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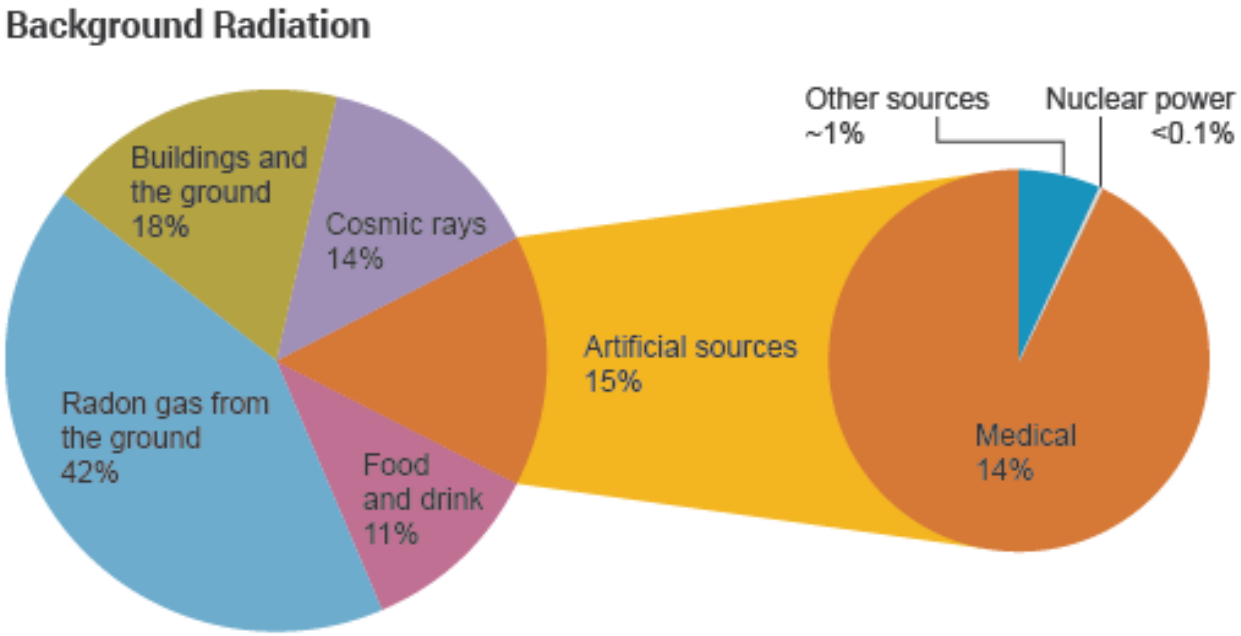
Fact Sheet

What is radiation?

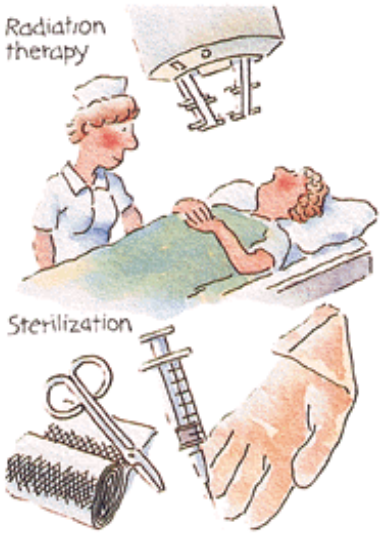
Radiation is energy travelling through space. Sunshine is one of the most familiar forms of radiation. It delivers light, heat and suntans. While enjoying and depending on it, we control our exposure to it. Beyond ultraviolet radiation from the sun are higher-energy kinds of radiation which are used in medicine and which we all get in low doses from space, from the air, and from the earth and rocks.

Radioactivity is all around us

Everything around us is radioactive to some degree.



Collectively we can refer to these kinds of radiation as ionising radiation.It can cause damage to matter, particularly living tissue. At high levels it is therefore dangerous, so it is necessary to control our exposure.



While we cannot feel this radiation, it is readily detected and measured, and exposure can easily be monitored.

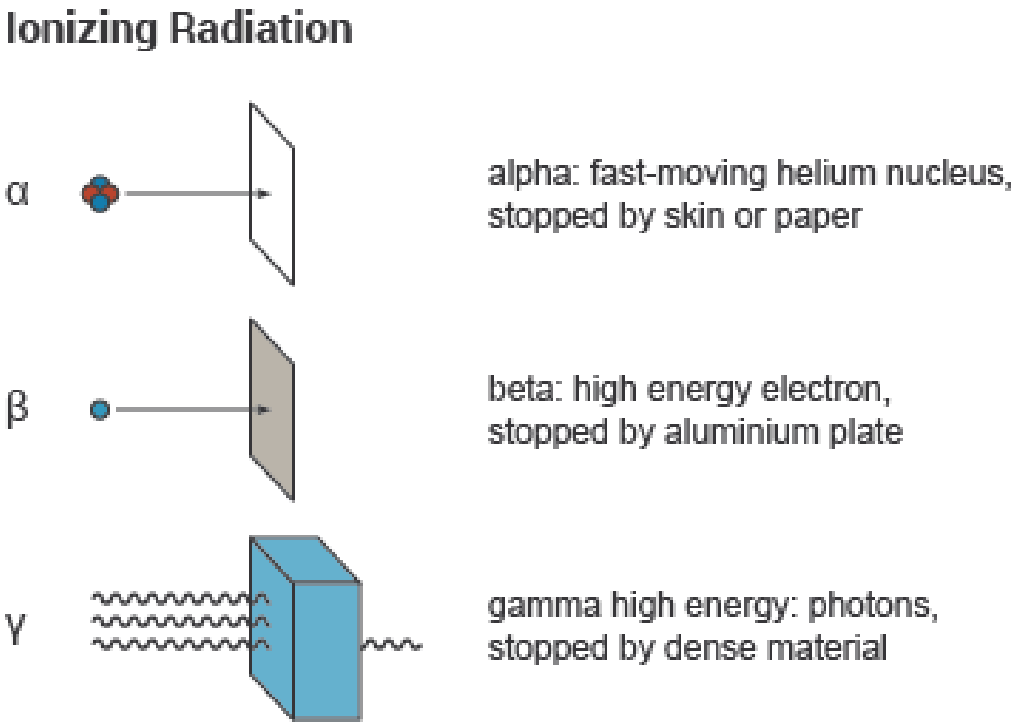
Living things have evolved in an environment which has significant levels of ionising radiation. Furthermore, many people owe their lives and health to such radiation produced artificially.

Medical and dental X-rays discern hidden problems. Other kinds of ionising radiation are used to diagnose ailments, and some people are treated with radiation to cure disease.

Ionising radiation, such as radiation from uranium ores and nuclear wastes, is part of our human environment, and always has been so.

At high levels it is hazardous, but at low levels such as we all experience naturally, it is harmless. Considerable effort is devoted to ensuring that those working with nuclear power are not exposed to harmful levels of radiation from it. Standards for the general public are set about twenty times lower still, well below the levels normally experienced by any of us from natural sources.

Radioactive materials can only become a hazard if they escape into the atmosphere. The vigilance of licensing authorities* has ensured that stations are designed not only to prevent accidents, but to minimise their effects should they occur.

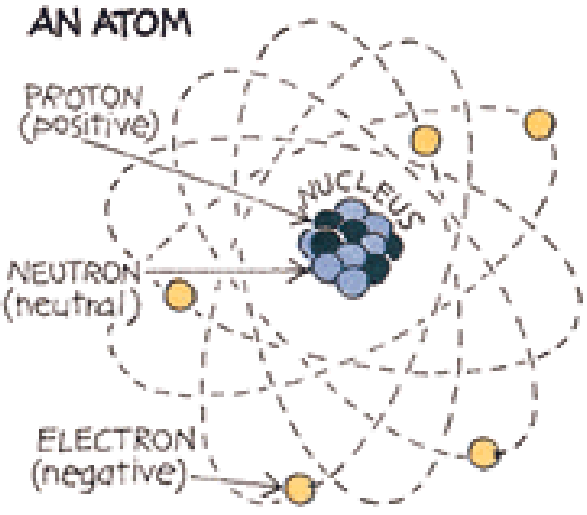


It's all about atoms and their nuclei

Radioactivity is a natural phenomenon. To understand it, we have to make a journey into the heart of matter. All matter is made up of atoms. We cannot see atoms: they are extremely small but complex building blocks.

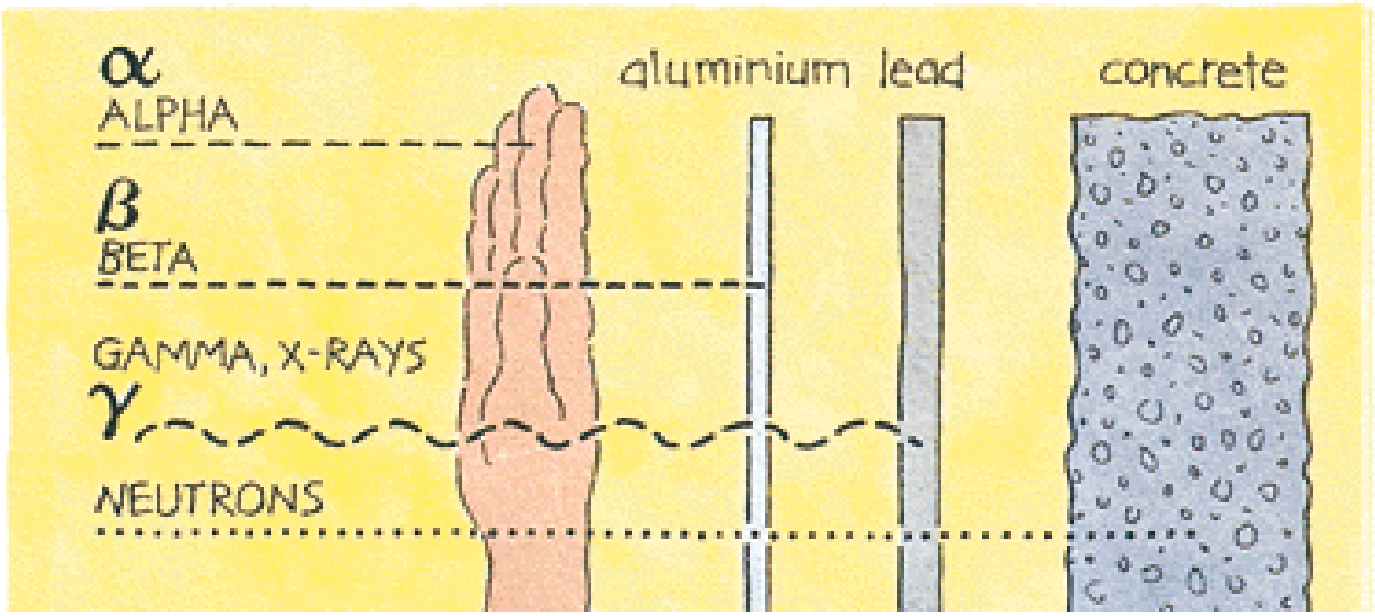
Each atom consists of a nucleus around which particles called electrons circle. The nucleus is made up of particles called protons and neutrons. You could compare an atom to a mini-solar system: the sun is the nucleus and the planets are the electrons that orbit around it.

There are many different atoms, but they all consist of protons, neutrons and electrons (apart from hydrogen, which has no neutrons). Atoms differ according to the number of protons, neutrons and electrons they have.



Stable and unstable atomic nuclei

There are various types of ionising radiation: alpha, beta, neutron and gamma radiation. Atoms that emit these kinds of radiation are said to be radioactive.



Alpha radiation consists of positively charged particles that are emitted from naturally occurring elements such as uranium and radium, as well as from man-made elements.

Alpha radiation is unable to penetrate the outer dead layer of skin, and can be stopped completely by a sheet of paper. However tissue that is not protected by the outer layer of skin or clothing, such as eyes and open wounds, must be carefully protected.

Alpha-emitting substances may also be taken into the body by inhalation or along with food and water and release alpha radiation directly to sensitive living tissue inside the body. Beta radiation consists of negatively charged particles. It is more penetrating than alpha radiation and can pass through 1-2 cm of water or human flesh. A sheet of aluminium a few millimetres thick can stop beta radiation.

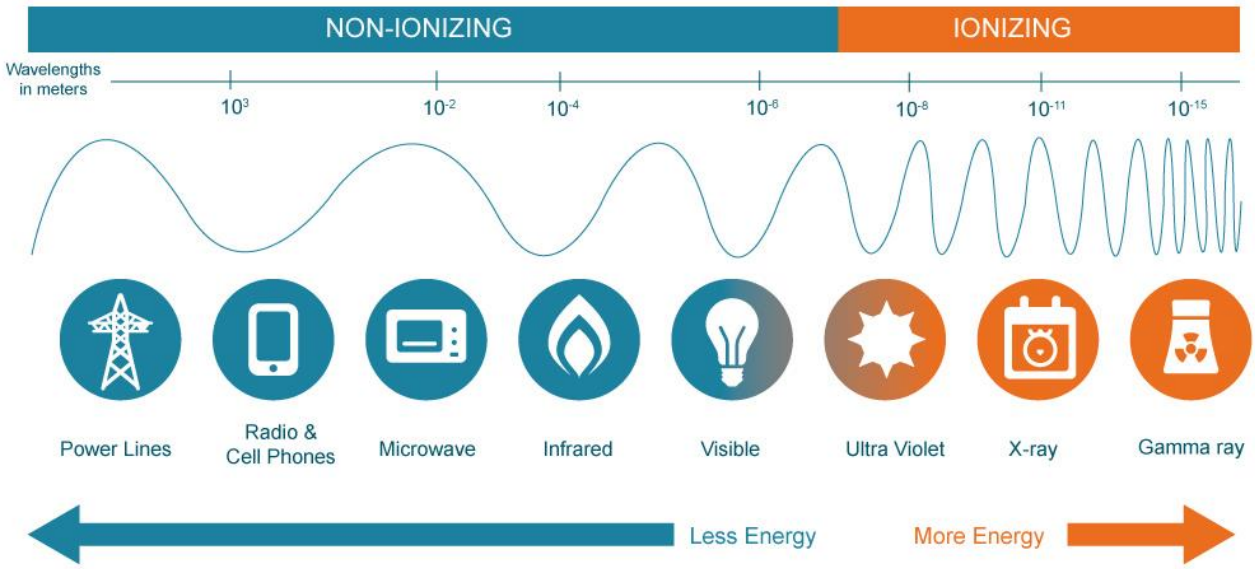
The licensing of nuclear installations in South Africa is the statutory responsibility of the NNR (National Nuclear Regulator).

Neutrons can also be very penetrating. Neutron radiation occurs inside a nuclear reactor, but efficient shielding against neutrons can be provided by, for example, water.

Gamma radiation, like X-rays, consists of electromagnetic waves. It can pass through the human body, but would be almost completely absorbed by one metre of concrete.

Dense materials such as concrete and lead are often used to provide shielding against gamma radiation.

Humans have always been subjected to natural radiation. We are exposed to radiation from the sun and outer space (cosmic rays) and naturally occurring radiation elements are taken into our bodies by means of food and water or by inhalation. Radiation is emitted by ground, soil and rocks and naturally varies greatly from location to location.

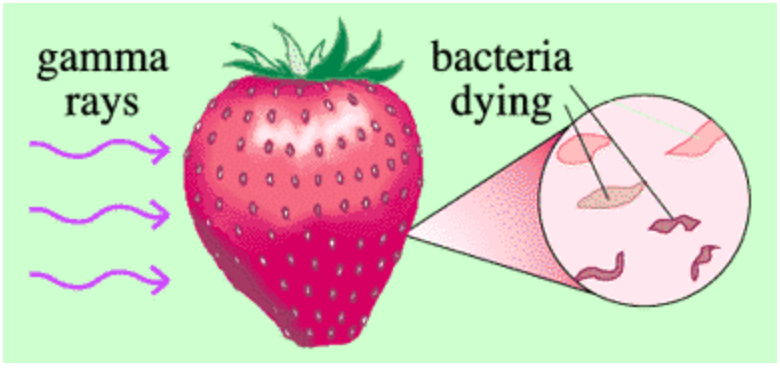


The sievert is a unit of radiation dosage equal to 100 joules of energy absorbed per kilogram of matter. The internationally accepted maximum limit of radiation that an individual member of the public can receive is 1 000 microsieverts per year (1 000 microsieverts = 1 millisievert = 0.001 sieverts).

The NNR licence for Koeberg stipulates a maximum dose of 250 microsieverts per year that an individual member of the public can receive.

The dose picked up by an individual member of the public from natural background radiation is approximately 3 000 microsieverts per annum.

Some people object to nuclear power stations because of a fear of radiation. Radiation must be treated with respect, but can be used to the advantage of humankind, as proved by medical X-rays, in the treatment of cancers, and in the preserving of fresh produce.



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