

초청강연 II (Invited Lecture II) | 일시 2023.5.18(Thu) 17:15 | 장소 한라홀(Halla Hall, 3F)



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The Acceptance of Nuclear Energy, a Matter for Education

Life has gained access to new forms of energy in a number of major steps. Previous ones brought lessons on waste, the environment, education, fear and personal confidence that we should acknowledge today.

Changes in the environment suggest that the next step, the nuclear step, has started. The need for this step to be nuclear comes from what we know about the physical world – its laws and the options it offers. This knowledge is essentially complete today. Only three possibilities are allowed by natural science: classical energy, electronic energy, nuclear energy. On Earth classical energy, in the form of wind, solar and hydro emanates from the Sun. Electronic energy, also known as chemical, is only available on a large scale on Earth as fossil fuels. It is seated in the quantum kinetic energy of electrons in atoms and molecules. Nuclear energy is similar being the quantum kinetic energy of nucleons in nuclei and is available on Earth as the residual unstable nuclei of uranium, thorium and potassium-40 left over from stellar collapse events that occurred before the Earth was formed.

Natural science tells us that there are no other possibilities. Human-inspired technology can exploit natural science, but not overcome it. The choice between the options is also influenced by our duty of care for the environment and our fellow creatures, and the need maintain a stable economic and political society. Critical is the energy density of the possible options. A careful analysis of these using simple Newtonian Mechanics and basic Quantum Mechanics exposes the impotence of renewables. They are also condemned by History and Economics. So, if combustion of fossil fuels is to be phased out, nuclear energy is the only option.

There are important differences between nuclear energy and radiation, its secondary manifestation. From the start of the 20th C nuclear radiation was exploited for health benefits following the work of Marie Curie. But for the past 70 years the benefits of basic education and the need to distinguish exciting entertainment from objective reality have been ignored. As a result, a general fear of nuclear weapons has become confused with an apprehension of the danger of radiation.

The safety of radiation on living tissue was assessed in 1934. Although the biological mechanisms are still being elucidated, nothing has happened since that date to change that assessment. However, in the 1950s, a period of distrust and secrecy influenced by US Senator Joseph McCarthy, radiation caution was magnified 700 times. The new recommended regulations were justified by false science (the LNT Model) and overseen by committees reporting to the United Nations. Yet data from Hiroshima and Nagasaki, Chernobyl, Goiania, Fukushima, natural high-radiation areas, experiments with laboratory animals and a century of clinical medical treatment, all confirm the 1934 threshold of safety. This contradiction remains today.

The immediate effect of radiation is to incapacitate a small number of cells. In the following hours and days live tissue responds by their reparation and replacement, as has been necessary for life to survive over 3 billion years. The final reaction, unique to humans able to measure radiation but not realise that life is already protected, is one of prolonged fear, even panic.

To be told “you have been irradiated” can be traumatic especially in the absence of understanding. Similar phenomena, like the placebo and nocebo effects, Voodoo, curses and exorcism, have real health effects. Unfortunately, the media and the entertainment industry are always keen to engage such fear and excitement.

The unscientific regulations and political caution inhibit the provision of nuclear power and make it artificially expensive. Young people today need the education and objective confidence to repeal these regulations and build nuclear power, cheap and safe, for all the world.