explanation for the success of this embryo may be the time at which it was introduced into Lesley Brown's uterus. Earlier attempts had used four-and-a-half-day-old embryos, while the successful embryo was introduced just two and a half days after fertilization. Edwards remarked after the birth that the last time he had seen the baby "she was a beautiful eight-celled embryo." Steptoe estimated that he tried implanting laboratory-fertilized embryos about 200 times before this success. An account of an earlier attempt, which resulted in an ectopic pregnancy where the embryo implanted in the oviduct rather than in the uterus, was published in 1976 (THE LANCET, Vol. 1, p. 880). Louise Brown was delivered by Caesarian section nine days before she was due, Steptoe said, because he had detected a slight toxemia in the mother and didn't want to risk a still-birth.

Although the birth was the first success in many tries, both Steptoe and Edwards feel it was not just luck and expect laboratory fertilization techniques to become an established procedure for overcoming infertility. About a third of infertile women have blocked or defective oviducts, Lesley Brown's problem. Surgical procedures for correcting those defects are becoming increasingly effective, but now only 17 percent of such operations succeed. Steptoe also suggested laboratory fertilization could permit conception with the sperm of men who have low sperm counts. Fewer sperm are needed to fertilize an egg in a glass dish than one in the female reproductive tract.

The doctors hinted, but would not state, that they have already implanted embryos in other women who will soon give birth. Physicians at a London hospital are also reported to be implanting laboratory-fertilized eggs in infertile women.

There will be no U.S. "test tube" baby, at least for some time. A federal order in 1975 barred the Department of Health, Education and Welfare from funding any human fertilization experiments unless they had been approved by a national ethics advisory board. That board was not formed until last January; twelve of the fourteen members have so far been appointed and it has had only two meetings. Board member Rev. Richard McCormick of Georgetown University says that the staff will now begin to gather background information on laboratory fertilization. He expects an increase in requests for the procedure and in requests for research funds. Both McCormick and David Hamburg, the board's vice chairman, say they plan to move very cautiously on the issue.

Although several research laboratories are eager to begin work, or pick up experiments suspended since 1975, the procedure brings up a number of long-standing moral and religious issues. There is the abortion debate: Does it constitute abortion if an egg fertilized in a laboratory procedure is not implanted in a womb? There is the question of whether enough animal experiments have been done to justify trials with humans. There is the question of how rights of the child-to-be can be considered. Daniel Callahan, director of the Institute of Society, Ethics and the Life Sciences in Hastings-on-the-Hudson, N.Y., suggests that now that an apparently healthy child has been produced by laboratory fertilization, further attempts are ethical. However, he holds that given the unknown risk of abnormality, the British attempt was probably unethical. Many people fear future misuse of the laboratory fertilization technique: It could allow use of surrogate mothers and selection of specific offspring characteristics. Yet Steptoe contends that all he is doing is helping women whose child-bearing mechanism is slightly faulty. The birth of that British baby is also the birth of an intensified international debate. □

Neutron star is teragauss magnet

When a star collapses, its magnetic field does too. And when a magnetic field collapses, it gets stronger. This proposition has been demonstrated for white dwarf stars. Calculations of their magnetic fields from magnetic effects evident in their light have yielded quite high numbers. Now we have the calculation of the magnetic field of a neutron star. The number given is 1.5×10^{12} gauss. By comparison the earth's field is half a gauss, and the strongest steady field produced in a laboratory is 301,000 gauss. An ordinary toy magnet produces about 100 gauss.

The calculation depends on a finding made by an experiment aboard the HEAO-1 satellite, a group of hard X-ray detectors operated by Lawrence E. Peterson and James Matteson of the University of California at San Diego, and Walter H. G. Lewin of Massachusetts Institute of Technology. The finding was a dip in the spectrum of the X-ray source 4U0115+63. This was the second such X-ray spectral dip to be reported. Joachim Trümper of the University of Munich had found a similar one in the source Hercules X-1.

Such a dip can be the result of cyclotron absorption, absorption of X-rays of a particular energy by electrons orbiting in a magnetic field. It is called cyclotron absorption because it imitates the behavior of particles in the magnetic field of a cyclotron. But why should there be a magnetic field and electrons to do the cyclotron absorbing? That depends on the astrophysical assumptions about binary X-ray sources.

In January graduate student Lynn Cominsky and Walter Clark of MIT had determined that 4U0115+63 was a pulsing X-ray source, pulsing with a period of 3.6 seconds. Pulsing X-ray sources are usually members of binary systems, two objects bound together by gravity and revolving around each other. The pulsations are caused by eclipses of the X-ray source by the other object. The X-ray source is usually a highly condensed object, a neutron star or maybe a black hole. The neutron star draws matter from its companion, usually a more or less ordinary star, and the matter as it falls onto the neutron star forms a disk around the neutron star. In this accretion disk friction causes heat, and heat causes radiation, and that is the source of the X-rays. All of this is astrophysical assumption, but it is a common one that many astronomers find highly plausible. If the condensed object is a neutron star and it has a magnetic field, as it ought to, electrons in its atmosphere will behave in cyclotron fashion. That is standard physics.

The location of 4U0115+63 was sent to the McGraw Hill Observatory in Arizona and there Claude R. Canizares and Jeffrey E. McClintock identified a faint blue star, strengthening the assumption that this is a binary system. The HEAO detectors were turned on the source, and the spectrum with the dip came out. Analysis of the spectrum by Brian Cooke, Francis A. Primini and Eugene Tsiang and students John P. Doty, Carl A. Dobson, Spencer K. Howe and Allan Goldman convinced the observers that the dip was a real spectral feature and not an equipment effect, and it has been so reported to a meeting of the American Astronomical Society and on the circulars of the International Astronomical Union. □