1.7: Longitudinal Relaxation, T_1

It turns out that there are two varieties of relaxation. The first, discussed above, has to do with the establishment of thermal equilibrium between an assemblage of nuclear magnets with different quantum numbers. This is "longitudinal" relaxation, since it results in establishment of an equilibrium value of the nuclear magnetization along the magnetic field axis. Thus, an assemblage of nuclei in a very weak magnetic field, such as the earth's magnetic field, will have essentially no net magnetization of the nuclei along the field axis, since only a few more of the nuclei possess the spin quantum number +1/2 as compared with those with the value of -1/2. When this assemblage is placed in a magnetic field and relaxation takes place, there is an increase in the sample magnetization along the field axis as more of the nuclei drop into the lower energy state with magnetic quantum number of +1/2. The characteristic longitudinal relaxation time is designated as T_1.