Marie Curie and Nuclear Power

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Last week saw the 150th anniversary of the birth of Maria Skłodowska. Marie Curie, as she became, received Nobel Prizes in both physics and chemistry for deciphering the basis of nuclear science and radioactivity, knowledge that she then applied to medicine, including the treatment of cancer. For the latter at least she is gratefully and universally remembered.

Yet were she to return today she would be shocked at the failure of humanity to welcome the energy made available by nuclear science. Her work exposed the source of this energy, a million times that of fire, although it was only some years after her death in 1934 that the way to release it was discovered. Marie Curie wrote *Nothing in life is to be feared. It is to be understood*. But in the aftermath of World War II it was fear that blew world opinion off course – political fear of nuclear weapons and an insidious fear of death and disease by radiation. It envisaged that large populations and generations as yet unborn would be affected in the event of war or accident. These images penetrated deep into general culture, creating fantasies far beyond nature and the scope of science. However today we can study the real evidence that has accumulated over 70 years and the matching expansion in understanding of biology. Thankfully, we can see that there is no scientific basis for the horrors that many supposed years ago and we can understand how evolutionary biology learnt to protect life particularly effectively against radiation already many billions of years ago.

But the unreasonable fear still persists today alongside a growing concern about climate change. James Lovelock wrote *Those who know the most about climate change are most afraid. Those who know the most about nuclear are the least afraid.* Fear of nuclear certainly stimulates media excitement and is thought to justify enormous compensation payments and an ever greater provision of nuclear safety. But these serve no purpose. There were no radiation casualties at Fukushima and none is expected. At Chernobyl there were 28 radiation fatalities among the early fire fighters and perhaps 15 deaths from thyroid cancer. Otherwise in 60 years around the world the loss of life from the use of nuclear power has been essentially zero, a safety record that no other energy source can match. Fear of nuclear energy has been institutionalised and internationalised, but life and the environment are affected by evidence and science, not regulation and popular media, as illustrated in the story of King Canute seated on his throne on the seashore.

To mitigate any possible effect on climate change carbon-based energy sources are best avoided. Most other sources – wind, hydro, solar, geothermal, tidal and others – are available only in some places or at some times. Furthermore energy is notoriously difficult to store in large quantities and this is unlikely to change. So a special feature

of nuclear is important – it can provide a large guaranteed supply anywhere at anytime. Gone are the days when an economy might tolerate deliveries of goods becalmed off-shore aboard wind-driven transport or delayed in factories awaiting power from stationary electric wind turbines. A nightly *Electricity Forecast* that occasionally ended with the advice *The National Grid has issued a Red Alert, there may be breaks in electricity supply tomorrow in some areas but prospects may improve later in the week* would not fill the bill. This is not a matter of cost. There are times when wind and solar do not deliver enough energy at any price. As the Department of Energy (US DOE) has recently reported, without carbon or nuclear the supply cannot be stabilised. Related conclusions have been reached by the Agency for the Cooperation of Energy Regulators (EU ACER).

Future economic and environmental stability depend on engaging our understanding of the nuclear nature of matter for the health of society as a whole, not just for medical health. Individually people accept radiation doses for their own health at levels up to a thousand times what they are afraid to countenance in the environment. In autocratic regimes nuclear investment is already proceeding apace with little attention to public opinion. In every democracy education and adequate public explanation should spread the news that nuclear technology is harmless to health and the environment. Like Marie Curie all should welcome the benefits of nature without fear – including nuclear power. The hope is that those gathering at COP23 in Bonn will see the future in this positive light.

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