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## Probing the secret of life with accelerator driven light sources

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Life operates in a world governed by the second law of thermodynamics, which is sentence of decay disorder and death and we know that that is the fate of all living things. The interesting question is how do living things establish themselves and manage to put off their thermodynamic fate for so long? Life evolved at room temperature and the energy available in a room temperature environment,  $kT$ , is 6 terahertz (THz) where  $k$  is Boltzman's constant and 1 THz is an electromagnetic wave with a frequency of  $10^{12}$  Hertz and a wavelength of 300 microns. We thus expect that the biological organisation of living things will exploit THz radiation and clearly a way to investigate this would be to irradiate simple things, such as bacteria, with THz radiation and see what happens. Unfortunately there is a "THz gap" in the spectrum of electromagnetic radiation where we cannot make a powerful source of radiation. Laboratory sources can only generate about 100 microwatts of power, which isn't enough to do useful experiments. Fortunately electron accelerators are now becoming available that can generate tens of kilowatts of power in this frequency range and it is now becoming possible to study living things with this radiation. This lecture will give an account of some of the interesting results that are coming out of this research.

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