

# NUCLEAR ENGINEERING

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# Show some emotion

*Does the nuclear industry need to become more emotional and make use of the medium of fiction to get its message across to the public? By Alain Michel*

Recent polls on the public acceptance of nuclear power have been encouraging. Take for example the *Special Eurobarometer 297* survey, published in June. This found 44% of European Union citizens in favour of energy production by nuclear power stations, compared with 45% opposed (see *NEI* August 2008, p32-33). And in the UK, a November poll by Ipsos MORI on behalf of the Nuclear Industry Association (NIA) showed that 65% of the UK public support nuclear as part of a balanced energy mix while just 10% are against it.

But does this increasing public acceptance of electricity production by nuclear power stations mean that people are content with the existence of nuclear plants? Often the answer to this question is 'yes', but only if there is no alternative! People understand the security of supply benefit that nuclear provides but they are not convinced that there is a demonstrated solution to the 'waste problem'. And for that reason they ask questions like 'is there an alternative?' and 'can't you propose another energy source?'

Why such a fatalistic attitude? Are people really well informed on nuclear energy? Documents, books and even documentary films have been widely distributed by the nuclear utilities and manufacturers – but who looks at them? During the *PIME* 1998 conference, I introduced the idea that fiction has by far more influence than documentaries. Thus I started collecting hundreds of novels and films, and tried to understand the reasons for their influence on the public's perception of nuclear power.

According to the Roman statesman and philosopher Cicero, a public speaker should "captivate, arouse and convince." But what have we done – as nuclear communicators – most of the time? We accept that nuclear activities cannot captivate everyone; and because we choose (or are told) to behave rationally in nuclear matters, we refuse to introduce emotions into the debate. Thus we try to convince with rational technical, scientific or economical argu-

ments. And to say the least, with most people this simply does not work!

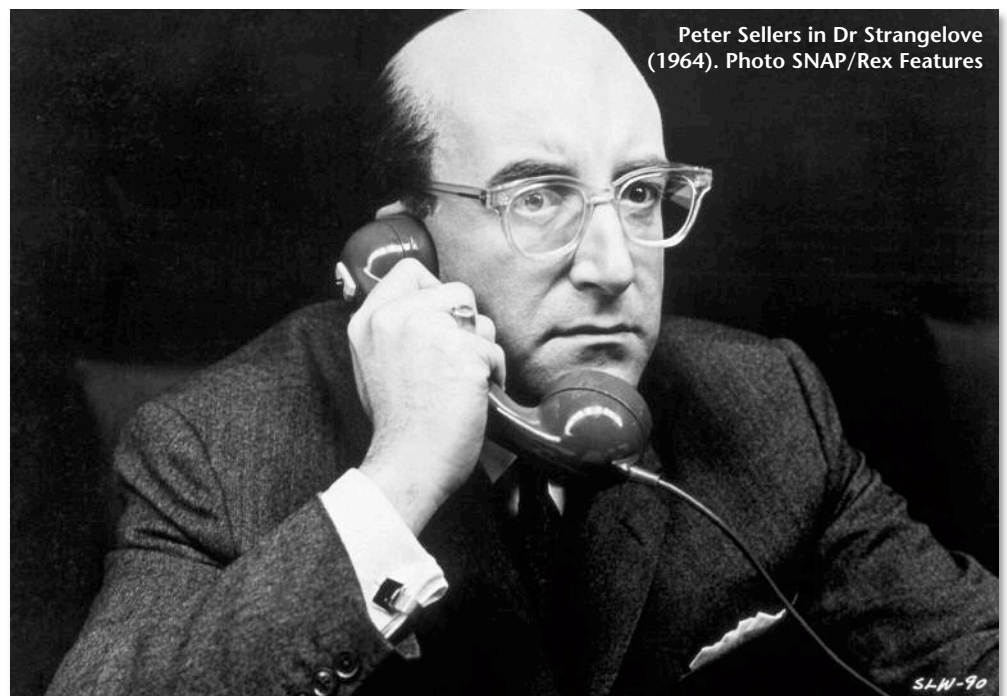
## NUKEMOTIONS

So, why should nuclear communicators find better ways to attract, even seduce public opinion? Because, as Voltaire stated, "public opinion is so much the queen of the world, that when reason attempts to fight against it, it is sentenced to death." Many factors influence a person's opinion. But when the time comes to vote in a referendum or choose an answer to a poll question, we do not recall them all. It is the most powerful images – the ones that relate to emotions – that usually submerge all others and determine our decision, whether consciously or not.

According to the *Oxford English Dictionary* an emotion is "an excited state of the mind or feelings." The *New Penguin English Dictionary* asks: "Emotive or emotional? (...) *He made an emotional speech* would mean that the speaker showed in his speech how strongly he himself felt about something. *She made an emotive speech* would suggest that she was more interested in stirring up the crowd than expressing her own feel-

ing." In nuclear fiction we have both. Some works are emotional such as Nadine Gordimer's book *Get a life* – a novel in which she describes her own emotions; she is emotional rather than emotive. Yet others are clearly emotive and have a desire to stir the population's feelings. The numerous "fictions" at Greenpeace demonstrations are a good example.

Professor of economics at the *Conservatoire National des Arts et Métiers* (CNAM), Jean de Kersvadoué, wrote recently: "For information to find its place in human memory, it must be conveyed by emotion. Statistics are boring. Drama draws attention and distorts memory to such a point that it becomes difficult to situate facts, to separate the exceptionally from the extremely dangerous." This is particularly noticeable at present, in a world where magic spells, dreams and fantasies surround us. We find examples in everyday life: many adults, but also children, retreat on the Internet into *Second Life* or other fantasy worlds and games. So perhaps there is a bonus for those who make people dream? As Belgian minister, Louis Michel, once said: "Today we live in an emocracy."



Peter Sellers in *Dr Strangelove* (1964). Photo SNAP/Rex Features



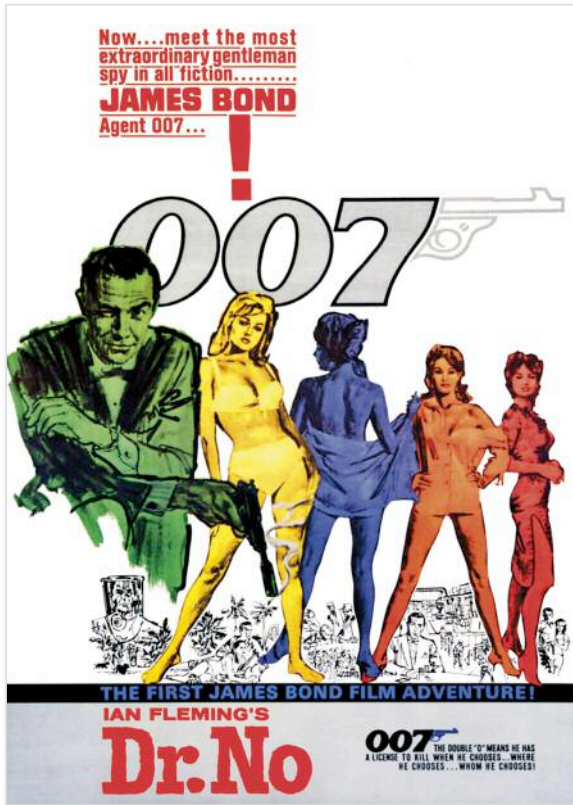


Photo Everett Collection/Rex Features

**WHY FICTION?**

Stirring feelings in order to reach desired goals has been well understood by anti-nuclear movements; Greenpeace dramatizes effectively. But can fiction in books and films do the same? In 2002, on Nuclear Space's pro-nuclear website, Wayne Smith wrote: "Hollywood, never one to miss out on revenue making idea, long ago recognised the selling power of fear. Whether or not fear is justified is irrelevant. After all, the first rule of movie making is not to let the truth get in the way of a good story." And Guy Philippi, a Hollywood script reader, said at the American Nuclear Society meeting in 2008: "The most important thing to keep in mind about nuclear movies is that reality takes a backseat to what is dramatically acceptable in a script." It's understandable that most fiction writers favour drama. The problem comes

when their stories are confused with reality by the spectator/reader, whether willingly or not.

Noëlle Châtelet, a novelist who also teaches at Paris V University, prefers to use characters in her novels when she wants to suggest something of philosophical importance. Jean-Claude Rufin in *Le parfum d'Adam* wrote: "It seemed to me that a novel was probably the best way to discover the complexity of this subject [extreme ecologism] and the crucial importance of the related issues. But this book remains a novel and not a lecture." He added that some novels may have such a strong influence that they become a 'bible' able to guide the behaviour of groups of people, as Edward Abbey's *The Monkey Wrench Gang* was for a whole generation of activists.

The same is true for films. Marion Hänsel, a Belgian film director said that fiction allows the audience to have empathy with the characters while this would not be possible with a real person. Helen Caldicott, anti-nuclear campaigner and writer, in a study of nuclear movies warned: "Never underestimate the subliminal and overt power of film and television." Some nuclear films reach a wide audience for a long time. Just remember the nuclear background in most of the early James Bond films and also some of the more recent ones like *The World Is Not Enough*, where Bond prevents the introduction of excess plutonium into a submarine reactor, thus avoiding a nuclear disaster in the middle of the Bosphorus. Other Bond films are usually about stolen nuclear missiles, but it has also been reactors (which finally explode eg in *Dr No*) or illegally trafficked fissile materials. For more than 40 years, somehow, Bond films have popularised nuclear but not really in a very positive way, because unless the hero acts, nuclear is tantamount to the Apocalypse.

Jean de Kersvadoué in *Les Prêcheurs de l'Apocalypse* affirms: "There is no other

domain where opinion even of educated persons, is so far from facts. There is no other domain where the presentation of experimental results or statistics leads to so much controversy not to say that it is impossible. There is no other domain where passion so clearly overcomes reason."

**SCARE FACTORS**

Probably the most extensive study of nuclear fiction is in *Nuclear Fear* (1988), by Spencer Weart who wrote: "Radioactive monsters, utopian atom-powered cities, exploding planets, weird ray devices, and many other images have crept into the way everyone thinks about nuclear energy, whether that energy is used in weapons or in civilian reactors. The images, by connecting up major social and psychological forces, have exerted a strange and powerful pressure within history." And such images inevitably strengthen anxieties about nuclear power with most stories having more than one 'scare factor'.

**Dragons**

Let us start with the monsters so dear to Greenpeace and other nuclear opponents. The photo below shows a Nessie-type dragon at an anti-nuclear protest. In 1992, Greenpeace floated a similar dragon on a river near Belgonucleaire's Dessel MOX plant, which they wanted closed. The dragon is a recurrent image for nuclear energy. The most recent one I noted was last year in a puppet show in France – a little dragon born in 1939 that grows fiercer and fiercer. What surprised me was that this show was also presented in a very official setting: the museum *Cité des Sciences et de l'Industrie*, in Paris.

Nuclear scientists' love for mythology probably induced some of these myths: it seems logical to name a breeder reactor Phénix or Superphénix. I don't remember why the UK's test reactor at Winfrith was named Dragon, why Isis and Osiris were chosen as names for early French reactors or why Fafnir, the name of a German mythic dragon, was also given to a test loop.

In nuclear novels, dragons are still alive and kicking. *Legacy of Dragons: A Nuclear Espionage Thriller* (2006) imagines that a fourth atomic bomb had been made at the end of World War II, lost in the Pacific, recovered, and subsequently lost again near the Channel Islands. Everyone from terrorists to the US and British navies are after this drowned plutonium dragon. *Nuclear Dragon* (2004) by Ken Carodine tells the story of a mysterious fusion reactor on



A MOX monster at a 1993 Greenpeace demonstration near the Tihange nuclear plant in Belgium. Photo courtesy Alain Michel

a remote Pacific island that ends in a catastrophic situation. *The Tail of the Dragon* (2000) by Robert Wise and William Louis Wilson starts in the San Onofre plant, California, during a seismic alert. Operators worry about the spent fuel pond. "One crack in this place and Los Angeles will be a dead city for a century."

"Ancient cartographers used to populate the edge of their known world with dragons and other mythical monsters," said James Gilmore, chairman of the Advisory Panel to Assess Domestic Response Capabilities for Terrorism Involving Weapons of Mass Destruction, in the introduction to a 2008 book by Brian Jenkins titled *Will Terrorists Go Nuclear?* "We tend to do the same at the edge of our knowledge. But we must be careful not to let dangerous fantasies become the perceived reality that dictates our course of action." Unluckily many readers tend to consider that these stories reflect at least partially true facts ...

### **The devil: plutonium**

After the dragons, it seems logical to talk about the devil that is plutonium. *Plutonium: Blessing or Curse?* asked a book published in 1998. Yet, although it gave an objective view of the question, it did not receive as much public appreciation as numerous tales, novels, films, but also comic books on the subject.

"If ever there was an element that deserved a name associated with hell, it is plutonium," once declared a US Senator. This made me think: if the planet Venus had been in the place of Pluto, would the situation be different? Pluto was the god of all the resources and wealth that comes from the ground. It is believed his name was derived from the Greek word for wealth (Ploutos). Unluckily he was also associated with the underworld, hell or Hades. But the nuclear communicators did not try to put forward the positive side. Scares dominate.

Plutonium's toxicity and its association with cancer causes fear and is used to this effect in books such as *Plutonium Murders* (1997) by Robert Davies. But plutonium scares mostly because of its primal use – the atomic bomb. And it will carry forever this original sin. Thus the potential illicit trafficking, proliferation and terrorism associated with plutonium is the main subject of most stories. Some are now 'classics' like Collins' and Lapierre's *The Fifth Horseman*, first published in Great Britain in 1980. In more than fifty years of civilian use of nuclear energy, associated in

some European countries with the reprocessing and recycling of plutonium, there has never been any case of blackmail based on the possession of plutonium. But the scare is still very present and will long remain an obstacle to the deployment of breeder reactors.

### **Bombs away**

Living with the existence of thousands of atomic bombs has always created a lot of anxiety which is reflected in both fiction stories but also historical narratives. The book *The Flowers of Hiroshima* (1959) by Edita Morris or the film *Hiroshima mon amour* (1959) directed by Alain Resnais are early examples. Other books like Don DeLillo's *Underworld* (1997) reflect the daily life when atomic bombs, SAC bombers and the Cold War stressed every US citizen. Some have tried to raise awareness by mocking the proponents of nuclear weapons: Stanley Kubrick's *Dr. Strangelove or: How I Learned to Stop Worrying and Love the Bomb* (1964) is a most celebrated example. Others have shown the dramatic effects and the impossible survival conditions after a nuclear explosion, in most realistic images. Typical are Watkins' *The War Game* (1965) – that was not shown on BBC before 1985 because of its disturbing content and its outspoken anti-nuclear sentiment – or *The Day After* (1983), an American television movie.

Catastrophic stories of world destruction existed even before the first atomic bomb exploded. Anatole France in *L'Île des Pingouins* (1908), H.G. Wells in *The World Set Free* (1914), and René Barjavel in *Ravage* (1943) all described the world destroyed by a mysterious energy connected with the new discoveries. Novelists are often excellent futurologists. Although the Cold War has been over for years, stories about atomic bombs are still on television. *Jericho*, a television series about life in a small US town after the main cities in the States were destroyed by atomic bombs, was aired in the USA from 2006 until 2008, and is now on various European television channels.

### **Nuclear meltdown!**

This anxiety connected with the extraordinary destructive power of nuclear reactions has been extended in many people's minds to nuclear power plants. Many stories question the use of nuclear as a power resource slating plants as a potential sources of proliferation, of accidents 'waiting to happen' due to bad designs, incapability of the operators to protect them against sabotage or terrorism *etc.* Some also consider the potential

risks of running reprocessing plants.

The most well-known film, *The China Syndrome*, starring Jane Fonda, Michael Douglas (both antinuclear activists in the real life) and Jack Lemmon was released on 16 March 1979, just 12 days before the Three Mile Island (TMI) accident. It was so near but in fact less catastrophic than the real accident. The film had a strong impact because, like today, the actors were celebrities and thus many people believed what they had to say.

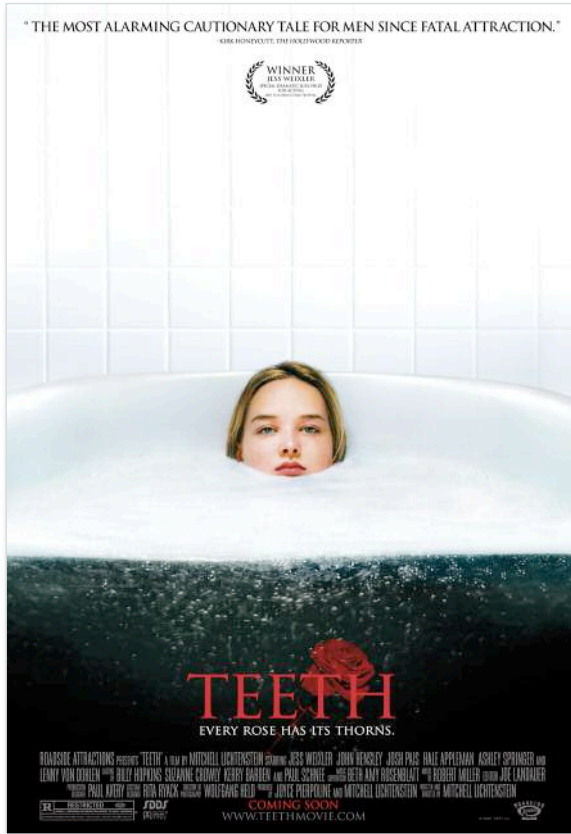
Quite often stories about nuclear sabotage or terrorist attacks come near to catastrophe, but in the end the plots do not succeed. Good examples of this are: *Burning the Apostle* (1993) by Bill Granger or Patricia Cornwell's *Cause of Death* (1996). Other writers, like Jacques Neyrinck, use their novels to raise emotions against real projects. With *Les cendres de Superphénix* published in 1997, Neyrinck wanted to demonstrate that this existing reactor would be the cause of a catastrophe and a major political crisis.

If the TMI accident and related fictions had an impact on nuclear development, it also led to improvements in other plants. The Chernobyl accident – although it happened to an RBMK reactor, which is a totally different

Dr Strangelove (1964). Photo Everett Collection /Rex Features







Teeth (2007)  
c.Weinstein/  
Everett/Rex  
Features

consciousness just like that of the atomic mushroom cloud.”

Other writers imagined similar accidents occurring in their own countries. Gudrun Pausewang’s book *Die Wolke* (1987) – *The Cloud* – was published again and again, with a recent edition for youngsters published in 2005 by the newspaper *Süddeutsche Zeitung*. It is a bestseller and a film was made in 2006. In this story, an accident takes place in Grafenrheinfeld, an existing German reactor.

One might think that the numerous stories of nuclear accidents such as those that appeared just after Chernobyl would have all but disappeared today. This is an illusion. Two recent examples appeared last autumn: an episode of *Terminator 3 – The Sarah Connor Chronicles* released on US television by FOX takes place in a nuclear power plant. And to quote from the show: “Carl Greenway had a reputation of being overly cautious – and if he stops tomorrow’s test because of a problem, the plant will likely shutdown and the rest of the employees may lose their job. His boss is pressuring him to ignore the problem with the coolant, but if he does, the plant could melt down.” The second example *Inéluctable* was shown on *Arte.TV* – a French channel – during primetime. In this film, a serious incident happens in a French nuclear power plant. The authors said their aim was to demonstrate the potential consequences when official authorities relax safety to favour commercial logic.

**Contamination = deformation?**

Radioactive contamination is probably the main fear associated with a nuclear accident. It has existed since the early days of nuclear development and is still present today. Just two examples, past and present: a 1954 movie – *Them!* – where giant ants are created by irradiation

and one in 2007, that induces even worse anxieties. In the film *Teeth*, because her family lives near a nuclear power plant, a girl develops a toothed vagina! And thus she inadvertently castrates her boyfriend. Even if this story is taken as a joke, a nasty feeling remains.

In *Cause of death*, Patricia Cornwell gives a far more objective view of radioactivity but also expresses many people’s feelings. One of her characters says: “Look, a little radioactive is like a little pregnant or a little dead, in my opinion...Some people are phobic of all kind of things. Me, it’s radiation.”

The anxiety connected with radiation appears also in very ‘serious’ literature like *Get a life* (2005) by Nobel Prize winner Nadine Gordimer. The story mixes the potential consequences of a radioactive thyroid treatment – “If what is born is not affected, mutated in some way by sperm spurted from a body that has emanated radiance” –with the potential risks induced by the Pebble Bed Modular Reactor (PBMR) project, that “may be the apocalyptic one.”

**Nasty, nasty waste**

Finally, radioactive waste is a major concern. Again, the books and films on this subject are numerous. But most fiction tends to focus on the short-term problem of waste trafficking rather than the more long-term problem of stable waste storage. Some stories illustrate the NIMBY (not in my back yard) actions of locals eg in Watson’s *Where Nobody Sees* (1987), but even in this book big companies are accused of making money from waste storage. An argument still present in 2002 in Stephanie Benson’s book *Nucléaire Chaos*.

Terrorist action is the core of *Sea of Fire* (2003) the tenth book in Tom Clancy’s *Op-Center* collection. Here the action takes place in the ocean near Indonesia, where China and Japan supposedly dump nuclear wastes. Published the same year, Stan Barnett’s *A Single Star* imagines that the transport of Russian plutonium and uranium by rail to Savannah River leads to terrorist action, and to such an extreme situation that the state of South Carolina has to secede in order to take control of the situation!

To conclude this short list of influential fiction, I will use Patrick Mannix’s opinion in a study of *The Rhetoric of Antinuclear Fiction – Persuasive Strategies in Novels and Films* (1995). In this study concerning atomic weapons he wrote: “I would not maintain that significant changes result from the public’s experience of any single work of antinuclear fiction, but rather from a general pattern of



A nuclear accident causes a mass exodus in Die Wolke (2006) c.Concorde/Everett/Rex Features

such experiences. Little by little such a pattern, by repeating and reinforcing the arguments against nuclear weapons, infiltrates the consciousness of a nation. Little by little, people begin to accept attitudes that are inimical to the presence of such weapons.”

I am certain that the same can be said of civilian installations. Little by little, minds shifted from a positive attitude in the fifties, full of hopes – electricity production too cheap to be metered – to the present situation characterised when not by active opposition, by fatalistic acceptance, seldom by enthusiastic support.

### MORE EMOTION NEEDED?

So, should emotion be part of nuclear industry communication? Surprisingly, the nuclear industry never tried to use fiction to present its story. Is it because many people think that positive stories can not make good drama? This opinion lacks imagination! Famous novelists have written positive stories *eg* Arthur Hailey’s *Overload* (1979) could have balanced negative feeling evoked by *The China Syndrome*. His book is based on an energy crisis that might result in California if the construction of a coal plant is obstructed. It would have been easy to adapt such a story to the nuclear situation.

Nevertheless, today there are some good novels set in nuclear plants. These stories give a clear image of nuclear operators, nuclear plants and machinery, and of their safety, security and safeguards – even under difficult circumstances (otherwise there would be no drama!). Examples are *Rad Decision: A Novel of Nuclear Power* (2006) by James Aach, a writer with twenty years of nuclear experience, who writes the story of how an internal sabotage attempt at a nuclear plant fails. Or *Le Syndrome M* (1997) by Jacques Braibant, where a sect reproduces the *Ten Plagues of Egypt*, and the last apocalyptic one fails to take place at the Tihange plant. This author was informed by the plant engineers and had a publisher with nuclear experience!

Other organisations have used television to improve their image. The Belgian Air Force helped Flemish TV by using its Sea King helicopters in the series *Windkracht 10*, which resulted in a new wave of candidates. In 2000, the US postal service supported a TV sitcom where two postal inspectors played a major role, giving the service a positive image. The French gendarmerie (military police force) opened its sites and provided material for *Une femme d'honneur*, a series that was successfully shown on French and Belgian televisions for years.



The China Syndrome was released in 1979, just 12 days before the Three Mile Island accident. Photo Everett Collection/Rex Features

“As nuclear industry is hesitant to project itself in a positive manner, waste, military applications and accidents tend to catch the attention of the public opinion and dominate the image of the sector, as they are the only occasions when the industry makes the headlines,” warned Luc Olyslager during *PIME* 2004.

A recent study by the Jóvenes Nucleares in Spain on the impact of the Simpson series said that although “it sacrifices technical correctness to favour humour...it has created a sustained presence of nuclear energy on television, in millions of homes, generating an unprecedented familiarisation with this type of energy source.”

So, why doesn’t the nuclear industry use fiction? Perhaps those who believe that we should use more humour and emotion have not argued the case strongly enough to convince the rationalists who head the industry. Yet, all is not lost – there may still be time to act ...

Remember that the power of dreams was often the base of industrial realizations. Many people – including the nuclear physicist Léo Szilárd, who was responsible for the creation of the Manhattan Project – have found their inspiration in fiction. Szilárd wrote: “Science would run dry if all scientists were crank turners and if none of them were dreamers.”

As for the future of nuclear activities, luckily new projects have been dreamed up and are in the process of being launched *eg* PBMR and even smaller projects like Hyperion’s hydride reactor (see pages 25-27). And many dreams of the sixties have come

to life again with the development of Generation IV reactors. Finally it seems that young engineers can see an inventive future in nuclear energy. It is no longer simply about the routine and mundane tasks of plant maintenance and decommissioning or the desperate one of dismantling operational reactors for political reasons.

Unfortunately for the present generation according to the Michel Serres, “Today we are missing a Jules Verne to strengthen the connection between science and society.” And because of this there are more anxieties surrounding science and the associated technologies than perhaps there need be. For Bertrand Piccard, the Solar Impulse project – around the world in a solar aeroplane – was partly initiated to put dreams and emotion at the heart of the scientific adventure once again.

I do agree with ANS president Burchill that everyone in the nuclear community should “Get the word out,” but I do not follow him when he writes that we should not be emotional. We have to be rational, well informed and experienced but sometimes emotional. Or, sooner or later emotive!

Thus I was very happy to read that Nils Diaz, former US Nuclear Regulatory Committee (NRC) chairman, said during the ANS June meeting last year – “It’s time to put passion and emotion in what we have to do.”

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