Letter to the Editor

On the Nuclear Transformation with the Absorption of the Orbital Electron

According to the present theory of β-disintegration, the nucleus of atomic number Z transforms into its isobar Z-1 with the emission of a positron and a neutrino, if the difference ΔW of proper energies of these isobares is larger than $mc^2+\mu c^2$, where m and μ are the masses of the electron and the neutrino respectively. On the contrary, the isobar Z-1 transforms into Z with the emission of an electron and an anti-neutrino, if ΔW is smaller than $-mc^2-\mu c^2$. The isobar Z can transform into Z-1 also by absorbing one of the orbital electrons and emitting a neutrino at the same time, if ΔW is larger than $-E+\mu c^2$, where E is the total energy of the orbital electron.

Thus, two isobares with consecutive atomic numbers are both stable, only if ΔW lies between $-mc^2-\mu c^2$ and $-mc^2+\mu c^2$. This condition can be fulfilled very rarely, if the neutrino mass is small compared with the electron mass. Since the existence of several such pairs of stable nuclei (was confirmed by experiment recently[1]), it will be worth while to give a brief account of the results of our previous calculations on this subject.[2] It will be interesting, moreover, to determine the ratio of the probabilities of the positron emission and the electron absorption above considered,