against the policemen who wrongly held him. It is easy to see how the incident has not endeared the NCIC system to New Hampshire police.

What would it take for the NCIC to make correct identifications of people? Ray Young, the assistant chief of the section of the FBI in charge of NCIC, declines to estimate how often people are misidentified by the computer. He says that the only foolproof system is fingerprint matching. For NCIC to include an automatic fingerprint matching capability, so that a suspect at the terminal could be clearly designated as the same as someone in the central files, would be "a tremendous boon" says Young.

The FBI Identification Division, which is separate from the division containing the NCIC has, in fact, sponsored work on automated fingerprint matching for years. But the problem, which at first sounded simple, has proved difficult to solve despite research by the National Bureau of Standards, Argonne National Laboratory, the Calspan Corporation, Sperry Rand Corporation, and Rockwell International.

In 1972, the FBI began testing a demonstration system called FINDER; to date it has a million individual prints encoded, representing 139,000 people, according to the FBI. But although the FBI has ordered two more FINDER machines, the FBI Identification Division is still a long way from having its entire file of 21 million individual fingerprint cards stored in the FINDER system.

The results of fingerprint matching tests, however, have improved dramatically in the last few years. For example, the Department of Public Safety in Arizona is buying the Sperry Rand system because, on a recent test, the system matched fingerprints accurately in 92 percent of cases, whereas a control group of manual searchers were accurate only 55 percent of the time. Nonetheless, FBI's Young estimates that the day of nationwide, automated fingerprint matching, and hence quick, reliable identification of suspects from remote terminals, "is a long way off."

CCH Future in Doubt

In recent weeks, the Carter Administration and some members of Congress have been debating the future of NCIC and CCH, and, specifically, the question of whether the FBI should be granted the authority for "message switching" among certain state records. Several people, primarily representative Don Edwards (D–Calif.) and civil liberties lobbyists, have raised the question of whether such a capability might give the FBI control over interstate police communications and expand what some regard as the FBI's already overblown "Big Brother" powers. Any central message switching, they say, should be run by someone other than the FBI.

But, from a technical standpoint, "message switching" may not neccessarily mean that the FBI would be able to intercept, or control, state-to-state communications. Furthermore, as Kelley's 1976 memorandum pointed out, "In order to make decentralization possible, a message switching capability is required to switch a request for a record from the national index to the state [having the] record and to switch responses back to the inquiring state."

Also in recent weeks, scientific interest in the CCH has revived. The Scientists' Institute for Public Information (SIPI), which is interested in techology and law enforcement generally, has been appointing a task force of experts to study first CCH, and later other crime information systems. Robert J. Gallati of Northeastern University, who was on project SEARCH and will be on the SIPI task force, believes that decentralization is the proper course.

For one thing, Gallati says, it will eliminate the cost of duplicating state records in Washington and expansion of computing machinery at FBI headquarters. For another, the reassertion of the state's responsibility for their criminal records will be an added incentive for them to proceed with the necessary, but costly, process of automating their fingerprint files.

Most important, Gallati says, is the issue of devising a technological system that will mesh smoothly with the historical pattern of law enforcement authority in the United States. As a matter of tradition, this authority has rested with the states, not the FBI. Gallati says, "Once it was determined that the CCH was to be a clearly national thing, the states lost the initiative. . . . But the Constitution doesn't vest the authority for law enforcement in the federal government; that authority is left to the states. So there is the philosophical problem of where we are headed as a bureaucracy and as a democracy, too."

—DEBORAH SHAPLEY

Science in Europe/Mr. Justice Parker and Plutonium

British nuclear power plans came under unaccustomed scrutiny last month when a public inquiry into nuclear fuel reprocessing started work. The inquiry was called by Peter Shore, Britain's environment minister, to examine plans for extending the existing reprocessing plant at Windscale on the northwest coast of England. Since it is in theory a local inquiry, it is meeting in Whitehaven, a small industrial port near Windscale; but its implications are national or even international.

Windscale, established in the 1940's to produce plutonium for the British bomb, is a sprawling nuclear factory consisting of several reactors, a reprocessing plant, and storage facilities where long-lived nuclear wastes are kept. It is run by British Nuclear Fuels Ltd. (BNFL), a nationally owned company set up to run the nuclear fuel business built up by the U.K. Atomic Energy Authority. BNFL wants to expand the Windscale plant to reprocess uranium oxide fuel from Britain's advanced gas-cooled reactors, and from light-water reactors abroad. Over the past year, the plan has been running into increasingly heavy weather, as critics charged that it would turn Britain into the world's nuclear dustbin. President Carter's renunciation of reprocessing increased the pressure and obliged Shore to call the inquiry—which is now seen in Britain as a major examination of the dilemmas of reprocessing and the plutonium economy.

As is normal with such inquiries, one man has been appointed to run the hearings and produce a report. He is a judge, Mr. Justice Parker, who in normal life specializes in commercial law. At the end of 5 or 6 months of constant session, after he has heard millions of words from hundreds of witnesses, he will write a report indicating whether or

not he thinks the proposed expansion should go ahead. Shore is not obliged to accept the recommendation, since the law gives him the power to overrule it; but he would need to have very good reasons for doing so.

The inquiry has thus provided a long-awaited opportunity for the proponents and opponents of nuclear power to come to grips. The principal clash will be between British Nuclear Fuels and Friends of the Earth, the environmental group that has taken the lead in the antinuclear campaign in Britain. But many other groups will also be represented: the electrical utilities (which back BNFL), the local government authorities, civil liberties groups, the churches, and other local and national environmental groups.

On the first day of the inquiry, 14 June, Mr. Justice Parker posed three questions which he said must be answered. Should uranium oxide fuels from British reactors be reprocessed at all? If yes, should that reprocessing be done at Windscale? If yes again, should the oxide fuel reprocessing plant be made twice as large as necessary so that it can also be used for reprocessing foreign fuel?

Thus, the argument covers both the general principles of whether reprocessing is desirable (already answered in the negative by President Carter for the United States), whether Windscale is the right place to do it if it is desirable, and whether Britain should assume the job of reprocessing other nations' fuels as well—becoming, as one witness put it, an international nuclear laundromat.

BNFL's case, summarized on the first day of the inquiry, rests on four propositions. Reprocessing is necessary, the company argues, to make spent fuel elements safe for long-term storage; unreprocessed they will deteriorate and ultimately pose a danger of radioactive contamination. Second, reprocessing makes sense as a form of energy conservation, since a single recycle of fuel makes it possible to add 30 to 40 percent to the energy extracted from the original uranium ore. Third, since reprocessing is necessary, it makes sense to finance the Windscale expansion by foreign capital and then use the plant to earn foreign currency by reprocessing fuel from overseas. Fourth, the company argues that the spread of reprocessing capability throughout the world—and hence the spread of nuclear weapons—becomes more rather than less likely if Britain renounces the reprocessing option, since there will then be greater pressure on other countries to develop their own reprocessing plants.

Friends of the Earth (FOE) contests the first point, calling in evidence the American example to show that reprocessing is not necessary on safety grounds. Used fuel elements can be stored without reprocessing for at least 25 years, according to FOE. The proposed plant is unlikely to work, says FOE, again citing American experience, and the proposed contracts for foreign reprocessing are likely to be stultified by President Carter's policies. And the extraction of plutonium from spent fuel rods will increase the risk of nuclear proliferation or of diversion by terrorists. This last-mentioned possibility could only be prevented by the imposition of a police state where individual liberties would be eroded. The plan, says FOE, is "ill-conceived, premature, inadequately guaranteed by foreign money and technically unproven."

The local environmental issues are likely to be contested most strongly between BNFL and the government of the Isle of Man, which has put in an unexpected appearance. The Isle of Man, a dominion of the Crown but not a part of the United Kingdom, is a small island in the Irish Sea, 35 miles from Windscale. It has used its relative independence from the United Kingdom to turn itself into a highly successful tax haven for British subjects torn between a love of their country and a desire to hang on to as much as possible of their money. The Isle of Man's case is that the Irish Sea is already excessively polluted by "routine" discharges from Windscale, and that the expansion will make the situation intolerable. The Isle of Man claims that the sea around Windscale is already 26 times more polluted with plutonium than the sea round the Pacific island where the United States tested its nuclear bombs.

Most of the first week of the inquiry was taken up by BNFL officials, who painstakingly assembled their case document by document. As the inquiry proceeds, there will be an opportunity for examination and cross examination of expert witnesses and the sparks should start to fly. But it is far too early to hazard even the most cautious prediction of what the outcome is likely to be.

Picking the Euronauts

Will the first Europeans to fly in space be Belgian, Danish, French, German, Italian, Dutch, Spanish, Swedish, Swiss, Irish, British, or Austrian? This is not a question which is yet causing the chancellories of Europe to shake, but for lovers of a good European argument, it is well worth watching. At the beginning of June, applications were invited from European scientists and engineers interested in flying in the European Space Agency's Spacelab mission, scheduled for 1980. Each of the countries can nominate not more than five candidates, who must have a degree in science or engineering, 5 years' research experience in one of the relevant disciplines, be more than 5 feet tall and less than 6 feet three, and no older than 47.

The European Space Agency itself will whittle the hopefuls down to six, and then ESA and NASA together will choose the final two for training. This is likely to be a thankless task, particularly if it involves choosing between a Frenchman and a German, or an Italian and a Briton. Whatever the jury decides, somebody is sure to lodge a protest.

British Squeeze Ploy

Research workers employed by the European Common Market are enraged by the refusal of Britain to sanction any expenditure on the EEC's long-term research program. The budget, amounting to 350 million "units of account" over the next 4 years, appeared to have been agreed upon at a meeting of the European research ministers in March. It remained only for the British government to rubber-stamp the agreement. But because the same meeting had failed to reach agreement over the siting of Europe's most important research project, the Joint European Torus (a fusion experiment), the British have refused to sanction any research expenditure at all.

Research workers at the EEC research center in Ispra, Italy, have sent a telegram to Brussels protesting the delay, and complaining that their livelihoods are in jeopardy. A British Labour MP, Tom Ellis, who is a member of the European Parliament's energy committee, has said that the British government is behaving "bloody-mindedly and petulantly, and even deceitfully, in this instance." It was, he said, "playing fast and loose" with the jobs of 300 research workers.

The British government's strategy is clearly to force the EEC to reach a decision about the siting of JET, which has

been discussed without success at the last six successive councils of ministers. Unless the research budget is sanctioned, money for research at the EEC's laboratories at Ispra, and in Belgium, the Netherlands and West Germany, will run out at the end of June, though there is enough money to go on paying salaries until the end of the year. Herr Guido Brunner, the EEC commissioner responsible for research and energy policy, hoped that a decision on JET might finally be reached at a meeting of Foreign Ministers on 21 June or at a meeting of EEC heads of government at the end of June. Presumably, if a decision is made—and even if it goes against Britain's site for JET, at Culham near Oxford—the British government will be prepared to loosen the purse strings.

Seveso Revisited

There is some encouraging evidence that the pollution at the Italian town of Seveso, where a chemical plant ran out of control last July and sprayed the countryside with the poisonous chemical dioxin, is not as serious as some had feared. Admittedly, most of the reassurance has come from the plant's owners, Hoffmann–La Roche, and therefore has to be treated with caution, but there do seem to be grounds for optimism.

The children injured by the dioxin—which causes an unpleasant skin rash known as chloracne—have made good progress, and experts who have treated them (including a British specialist with no Roche connections) are confident that they will recover completely. Three children, Roche says, may be left with permanent scars. As to fears that dioxin contamination would have teratogenic effects on pregnant women exposed to it, all those at a critical stage of pregnancy at the time of the incident have now had their babies without any higher than average incidence of abnormality.

Decontamination of the less affected areas around the factory, which has been proceeding during the winter and spring, also seems to have achieved good results. Inside the houses, special suction devices fitted with fine filters were used, and the outsides of the houses were washed with a special detergent solution. To prevent contamination of the sewage system, all the fluids used in this process were collected in containers. The gardens of the affected houses were cleared of plants, their topsoil was removed and replaced by fresh soil, a process also being applied to nearby fields. Analysis by wipe test in every house showed that it was possible to remove between 90 and 100 percent of the dioxin by these techniques.

Whether that will prove to be enough will soon be known. The chairman of the regional administration, Sesare Golfari, announced in June that 600 of those evacuated from their homes in the less contaminated areas would be able to return home "within a month." A further 200 individuals from the most contaminated area next to the factory would have new homes found for them elsewhere in Seveso, he said. Roche says that those going home will be in no danger, pointing out that after the accident they had continued to live in their houses for 3 weeks, before they had been decontaminated, without ill effects.

The remaining uncertainty arises over the decontamination of the worst affected areas, both houses and agricultural land, immediately around the plant. The houses could be cleaned by the techniques already used in the less affected areas, but the land is a tougher problem. The Italian authorities originally favored the incineration of the top layer of soil at a temperature of 1200°C in a specially built furnace which could later be used as a regional garbage incinerator. The local population is unenthusiastic about this idea, suspecting that Seveso will then become the region's refuse dump. As an alternative, Roche has suggested the use of agricultural techniques to promote the growth of the surface vegetation and accelerate the breakdown of the dioxin. This would be slower than incineration, the company admits, but more acceptable environmentally.

—NIGEL HAWKES

Thomas S. Kuhn: Revolutionary Theorist of Science

Notions of what scientists do tend to be shaped not by scientists themselves but by historians and philosophers of science. It is they who describe what scientific method is, and the process by which old theories give way to new. What is still probably the most generally held view of science, among both scientists and the public, is one that was shaped during the 1930's and 1940's by the school of positivist philosophers known as the Vienna Circle.

According to this view, science is a strictly logical process. Scientists propose theories on the basis of inductive logic, and confirm or refute them by experimental test of predictions deductively derived from the theory. When old theories fail, new theories are proposed and adopted because of their greater explanatory power, and science thus progresses inexorably closer to the truth.

Logical empiricism, as this view is known, deliberately ignores the historical context of science as well as the psychological factors which many people would consider important in science, such as intuition, imagination, and receptivity to new ideas. Logical empiricism still has its defenders, but many philosophers and historians of science now favor perceptions of the scientific enterprise that take human factors into account as well as the purely logical structure. And some, such as philosopher Paul Feyerabend of Berkeley, expound an extreme relativism which sees science as an ideology, for which only a historical or cultural explanation can be given.

Perhaps the principal force behind this major change of views about science was a book that encapsulated many of the ideas and discontents of the time and presented them in a new synthesis which cut blithely across the demarcation lines between the philosophy, history, and sociology of science. *The Structure of Scientific Revolutions* is a landmark in intellectual history which has attracted attention far beyond its own immediate field. Only 180 pages long in its original