Ancient TL

www.ancienttl.org · ISSN: 2693-0935

Huntley, D., 2001. *Some notes on language.* Ancient TL 19(1): 27-28.
https://doi.org/10.26034/la.atl.2001.331

Note

Some notes on language

The language of science is supposedly precise. In practice it is often not so, sometimes through ignorance or carelessness, and sometimes because precision requires so much to be said as to be impracticable. With this in mind, I hope these notes will help curtail some of the misuses of terms that have crept into the literature. I write these notes knowing full well that I am sometimes guilty of comparable offences against the language.

Age or Date? A date refers to a specific year in the past, for example AD1666 or 326 BC. An age refers to the amount of time of past existence, for example an age of 350 years means the thing referred to has existed for 350 years. The word "date" is often used erroneously when "age" is meant. "Date lists" are often really "age lists".

Black-body radiation. This is an idealized concept. Imagine a closed cavity in thermodynamic equilibrium, then the electromagnetic radiation within the cavity is a function only of the temperature, and is referred to as black-body radiation. If a tiny hole is made in the cavity then the radiation that comes out of the hole is a close approximation to black-body radiation. In contrast the radiation that is emitted by something that is hot is NOT blackbody radiation unless it is perfectly "black" and no such material exists. Such radiation is of less intensity than black-body radiation, and the spectrum will be different. The word incandescence is used to describe the emission from a tungsten light bulb or any other visibly hot object.

Dose.
The term "radiation dose" has a well-defined meaning; it is the amount of radiation energy absorbed per unit mass of matter. Thus if 1 joule of radiation energy is absorbed in 1 kilogram of matter, the radiation dose is 1 $J.kg^{-1}$ or 1 Gy. The key words here are 'energy' and 'absorbed' . What happens to the energy after it is absorbed is completely irrelevant to the evaluation of the dose. In practice, most of the energy will end up in the form of heat and leave the matter in question by thermal conduction, convection or electromagnetic radiation (there is an exception to this is if the matter is thermally isolated from the surroundings). A small fraction of the energy absorbed will end up stored by electrons and atoms in excited states. It would be wrong to talk about the absorbed radiation energy contained in something. Thus it would be equally wrong to talk about a dose contained in something and the phrases "dose in", "stored dose", "contained dose", acquired dose" and such should not be used.

Dose rate or Annual Dose? The annual dose is the radiation dose that occurs in one year and the SI unit for it is the gray (Gy). The dose rate is the radiation dose per unit time, and the practical unit for it is $Gy.ka^{-1}$. The term "annual dose rate" should not be used.

Luminescence. Luminescence is the light emitted by a substance in response to a stimulus. The stimulus may be heat, light, sound, shock, a beam of electrons, or anything else. The terms thermoluminescence, photoluminescence, sono-luminescence etc are used to refer to the light emitted in the cases of different stimuli. The term "optical luminescence" that is sometimes used does not make any sense since luminescence is already an optical phenomenon. Luminescence is not something that can be stored, removed, reset or set to zero.

Palaeodose. This word refers to a past radiation dose. The difficulty I have with current use is that in our work it is not the actual past radiation dose that is determined, but the beta or gamma dose that results in the same luminescence intensity during thermal or optical excitation. In the past, the term equivalent dose was introduced to deal with this difference. The introduction of the term was necessary because there can be a large difference between the actual radiation dose and the equivalent dose. This difference arises mainly because alpha particles produce different effects than do betas or gammas on a per unit-of-absorbed-energy basis. Someone reading our literature could easily be misled into thinking that palaeodose meant the actual radiation dose. For this reason I think we should be using the term palaeodose equivalent, Pe or Peq. For the same reason we should not be using the term 'dose rate' but be using 'equivalent dose rate', since what we evaluate is not the true dose rate.

Hz and Bq. Herz (Hz) is the unit for the frequency of a periodic signal. This is one that repeats on a regular basis, such as the sound of a tuning fork or the electrical voltage at a wall socket in a house. 1 Hz is 1 cycle per second. Becquerel (Bq) is the SI unit of activity of a radioactive source. The decays occur randomly, not periodically, in time. An activity of 1 Bq means the decays occur at an average rate of 1 per second. It is not appropriate to use either of these for the rate at which photons are emitted from a sample, or the rate at which photons are counted. Photon emission is a random process, not periodic, thus precluding the use of Hz. It is not radioactive decay, thus precluding the use of Bq. Hence one should use counts per second or something similar as the unit for the photon count rate.

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