

**Zeitschrift:** Helvetica Physica Acta  
**Band:** 23 (1950)  
**Heft:** [3]: Supplementum 3. Internationaler Kongress über Kernphysik und Quantenelektrodynamik

**Artikel:** Binding energies and the energy surfaces in the region of the heavy natural radioactive isotopes  
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**DOI:** <https://doi.org/10.5169/seals-422273>

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## **Binding energies and the energy surfaces in the Region of the heavy Natural radioactive isotopes**

by **A. H. Wapstra**, Amsterdam.

The binding energies of these isotopes can be computed relative to the last members of their families by means of combinations of  $\alpha$  and  $\beta$  decay energies. By the following method of interpolation we computed them relative to  $^{206}\text{Pb}$ , the last member of the U-family. As is well-known the binding energies of the isotopes are lying on three surfaces in the  $n$ ,  $A$ ,  $E$  spaces; one for  $N$  and  $Z$  even, one for both odd, and one for  $N$  or  $Z$  even ( $n$  = neutron excess,  $A$  = mass number,  $N$  = number of neutrons,  $Z$  = number of protons). Sections of these surfaces with planes  $N$ ,  $Z$  or  $A$  constant will nearly be parabolas in the region of maximum binding energies for isobars. We can therefore adjust the family to the U-family by claiming, that the binding energies of the  $e - e$  isotopes from these families with the same  $N$  or  $Z$  must fit to one parabola as accurately as possible. Then the  $e - e$  and the  $o - o$  surface are known respective to the binding energy of  $^{206}\text{Pb}$ .

In order to adjust the odd mass families to the U-family we assume, that the  $e - o$  surface lies in the mean halfway between the  $e - e$  and the  $o - o$  surface. The distance between the last two surfaces is found for some values of  $A$  by claiming, that the binding energies of isobars with even mass must lie on two parallel parabolas. The distance seems to increase from 1,8 MeV to 2,0 MeV for  $A = 210$  to  $A = 218$ , and then to decrease to 1,2 MeV for  $A = 235$ .

In order to study the distance between the  $e - o$  and the  $e - e$  surface we consider an isotope with a value  $N$  or  $Z$  used in adjusting the Th- to the U-family. For this isotope we compute the height on the estimated parabolic section with the  $e - e$  surface used. The difference with the binding energy of the isotope relative to the last member of its family will be a fair estimate of the distance between the  $e - e$  and the  $e - o$  surface, increased by the difference in binding energy of  $^{206}\text{Pb}$  with  $^{207}\text{Pb}$  or  $^{209}\text{Bi}$ . The distances obtained in this way follow a course with  $A$  analogous to the distance between the  $e - e$  and the  $o - o$  surface, so it is possible to choose the differences in binding energy mentioned in such a way, that the  $e - o$  surface is lying fairly well halfway the  $e - e$  and the  $e - o$  surface.

The result of our computations will be published in *Physica*.