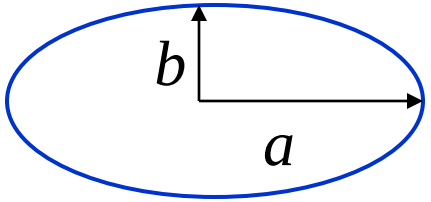
核分裂

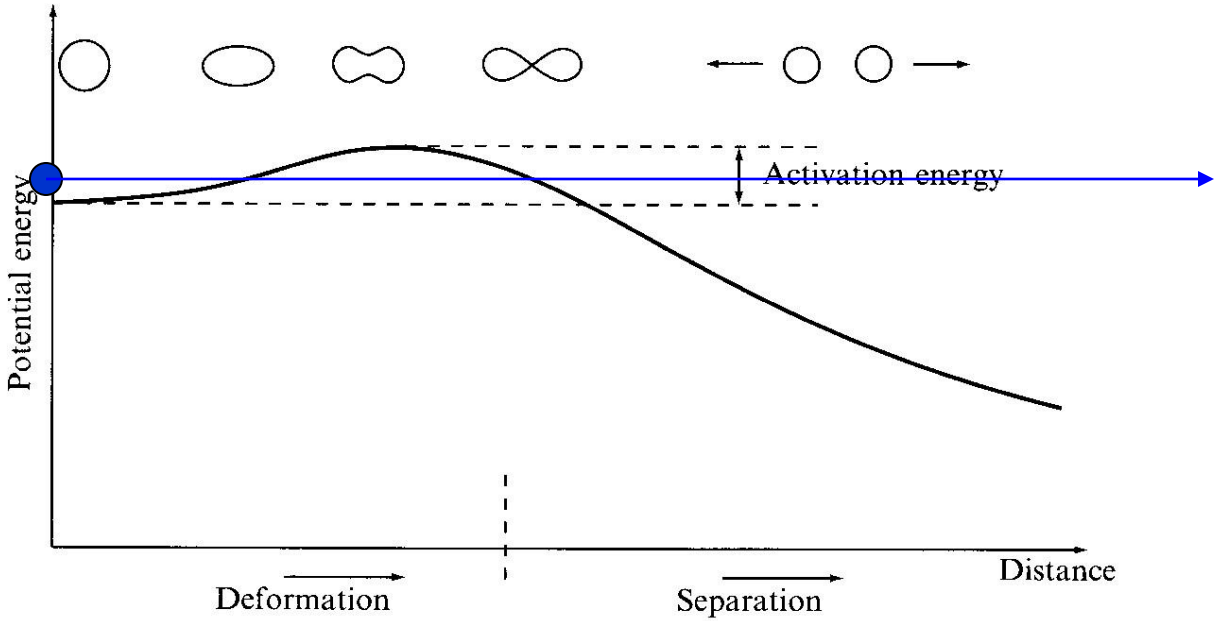
$$B(N,Z) = a_v A - a_s A^{2/3} - a_C \frac{Z^2}{A^{1/3}} - a_{\mathrm{sym}} \frac{(N-Z)^2}{A}$$

回転楕円体



$$a = R \cdot (1+\epsilon)$$
$$b = R \cdot (1+\epsilon)^{-1/2}$$

$$E_{\mathrm{surf}} = E^{(0)}_{\mathrm{surf}} (1 + 2\epsilon^2/5 + \cdots)$$
$$E_C = E^{(0)}_C (1 - \epsilon^2/5 + \cdots)$$



量子
トンネル

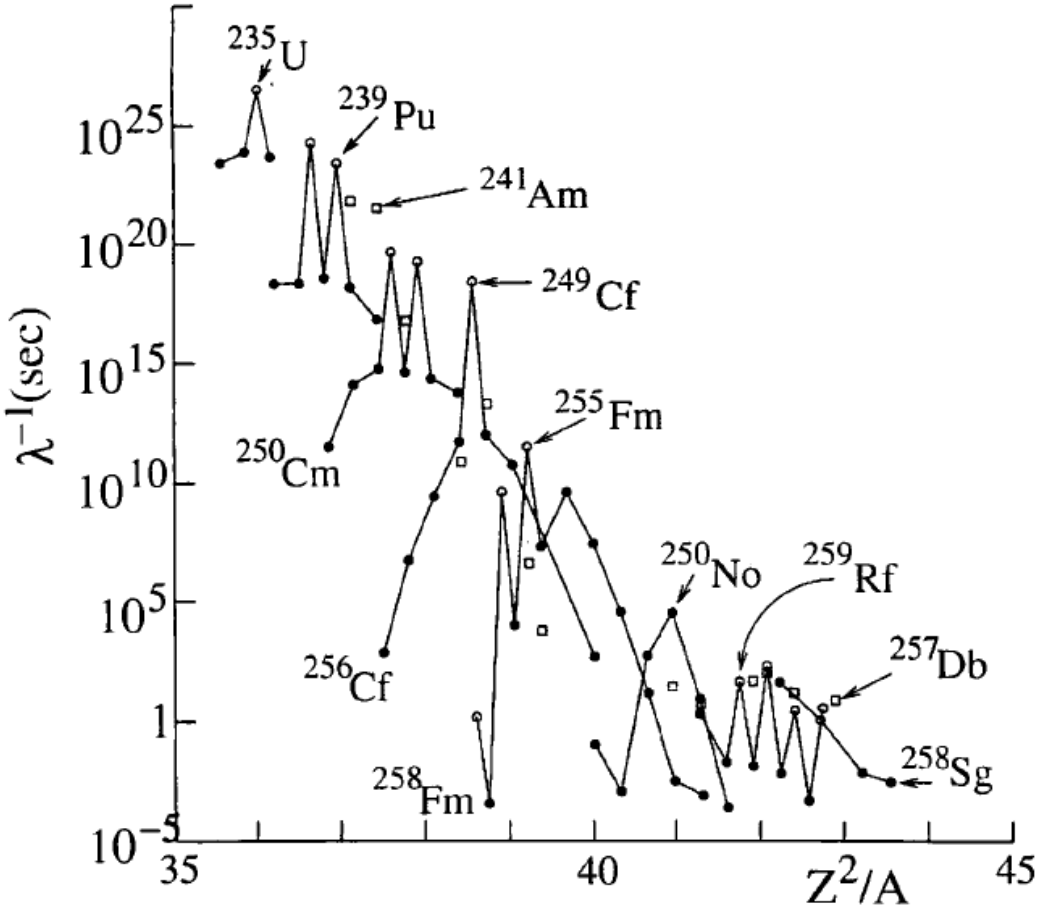


Fig. 6.4. Spontaneous fission lifetimes as a function of the fission parameter Z^2/A for selected nuclei. Circles are for even-Z nuclei. filled circles for even-even nuclei and open circles for even-odd nuclei. Squares are for odd-Z nuclei.

自発核分裂の寿命：Z^2/A が大きくなるほど、核分裂障壁が低くなって寿命が短くなる

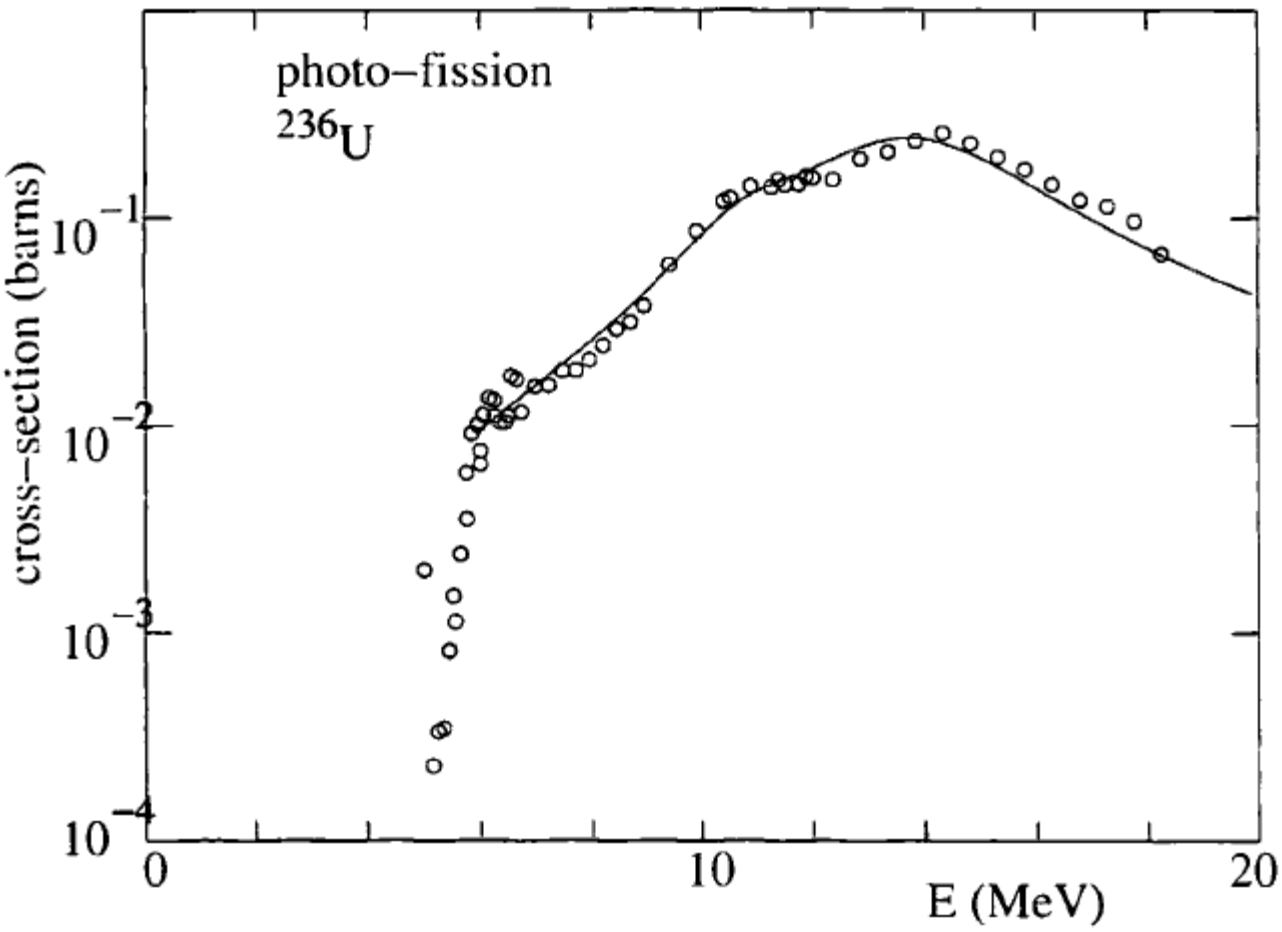


Fig. 6.5. Cross-section for $\gamma\,^{236}\mathrm{U} \rightarrow$ fission [30].

photo-fission（光核分裂）の断面積：フォトンのエネルギーが 5.7 MeV のあたりから断面積が急に立ち上がる（障壁の高さが 5.7 MeV くらい）

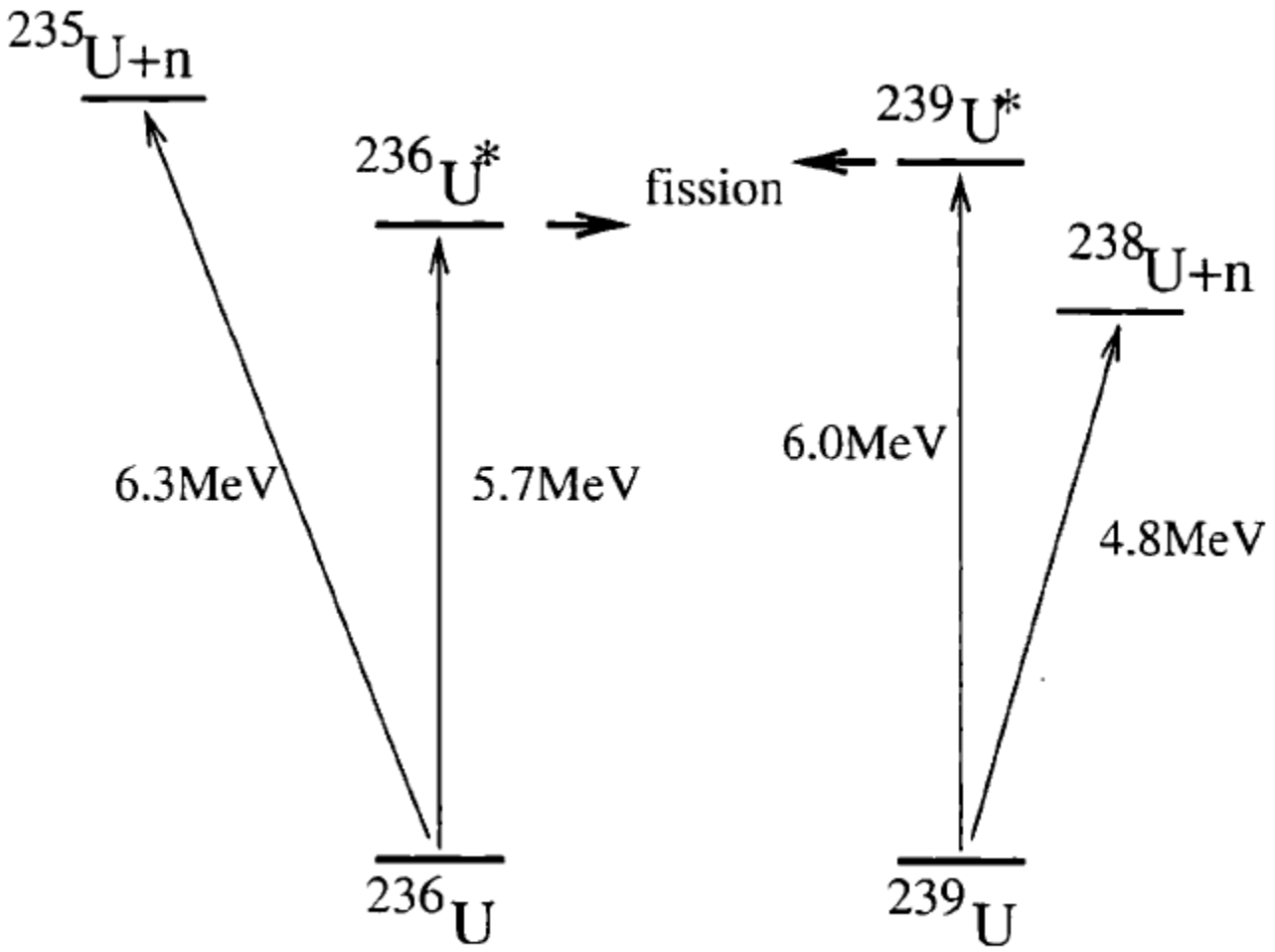
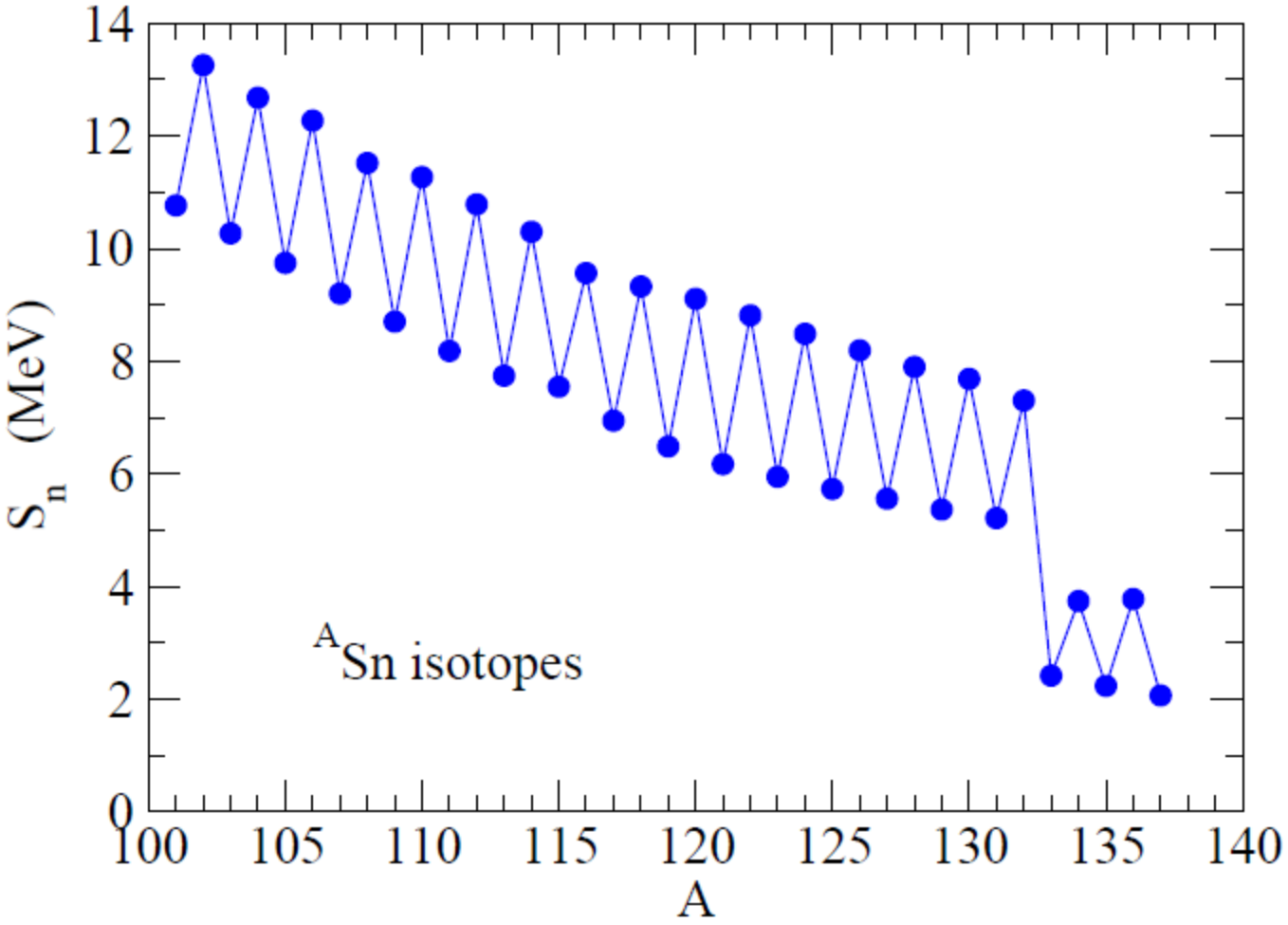


Fig. 6.6. Levels of the systems $A = 236$ and $A = 239$ involved in the fission of ^{236}U and ^{239}U. The addition of a motionless (or thermal) neutron to ^{235}U can lead to the fission of ^{236}U. On the other hand, fission of ^{239}U requires the addition of a neutron of kinetic energy $T_n = 6.0 - 4.8 = 1.2\,\mathrm{MeV}$.

核分裂障壁の高さと1中性子分離エネルギーの関係

even-odd staggering



1n separation energy: S_n (A,Z) = B(A,Z) – B(A,Z-1)