Science at the ARM

Following Dr Who to Oldbury power station

CHRISTIANE HARRIS

With the mass arrival from the BMA's annual meeting of 150 potential converts to the cause of nuclear power the Central Electricity Board's welcoming staff at Oldbury power station near Bristol must have felt a bit like Billy Graham. Certainly, every effort had been made to make us feel welcome *and* safe, with the tour of the station preceeded by a marquee buffet lunch, intended, perhaps, to encourage a receptive audience.

Safety was the key preoccupation on the site. Ubiquitous posters exhorted employees to "Be wise—protect your eyes" and to take care when lifting. As well as numerous notices about health and safety at work radiation detectors were evident everywhere. Information leaflets had been supplied on the coach so we had been able to fathom the basic concepts of reactor function but without some half remembered A level physics I would not have been able to digest all the facts about nuclear fission. Fortunately, the guides make the entire process seem "beautiful in its simplicity."

Our impromptu lecture theatre was directly over the reactor and a small area of flooring had been removed so that we could view the core. It was quite eerie sitting on top of a working reactor, its steady hum forming a background to the talks, which opened with Professor T R Lee, professor of psychology at the University of Surrey, speaking on "nuclear power as an emotional stressor." He told us that visits were "almost the only established method of changing people's attitudes on nuclear power," mainly because for most of us objections to nuclear power were based on emotional rather than intellectual arguments.

Probability risk assessors use fatal accident frequency rates when comparing the risk associated with specific occupations. Using such data, nuclear power was, he claimed, the safest form of power in Britain. Professor Lee also contrasted the industry's record with another seemingly low risk activity, horse riding. Yet from 1981 to 1983, 47 people had been killed in riding accidents and between 2000 and 3000 children had sustained riding accidents. Also, he questioned, if nuclear power was deemed unsafe was conventional power any safer? One hundred and seventy nine people had died and 2676 had been seriously injured in coal mining between 1971 and 1982.

Factors causing fear

If scientists were to be successful in lessening people's fears it was important to understand the factors that caused the public and scientists to draw different conclusions from the same data.

Oldbury-on-Severn nuclear power station.

Professor Lee highlighted the most important factors influencing public response to nuclear power:

- Some risks such as hang gliding were chosen and controlled by the individual. Such a choice was not available to residents of an area suddenly chosen as the site for a new nuclear power station.
- Surveys had shown that the people of Oldbury were far more tolerant of nuclear power than the inhabitants of other locations without a power station, so familiarity seemed to reduce people's worry.
- The fact that ionising radiation might affect the germ cells and thus cause defects in future generations increased public concern about the risks of a nuclear power station accident in contrast to a risk where the effect was immediate and short lived.
- Most people saw nuclear power as a moral issue.
- The number of people who might be killed at any one time was an important factor and amplified views of the severity of risk from nuclear installations.

A study at Three Mile Island in the United States had shown that after a radiation leak at the site inhabitants of the area suffered far greater stress than people living in similar areas that were not near a reactor. Possible ways of responding to this stress had been considered and included: increasing the benefits, such as more

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employment, associated with the station; leaving the area where a new reactor is built—an option that objectors to other environmental changes, such as an increase in noise, frequently chose; joining a local action group and seeking local support—for example, general practitioners could be an important source of support as could friends and relations; and cognitive restructuring—that is, if it was impossible to change circumstances it might be possible to change perceptions of them. (An example of such positive induction was the BMA's tour.)

Radiation in medicine

Medical ionising radiation is the major source of exposure to non-natural radiation in this country today, and it forms 11% of the population's total radiation dose. Reporting this in his talk on the benefits and risks of radiation in medicine, Professor L E J Roberts of the environmental risk assessment unit at the University of East Anglia, discussed the benefits and risks of radiation in medicine. Natural background radiation might cause 1% of all cancers (1400 cases a year)—the nuclear industry added only 0.1% to this natural background radiation. Residents of granite buildings in parts of Cornwall and Devon received almost 10 times the background radiation yet there was no evidence that the incidence of any cancer was higher there than elsewhere.

Studies by the United Kingdom Atomic Energy Authority and British Nuclear Fuels of the incidence of all cancers among those employed in the nuclear industry showed that their standardised mortality ratios were slightly higher for some cancers and lower for others. Although it was accepted that the increases might be attributable to ionising radiation in some cases, the numbers seemed to be small and hard to determine with certainty. The depression and morbidity associated with fear and uncertainty about the nuclear industry were, said Professor Roberts, a much greater burden to the population living near reactors than the physical risks of living in such an environment.

Turning to the disaster at Chernobyl in April 1986 Professor

Roberts assured his audience that British safety systems were based on the belief that any piece of equipment and any human being could fail. The type of reactor used at Chernobyl was likely to become unstable if operated at less than 20% of full power. On the day of the disaster the reactor had been operating at only 6% of full power for more than two hours and the operators had managed to circumvent four separate safety systems. Subsequently, acute radiation sickness had been diagnosed in 200 people and 31 had died. Professor Roberts urged his audience to see the accident at Chernobyl in context, serious though it undoubtedly was, and he believed it to be "probably the worst possible accident which could happen to a nuclear reactor." It had been the result of a combination of ignorance, lack of discipline, and poor management. It should not lead people to fear a similar accident at a British reactor, which was of a totally different design and subject to far stricter safety controls.

Where fact mingles with science fiction

In the subsequent discussion it emerged that alternative energy sources could meet only 5% of the United Kingdom's energy requirements. Even a barrier across the River Severn would only double that figure. To produce the same power output as Oldbury 1000 wind turbines with 100 m long blades would be needed and this system could not meet actual power requirements because the coldest days when these were greatest were invariably devoid of wind. So whatever people's personal opinion of nuclear power it was needed to meet our energy requirements.

Concluding the visit, Mr Keith Baddley, the station manager, observed that despite his belief that some very eminent doctors were present he had to boast of an earlier visit by another doctor whose personal fame was even greater. Doctor Who had fought a famous battle against the forces of evil in the chamber where we were sitting. That this scientific achievement of the twentieth century should form the background to a futuristic fantasy seemed entirely appropriate: we were, after all, looking at our future.

Two centuries of immunology and a touch of mediaeval history

DEBORAH NEWTON

To encompass two centuries of immunology in 30 minutes is no mean feat, but that was the target for the scientific session at the Jenner Centre in Berkeley, Gloucestershire. The Sasakawa Conference Centre, set in the beautiful grounds of The Chantry—Edward Jenner's home from 1785 to 1823—is named after the internationally renowned Japanese philanthropist, whose generous gifts helped the Jenner Trust to purchase and endow The Chantry, home of the Jenner Museum.

Professor J P Mitchell, chairman of the BMA local organising committee, introduced the first speaker, Professor Bruce Perry, emeritus professor of medicine at the University of Bristol, who has made a particular study of Jenner's life. Offering \$1000 on behalf of the World Health Organisation to anyone in the audience who could find a natural case of smallpox anywhere in the world, the professor attributed the eradication of this horrific disease to the birth of Edward Jenner, the ninth child of the vicar of Berkeley, on

17 May 1749. Jenner's early life as an apprentice surgeon had been in Sodbury, where he first heard of the popular belief that cowpox protected against smallpox. Jenner subsequently travelled to London to study at Hunter's anatomy school and on the wards at St George's Hospital, returning to Berkeley after only two years to become "a simple country doctor." Nevertheless, he corresponded with Hunter and in one letter Hunter advised his friend, "Why think? Why not try and experiment?"

Jenner married in 1788 and bought The Chantry which became his headquarters for the rest of his life. He studied patients who had had cowpox but had escaped smallpox when exposed to it; some of them he challenged by inoculating them with smallpox. On 14 May 1796 he saw Sarah Nelmes, a milkmaid with a cowpox lesion on her hand. From this he inoculated the boy James Phipps. Three months later he challenged the lad with smallpox, with no ill effect. In 1798 after collecting more cases Jenner published privately his book on the causes and effects of the variolae vaccinae. It is from Jenner's latinisation of "the smallpox of cows" that the word vaccination is derived. His book was more popular abroad than at home, but despite criticism he persisted and in 1801 predicted the eradication of smallpox. Ironically, from a twentieth century viewpoint, Jenner was elected to the Royal Society in 1789 not for his work on smallpox