methods, in addition to extreme variables, which could change conclusions by a rather large factor. It would seem, however, that whatever the percentage of error, the earth would appear to be much older than a few thousand years.

The radioactive dating methods, however, appear to put us on an entirely different basis. Samples can be weighed with exacting precision. Hypersensitive electronic equipment measures the rate of decay. Potassium, rubidium, thorium, and uranium disintegrate at a fixed rate which cannot be changed by any known force, whether heat, pressure, chemical conditions, or cosmic rays. In October 1961, following the reading of the current issue of *National Geographic* your professor wrote to Dr. Garniss H. Curtis, a professor in the Department of Geology in the University of California at Berkeley, asking the following question (among others):

"Assuming that samples of potassium 40 have been subjected to extreme physical and chemical conditions in order to determine the stability of the rate of decomposition, we wonder do you have any thoughts on the possible effects of variable atmospheric factors (such as cosmic-ray bombardment) on the question of constancy of rate? To what degree do you think such factors could affect the rate?"

Dr. Curtis graciously responded with a lengthy reply, in which he answered the above question as follows:

"Dear Reverend Dunzweiler:

"Concerning your interest in Potassium/Argon dating and the questions you asked about the method, I hope the following will be of help to you. . . .

"Within the range of physical and chemical conditions met with on earth, the decay of all radioactive elements is constant or varies so little as to be virtually undetectable. High energy bombardment can, of course, convert one element into another. Most of the cosmic ray bombardment that reaches the surface of the earth is soft and results only in stripping off electrons from the atoms it encounters. Destructive hits of nucleii are extremely rare. Occasionally, a K^{40} atom must be hit by a high energy cosmic ray and converted into other elements, probably neither calcium or argon. Just as often, however, the daughters, calcium and argon, are hit and converted into other substances. (I should say, are hit in proportion to the number of K^{40} atoms.) Thus the ratio is not changed. Short of the sun itself exploding, I do not believe that the decay of K^{40} on the earth can be appreciably changed by changes in cosmic ray flux."

-- Dr. Garniss H. Curtis, Department of Geology, University of California (Berkeley), In a letter to your instructor. (Dr. Curtis is the man who, using Potassium/Argon, dated Zinjanthropus -- see *National Geographic* October, 1961, for dating and method.)