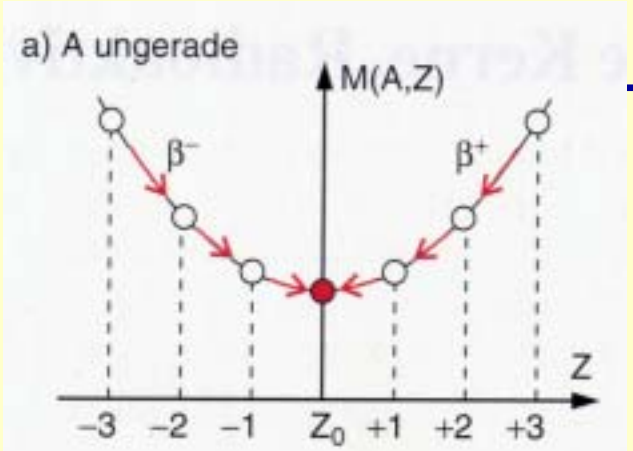
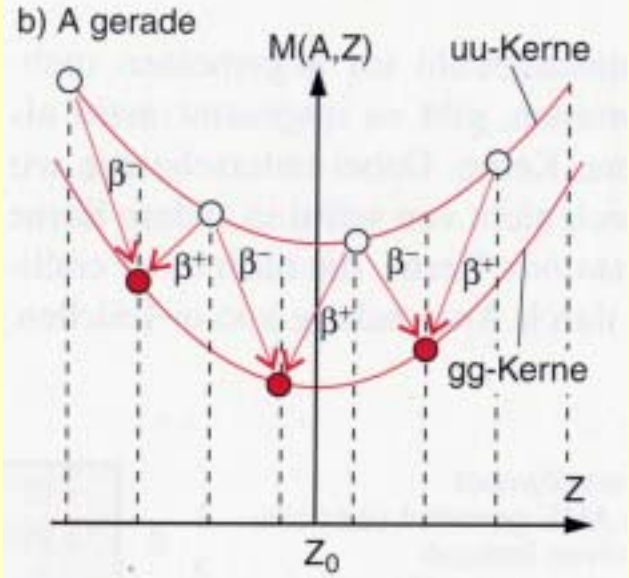
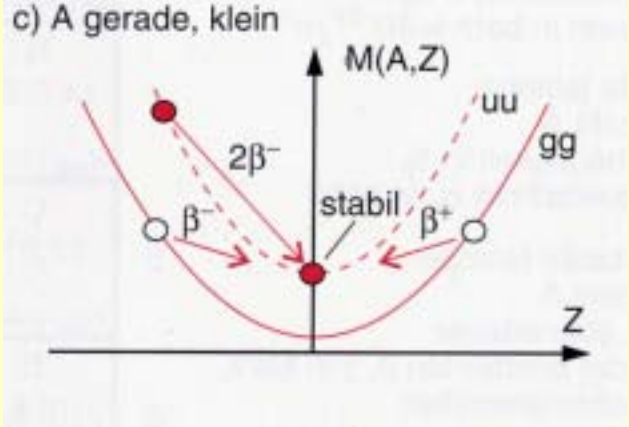
Tröpfchenmodell, Mattauch



Für **A ungerade** gibt es **ein** stabiles Isobar mit Z_0



Für **A gerade** mehrere stabile Isobare möglich



Oberhalb von Z=7 keine stabilen uu-Kerne
Unterhalb von Z=7 stabile uu-Kerne möglich

Zerfallsgesetz

$$\frac{dN}{dt} = -\lambda N = A(t)$$

$$N(t) = N_0 \exp(-\lambda t)$$

A Aktivität in Bq

$$\tau = \frac{1}{\lambda}$$

$$t_{1/2} = \tau \ln 2$$

Lebensdauer und
Halbwertszeit

$$\alpha: \quad {}^{A}_{Z}\mathrm{X} \rightarrow {}^{A-4}_{Z-2}\mathrm{Y}$$

$$\beta: \quad {}^{A}_{Z}\mathrm{X} \rightarrow {}^{A}_{Z+1}\mathrm{Y}$$

$$\gamma: \quad {}^{A}_{Z}\mathrm{X} \rightarrow {}^{A}_{Z}\mathrm{X}$$

→ 4 Zerfallsreihen

Zerfallsreihen

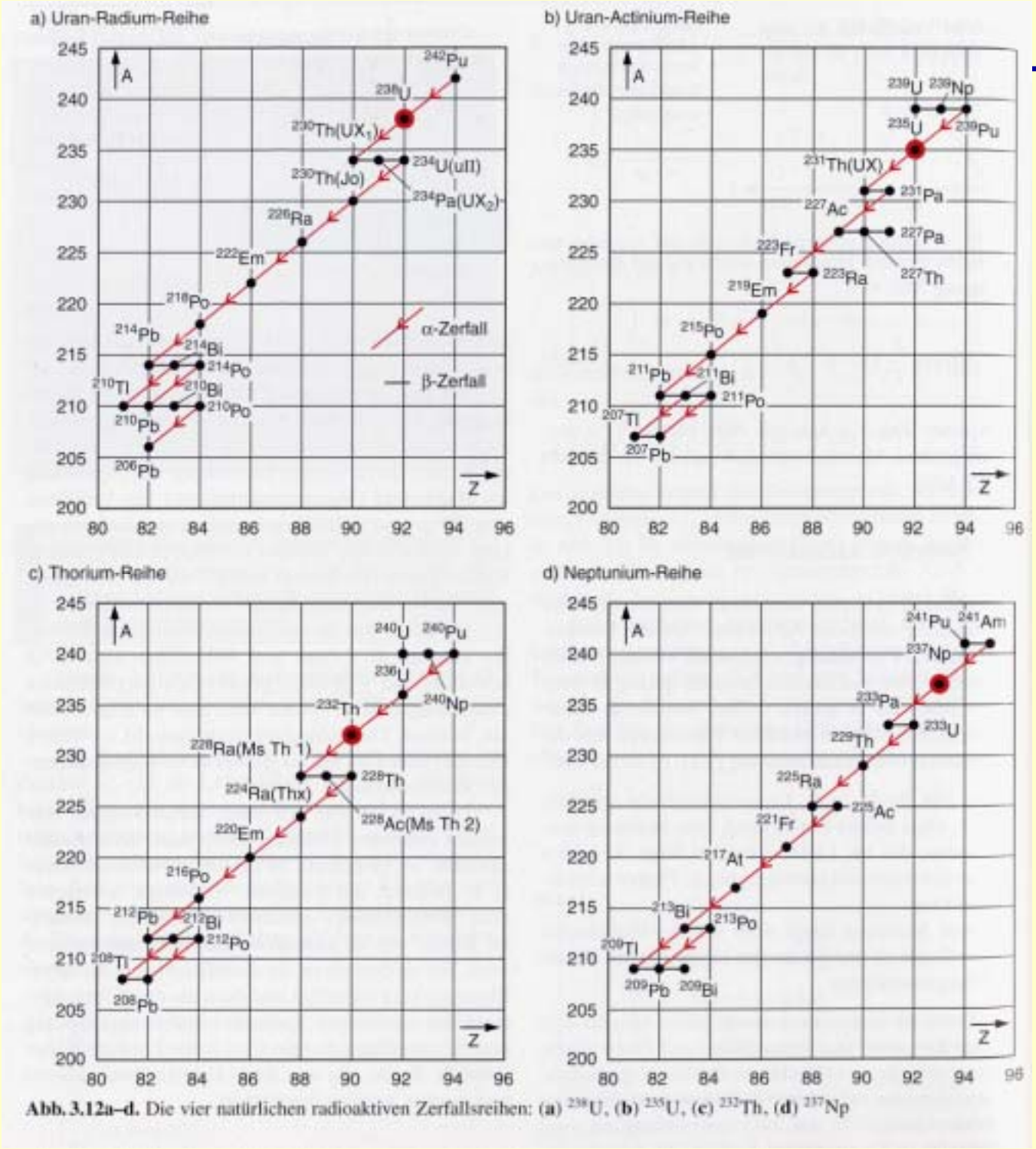
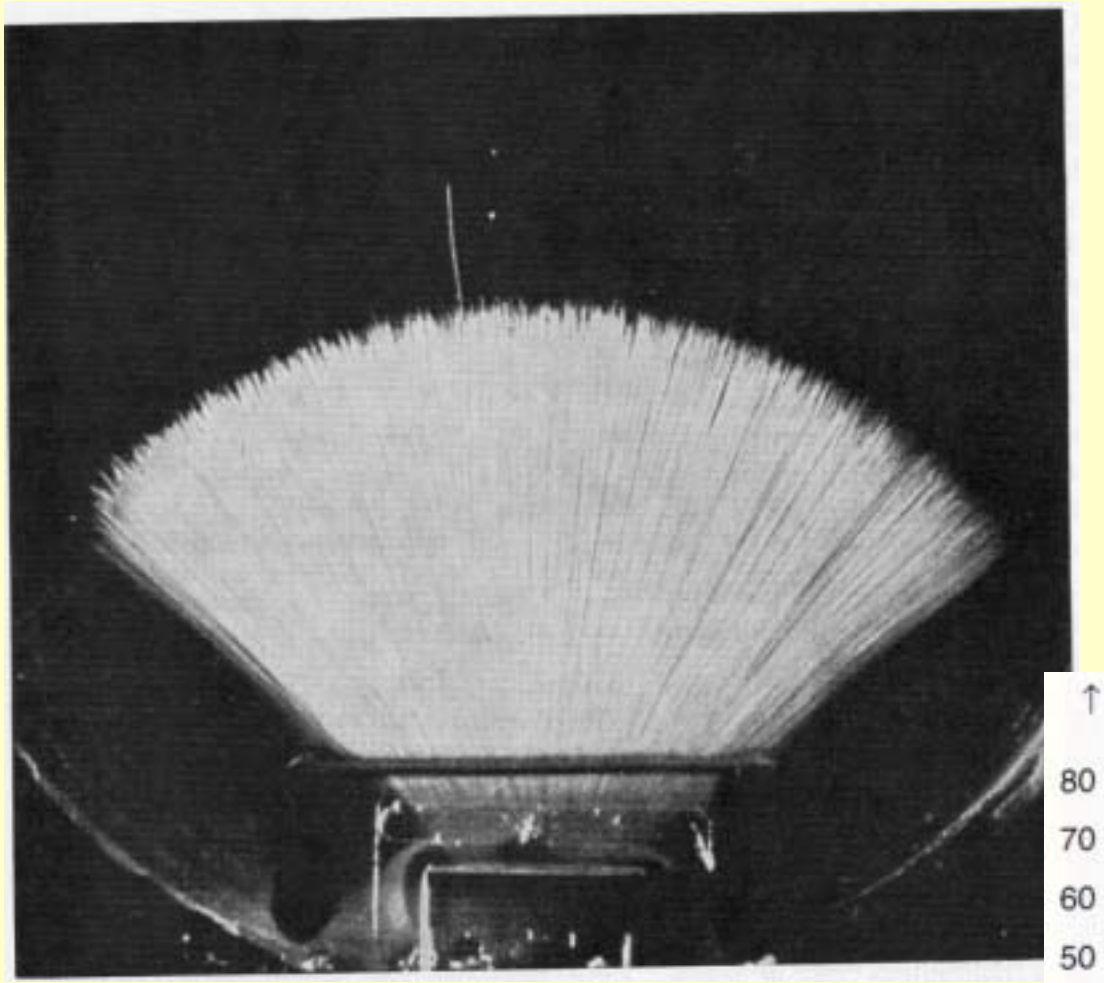
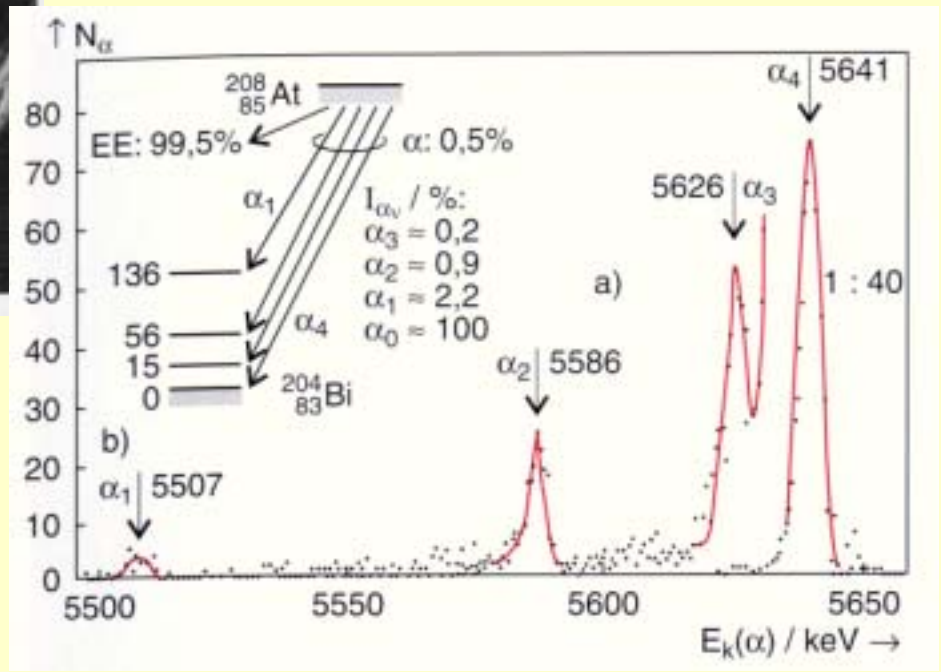


Abb. 3.12a–d. Die vier natürlichen radioaktiven Zerfallsreihen: (**a**) ^{238}U, (**b**) ^{235}U, (**c**) ^{232}Th, (**d**) ^{237}Np

Alpha-Zerfall



monoenergetisch/diskretes Energiespektrum



Alpha-Zerfall

Geiger-Nuttal-Regel

$$\log \lambda = A + B \log R_\alpha$$

Gamov-Modell: Tunnelbarriere

$$\log t_{1/2} \propto |T|^{-2} \propto E^{-1/2}$$