



On cave paintings and nuclear security

By Alvin Weinberg, director of the US Institute for Energy Analysis, Oak Ridge, Tennessee

DR J. Altuna took well-justified pride as he showed us the cave paintings in the Ekain caves near San Sebastian that he and his colleagues had discovered in 1968. The horses (pictured above) by some Cro-Magnon genius 11,000 years ago were in every respect remarkable: according to Dr Altuna, the best cave paintings of horses to have been discovered to date. The paint we now see is largely manganese dioxide which was probably mixed with animal grease to apply it to the wall.

I was in the Basque country at the invitation of Aranzadi, the Basque Scientific Society. I was to participate in a discussion of nuclear energy with Professor Erik Arrhenius of Sweden. My reaction to the cave paintings, aside from astonishment at the skill of the artist, was therefore coloured by the nuclear debate. Could these artefacts of man, some of which have lasted as long as 11,000 years with little deterioration, bear on the disposal of nuclear wastes? Dr Altuna was very doubtful—after all, not all the paintings are in perfect condition. On the other hand, some were; and in the absence of proof of the unprovable—we cannot know *absolutely* the fate of geologically sequestered wastes 10,000 years from now—we can draw inferences from long-lasting artefacts of man. Herbert Muller, in his *Freedom in the Ancient World*, speaks of the ancient cave-artists as having “unconsciously . . . worked for posterity”. In this instance they have, unwittingly, proved that at least some works of man can survive for immensely long times; 11,000 years is sufficient for the radioactivity in wastes to fall below that of the original uranium ore whose fission gave rise to the wastes. And if *some* artefacts can last that long without change, is it not more plausible to believe that we, who are more sophisticated than our Cro-Magnon

ancestors, can reproduce the necessary conditions for survival of solidified wastes than that we cannot?

Ekain, or the 30,000-year-old stone Venuses, or, for that matter, the 2,000-million-year-old natural reactors at Oklo in Gabon add to what I believe is already convincing evidence that waste disposal is tractable. The issue ought not to be used as an argument against the use of nuclear power, despite the controversy that once again rages over the feasibility of waste disposal.

Rather, the central argument, and the one that I suspect all the other issues will coalesce around, is the peculiar requirement for institutional stability demanded by nuclear power. It is therefore ironic that just 30 kilometres from Ekain, with its evidence for the technical feasibility of waste disposal, lies Lemoniz, a prime reminder that nuclear energy and social instability don't mix. About a year ago, a main steam generator in one of the pressurised water reactors under construction at Lemoniz was bombed by Basque terrorists; and a terrorist was killed in a shoot-out with guards at the construction site.

The Lemoniz incident was not primarily anti-nuclear: it was rather that Lemoniz (above right) was sited under the Franco regime without much consultation with the local Basques. It had become a symbol of Basque nationalism: in the view of many Basques, Madrid was imposing its will on them.

This essentially political objection to Lemoniz provides fertile ground for anti-nuclear activism. And in the colloquium, Professor Arrhenius and I were bombarded with the same questions I encounter everywhere: waste disposal, reactor safety, proliferation, low-level radiation effects.

The Basques are of two minds about Lemoniz. On the one hand, they see it

as imperialist intrusion. On the other, they sense that nuclear stations, rather more than, say, oil-fired stations, confer a degree of energy autarky. Once the Lemoniz reactors are built, the Basque country will have a large source of electricity entirely within Basque borders. A precondition for this additional degree of energy self-sufficiency, I pointed out to the Basques, is an end to nuclear terrorism. Once Lemoniz is operating and its core contains billions of curies of radioactivity, it must be judged out of bounds for would-be terrorists: a core meltdown induced by terrorist action would harm the Basque country more than anywhere else.

Would the presence of an operating reactor mitigate the scope of action of terrorist groups—at least to the extent of putting nuclear plants out of bounds? I should think this might be the outcome in the Basque country where terrorists and local population presumably have the same aim—more autonomy for the Basques. Once Lemoniz is operating, one would expect terrorist acts against it to cease. I am less sanguine about nuclear terrorism in other situations where the terrorists may have no motive except destruction of the existing order. The only safeguard against such terror is heavy security. It is no accident that Lemoniz is as closely guarded as any US atomic weapon establishment. But these security measures are confined to the reactor site, and to speak of such measures as implying a police state seems to me to be an absurd exaggeration. Heavy security against terrorists is a price that nuclear energy exacts; fortunately, the number of places that will have to be so guarded is small, and they pose little threat to the society as a whole. I would hope that nuclear plants everywhere are made as secure as Lemoniz now is. □