Radiation is everywhere, because it is largely occurs as part of everyday life.

We know light as something that comes from the sun, or from a light bulb, but what we know as light is only one kind of radiation: there are others, too. Radio waves, the very stuff that brings us pop music on the radio is another kind of radiation; so are ultra-violet rays, the invisible stuff that makes our skin go dark when you spend too much time in the sun in the middle of the day. It's also the stuff that makes your teeth gleam purple in the disco dark. Infra-red rays are the ones that let you see through a special camera in the dark.

All the different types of radiation are normally classified along a spectrum, a band of radiation starting with infra-red on one side and ultra-violet on the other, from very high frequency to very low frequency. We measure frequency by the number of times a wave of radiation goes up and down in a second.

When we get right down to the level of the atom, however, everything becomes a little weird.

Scientists of the very very small never know for sure whether a wave of nuclear radiation is a particle (a little tiny dot of something) or a wave (a little shake, rattle and roll). They call it the Uncertainty Principle after Werner Heisenberg, the Nazi Bomb Doctor, a guy who really wasn't that sure where he stood.

Individual atoms are normally held together by a weak glue of forces, with the reasonably stable **nucleus** chilling in space, while the **electrons** go whizzing about, rather like a teeny-tiny solar system, where the sun is the nucleus and all the planets are electrons. While the overall electrical charge of the nucleus is positive, the electrons are negatively charged, thus creating a dynamic balance of forces. Inside the nucleus itself, moreover, there are even smaller bits, of which the **positron** is biggest and the **neutron** next in line. As the names suggest, the positron is positively charged, and the neutron has no charge at all, or is electrically neutral.

Because these forces are not that strong, however, it doesn't take a lot to break them apart. In everyday life, therefore, we find atoms spontaneously disintegrating, and this is called **fission**. From this naturally occurring disintegration comes a little bit of energy in the form of a wave, and sometimes a neutron. This form of radiation is called **nuclear radiation** and the unstable atoms of a particular element are said to be **radio-active.** One of the biggest radio-active atoms in nature is uranium and the unstable uranium atom is known as Uranium-235, because it has 235 bits in its nucleus.

Naturally occurring nuclear radiation appears on the exposed surfaces of granite rocks, in hot springs, and from outer space during flights at high altitudes. You also get radiation from man-made instruments, such as medical X-rays (usually from Cobalt-60) and CAT scans, micro-wave ovens, televisions, cell-phones, and computers. Some of this radiation is called **ionizing radiation,** because it affects all life it comes into contact with by knocking off vital electrons from other atoms.

But the nuclear radiation occurring at **nuclear reactors** such as Koeberg is a different issue. Inside the nuclear reactor, the source of energy is Uranium-235. When this atom disintegrates under **neutron bombardment,** it creates very welcome **nuclear energy,** which is tapped to drive the electricity turbines, but it also creates other, unwanted and highly radioactive chemicals in liquid, solid and gaseous forms.

Chemicals such as **Strontium-90** and **Cesium 137** are two of the worst by-products of nuclear

reactors because they carry on producing radiation for over 30 years. Strontium-90 comes out through the discharged coolants and sewage **(liquid effluents)** and is known to produce lymphatic and blood cancers such as leukaemia when it gets into the human body. Cesium-137 usually comes out with gaseous emissions, and tends to embed itself in organic tissue and muscle structures. This can produce ovarian and breast cancers and affect the foetus, liver and spleen. While Strontium-90 has been detected in sewage at Melkbosstrand, near Koeberg, no studies have been done yet to measure the level of leukemias among children in the 0-14 age group, who are the most vulnerable to exposure.