

Background radiation

Human beings living in the world are sometimes in close proximity to rocks. Contrary to common belief, rocks containing thorium and uranium (most rocks) are quite radioactive. Brick exudes radioactive decay products. Even the air is full of decay products from the interaction of extraterrestrial sources of high energy particles with the air (cosmic rays).

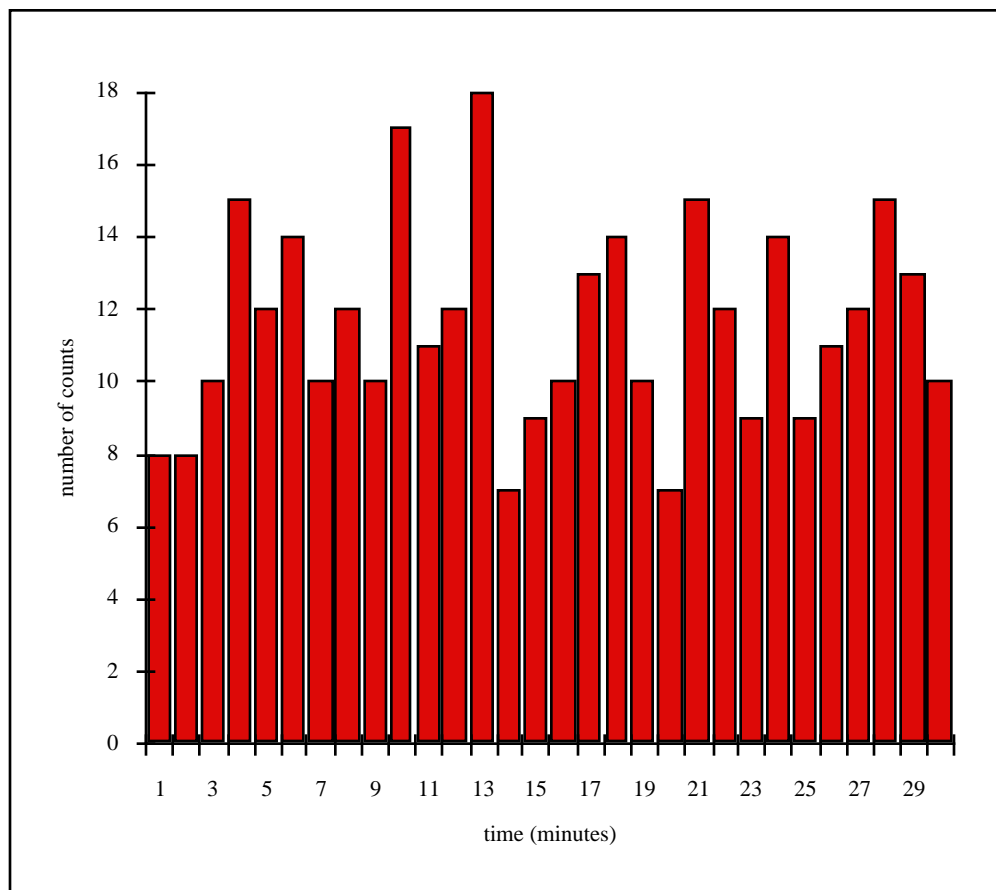


Fig. E20.1.1 Number of counts on a geiger counter in Marion, Ohio over a one-minute interval due to background radiation.

Figure E20.1.1 shows data taken in my physics classroom in Marion, Ohio. Note that the number of counts made by the geiger counter in any one minute interval appears to be

randomly distributed, but not zero. The mean count rate is about 12 counts per minute, or 0.2 counts per second.

People are made up of varying amounts of various elements including potassium. Potassium-40 is radioactive, and makes up 1.17% of all potassium. The proportion of $^{39}_{19}\text{K}$ is 92.26% and of $^{41}_{19}\text{K}$ is 6.73%. The relatively large amounts of potassium-40 in the body means that we ourselves are radioactive. Additionally, phosphorus is a major component of the body, and some phosphorus is radioactive. In addition to these natural constituents, radioactive iodine, strontium, and cesium from nuclear weapons tests can substitute for other elements in the body and add to its radioactivity.

The result: Radiation is natural, it is all around us. We cannot escape it.

The question we will deal with in this chapter is whether the *extra* amount of radiation to which we are exposed from human activities has measurable consequences.