NEWS ON DEVELOPMENTS
CURRENT DEVELOPMENTS AND ISSUES: A SUMMARY

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IN VITRO FERTILIZATION

British IVF doctors defenseless

"Doctors in test-tube baby clinics are now prevented by law from going to court to defend themselves if they are sued by patients or if their patients refuse to pay their fees," *New Scientist* reports. The problem arises from a confidentiality clause in Britain's Human Embryology and Fertilisation Act of 1990 that prevents IVF doctors from revealing their patient's identity. All information collected during infertility treatment must thus be kept secret even from a court of law. The British Department of Health is now looking into the problem, but it may take a Parliamentary amendment to the Act to resolve the issue.

GAIL VINES. 1991. Defenceless doctors. *New Scientist*. December 21/28: 5.

ARTIFICIAL WOMBS

Goat fetus raised in artificial womb

Japanese scientists removed a 120-day-old goat fetus from its mother by cesarean section and placed it in an artificial, rubber womb. The kid was delivered 17 days later. The artificial womb was filled with 42 liters of artificial amniotic fluid consisting of sodium and potassium chloride, glucose, and proteins, kept at a constant temperature of 39.5 °C. The fetus was fed with normal, oxygenated fetal blood by catheter. Because the artificial womb was much larger than a normal womb, the fetus was sedated to keep it from being overactive and using too much oxygen.

The researchers estimate that a 120-day-old goat fetus corresponds to the 20th to 24th week of pregnancy for humans. The researchers state that they developed the artificial womb to study animal models for fetal experimental medicine and for the possible rescue of immature or sick human fetuses. Yoshinori Kuwabara, the gynecologist in charge of the research, states, "I don't worry about the ethical problems. I just want to rescue the fetus where it is impossible to be rescued by present treatment."

The kid was still suffering side effects from the sedatives one month after its delivery. It could not stand or breathe by itself.

PETER HADFIELD. 1992. Japanese pioneers raise kid in rubber womb. *New Scientist*. April 25: 5.

ABORTION

Poland split on medical ethics

A new code of medical ethics has been drawn up by the Supreme Council of the Polish Chamber of Physicians. The code was in answer to continued pressure from the Catholic Church for doctors to take an antiabortion stand. The code would protect the rights of the fetus but would also allow research on mentally ill individuals, children,

and prisoners without their consent. The code was first adopted at a medical congress called by the Supreme Council. But it just barely passed this group and the delegates complained that they were given no time to read the proposal carefully or to consult with others before making a decision. Subsequently, the medical profession has split on the issues.

An Ombudsman, Ewaa Letowska, found that the antiabortion stance conflicts with Polish women's legal right to abortion and that the "doctor's congress had ignored Polish law on patient confidentiality and the necessity for researchers to obtain informed consent from people taking part in medical studies," *New Scientist* states. A final ruling on the legality of the new code will be ruled on by the Constitutional Tribunal.

VERA RICH. 1992. Code on medical ethics divides Poland's doctors. *New Scientist*. March 7: 13.

Developments on abortion pill in Germany and U.S.

The Federal Republic of Germany Parliament has discussed the possibility of pressuring the drug company Hoechst to market RU 486, the so-called abortion pill, in the FRG, adding fuel to the charged debate on abortion. "Two years after reunification, the country has still to agree on a common abortion law," Taryn Toro of New Scientist states. "Women in what was East Germany can have abortions on demand in the first three months of pregnancy. But in the west a woman must still obtain a letter from her doctor stating that having the child would damage her physically or psychologically."

Health ministers from the German states see RU 486 as a less intrusive form of abortion and want to have it introduced. But Hoechst states that the drug will only be marketed in Germany when there is a unified abortion law. To complicate matters, Hoechst chairman Wolfgang Hilger is against abortion and has been accused of stalling on introducing RU 486 for this reason. Hoechst denies that they have taken a stand on abortion and states that Germany lacks the proper clinical facilities to guarantee the safe use of RU 486.

In the U.S., feminists are planning an economic campaign to pressure the French drug firm Roussell-Uclaf to market RU 486 in the U.S. "The Feminist Majority Foundation, based in Cambridge, Massachusetts, says it will enlist unions, physicians and consumer groups in the fight for access to RU 486," *New Scientist* reports. Roussel-Uclaf has been afraid to market the abortion drug in the U.S. because of boycott threats from antiabortion organizations. The feminist action is meant to show Roussell-Uclaf that they will lose more if they don't market the drug.

The campaign will be aimed at subsidiaries of Roussell-Uclaf such as Hoechst and Rhone-Poulenc. The companies targeted produce drugs and textiles, and the campaign will include consumer boycotts of their products, physician refusal to prescribe their drugs, and pressure from unions with strong support for women's rights.

TARYN TORO. 1992. Abortion pill confuses debate on Germany's twin laws. *New Scientist*. March 28: 18; 1992. American feminists fight for abortion pill. *New Scientist*. April 25: 9.

FETAL TISSUE RESEARCH

Support for fetal tissue research in U.S. grows

For the past 4 years there has been a de facto moratorium on federally funded research on fetal tissue for transplantation. The moratorium was imposed by Ronald Reagan and has been kept in place by President Bush. They stated that allowing medical research on fetal tissue would encourage women to have abortions. But a commission found no evidence that this would be the case, and the

continued ban is clearly linked to Reagan's and Bush's antiabortion politics.

The U.S. House of Representatives passed a bill that would lift the ban by a vote of 274 to 144. Supporters of the bill then lobbied heavily in the Senate, trying to convince conservative, antiabortion senators that fetal tissue research was "pro-life." Lobbyists are emphasizing the benefits of fetal tissue transplants and how the legislation will keep women from having abortions just to donate fetal tissue. They are consciously avoiding a discussion of the ethics of the process.

A key Senate committee voted 13 to 4 in favor of the bill, and the Senate voted 87 to 10 to support lifting the ban. The amount of support the bill has received, including that of antiabortion members of Congress, means that it will probably be supported by the two-thirds majority vote needed to override an expected presidential veto.

CHRISTOPER ANDERSON. 1992. Battle lines form over fetal tissue research. *Nature* 355: 189; BARBARA CULLITON. 1992. Needed: Fetal tissue research. *Nature* 355: 295; 1992. Fetal tissue fight. *Science* 254: 1199; CHRISTOPHER ANDERSON. 1992. US Senate votes to overturn research ban. *Nature* 356: 467.

Mexican surgeon criticized for brain grafts

Ignacio Madrazo, a Mexico City neuro-surgeon who pioneered brain grafts of fetal tissue to treat Parkinson's disease, has been criticized of recklessness in his rush to test the method on patients with Huntington's chorea. Madrazo claims a Huntington's patient who received a graft of fetal brain tissue has improved. But other researchers say they can see no improvement. They are highly critical of Madrazo for recklessly testing a technique in humans without having validated it with animal research first.

MARCIA BARINAGA. 1992. Grafts for Huntington's – Too much too soon? *Science* 254:1108.

GENETIC ENGINEERING

Private company being formed to sequence DNA

Frederick Bourke, a wealthy U.S. industrialist, is developing the first private company that will sequence DNA on a large scale. This is the first attempt to commercialize the Human Genome Project, the project to map and sequence all the human chromosomes. Bourke will provide the financing, but the scientific expertise will be led by Leroy Hood, who pioneered automated DNA sequencing at the California Institute of Technology. Bourke and Hood plan to set up a staff of 60 to 70 people and to be sequencing 100 million bases a year within the next 5 years.

In a first round of recruiting, they tried to entice two of the leading scientists in the field of DNA sequencing, John Sulston of the Medical Research Council's Laboratory of Molecular Biology in Cambridge, Great Britain and Bob Waterson of Washington University, St. Louis, U.S. The attempt to recruit Sulston immediately caused controversy in Great Britain. Sulston is head of the project to sequence the DNA of a nematode, an organism with a fairly small genome; The project is a large part of Great Britain's stake in the Human Genome Project, and many scientists resent the possibility that this publicly funded research would be transferred and benefit a private company in the U.S.

Other scientists involved in the Human Genome Project are worried that the sequencing data created by a private company would be kept secret. Bourke has tried to calm such fears and has said that "the sequence information will be made public very quickly, but we will have first crack at it." The company plans to profit from sequencing DNA under contract, developing and selling new technologies and diagnostics linked to the sequences it discovers.

After deliberations, Sulston decided not to accept the offer. He cited major differences of opinion between himself and Bourke as one of the reasons for not accepting. Sulston insisted that the sequence data be public but found that this would not be possible, despite Bourke's previous promises. James Watson, head of the U.S. Human Genome Program, believes it is only a matter of time before more private sequencing companies are developed. "This is capitalism," Watson says. "You can't stop it."

ROGER LEWIN and GAIL VINES. 1992. US company plans to hijack DNA project. *New Scientist*. February 1: 13; ROGER LEWIN. 1992. DNA sequencing poised to go private. *New Scientist*. February 8: 17; CHRISTOPER ANDERSON and PETER ALDHOUS. 1992. Genome project faces commercialization test. *Nature* 355: 483–84; PHYLLIDA BROWN. 1992. Genome project leader to stay in Britain. *New Scientist*. April 25: 7.

James Watson resigns from Human Genome Program

James Watson, head of the National Institutes of Health (NIH) Human Genome Program resigned his post in April. He leaves amid charges of conflict of interest over stock he owns in several biotechnology companies. There are also rumors that the real reason he left was because of a feud between him and NIH director Bernadine Healy over Healy's decision to patent complementary DNA (cDNA) sequences. Watson may also have played a major role in seeing that Frederick Bourke, a wealthy industrialist, did not succeed in recruiting John Sulston to his private DNA sequencing company.

Watson owns stock in Merck and Amgen, two leading companies in gene sequencing, a fact that Bernadine Healy felt could be misinterpreted by the public. Watson has been open about owning the stock since he became head of the genome project, and the Special Counsel for Ethics has never been able to decide if a true conflict of interest existed. Many feel that the charge of conflict of interest was a smokescreen for the heated feud that has existed between Healy and Watson over patenting gene sequences. Craig Venter, an NIH researcher, filed a patent for 347 cDNA sequences without knowing what the genes do. Healy supported the patent application but Watson was vehemently opposed to it.

The run-in with Bourke may have been the last straw in the drama. Bourke is friends with a number of powerful politicians in the U.S. Senate, and Watson may have made one enemy too many. Bourke accuses Watson of encouraging a British drug company, Glaxo, to start a gene sequencing company centered around John Sulston, a move that put a stop to Sulston joining Bourke's company. Bourke also states that Watson owns stock in Glaxo.

Watson's resignation will change the direction of the Human Genome Program. Watson favored large-scale DNA sequencing and funding of large centers and was adamantly opposed to cDNA sequencing. Researchers anticipate that NIH will be more open to supporting smaller research centers, more research on how genes function, and cDNA sequencing. They also hope to see an end to the "old-boys' genome network" that may have slowed up the project at NIH. Michael Gottesman of the National Cancer Institute will step in as acting director until a new director is appointed.

CHRISTOPER ANDERSON. 1992. US genome head faces charges of conflict. *Nature* 356: 463; PHYLLIDA BROWN. 1992. Nobel prizewinner quits genome project. *New Scientist*. April 18: 6; CHRISTOPHER ANDERSON. 1992. Watson resigns, genome project open to change. *Nature* 356: 549.

New patent application filed for gene sequences

Craig Venter of the National Institutes of Health (NIH) has filed a patent for 2,375 new

complementary DNA (cDNA) sequences. Venter created a storm within the international human genome research world last year when he filed his first patent for 350 cDNA sequences. A cDNA sequence is equivalent to a gene. Venter does not know what the genes do, which has always been assumed to be essential knowledge before being granted a patent. No one knows if his cDNa sequences are patentable, but the fact that NIH, a public agency, has tried to patent them has upset researchers all over the world.

First out was the American Society of Human Genetics, which condemned the NIH plan. They charge that this will create a mad scramble for patents, which will sabotage international collaboration. Then the Human Genome Organization came out with a statement criticizing NIH. Next in line with a condemnation was the committee that advises both NIH and the Department of Energy on the Genome Project.

NIH director Bernadine Healy counters the critique by saying that the patent application was the only way to go considering how uncertain patent law is on this subject. And many of the critics agree that it is better to follow the patent applications through than to withdraw them. It is important to know if the sequences are patentable or not.

Until the question is settled, other countries are withholding their DNA sequence data. In Britain, the Medical Research Council has reluctantly decided to file patent applications for 2,000 cDNA sequences from its research project. This has caused researchers from Italy, Germany, and France to refuse to put their cDNA sequences in the international DNA sequence data base housed in Great Britain. Both the French and Italian national bioethics committees have condemned the patenting of genes with unknown functions. Japan has also stated that it will not try to patent cDNA sequences and will make all data freely available.

Several attempts are now being made to defuse the situation. Science ministers within the Organization for Economic Cooperation and Development (OECD) discussed how to resolve the conflict that is threatening to undermine the international human genome project. Alan Howarth, Britain's science minister, met with Allan Bromley, science adviser to President Bush, to discuss possible solutions. They came up with a compromise-the White House has requested that the U.S. patent office make a rapid assessment of the patentability of cDNA sequences. They hope the Patent Office can come up with an answer by June, before a meeting of the European Community-U.S. Consultative Group. The group is planning to discuss internationally acceptable rules on patenting.

LESLIE ROBERTS. 1992. OSTP to wade into gene patent quagmire. *Science* 254: 1104–5; PETER ALDHOUS. 1992. HUGO opposes Venter. Nature 355: 194; CHRISTOPHER ANDERSON. 1992. Patents, round two. *Nature* 355: 655; LESLIE ROBERTS. 1992. NIH gene patents, round two. *Science* 255: 912-13; ANDY COGHLAN. 1992. US gene plan 'makes a mockery of patents'. *New Scientist*. February 22: 10; PETER ALDHOUS. 1992. MRC follows NIH on patents. *Nature* 356: 98; 1992. Patent nonsense? *New Scientist*. March 14: 7; DAN CHARLES and ANDY COGHLAN. 1992. Ministers move to limit genome patents. *New Scientist*. March 14: 9; DAVID SWINBANKS. 1992. Japanese researchers rule out gene patents. *Nature* 356: 181; ANDY COGHLAN. 1992. Moves to defuse row over genome patents. *New Scientist*. March 21: 12; 1992. Patents thwart genome project. *New Scientist*. April 11: 7; PHYLLIDA BROWN. 1992. Call for 'treaty' on human gene patents. *New Scientist*. May 9: 5.

HUGO trying to find its role

The international Human Genome Organization (HUGO) was created 3 years ago

to help facilitate communication between the many international groups working within the human genome project. But HUGO has been fairly quiet lately due to lack of funds. The position of director, previously held by James Wyngaarden of the U.S., has been vacant because HUGO can not afford to pay anyone.

HUGO also made the mistake of chartering the organization in Switzerland for tax purposes. Swiss law requires a long, drawn-out process if the organization changes its operations. HUGO has had to change operations as the human genome project has grown and changed, which has turned out to be a very expensive problem, requiring a lot of legal help.

HUGO has also been seen as an elitist "old-boys network," where every member was required to be nominated by five other members, go through a prescreening process, and be voted on by the entire organization. HUGO is, however, trying to change its image and find a clear-cut role. New members need only two nominations, and no vote is required. In a recent controversy over differences between traditional gene mappers and the high-technology physical chromosome mappers, HUGO is trying to act as marriage broker.

LESLIE ROBERTS. 1992. HUGO takes on role as marriage broker. *Science* 254: 932; CHRISTOPHER ANDERSON and PETER ALDHOUS. 1992. Still room for HUGO? *Nature* 355: 4–5; 1992. Where HUGOing? *Science* 255: 27.

Two new methods for sequencing DNA developed

Two completely different methods of sequencing DNA have been developed that may speed up the genome project in the future. One method uses the principles of mass spectrometry that are commonly used in chemical analysis. The method works by vaporizing and ionizing a substance into fragments and then sending the fragments into the mass spectrometer, which measures their mass. Researchers at Wayne State University, Detroit, U.S. have managed to attach dyes to DNA fragments that make it possible to analyze the DNA by mass spectrometry at a rate 4,000 times that of the quickest methods available today. So far the researchers have only tested very short strands of DNA, but they hope to have a method for longer pieces by the end of 1992.

Another group of researchers has been able to visualize the structure of two of the four bases that make up DNA using a scanning tunnelling microscope. This may make it possible in the future to sequence DNA by actually looking at it. A major difficulty, however, is that DNA strands are coiled like a spring, which makes it difficult to get them to lie flat, a requirement with this type of microscopy.

ANDY COGHLAN. 1992. Dyes could speed up the genome project . . . *New Scientist*. February 29: 25; ANDY COGHLAN. 1992. . . . while a microscope points the way to seeing DNA. *New Scientist*. February 29: 25.

Society not prepared for genome project's consequences

A major criticism of the Human Genome Project is that very little research is being done on how people react to genetic information, especially if it tells them that they are predisposed to fatal or debilitating diseases. Hilary Rose of the University of Bradford, Great Britain states that people may suffer severe trauma from such information.

The proponents of the Genome Project cite that some people will want genetic screening to find out if they are predisposed to certain conditions that can then be adjusted by diet or lifestyle. But the critics say that such knowledge could be devastating for many who learn that they or their newborn child may die young or contract a debilitating disease.

"Alison Stewart, the editor of Trends in Genetics, cited a study of how people screened for genetic predisposition to Huntington's disease reacted to the news that they were at high or low risk of developing the disease," *New Scientist* reports. "The study showed that those people told they had only a tiny risk of developing the disease became as anxious and depressed as the people certain to develop the disease."

ANDY COGHLAN. 1992. Human blueprint: Is it better not to know? *New Scientist*. May 2:9.

Human gene patent protest in Europe

"The Green group in the European Parliament has appealed against the granting of a patent for a human gene," *New Scientist* reports. "Last year the European Patent Office [EPO] in Munich awarded the Howard Florey Institute at the University of Melbourne, Australia, a patent on the gene for a human hormone, relaxin. The Greens have lodged a formal protest with the EPO in the hope that the case will arouse public pressure for a European ban on patenting human genes."

Relaxin relaxes the birth canal muscles and is used to help women in labor. The appeal will take several years and is a conscious delaying tactic from the Greens. They want a public discussion, since they consider genes unpatentable because they are discoveries, not inventions. But the EPO says it is the application and production of the gene that are patentable.

In one remarkable case, the "Baylor College of Medicine in Texas applied to the EPO in 1988 to patent a method for expressing specific genes in the mammary glands of mammals," *New Scientist* states. "They also applied to patent any mammal with the implanted gene in its germ line. The application asked separately for a patent on 'mammals' and 'nonhuman mammals'. The EPO says Baylor wanted to patent a human [woman] with the implanted gene and rejected the application. Baylor is appealing. Paul Braendli, head of the EPO, says 'human beings are not patentable'." But European law does not actually forbid the patenting of humans.

DEBORA MACKENZIE. 1992. Greens go to law to block human gene patent. *New Scientist*. February 1: 18.

EEC directive on patenting living organisms still unsure

A directive that would allow the patenting of plants and animals has been tied up within the European Parliament for 3 years. But it has finally been approved by the legal affairs committee and will now go to the ministers of the European Economic Community (EEC) states for final approval.

The directive has created a storm of protests all over Europe. The chemical industry wants patent protection for everything they want to market, threatening that otherwise the U.S. and Japan will take over the biotechnology market. But various public interest groups such as the Greens and religious groups see patenting living organisms as immoral. Scientists, plant breeders, environmentalists, and lawyers are caught in the middle of the fray, worried about the implications such patents may have.

The original proposal would have allowed patents on nearly anything, including animal and plant varieties currently considered to be unpatentable. Even humans could be patented, but the controversy this raised led to a revision of the directive removing this possibility. But early human embryos may be patentable, since in some countries such as Great Britain they are not considered human until 2 weeks of age.

The implications patents on living organisms may have are far reaching. Patented plants would force farmers to buy new seed each year or else pay royalties for seed saved after harvest for the next year's crop. This would likely drive small farmers out of business. Plant breeders would no longer have

free access to plant varieties for further breeding if these contained patented genes or were created using genetic methods. These would require the breeder to pay royalties for their use and would create increased costs. This in turn would probably bankrupt small seed companies.

Henk Hobbelink of Genetic Resources Action International (GRAIN) "says patents will also lead to increased genetic uniformity on farms – a move which could increase the risks to crops from pests and disease," *New Scientist* reports. One third of all plant patent applications to EPO have come from three companies: Lubrizol, Monsanto, and Ciba-Geigy. "Hobbelink says three-quarters of the applications were made by transnational corporations, or companies on contract to them. He predicts that small breeders will be wiped out and that small biotechnology firms will be bought up by multinationals. This trend will concentrate patents for crop plants in the hands of companies that already produce most of the world's agricultural chemicals and control much of the food processing business. Power over food production would then be in the hands of a few big companies."

Many question what patents are for. Patent officials see patents as a method for promoting innovation and inventiveness – otherwise companies would not invest money in developing new products. But many lawyers doubt this, and instead see patents as a method for companies to prevent competitors from using the patented process or invention. A major argument has been that patents promote openness, otherwise the information would remain secret. But scientists involved in the research disagree. Patents do not lead to openness because the results still have to be kept secret while the patent application is being written, which prevents scientists from publishing their work.

DEBORA MACKENZIE. 1992. Europe debates the ownership of life. *New Scientist*. January 4: 9-10; PETER ALDHOUS. 1992. Progress on animal patents. *Nature* 355: 382.

Australia says yes to patents

"An Australian parliamentary committee says that the government should permit the patenting of live organisms and that any objections to genetically modified organisms should be dealt with by other means," *Nature* reports. Australia is the only country that has approved a genetically modified organism for general release into the environment.

"The committee's report concentrates on setting guidelines for the conditions under which such organisms should be used. It recommends that existing, semivoluntary approved processes be strengthened and given the force of law. It also calls for a formal mechanism to obtain approval for the release of both live organisms and those that are byproducts of such genetic engineering."

MARK LAWSON. 1992. Australia says yes. *Nature* 356: 372.

DNA fingerprints: Politics and science–Part 1

DNA fingerprinting is now widely being used by police to identify a criminal from blood or hair left at the scene of the crime. In courts of law, the method has primarily been controversial, because several laboratories have carried out sloppy laboratory work leading to several convictions of innocent victims. These cases were later overturned. But when properly done, most scientists agree that the method is very powerful and can be a useful identification tool.

The method involves taking a sample of DNA, cutting it up into small pieces using specific enzymes, and then separating the fragments on a gel using an electric current. Small fragments move faster in the gel than larger ones. The resulting "fingerprint" is a set of bars, which look somewhat like the bar codes on supermarket items. Because every individual has a unique genetic makeup, the

enzymes that cut the DNA will create slightly different sized fragments in different individuals, which in turn modifies how the bar code looks – how many bars and how far apart they are.

But because the laboratories can only use a few enzymes and not all possible ones, there is a small possibility that two people might have the same DNA fingerprint. The more closely related they are, the higher the probability that this might occur. Proponents of DNA fingerprinting have cited the probability of two people having the same fingerprints as low as one chance in a quadrillion. The probability figures are important in court cases because they tell jurors how much weight the evidence carries. But two population geneticists state that these kinds of statements are misleading and have no basis in science.

Richard Lewontin of Harvard University and Daniel Harti of Washington University School of Medicine have published an article in *Science* that is highly critical of the way geneticists calculate these probabilities. The calculations are made on the assumption that Caucasian, black, and Hispanic populations in the U.S. are homogeneous. But this is not the case, since these populations are made up of many subpopulations, each with its own genetic diversity.

For example, the Hispanic population is made up of subpopulations coming from Mexico, Puerto Rico, Guatemala, Spain, and Cuba, including groups that are almost completely Indian and others that are mainly from European stock. This means that individuals from a subpopulation will be more similar genetically than would be calculated from the standard data bases being used, and this increases the probability that their DNA fingerprints might be similar. The current data bases need to be expanded with data about the genetic variation in diverse ethnic groups before accurate probabilities can be made. Until this is done, Lewontin and Harti argue that probability statements should not be allowed in court.

The controversy grew nasty even before the publication of the article in *Science*. Lewontin and Harti submitted the article in September, 1991, and it was reviewed and accepted. Unbeknownst to them, the manuscript was circulated at an international conference on human genetics. Several pro-DNA fingerprinting scientists, including Thomas Caskey of Baylor College of Medicine, Texas, and Kenneth Kidd of Yale University put pressure on a senior editor at *Science* who was attending the conference. Caskey sits on *Science's* board of reviewing editors, has a grant for $200,000 US to study DNA fingerprinting, and licenses his methods to Cell-mark Diagnostics.

When Daniel Koshland, editor of *Science*, heard about the lobbying, he had the manuscript reviewed again and came up with several suggestions for changes to soften the critique. At the same time, on Caskey's recommendation, Koshland made the unprecedented decision to solicit a rebuttal of the article, to be published in the same issue. The rebuttal was written by Ranajit Chakraborty, University of Texas, and Kenneth Kidd, both staunch supporters of the method and frequent witnesses in court cases.

Lewontin and Harti were also called by a U.S. Department of Justice official who they claim tried to talk them out of publishing their article. They were both deeply offended by the attempt and suspect that Koshland was pressured by the FBI to try to stop their article as well.

LESLIE ROBERTS. 1991. Fight erupts over DNA fingerprinting. *Science* 254: 1721–23; CHRISTOPHER ANDERSON. 1991. DNA fingerprinting discord. *Nature* 354: 500; ROGER LEWIN. 1992. "FBI pressure" on journal forces climb-down. *New Scientist*. January 4: 4; ROGER LEWIN. 1992. Matching of DNA fingerprints prompts renewed concern. *New Scientist*. January 4: 13.

DNA fingerprints: Politics and science – Part 2

The U.S. National Academy of Sciences National Research Council (NRC) has released a report (*DNA Technology in Forensic Science*, NRC, 1992) on DNA fingerprinting that endorses the method. But the report recommends regulating and testing examiners and laboratories carrying out the technique, and measures to improve the statistical basis for making comparisons.

They agree to some extent with the critique of Richard Lewontin and Daniel Harti (see above) and recommend that blood samples from 100 individuals from 15 to 20 different ethnic groups be studied to improve the data base for calculating probabilities of random matches. However, the NRC report also endorses certain methods of calculation that the critics also consider to be bad science. One of these is the multiplication rule that is the final step in calculating the probability of two DNA fingerprints randomly being identical.

The critics claim that the NRC report was rewritten after a leaked draft was reviewed by FBI scientists. They state that the FBI convinced the NRC to remove parts of the chapter on population genetics that would have made it difficult to use DNA fingerprinting evidence in court. A judge in Seattle ordered a copy of the first draft released for a current case and substantial changes were found between this and the final report, supporting the claims of the critics. Among the changes was a recommendation to *not* use the multiplication rule in the first draft. This method was endorsed in the final report.

As an example of the need for further research on ethnic genetic variation, a new analysis of genetic data from a remote Indian tribe in South America turned up some surprises. Kenneth Kidd (see above) collected the samples and has claimed in both a journal article and in the courts that none of the 54 individuals in this tribe had identical DNA fingerprints. Kidd is a strong supporter of DNA fingerprinting, and used the data to convince juries of how rare random matches of fingerprints are.

Laurence Mueller, of the University of California, Irvine, took another look at Kidd's data. Mueller had a computer compare the 1,431 combinations of pairs at seven different locations on their genetic material. The more locations used, the lower the probability of a random match. Forensic scientists usually use only three or four locations or loci when creating a DNA fingerprint. Muell-er's results showed that "322 pairs matched at four loci, 61 [matched] at five loci, five pairs of Indians that matched at six loci and two pairs that matched at all seven loci," *New Scientist* reports. "This was exactly what Kidd had testified did not occur."

CHRISTOPHER ANDERSON. 1992. Academy approves, critics still cry foul. *Nature* 356: 552; DAN CHARLES. 1992. Courtroom battle over genetic fingerprinting. *New Scientist*. April 18: 10; CHRISTOPHER ANDERSON. 1992. FBI gives in on genetics. *Nature* 355:663.

Conflict of interest major concern in U.S. gene community

"During the past year and a half, six members of two genetics panels at the National Academy of Sciences (NAS) have resigned or been asked to drop their connections with private companies because of concerns that commercial ties might affect their scientific judgement," *Nature* reports. For example, the chairman of the Committee on Predicting Future Diseases, Thomas Caskey, of Baylor College of Medicine, Texas, left the committee in mid-1991 because of his financial ties. On December 21, 1991, Caskey resigned from the NRC panel (see above) writing a report on DNA fingerprinting when it became known that he had financial connections to Cellmark Diagnostics, a major DNA fingerprinting company.

The U.S. Congress will hold hearings this spring over conflict of interest among major proponents of DNA fingerprinting. Lawyers who lost a landmark case have petitioned to have the case reopened because several of the experts testifying for DNA fingerprinting had commercial ties at the time. At the center of the case is Thomas Caskey, who is a major promoter of DNA fingerprinting and who testified in support of the method, which led to three men going to prison.

Caskey would have been disqualified from testifying if his ties to Cellmark Diagnostics had been known. The lawyers also state that Caskey failed to disclose that he had applied for a $200,000 US grant to do DNA fingerprinting research. The grant was from the National Institute of Justice (NIJ), funded by the Department of Justice.

Another expert witness, Stephen Daiger of the University of Texas Health Science Center, had also failed to disclose a similar grant application for $300,000 US from NIJ. Daiger's coinvestigator for the grant is Ranajit Chakraborty, who has also testified in other court cases for DNA fingerprinting. Chakraborty was one of the authors of a rebuttal of a scientific article challenging DNA fingerprinting (see above).

The Council for Responsible Genetics, a critical watchdog organization, wants "tougher ethical standards." They warn that the Human Genome Project may become "compromised by the undisclosed biases of its participants." For example, one scientist who reviews research grants has seen several cases where researchers have included payments in the grant to private companies where they have undisclosed financial interests.

CHRISTOPHER ANDERSON. 1992. Conflict concerns disrupt panels, cloud testimony. *Nature* 355: 753–54; 1992. Conflict of interest revisited. *Nature* 355: 751.

British DNA fingerprint data base challenged

"The British civil rights group Liberty is seeking to take London's Metropolitan Police to the European Court of Human Rights, questioning the legality of its database of DNA fingerprinting results," *Nature* reports. The Police and Criminal Evidence Act requires that regular fingerprints taken from a suspect who is later cleared of the crime must be destroyed. But the Act does not mention what to do with DNA fingerprints.

Liberty is fighting for an individual who gave a blood sample to police to help in an investigation. Although never suspected of the crime, the police have refused to remove his DNA fingerprint from their computer data base.

PETER ALDHOUS. 1992. Challenge to British forensic database. *Nature* 355: 191; JEREMY WEBB. 1992. Police attacked over DNA fingerprinting. *New Scientist*. January 18: 12.

Gene tests finding military and civilian use

"All American soldiers will soon have blood samples on file, so that their bodies can be identified by genetic tests," New Scientist reports on January 18. The samples will be taken when the person enlists and destroyed when they leave the military.

Some of the bodies of victims of an Airbus crash were identified using genetic fingerprinting, as they could not be identified using conventional methods. DNA from the corpses was compared to that taken from parents and siblings.

1992. Blood and body bags. *New Scientist.* January 18: 15; SYLVIA HUGHES. 1992. Genetic tests identify plane crash victims. *New Scientist*. April 11:6.

Gene therapy developments

Researchers at the U.S. National Heart, Lung, and Blood Institute have managed to introduce a functional cystic fibrosis gene into

the lungs of rats. They put the gene in a special virus called an adenovirus and then applied it directly to the lung. Adenoviruses infect lung cells. The gene was active in the rats for 6 weeks.

Experiments at the National Institutes of Health have shown that it is possible to isolate stem cells of the bone marrow from the bloodstream and concentrate them. The cells can then be modified with a new gene and re-introduced into the patient, where they then migrate back to the bone marrow. Stem cells produce the body's blood cells and last a lifetime. The researchers plan to use the method to treat two young girls suffering from adenosine deaminase (ADA) deficiency, which destroys the immune system.

In a similar experiment, Italian researchers have modified stem cells in a 5-year-old child with ADA deficiency and reintroduced them. This is the first human gene therapy using stem cells.

A group at the University of Michigan Medical Center in Ann Arbor have succeeded in using myoblasts, immature muscle cells, to carry genes into muscle tissue of mice. The new genes were active and the muscle cells secreted the gene product into the blood. This is a completely new type of gene therapy and could have potential for treating muscle diseases as well as for delivering needed substances to the body, such as insulin in diabetics.

JEAN MARX. 1992. Gene therapy for CF advances. *Science* 255: 289; ROGER LEWIN. 1992. Gene therapy promises cure for cystic fibrosis. *New Scientist*. January 18: 9; LARRY THOMPSON. 1992. Stem-cell gene therapy moves toward approval. *Science* 255: 1072; ALISON ABBOTT. 1992. Italians first to use stem cells. *Nature* 356: 465; MICHELLE HOFFMAN. 1991. Putting new muscle into gene therapy. *Science* 254: 1455–56.

Great Britain sees no problems with gene therapy

The *Report of the Committee on the Ethics of Gene Therapy* (HMSO, January 1992) finds that there are no ethical problems with somatic gene therapy and that the practice can be compared to transplanting organs. But gene therapy should be considered experimental and no one should try to modify eggs or sperm. The report recommends that a supervisory body of scientists and lay people be created to assist in approving gene therapy experiments.

PHYLLIDA BROWN. 1992. Gene therapy wins official blessing. *New Scientist*. January 25: 18; PETER ALDHOUS. 1992. Britain gives the green light. *Nature* 355: 190; P.A. 1992. Call for UK gene therapy. *Nature* 355: 286.

Gene therapy group disbanded

The Recombinant DNA Advisory Committee (RAC) at the U.S. National Institutes of Health has decided to disband its human gene therapy subcommittee. Several members of the RAC also sit in the subcommittee and it has been seen as just another hoop to jump through for researchers submitting gene therapy protocols.

DIANE GERSHON. 1992. NIH merger to shorten review. *Nature* 355: 664.

Engineered mouse cells may form artificial pancreas

"A tiny plastic tube filled with cells genetically modified to produce insulin could one day form the basis of an artificial pancreas to treat diabetes," *New Scientist* reports. Researchers at the University of Texas, Dallas, have modified cells from the mouse pituitary gland to contain the gene for insulin as well as a regulator gene sensitive to glucose. The cells were placed in a small hollow fiber that is wide enough for glucose and insulin to pass through, but not for cells of the immune system. This protects the mouse cells from

being destroyed. The cells produce insulin in response to glucose, mimicking the pancreas.

DAVID CONCAR. 1992. Mouse cells engineer hope for diabetes treatment. *New Scientist*. January 25: 29.

Genetically modified skin grafts new form of gene therapy

Experiments have shown that human skin cells grafted onto hairless mice led to the introduction of human proteins into the mice. The proteins disappeared when the graft was removed. This could be developed to use genetically modified skin cells that can produce substances such as insulin, which is missing in diabetics. A skin graft would then produce the missing substance and would be simple to remove if problems were to arise.

DAN CHARLES. 1992. Engineered genes in grafted skin could be body's protein factory. *New Scientist*. February 22: 17.

Olympic sex test denounced

In 1968, the International Olympic Committee (IOC) introduced a requirement that women pass a sex test proving that they were not men parading as women. The test uses cells swabbed from the inside of the cheek and checks that two X chromosomes are present. However, some women have a condition known as androgen insensitivity syndrome where the women have an X and a Y (male) chromosome. The Y chromosome leads to production of male hormones but the woman's cells are insensitive to them and therefore they remain female and have no athletic advantage over women with two X chromosomes. These women have been disqualified from the Olympics, however.

Now the IOC is replacing the cheek swab with a DNA test that tests for the presence of particular parts of the Y chromosome. This will still disqualify women with androgen insensitivity syndrome. It is also easier to perform and will lead to more testing, with the consequent risk of false positives.

Geneticists in France denounced the tests and demand that they be withdrawn. They are humiliating and have never detected a man masquerading as a woman. But a number of women have been disbarred unfairly. In several cases, women passed the test at one time; failed it another time, which resulted in their medals being taken away; and then found that a third test showed the second test to be false.

A group of U.S. and U.K. researchers also condemn the tests and propose instead that all Olympic athletes undergo a complete physical by approved doctors to ascertain their health and their sex. They consider the sex tests to discriminate against women.

WILLIAM BROWN. 1992. Sex-test confusion could create havoc at Olympics. *New Scientist*. January 18: 14; 1992. Non to sex tests. *New Scientist*. February 1: 19; M.A. FERGUSON-SMITH *et al*. 1992. Olympic row over sex testing. *Nature* 355: 10.

U. S. biotechnology policy published

The White House published guidelines for the regulation of biotechnology products in March 1992. The guidelines follow the same lines as a report given out by the National Research Council in 1989, basing the need for regulation on the risk the product poses to the environment, not the method it was made with. This means both genetically modified organisms and organisms created by traditional breeding should be regulated in the same way.

The guidelines now make possible the publication of regulations for releasing genetically modified organisms into the environment that the U.S. Environmental Protection Agency and the Department of Agriculture have developed. But the guidelines may make some of the regulations difficult to implement, since both the EPA and USDA

currently regulate genetically modified organisms more strictly than pesticides, chemicals, and traditionally modified organisms. This is in conflict with the White House policy, which does not want biotechnology products regulated more tightly than other products.

The White House policy now means that there is a fundamental difference in how the U.S. regulates biotechnology in comparison with Europe, where the method of production determines how the product is regulated. The U.S. policy is much more friendly to biotechnology business and may mean that European companies will be tempted to relocate to the U.S.

An editorial in *New Scientist* sees this as an attempt by President George Bush to "win votes from industry by guaranteeing that the regulations will not be allowed to become 'too burdensome to businessmen'." *New Scientist* sees the danger in short-term political interests that could lead to long-term damage of the environment. An editorial in *Nature*, however, commends the White House on a policy "that is utterly in keeping with good science." After pooh-poohing the concerns of environmental groups and ordinary citizens over their fears that biotechnology may damage the environment, *Nature* states that "the benefits of the technology (creating herbicide resistant crops, for instance) are easy to identify."

HELEN GAVAGHAN. 1992. Washington takes a stand on biotechnology. *New Scientist*. March 7: 10; 1992. New biotech rules. *Science* 255: 911; 1992. Bushwhacking the environment. *New Scientist*. March 7: 7; 1992. US biotechnology policy. *Nature* 356: 1–2.

Canada's biotechnology regulation under fire

A government report released by the National Biotechnology Advisory Committee states that the current uncertainties in regulation policy are discouraging research and undermining public confidence in biotechnology. The bureaucratic process is too slow and the number of professionals available to assess the risks of biotechnology products is too few. Regulations for field testing genetically modified plants are antiquated and confusing, and regulations are lacking for other applications.

DOUGLAS POWELL. 1992. Canadian biotech regs under fire. *Science* 254: 1720.

Gene law in Germany being felt

The Federal Republic of Germany passed one of the most comprehensive regulatory laws for the use of genetically modified organisms in 1990. The effects of the law are now being felt by researchers, who are required by the law to apply for permits to carry out any experiments using genetically modified organisms. They are also required to attend a 3-day course on the law and laboratory safety.

Many researchers are angry at the regulations because they have to wait between 3 to 6 months in some cases before beginning experiments. The law is being implemented differently in the different German states as well, which is causing more confusion. Some states have already forced researchers to attend the 3-day course, while others have not begun to arrange them. And some officials are more cautious in their decisions, leading to longer turnover times for permits.

The situation will probably improve as officials become more accustomed to their role. But in the meantime, many researchers are leaving or changing their research emphasis to escape the permit process.

PATRICIA KAHN. Germany's gene law begins to bite. *Science* 255: 524–26.

Bioethics enters the genetic engineering agenda

The 26 countries of the Council of Europe have adopted a draft European Convention on

Bioethics. The Convention is expected to be ready by late 1993 and will be based on the European Convention on Human Rights. It includes respect for human dignity, protection of individual integrity, and the prohibition of commercializing the human body or its organs.

France has presented three bioethics bills to Parliament. One bill deals with how genetic data will be handled on computers. The second bill is a law on genetic identity stating that a person's genetic makeup may be modified only for therapeutic reasons. The third bill is the most controversial, and covers the therapeutic use of human organs and products. "For the first time, there will be penalties for trafficking in human organs, acting as an intermediary for surrogate motherhood, which is to be banned, and carrying out gene tests not authorized by a court of law," *New Scientist* reports. The bill also covers medically assisted reproduction, including in vitro fertilization and insemination.

And in the U.S., the National Institutes of Health are creating a public policy center that will help to anticipate and deal with many of the ethical issues being raised by the Human Genome Project. The idea is to give bioethicists "the intellectual resources to identify, ponder and then begin to resolve these issues before they explode into public view," Jeffrey Mervis of *Science* writes.

IAN MUNDELL. 1992. Europe drafts a convention. *Nature* 356: 368; SYLVIA HUGHES. 1992. French debate bioethics bill. *New Scientist*. April 4: 9; JEFFREY MERVIS. 1992. NIH forms policy centre to study research ethics. *Nature* 356: 367.

Industry pressures against regulation in Europe

The Senior Advisory Group on Biotechnology (SAGB) is an industrial lobbying group representing nine of the biggest chemicals companies in Europe (ICI, Ciba Geigy, Hoffmann-LaRoche, to name a few). SAGB is expanding to include 28 biotechnology companies as well. It is exerting pressure on the European Community to use existing product safety regulations for the biotechnology industry and its products. Otherwise Europe will not be able to compete with the U.S. and Japan. SAGB is also lobbying hard for the adoption of the EC directive on patenting biological inventions.

PETER ALDHOUS. 1992. Biotech lobby pressures EC. *Nature* 355: 289.

British industry not happy with proposed legislation

Since the adoption of two European Community directives on genetically modified organisms (one on contained use, the other on releases into the environment), only a few countries have complied by bringing their own legislation into line with the directives. The British Department of Environment (DoE) has now come up with draft regulations that have upset industry. Industry charges that the regulations are costly and cumbersome, and will drive biotechnology companies out of Great Britain. And some members of the Advisory Committee on Release to the Environment (ACRE) think the laws could have been improved if the DoE had consulted ACRE and another expert committee at their disposal.

Environmentalists were fairly happy with the proposed laws. But Greenpeace International is concerned over a clause that would allow the law to be overridden by ministers, who could suppress information about a release if it posed a risk to "national security".

ANDY COGHLAN. 1992. Industry slams draft law on novel organisms. *New Scientist*. January 25:20.

Problem genes in organisms can easily be removed

Plants and microorganisms that have been genetically modified for specific traits often

carry extra genes that are used as markers. The most common markers are herbicide and antibiotic resistance genes. These are used in early phases of the gene transfer to select those organisms that carry the new trait, since it is linked to the marker gene and thus makes the modified organisms capable of withstanding herbicides or antibiotics in the growth medium. The only organisms left after such treatment will be the modified ones. The marker genes are not needed after this point but are carried as extra baggage.

Concern has been raised that the marker genes may pose an environmental hazard should pollen from a modified plant pass on herbicide resistance to closely related weeds, or antibiotic resistance to microorganisms. Now two research groups have developed a method that can remove the marker genes after they have done their job. They have placed special sites before and after the marker gene that allow the gene to be snipped out by an enzyme.

ANNE SIMON MOFFAT. 1991. Excess genetic baggage dumped. *Science* 254: 1457; ANDY COGHLAN. Cutting out a hazard of genetic engineering. *New Scientist*. February 1:28.

Pollen from insect-pollinated plants can spread 1 km

Norman Ellstrand of the University of California, Riverside, has shown in a field test that pollen from insect-pollinated plants can reach long distances. Ellstrand followed the spread of genetic material via pollen from a plot of cultivated radishes to wild radishes planted at different distances from the central plot.

The seeds from the wild radishes were tested for a gene found only in the cultivated sort and that could only be found in wild radishes if they had been pollinated by the cultivated radishes' pollen. The gene was most frequent in the wild radishes 1 m from the plot. The further the distance, the less frequent the gene. But Ellstrand was surprised to find that some seeds from a plot 1 km away showed the gene.

Ellstrand concludes, "Our data suggest that distances from engineered crops to compatible weeds must be at least several kilometers for spatial isolation to prevent the escape of engineered genes."

ANDY COGHLAN. 1992. Will altered crop genes run wild in the country? *New Scientist.* March 21: 21.

Two unregulated routes found for spread of genetically modified bacteria

Genetically modified microorganisms (GMOs) are regulated so as to prevent their uncontrolled spread into the environment. Researchers at the Dutch National Institute of Public Health and Environmental Protection have studied two possible routes for the unintentional spread of such organisms, the white lab coat and postal packages.

White lab coats used in biotechnology research and production are the perfect escape route for genetically modified bacteria, the researchers found. Most research is done using *E. coli*, a bacteria found in the gut. To keep it from being able to survive outside the lab, a particular strain called K12 has been developed. According to theory, K12 can only survive in laboratory cultures and would not be able to survive on a wet lab coat once it dried.

The Dutch researchers found, however, that K12 bacteria survived being dried out on lab coats, and they also found that the lab coats were sent to a local laundry. The laundry soaks the lab coats in 35 °C water, releasing the bacteria, which are then washed alive into the sewage system. The researchers also found that they could isolate live K12 as well as wild *E. coli* from a 2-year-old lab coat, even though the K12 contained extra genes.

The bacteria were found to penetrate through the coat and onto clothing as well.

Clothes are most often washed at home. Sure enough, they found K12 in the wash water after washing contaminated clothing. So K12 enters the sewage system and can survive there for up to 72 hr, increasing the risk of transferring new genes to other bacteria.

In a second study, Dutch researchers requested samples of GMOs from a total of 10 laboratories in Europe, the U.S., Australia, and Singapore. All were sent by post. The U.N. has implemented rules for how living pathogenic microorganisms should be mailed, and these rules are applied to genetically modified organisms as well. The samples must be sent enclosed in two watertight containers with absorbent material between them to soak up a spill if one should break, and the package should be marked with a biohazard sticker.

Of the 10 samples requested, none was marked with a biohazard sticker and none conformed to U.N. or Dutch specifications for packaging. Four samples were sent in glass tubes and one in a petri dish. The researchers then proceeded to treat the packages to the rough handling that might come about in the process of being shipped by post. They all survived being dropped but several succumbed to being stepped on. Only one package survived when a 6.3 kg weight was dropped on it. The experiment illustrated that sending GMOs by mail could lead to leakage and their subsequent release into the environment.

DEBORA MACKENZIE. 1992. Clean white coats spread mutant microbes. *New Scientist*. March 21: 11; D. M. 1992. Mutant bacteria may escape from the mail. *New Scientist*. April 4: 6.

Large-scale test of rabies vaccine successful

A large-scale field test of a genetically modified rabies vaccine seems to be efficacious in immunizing red foxes, the main host of the virus in Western Europe. The field test was carried out in Belgium. Bait was distributed by helicopter, and after one year over 80% of the red fox population had been vaccinated. This is the level that is required to block transmission of the disease at the current population density.

Rabies incidence declined dramatically during the test. A possible future problem may be that, without rabies, more foxes will survive, which will increase the population densities. This in turn requires that a higher percentage must be immunized to prevent a new outbreak.

ROY M. ANDERSON. 1991. Immunization in the field. *Nature* 354: 502.

New developments in plants

Researchers have succeeded in modifying tobacco plants to produce an enzyme that converts the common weed killer cyanamid into urea. The urea is then converted to nitrogen compounds that fertilize the plant.

Apricot trees have been genetically engineered to resist the plum pox virus, a major pathogen of stone-fruit trees.

U.S. argricultural researchers are asking the government and industry to restrict their use of *Bacillus thuringiernsis* (Bt) as a biopesticide. Bt produces a toxin that kills insects, but evidence is coming in that intensive use is leading to Bt resistance in insects. Many biotechnology companies are placing the Bt toxin genes in plants so that they can produce their own pesticide.

DAVID BRADLEY. 1992. Genetic weeding and feeding for tobacco plants. *New Scientist*. January 4: 11; GAMINI SENEVIRATNE. 1992. Gene transplant gives apricots a riper future. *New Scientist*. March 14: 14; CHRISTOPHER ANDERSON. 1992. Researchers ask for help to save key biopesticide. *Nature* 355: 661.

Genetically engineered sheep being developed

Australian researchers have modified a mouse so that it contains a tobacco gene for

chitinase. Chitinase is an enzyme that kills insects. The purpose of the modification is to test whether the chitinase is found on the skin of the mice. This would make possible the development of insect-resistant sheep who would in turn produce moth-proof wool.

1992. Australian sheep let their hair down. *New Scientist*. January 4: 8; LEIGH DAYTON. 1992. "Self-dipping" sheep will poison parasites. *New Scientist*. April 4: 19.

Bovine milk hormone moratorium continues in Europe

"The European Commission wants more research into the harmful effects of the genetically engineered hormone bovine somatotrophin before national governments license the drug in Europe," *New Scientist* reports. They also want to extend the current 1-year moratorium for 2 more years.

Allegations are being made that research data unfavorable to BST is being suppressed. In the U.S., a Vermont state legislator requested the results of a study by Monsanto, one of the companies wanting to market BST, that was carried out at the University of Vermont. He received the health records of the cows, but no information on which ones had been treated with the hormone. Monsanto states that its contract with the university allows it to refuse to release raw data. But a university scientist, Maria Lyng, leaked the list of which cows had been treated because she was concerned about a possible cover-up of the side effects of the hormone.

Lyng had previously been dismissed from her job because she asked awkward questions about BST effects. She studied aborted and stillborn calves, but the BST researchers refused to let her examine their aborted calves. The information she leaked showed that cattied treated with BST bore deformed or stillborn calves more often than normal, and that the cows retained the placenta more often and showed other health effects related to excess fat breakdown.

Most worrying "is that of 12 daughters of treated cows, three bore deformed calves," suggesting that BST is mutagenic. The Food and Drug Administration refuses to believe that BST is the cause of these effects, but the scientist who reviewed the data stated, "Perhaps the FDA has not heard about diethylstilbestrol [DES]." DBS is a hormone that was once given to pregnant women, and their daughters were found later to have increased rates of vaginal cancer.

DEBORA MACKENZIE. 1992. Doubts over animal health delay milk hormone. *New Scientist*. January 18:13.

PCR licensing fees reduced

The Swiss drugs firm Hoffmann-LaRoche has agreed to lower prices for licensing its polymerase chain reaction (PCR) technique and to lower its royalty percentage. Hoffmann-LaRoche has a monopoly on the technique but has faced considerable pressure because its prices are making genetic diagnosis too expensive. After being threatened by a possible government takeover of the patent by eminent domain, the company backed down.

MICHELLE HOFFMAN. 1992. Roche eases PCR restrictions. *Science* 255: 528; CHRISTOPHER ANDERSON. 1992. Roche cuts controversial PCR fees, testing limits. *Nature* 355:379.