

Our God is a God who hides as well as reveals himself, yet his providence is unfailing. We do not see all the workings of providence not because it is not there but because our knowledge is severely limited. Even when hidden, God carries his providence forward. Whatever hesitant perception Zacchaeus had concerning the direction of his life was carried forward as his steps broke into a run.

He ran up to the tree, he rushed down in a hurry from it. The nearer he was to Jesus the more clearly he acted and understood. His life would need reshaping, his career prospects redefining. He was now at home with Jesus.

Nuclear Radiation: Facts and Fears

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There is widespread public anxiety about the effects of nuclear radiations, particularly concerning the cases of childhood leukaemia near nuclear plants. Seven cases occurred in Seascale in Cumbria near the nuclear reprocessing plant at Sellafield from 1955 to 1983. This number seemed to be much greater than would be expected by chance, and received much publicity. It was, however, very difficult to understand how these cases could be blamed on Sellafield, since the amount of nuclear radiation released is far smaller than the natural background.

A possible mechanism was suggested in 1987 by Gardner, who postulated that the children developed leukaemia as a result of their father's exposure to nuclear radiation. He collected statistics that showed a significant correlation between paternal radiation dose and leukaemic children. This led to several Court cases in which families sought compensation from British Nuclear Fuels, the company operating the plant.

The Gardner hypothesis has such serious implications for the nuclear industry that many further investigations were made. These were on the actual process whereby paternal irradiation could lead to childhood leukaemia, the observations of leukaemia in the children of survivors of the atomic bombing of Japan, and more extensive studies of leukaemia around nuclear plants. The results of these studies have

now been summarised by Sir Richard Doll, Dr H.J.Evans and Dr S.C.Darby in *Nature* (367.678.1994). They conclude that the Gardner hypothesis is wrong.

The possibility that nuclear irradiation could cause a gonadal mutation leading to childhood leukaemia can be studied using data on genetically-determined leukaemia. The detailed statistical knowledge shows that there may be a recessive mutation that could contribute to a number of observed cases. However, "it effectively excludes any major contribution from the type of mutation that would be required to account for the appearance of the Sellafield cases in the first generation, namely a dominant mutation with a high degree of penetrance".

Studies by Neel and colleagues of "the children of atomic bomb survivors, including more than 1500 born to parents who received a gonadal dose of one sievert or larger, revealed no clearly increased frequency of mutations". These doses are far higher than those received by the Seascale workers.

Further studies were made of all the leukaemia cases in people under 25 years of age in 1958–90 born after 1958 in Scotland and a part of north Cumbria near the Scottish border, and of all children under 15 born near five nuclear installations in Ontario. They found that "neither set of results supported the probability of a hazard from the father's occupation". Several other studies have reached the same conclusion.

Thus the authors conclude that "the association between paternal irradiation and leukaemia is largely or wholly a chance finding". They note that there appears to be "small but real clusters of leukaemia in young people near Sellafield, and some other explanation for them needs to be sought."

This highly authoritative study should finally lay to rest the fears of nuclear radiations from plants like Sellafield, but whether it will or not depends largely on the mass media. The presence of leukaemia clusters, and particularly the Gardner hypothesis, has been widely publicised by organisations opposed to nuclear power. This has encouraged families with children suffering from leukaemia to seek compensation, but when the scientific evidence was laid before the court, the judgement inevitably went against them.

It is greatly in the public interest that these matters should be treated as objectively as possible, taking full account of the scientific evidence. This would avoid much unnecessary anxiety, and enable the best decisions to be taken concerning our future energy supplies.

Unfortunately the treatment of such matters in the media is still far

from ideal. As an example one may cite a recent advertisement by Greenpeace which appeared in several national newspapers a few months ago. This advertisement showed a photograph of a baby, described as a Kazakhstan nuclear test victim, followed by the quotation "Hush mother do not cry. I am filled with angels". The advertisement continues: "These brave calming deathbed words of a child radiation victim may shock us. They should not surprise us". The impact of this emotion-laden photograph is somewhat changed when one learns from other sources that the child is suffering from hydrocephalus, and according to Prof. Trott, professor of radiation biology at St Bartholomew's Hospital, no case of hydrocephalus has ever been identified as liable to have been caused by radiation exposure.

The advertisement continues: "Ever since Hiroshima, children have borne the brunt of the nuclear industry's fall-out. In the womb, and as they grow, children are more vulnerable to the effects of radiation. Therefore they suffer more from radiation linked diseases such as leukaemia, foetal malformation and other genetic defects. In some ways, because of this sensitivity, they protect us. Acting as some awful early warning device. These early warning signs have been seen near to nuclear installations such as Sellafield, where plutonium is processed for nuclear weapons . . . Children have died. We know *something is wrong*".

These statements about the sensitivity of children to radiation are correct, but the connections with Hiroshima and Sellafield are not.

The implications of the reprocessing plant THORP are now mentioned: "As if this were not enough, we now face the prospect of huge increases in radiation, heightened chances of accident and greater plutonium risks, all from THORP, the newly licensed nuclear reprocessing plant at Sellafield. It is our opinion that these risks are real. They beckon a world where radiation linked disease becomes an accepted part of everyday life. As if to prove the point, it can be shown from official figures that 2,000 will die because of the discharges from Sellafield over the next ten years."

This statement is untrue. The amount of radiation that will be emitted by THORP is minute, comparable in magnitude to the extra radiation experienced on a short aeroplane flight, or a visit to Cornwall. No one, to my knowledge, has ever cancelled a holiday in Cornwall because the natural background is two or three times the natural average. The figure of 2000 deaths from the discharges from Sellafield over the next ten years is based on the assumption that the death rate is proportional to the dose, even for very small doses, and

this is a very implausible hypothesis. It assumes, in effect, that the body is unable to recover from small doses in the same way that it cannot recover from massive doses. Making the proportionality hypothesis, using the mortality rates from massive doses and multiplying by the number of people in the population, gives a mortality figure similar to that quoted. This is obviously a totally unjustified procedure and the result has no meaning.

The advertisement concludes: "Greenpeace will go on fighting against a rationality which allows children's lives to be weighed, like so many molecules, by an industry intent on spreading radiation and the means of mass destruction around the globe. Please help us to continue the fight. To be on our side all you need is a sense of right and wrong and to refuse to be walked over by powers who deem it right to play with children's lives. In the end we will win."

To say that the nuclear industry is careless about children's lives and is intent on spreading radiation around the globe is a completely unjustified calumny on an industry that spends hundreds of millions of pounds on ensuring the highest safety standards, and has a safety record second to none.

It is very curious that an organisation with considerable resources should publish such statements. Nuclear power stations in operation make no contribution to acid rain or to the greenhouse effect, and actually emit less radioactivity than coal power stations. They are therefore making a massive contribution to preserving the cleanliness of our environment. It is difficult to understand why an organisation that claims to be working towards a clean environment is not fully supportive of the nuclear industry.

It is also difficult to see how organisations that produce advertisements such as this are contributing responsibly to the public debate about an optimum energy programme. It may be noted that this advertisement has been the subject of complaints to the Advertising Standards Authority, and after extensive expert study the complaints have been upheld. This provides an authoritative endorsement of the above remarks.

The advertisement ended with an appeal for donations (£14.50 single; £19.50 family). Doubtless many good people, their hearts touched by the picture of the dying babe and horrified by the prospect of THORP's operators deliberately multiplying such tragedies, have responded generously. Let us hope that their contributions will not be used to produce more advertisements of the same genre.