THE POSSIBLE END OF THE PERIODIC TABLE OF ELEMENTS AND THE "GOLDEN RATIO"

J. WLODARSKI
Proz-Westhoven, Federal Republic of Germany

Atomic nuclei consist of protons (P) and neutrons (N). The number of protons in the nucleus is equal to the position number, or atomic number (Z), of the elements in Mendeleev's Periodic System of Elements.

The heaviest element — found in nature long ago — the uranius (U), has for a long time occupied the last place (Z = 92) in the Periodic Table.

During the last 30 years, the Periodic Table has become bigger on account of production of the artificial "transuranium elements" (with $Z > 92$). At present, the list of known elements already contains 104 names.

The atomic physicists of the USA and USSR are now making great efforts to create some super-heavy elements in their laboratories.

It is known that all elements with $Z > 90$ are spontaneously fissionable. The spontaneous fission half-life of nuclei decreases rapidly with increasing Z and makes the creation of super-heavy elements more and more difficult.

Only in the region of two possible "islands of stability" some atomic nuclei have more chances of being relatively stabilized. According to some theoretical consideration, the best probability for a comparatively stable super-heavy element is at atomic number 114 (nucleus $_{114}[x]^{298}$), but there are some theoretical indications that suggest this would occur also at atomic number 126 (nucleus $_{126}[y]^{310}$).

It should be noted that a probability for the creation of these two hypothetical elements, besides fulfilling all remaining theoretical conditions, still depends on the value of fission parameter Z^2/A (where A is mass number equal to number of P + number of N) for every nucleus.

This parameter is a criterion of instability of nucleus against spontaneous fission and has a general trend of increasing with increasing Z. So for $_{92}U^{238}$ the value of $Z^2/A = 35.6$, for $_{94}Pu^{239} = 37.0$, for $_{98}Cf^{246} = 39.0$, etc.

On the basis of the liquid-drop model of atomic nuclei, the fission parameter has a limiting value equal to 44.0. (See the illustration on page 92.)

[Continued on page 92.]