tons of oil a year, saving France some $10 billion in oil purchases even at today's prices. And France expects to earn a healthy income from the export of enriched uranium by Eurodif and of PWR's by Framatome.

The political standing of the program in France has also been helped by its achievements. The projects undertaken by French nuclear engineers have been successful, in the military as well as civilian fields. The management structure of the program owes much to Giraud, the present Minister of Industry. As head of the CEA from 1970 to 1978, Giraud shaped the major features of the present nuclear program, by pushing ahead with Eurodif, founding Cogema, healing the rift between EdF and CEA, and backing development of the fast breeder. French president Valèry Giscard d'Estaing, also an engineer by training, has given the program full support since taking office in 1974.

Continuity is the characteristic theme of the French nuclear power program. Beginning at least in 1970, a political and technical consensus as to its objectives has allowed France's program, perhaps alone of Western countries', a period of continuous and sustained development. The government has refused to be deflected from its nuclear goals either by internal opposition or by external pressures such as the nonproliferation policy launched by President Carter in 1976.

Is the French experiment of all-out commitment to nuclear power the one sure road to energy independence, as the government insists, or a gigantic economic and safety gamble which will bring the nation to disaster, as the program's critics predict? The ambitious program is only now beginning to assume its mature form, but the strengths already evident suggest that nuclear energy makes sense, at least for France.

—NICHOLAS WADE

Malpractice Award Rattles Johns Hopkins

Former medical student wins $2-million verdict against his alma mater

"I wouldn't have that boy's injury for $2 million, not even for $4 million," says Marvin Ellin, the trial lawyer some people call Mr. Malpractice of Baltimore, the one who on 26 June obtained for his client the largest medical malpractice award ever made by a jury in Maryland. The award—$2 million—was given in the Baltimore City Court to a 34-year-old ophthalmologist named James Lehninger.

The case is rare in that it involves one doctor suing another for malpractice. It is rare, too, to find so large a sum awarded for a less-than-devastating illness. (Lehninger fractured his hip on a ski slope 9 years ago, and complications arising from that accident will compel him to live with an artificial hip joint.) Most remarkable is the logic used to justify the award: Lehninger claimed he would lose $1.4 million in future income because his bad hip would force him to go into academic medicine rather than private practice.

The loser in the trial was the Johns Hopkins University Medical School, which runs the hospital and emergency room where the alleged malpractice occurred. The university is appealing the verdict on grounds that Maryland's 3-year statute of limitations bars action on a 9-year-old injury. Officials are unwilling to discuss details until after the appeal is tried, a proceeding which they say could begin next January.

Faculty members at Hopkins were shaken by the decision this summer, partly because they see in it the worst qualities of the lawyers' method of assuaging human injury, but also because it has drawn the school into a painful family dispute.

Lehninger was a medical student at Hopkins when the accident occurred. His most important witness against his alma mater was his father, Albert Lehninger, author of a widely used biochemistry text and for many years chairman of Hopkins' biochemistry department. The chief physician on the defense's side was Robert Robinson, an equally distinguished professor at Hopkins and former chairman of the orthopedics department. Both had retired from their chairmanships at the time of the trial. They remain on the faculty.

Faculty members do not want to be quoted, but they speak freely off the record of what they consider to be an outrageously generous award. Its size, they argue is out of proportion to the scale of injury, a windfall, as they see it, that plopped in Lehninger's lap because his skillful lawyer knew how to shake the tree.

They were particularly miffed by the economic rationale, which seemed to disparage academic medicine. Hopkins tends to see itself as a place where the academic elite is trained. Ellin brought to the trial an economic consultant named Manuel Smith who did some calculations for the jury. He computed Lehninger's probable working lifetime, his possible income as an ophthalmologist in private practice, and his probable income as an academic. The switch from private practice to academe, he figured, amounted to a loss of $1.4 million for Lehninger.

Ellin defends the claim eagerly, saying that $2 million is small compensation for his client's loss of quality of life. He points out that the jury did not stipulate how much of the total award was for economic loss and how much for mental anguish.

Because the bone in Lehninger's hip is deteriorating, Ellin says, Lehninger will have to have an artificial joint put in within a year. This will last for no more than 10 years before it becomes loose, when it will have to be replaced with a new joint which may last for no more than 5 years. After that, the bones will have to be fused, a procedure that leaves the patient walking with an unnatural, lurching gait. These problems, Ellin says, will make it impossible for Lehninger to develop a private practice. He will not be able to visit patients on the ward or remain standing during long operations. (Lehninger had hoped to be an ophthalmic surgeon.)

Furthermore, Ellin explains, Lehninger was a very "sports-minded" young doctor. He will no longer be able to run the 3 to 4 miles he ran daily while in school, nor will he be able to keep up his excellent game of tennis, nor will he swim competitively as he did before.

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Acid Rain Agreement

The United States and Canada on 5 August moved a step closer to joint action on acid rain, an environmental pollutant that each exports to the other. Secretary of State Edmund Muskie and Canadian Ambassador Peter Towe agreed to establish scientific working groups of government experts from both nations, in preparation for the start of formal negotiations next June to limit acid rain.

Neither side expects that negotiations will be easy. Acid rain is caused in large measure by emissions from power plants, and any international arrangement must tread delicately around the energy plans of each nation, including greater interest on both sides in energy from coal. Coal-fired power plants emit more of the sulfur oxides and oxides of nitrogen that react in the atmosphere to precipitate as sulfuric and nitric acids in rain and snow.

The limited scope of the preliminary agreement reflects the diplomatic difficulties. It calls for consultation on anticipated industrial development near the U.S.-Canadian border, and on anticipated changes in regulatory policy. Canada is pleased with current tough provisions of the U.S. Clean Air Act as applied to emissions from new power plants, and would like to see old plants governed by the same standard. But it is worried that Congress might gut even the existing provisions in the rush to coal, when the act comes up for renewal next year—a fear that is shared by environmentalists in the United States. The preliminary agreement calls on both sides to enforce existing laws vigorously during negotiations, and to develop policies and strategies for tougher controls "as necessary or appropriate."

The agreement also establishes a scientific working group to take air samples and estimate the impact of acid rain on each nation's environment. The regions most affected are Vermont and New Hampshire, as well as the Adirondack Mountains in New York State and an area of Canada north of the Great Lakes known as the Precambrian shield region. Each lacks acid-neutralizing natural minerals, and thus is vulnerable to destruction of its fish and possibly agricultural crops and forest.

Another working group is to determine precisely where the acid rain originates. According to current estimates, the United States contributes half of the acid rain precipitate in Canada, while the Canadians contribute four to five times less to the United States. But the relative contributions vary with seasonal windflows, which have not been pinpointed.

A third working group is to compose a strategy for acid rain abatement. John Roberts, the Canadian minister for the environment, has estimated potential Canadian abatement costs at $400–$500 million a year between now and the year 2000, while U.S. costs will be five to eight times higher.

Each country will obviously be constrained at the negotiation table by whatever might prove acceptable to the various legislators and utilities interested in the agreement. In Canada, the political problems are made more difficult by the relative independence of each of its provinces.

In the United States, the utility interest is a powerful lobby, as indicated by a recent Senate vote on a bill requiring conversion of 80 power plants from oil and natural gas to coal (the "Oil Backout bill"). The changeover is expected to increase emission of sulfur oxides and nitrogen oxides by 20 percent. Acting out of concern for the effects of acid rain, Senator Paul Tsongas (D-Mass.) proposed an amendment barring the power plants from increasing the emissions, either by burning low sulfur coal, burning at a lower temperature, or achieving offsetting emission decreases elsewhere. Some of the utilities' costs would be covered by federal grants and loans. But the amendment failed in committee and lost on the Senate floor by a vote of 63 to 31, after intense industry lobbying.

Muskie says the achievement of an agreement with Canada on acid rain "is close to my heart as a New Englander, a former senator from a border state, as a committed environmentalist, and as a citizen who believes deeply in a strong friendship and partnership between our two countries." It is obvious that he will need more support, and Congress is the place he must ultimately go to get it.—R. JEFFREY SMITH

Had the trial been conducted in California, where juries really appreciate the importance of the quality of life, Ellin thinks, the award would have been double what it was.

Lehninger's story of how he came by his bone disease is fairly straightforward, except at the points where he argues that the physicians at Hopkins were partly responsible for causing it. In the court filings he claims that malpractice was committed twice: first, when the original fracture was examined, and then 2 years later, when surgical pins were removed from the hip. Mistakes made at these times, Ellin argues, fostered the development of avascular necrosis (death of the bone due to inadequate blood circulation) in Lehninger's hip. It is an irreversible disease that destroys the affected area of bone.

Albert Lehninger, the father, did not want to comment, except to say that he "had to testify." This was an apparent reference to the fact that he was called as a witness to corroborate a key conversation between his son and his son's physician, Robinson. The discussion took place in 1973 when the pins were taken out, and the gist of it, the Lehningers say, was that Robinson assured the Lehningers that there was no evidence of avascular necrosis, and that if it were going to appear, it would have done so by that time. The point was critical because the statute of limitations does not apply when important information has been withheld, or a patient has been misled about his condition. The Lehningers argue that Robinson's reassuring words prevented them from discovering what had really happened until nearly 5 years later. It was then, they say, that the statute of limitations began to run.

Lehninger, the son, was unavailable for comment, having completed a fellowship at the University of Texas at Galveston and departed without leaving a number where he could be reached. A colleague there, John Barber, said Lehninger had been doing cat research and was looking for an academic post of some sort, but that most had been filled by now.

The medical history of this case began in 1971, when Lehninger fell on the ice while on a weekend ski trip. He took himself to the Hopkins emergency room complaining of pain. A resident physician had an x-ray made, examined it, and concluded that there was no evidence of a fracture. He sent Lehninger home with a cane and instructions to rest and return to the hospital a few days later. Before returning to the hospital, Lehninger fell again on the same hip. He went to the

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hospital by ambulance. This time he was treated by the head of orthopedics, Robinson.

Robinson discovered a displaced fracture of a hip (a complete break) and quickly hospitalized Lehninger, pinning the broken bone together with surgical nails. He also discovered, and told the Lehningers, that the original reading of the emergency room x-ray had been wrong, that it revealed that there had been a subtle, impacted fracture which should have been treated immediately. Under questioning by Ellin in pretrial proceedings, Robinson said, "There are a lot of people that wouldn't pick that fracture up" in examining the x-ray film. He said that he would have spotted it, had he been in the emergency room, "because of experience," and that, had he seen it, he would have put Lehninger in bed and probably pinned the hip. At the time, Robinson asked to have the report on the first x-ray amended to show that a subtle fracture had been present from the outset. The report was amended.

An orthopedic expert who testified in Lehninger's behalf, George Schoedinger III of the St. Louis County (Missouri) Orthopedics Group, says the fracture was "perfectly clear" on the first x-ray. The crux of the issue, he thinks, is that Hopkins had an inadequate administrative system for reviewing x-rays. According to Schoedinger, it is understandable that an emergency room doctor might miss a subtle fracture, but standard procedure requires that the film also be reviewed by a specialist—in this case, a radiologist. Schoedinger says Hopkins' review system was poor, and this allowed the fracture to go untreated until Lehninger had his second fall.

It is impossible to determine whether the avascular necrosis was caused by the first fall or the second. The second fall, which actually displaced the bones, probably did the critical damage, cutting off the blood to the head of the hip bone. But orthopedic experts say that avascular necrosis sometimes is associated with an undisplaced fracture, such as the one Lehninger sustained on the ski slope.

Richard Ross, dean of Hopkins' medical school, declined to talk about the case. "We have been given strict instructions by our lawyers that we are not to discuss any of this until the appeal has been run out," he said. He has asked other faculty members, including Robinson, to remain silent for the time being. However, the chief of radiology, Martin Donner, maintains that, since 1965, x-rays in the emergency room have been reviewed by radiologists in training. "Nowadays," he added, "all x-rays are also reviewed by the senior staff."

The story continues. Under Robinson's care, the hip was repaired, and it healed. In December 1973, 2 years after the break, Robinson removed the pins and took new x-rays. At this time, the Lehningers claim, Robinson told them there was no sign of avascular necrosis and no danger that it would set in. Lehninger says he was allowed by Robinson to resume sports activity. Then in 1977 he developed a severe pain in his hip, had an x-ray taken, and learned that his hip was deteriorating because of avascular necrosis. No lawsuit was filed until 1979, the Lehningers' attorney says, because it was not until 1978 that the Lehningers discovered evidence that the bone disease should have been spotted earlier by Hopkins' doctors.

The nub of the Lehningers' argument is that the disease was already present in 1973, and that Robinson should have seen it, informed them, and possibly attempted to treat it by "revascularization." Furthermore, they say, the disease probably would not have set in if the original fracture had been spotted and pinned together in 1971. In the trial, Schoedinger testified on Lehninger's behalf that evidence of necrosis was clearly present in the 1973 x-ray. Robinson testified that it was not. The university's lawyer did not call in any other experts to back Robinson's reading because, "It was a question of credibility . . . it didn't seem necessary."

Lehninger's attorney introduced a document subpoenaed from Hopkins' files that weighed against Robinson. It was a retrospective analysis of the 1973 x-ray, written in 1977 by staff physician David Hungerford, after the bone disease had appeared. Hungerford had written of the 4-year-old photo: ". . . there is some minimal deformation of the subchondral plate which is suggestive of the possibility of avascular necrosis." Hungerford now minimizes this analysis, for he says it is simple to spot a problem when you know what you are looking for: "Vision with the retroscope is always 20/20."

Like other Baltimore doctors who feel that malpractice suits have gotten out of hand, Hungerford thinks an "absolutely ridiculous definition of negligence," is being applied to medicine. People unavoidably miss things in an x-ray, and when those mistakes come before a jury, they are judged against a standard of perfect accuracy—a burden which Hungerford calls both unrealistic and unfair.

Donner points out that a recent study of radiological practices at the Massachusetts General Hospital (see *Radiology*, August 1979, p. 277) found that in about 20 percent of the cases some significant pathology is missed when x-rays are reviewed. Misses in the radiological world are particularly obvious—and thus good material for litigation—because everything is documented on film.

Ellin's response to this complaint, which seems to drive the Baltimore doctors up the wall, is that the law is not concerned with averages, but with particular cases. The good work a doctor has done in the past cannot be used to negate a mistake in the present. Ellin likes to use a traffic analogy when addressing the jury. He says, imagine that this good doctor had run a stop sign and injured the patient by mistake. Would you absolve him of negligence because he had driven past this same stop sign every day for 20 years and stopped correctly every time before this? Juries tend to agree with Ellin that the doctor should not be absolved.

As a score of other states have done, Maryland has tried to smooth out some of the inequities in the medical malpractice business by imposing a form of no-fault insurance, known as the Health Care Malpractice Claims Arbitration Act of 1976. It was designed to move the entire problem out of the courts and turn it over to a bureaucracy, which was supposed to make the process of settling claims easy, efficient, and routine. Under this system all claims over $5000 must be submitted first to compulsory, nonbinding arbitration, supervised by panels of doctors and lawyers.

One of the physicians who backed the legislation, Charles Henderson, former president of a group known as the Medical Practice Action Committee, thinks that the attempt to run a no-fault system is collapsing. Only a few physicians have volunteered to serve on the panels, he says, and the number of lawyers involved is "miniscule." The system was meant to handle 30 to 40 cases a year and, instead, it is getting that many each month. There is an incredible backlog. The mechanism will require a thorough overhaul, Henderson thinks. Some, particularly the lawyers, would like to scrap it and take the restraints off the litigants.

Ellin does not hesitate to defend a system which seems to give the largest awards to patients with the best lawyers, and not necessarily to those with the greatest needs. His explanation is very like the physicians' defense medicine. "Justice," Ellin says, "does not come neatly wrapped in uniform 1 pound 4 ounce packages."—ELIOT MARSHALL