

The Ecologist Digest

Nuclear Power: Bombs, Accidents, and the Arms Race

How crack could lead to nuclear catastrophe, Nigel Hawkes, *The Observer*, June 28th 1981.

Inspection techniques are not yet sensitive enough to ensure acceptable levels of safety in the type of nuclear plant Britain intends to build, according to a former Chief Scientific Adviser to the Government, Sir Alan Cottrell. Present techniques, using ultrasonic waves to probe the eight-inch steel walls of the pressure vessels, cannot detect cracks unless they are at least two inches long. Sir Alan considers it essential to be able to detect cracks 1/4-inch long with a 50 per cent probability, and cracks one-inch long with a very high probability. Sir Alan's remarks on pressure vessel cracks are bound to be seized on by opponents of the Central Electricity Generating Board's plan to build a pressurised water reactor at Sizewell, Suffolk. The Sizewell plant has run into problems. The design, prepared by the National Nuclear Corporation, horrified the CEGB by being so expensive it offered hardly any advantage over Britain's own advanced gas-cooled reactor. To meet British safety standards, the Sizewell PWR was going to cost 60 per cent more than the American PWR on which it was based. Extra concrete shielding to cut radiation exposure of the power station workers, and extra emergency core cooling systems to deal with failures of normal cooling, were two of the costly extras. The CEGB told the corporation to think again and produce a cheaper design without compromising safety.

Something that will not go away: Plutonium 241 is building up off the Cumbrian coast, Anthony Tucker, *The Guardian*, July 16th 1981.

The annual report on radioactive discharges for 1980, published a few days ago by BNFL, shows that the amount of plutonium-241 discharged into the sea fell from 40,000 curies in 1979 to around 20,000 curies in 1980. Plutonium-241, unlike other isotopes of plutonium, is not subject to authorisation limits — that is to say it can be discharged at will. In the past it has been but, according to "official" statements by the Department of the Environment and others, control may be necessary perhaps in 1983 or later. The dramatic voluntary reduction reported by BNFL could be the beginning of, or a ploy to avoid, a real squeeze. There is a serious 241 problem! Technically plutonium-241 is a nuisance, a product of long-term irradiation of fuels, a contaminant, therefore, of clean plutonium-239 needed for various

purposes, but hard to separate. And, from the freedom given for the discharge of this particular isotope when controls were formulated in the fifties through the sixties, its potential hazard was not seen. Because it is a beta-emitter rather than an alpha-emitter like plutonium-239, its biological hazard was rated fairly low. Perhaps it was also assumed by those in command of our radiological destiny that plutonium-241 would disperse through the oceans and disappear. Such mistakes are common but incredible, since the essential problems of sediment fixation and biological concentration were identified as a potential hazard for heavy metals of many kinds back in the late 1950s. Whatever that means about assessment at the time, the result over the past decade, has been increasingly large uncontrolled annual discharges of plutonium-241 into the sea. A paper published in *Nature* gives the accumulated total as 381,527 curies to the end of 1980, corrected for decay at the plutonium-241 half-life of 14.7 years. Virtually the whole of this output is retained in the top few centimetres of sea-bed sediment within a few miles of the point of discharge. That is potentially serious in its own right for, quite apart from contamination of food chains, sediments move shoreward, materials on the shore dry out, and dried out materials can easily be resuspended as particles in the atmosphere. But there is a worse aspect of the problem. Plutonium-241 decays to Americium-241 which has a half-life of 433 years and which, in turn, decays to Neptunium-237 which has a half-life of around 2 million years. Both of these isotopes are alpha-emitters. That is to say they are among the most biologically hazardous of materials. Americium-241 is a bone and liver-seeking isotope, in some ways similar to plutonium-239, but with bizarre and unexpected characteristics, such as concentration in the skull and jaw bone. Virtually nothing is known about its specific effects in humans. The relevant experiment, it seems, is only just beginning. As the article in *Nature* shows, the accumulated plutonium-241 off the Cumbrian coast is now large enough to produce significant amounts of Americium-241. When added to authorised discharges of Americium-241 there would seem to be about 18,000 curies now retained in near-coast sediments. The DOE talks about possible controls in the years ahead: the industry does not mention them. What about applying some real controls now?

Update on Tsuruga Nuclear Power Plant: Contamination Worse than First Reported, *Chikya No Koe*, June 1981.

A Kyoto University School of Agriculture research group which has been conducting radioactive contamination tests at Wakasa Bay for the past ten years has declared that the radioactive contamination there after the recent massive spill was much greater than was officially announced on April 18th. The research group took gulfweed samples from in front of the drain outlet on April 22nd and found 111 pico-curies of cobalt-60 and 40 pico-curies

of manganese-54. The cobalt-60 concentration is 200 times the officially announced level of 0.45 picocuries. If the gulfweed were to be consumed at a rate of 40 grams a day for a year, the radioactive exposure level would be 7 millirems of cobalt-60 more than the 5 millirems set forth by the state as a target radiation level for residents around atomic power plants, the group noted. Despite the doubts cast by the group, prefectural government officials claimed that no health problem is involved on the grounds that gulfweed taken near the drain outlet is not eaten. Officials had to admit, however, that such high level concentration of radioactive substances hadn't been detected at other nuclear power plants. In a report to the Ministry of Trade and Industry, the operators of the Tsuruga plant admitted that in addition to the series of radioactive waste water leakage accidents made public earlier in the year, there have been ten power plant facility floor contamination accidents and ten equipment breakdowns in the building housing the reactor. In one of the accidents, the report said, about 10 tons of radioactive waste water leaked in waste water treatment facility in September 1975 and contaminated about 200 square metres of the floor. That accident was similar in scale to the one of March 8th. The report also said five radioactive waste water leakage accidents occurred in 1975, 1977, 1978, and 1981 and they were attributed to human error.

False Alerts and Faulty Computers, William J. Broad, *Science*, 5th June 1981.

An early-warning computer system buried deep inside a hollowed-out mountain in Colorado is unreliable and inadequate because of poor design and management, congressional investigators charged at a recent House of Representatives hearing. In response, a Pentagon communications official said a change was under way: the early-warning centre will no longer have to use computers of the World Wide Military Command and Control System (known as Wimex), a controversial multibillion system that has come under repeated attack for poor reliability. The early-warning system at the underground headquarters of the North American Aerospace Defense Command (NORAD) was the source of a series of false alerts in 1979 and 1980 that received widespread media attention. The computers falsely reported that Soviet missile attacks were underway, and, during a 1979 alert, jet interceptors took off and the launch control centres for the 1000 or so Minuteman missiles scattered across the American heartlands went on a low-level nuclear alert. After each false alert, the Pentagon asserted that the problems had been fixed. In one case the Pentagon reported that an alert had been touched off by the accidental running of a computerized war game; in another, a silicon chip had broken down.

The crash that could have made 'a desert' in England, Martin Bailey, *The Observer*, 9th August 1981.

An air crash, which resulted in blazing fuel engulfing three nuclear bombs stored on a British air base, could have turned eastern England into 'a desert', according to a retired United States Air Force general. The disaster, which happened at RAF Lakenheath in 1956, is the only known 'broken arrow' — an accident involving nuclear weapons — in Britain. Officially the Pentagon has revealed only the scantiest of details about a crash involving an American B-47 bomber at an 'overseas base' on 27th July 1956. On landing, the plane went out of control, 'crashing into a storage igloo containing several nuclear weapons.' The B-47 crashed in Cambridgeshire after an unarmed flight from Nebraska. It skidded on the runway and burst into flames. Blazing jet fuel hurtled towards a nuclear bomb storage igloo on the side of a gentle hill, just to the right of the runway's end. The Centre for Defence Information claims there were three Mark 6 nuclear bombs, each 12 ft long, and 6 ft in diameter, in the igloo. Firemen poured large quantities of foam extinguisher on the igloo. Little effort was devoted to saving the B-47, and the crew of four were burnt to death. But the fire spread inside the igloo and the nuclear bomb casings were badly burnt. Each nuclear bomb contained eight tons of TNT as part of its trigger mechanism. Fortunately the firemen were able to put out the blaze before the dynamite exploded, but until the fire was brought under control it threatened to become a major disaster. The retired Air Force general is quoted by the Centre for Defence Information as saying that if the fire had ignited the TNT, 'it is possible that a part of eastern England would have become a desert.' At the time he was a B-47 pilot based at Lakenheath. Another US officer who was there admitted that a big disaster was prevented only by 'a combination of tremendous heroism, good fortune and the will of God.'

NIOSH Under Siege, Marjorie Sun, *Science*, 17th July 1981

The US National Institute for Occupational Safety and Health (NIOSH) is under siege these days. Two weeks ago, the Reagan Administration announced plans to split up the agency's Washington staff and transfer its scientists to Cincinnati and its administrators to Atlanta to be closer to its parent, the Centre for Disease Control (CDC). On another front, the agency's proposal to study workers at the Portsmouth Naval Shipyard for possible chromosomal damage from ionizing radiation has been denied by Admiral Hyman G. Rickover, deputy assistant secretary for naval reactors for the Department of Energy. NIOSH, with the help of Secretary of Health and Human Services Richard Schweiker, has been trying to persuade Rickover since last January to allow the cytogenetics study to proceed. The study would examine 266 workers and 266 controls for any cellular abnormalities that might

be associated with exposure to low-level ionizing radiation from the nuclear-powered ships. NIOSH says the study would require 1 to 2 hours of a worker's time to collect blood and sperm samples. The data may ultimately help scientists to determine if any chromosomal damage found can be used as a predictor of disease later in life. Schweiker wrote to Rickover in May, "As long as there is any doubt about the long-term consequences of exposure to ionizing radiation, it is in the opinion of NIOSH that studies which can further define the absence or presence of such effects should be performed." Rickover replied in a letter, dated 3 June, "This statement represents one of the more all-encompassing justifications statements I can recall seeing. Indeed, the same thing can be said in support of studying every substance or experience that human beings face. By deleting the words, ionizing radiation, you could substitute milk to motherhood to justify a study of their long-term consequences. The proposed cytogenetic study clearly falls into the category of research for the sake of research." Rickover concluded the letter by asking Schweiker to cancel the study in the interests of the workers and "the national defense work that must be performed there." The original concern about the effect of ionizing radiation stems from a study reported by a Boston researcher, Thomas Najarian, in 1978. Najarian, after examining death certificates of shipyard workers, concluded that those who were exposed to low-level radiation suffered twice the expected rate of cancer and have a fivefold greater chance of leukemia. Later, under contract with NIOSH, Najarian repeated the study with better data supplied by the Navy. The second study repudiated the earlier findings. These two investigations only were mortality studies, NIOSH officials say. With the wealth of data on shipyard workers from the previous studies, they argue they have a rare opportunity to conduct a cytogenetic study with relative ease. But with NIOSH in disarray and its political base eroding, agency officials will have a tough time convincing the Navy to let them on base.

Chemicals, Drugs, Health and Pollution

Return of 2,4,5-T? *New Scientist*, 2nd July 1981.

The US Environmental Protection Agency (EPA) is likely to lift its two-year ban on the herbicide 2,4,5-T later this month after talks with the Dow Chemical Company. The herbicide is a component of Agent Orange, which the US army used as a defoliant during the Vietnam War, and has since been blamed for the high rate of diseases in veterans and their children. The EPA suspended most uses of 2,4,5-T in 1979 following the discovery of an unusually high rate of miscarriage in a heavily sprayed area of

Oregon. Dow Chemical, a major manufacturer, immediately filed a suit. But two months after President Reagan took office, the company and the EPA began secret talks — which Washington observers expect to end in an agreement.

Death by Microwave, Keith Hindley, *The Sunday Times*, 9th August 1981.

Samuel Yannon, a radio technician who worked for 15 years on top of New York's Empire State building, died in 1974 as a result of chronic exposure to microwave radiation. That is the ruling of the state's workers' compensation board, after a lengthy investigation of his case. It marks the first official recognition of a direct casual link between a fatality and exposure to microwaves. Most countries do not yet have firm safety limits for the maximum acceptable microwave dose. The majority, including Britain, has adopted an arbitrary level of 10 milliwatts of microwave power per square centimetre as a broad guideline. Samuel Yannon worked in an environment with a microwave level of just 1.2 milliwatts. Yannon worked tuning television transmissions to local receiving stations. After eleven years, he began visiting doctors with complaints of problems in sight and hearing. He voiced concern from the start that his exposure to radio waves might be involved. He eventually developed cataracts, a loss of balance and severe premature senility. His mental state deteriorated so badly that he recognised no one and wasted away physically, losing eight stone in weight. When he died, his withered, crooked frame weighed just under five stone. His employers had claimed that he died from Alzheimer's disease — an ailment of old age which is common enough for one person in 10 over 60 to have it — but few doctors agreed. Professor Milton Zaret, an ophthalmologist from New York university, said that Yannon's symptoms were identical to those he had seen in many patients who had been exposed to heavy microwave doses. Zaret added that his own work had established a very clear link between severe cataracts and microwaves. In America there are now around 30 lawsuits in progress, claiming compensation for either illness or injury after exposure. Microwaves are being blamed for a range of ailments: cataracts, pancreatic cancer, endocrine disorders, premature senility, behavioural problems and diseases involving white blood cells. The mounting evidence is convincing Western doctors that even low doses of microwaves can be medically dangerous if exposure occurs over a number of years. Surprisingly, the bulk of medical research on microwaves has been carried out in the Soviet Union where "microwave sickness" has been a recognised disease for more than 20 years. The Soviet outline of the general symptoms closely matches Yannon's.

Man Versus Medfly: Some Tactical Blunders, Eliot Marshall, *Science*, vol. 213, 24th July, 1981.

Yielding to an ultimatum from Washington D.C.,

California Governor Edmund G. Brown, Jr., agreed on 10th July to permit aerial spraying of an insecticide over a large swath of suburb around San Jose. Brown said the federal government "put a gun to my head" in its emergency campaign to wipe out a fast-spreading infestation of Mediterranean fruit flies. The infestation around San Jose has been in evidence since May of 1980, probably brought in on fruit from Hawaii, although the true source is not known. Because the infestation seemed out of control, and because other states were panicking, Secretary of Agriculture John Block threatened to quarantine all suspect California produce beginning on 13 July if Brown did not permit aerial spraying. Brown was reluctant. Many of San Jose's 600,000 residents oppose spraying because they fear that the chemical used, malathion, might have unidentified and subtle toxic effects on humans and pets. The crisis began around 1 July when Medfly larvae were found in Mountain View, an area near San Francisco that had been free of the insect and was thought to be on the very outer edge of the infested zone. When 100 or so new nests of larvae were found there, officials were shaken because no one had trapped any wild Medflies in the area. How had the larvae got there? Was the monitoring system breaking down? The answer appeared on 8 July, but only after panic had spread to Washington, D.C. Flytraps are used to catch samples of the enemy and trace the invasion routes. One of these traps caught something that should not have been there: a female Medfly colored with yellow dye, bearing fertile eggs in her abdomen. The yellow dye meant that this fly was one of a batch of flies bred in a commercial laboratory in Peru, treated with radiation to produce sterility, and sold to California along with millions of other similarly treated flies. Laboratories in Hawaii and Mexico have sent shipments to California as well, and the state has reportedly released hundreds of millions of sterile Medflies. Now it appears that as many as 100,000 of the Peruvian flies released in Mountain View may have been improperly treated and, in fact, remained fertile. For nearly three decades sterile flies have been used against insects like the Medfly that mate only once before laying eggs. By saturating an infested area with sterile males, pest fighters can reduce the odds of successful mating to 100 to 1, for that is the ratio by which laboratory-bred flies outnumber the wild flies after their release. The wild females mate once with sterile males, lay sterile eggs, and die. At the same time, chemicals sprayed by hand to kill larvae that would hatch from the ground to become the next generation. Thus the cycle is broken. Some scientists now conclude that

the Mountain View infestation was entirely a manmade event, not evidence that the flies had successfully evaded the ground spraying program.

Behind the Scandals in Science Labs, Abigail Trafford, *U.S. News & World Report*, March 2, 1981.

A series of scandals involving the faking of research results, alleged plagiarism and cover-up is prompting major reforms in universities and medical institutions across the USA. At Yale University, an assistant professor fabricated data in his research on patients with anorexia nervosa. So far, 11 scientific papers from the Yale laboratory have been retracted, and the researcher Vijay Soman, has resigned. The scandal began almost two years ago when Helena Wachslight-Rodbard, a physician at the National Institute of Health, charged two Yale faculty members with plagiarism of her work. Subsequent audits revealed falsification and widespread destruction of Soman's research data. One patient included in the study didn't even have anorexia. "It's the 'Watergate of Science'," says a researcher at Yale. "It not only questions the peer-review system for publishing papers but also the system for getting grants, the review of grant proposals and the system of electing assistant professors to tenured positions." At Boston's University Hospital, the medical community was shocked to learn that a research team treating cancer patients falsified records to make an experimental cancer therapy appear more effective. The physician in charge, Dr. Marc Straus, a lung-cancer specialist, resigned under protest, moved to New York to practice medicine and is now under investigation by NIH for possible misuse of federal research funds. At Massachusetts General Hospital, a cancer researcher on the faculty of the Harvard Medical School was forced to resign after it was learned that he had faked data in a paper on Hodgkin's disease, a cancer of the lymph glands. At the Memorial Sloan-Kettering Institute for Cancer Research in New York City, a scientist darkened the skin of mice to concoct evidence that skin grafts from another species of mice could be successfully performed — a feat hailed as a major breakthrough in cancer research, until the fraud was uncovered. Health leaders cite various reasons for fraud in experiments, from competition for shrinking research funds to the publish-or-perish dictum faced by scientists. In response to the scandals, the National Institutes of Health now have new guidelines to monitor more carefully the 18,000 research grants they fund every year with taxpayers' dollars.