

Experimentalphysik III

# Experimentelle Grundlagen der Quantenphysik

---

Frank Cichos

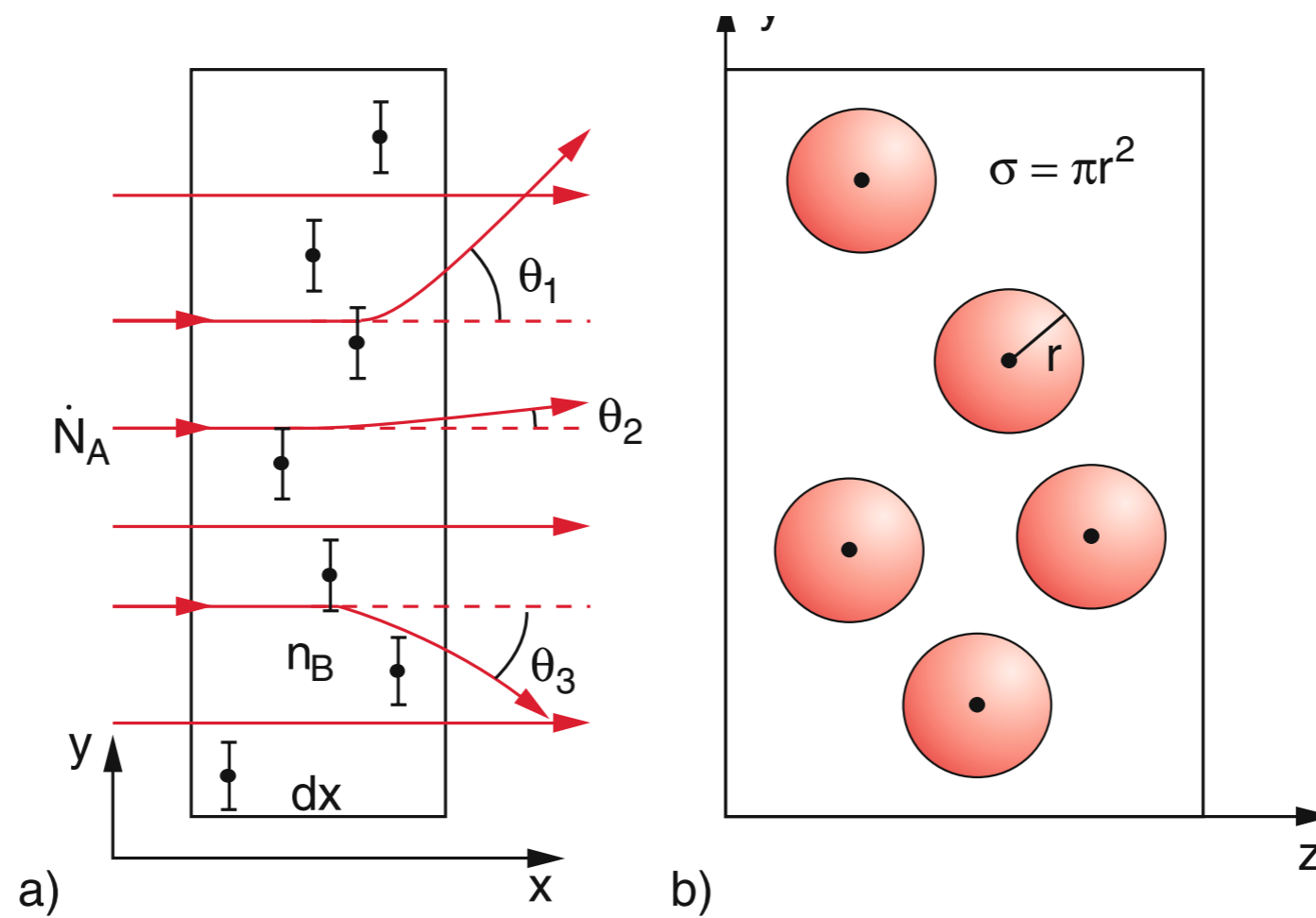
Vorlesung 3

Wie schwer sind Atome?

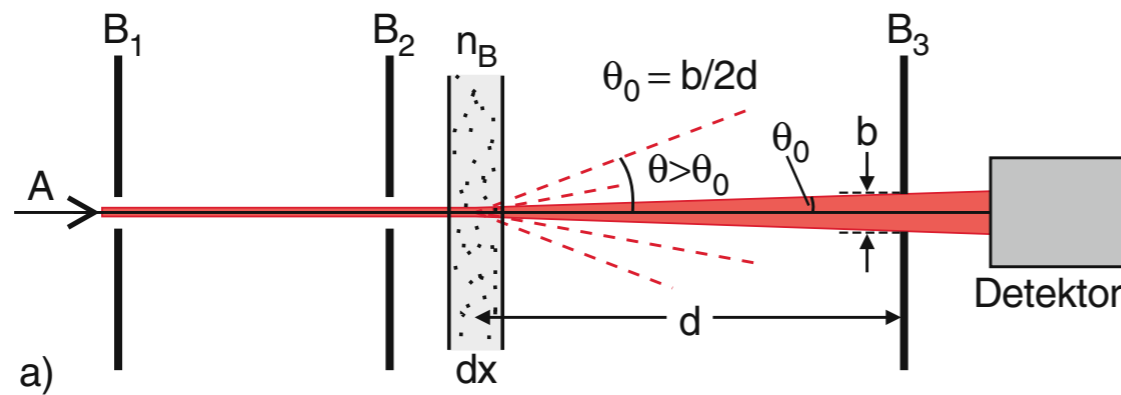
Wie groß sind Atome?

Sind Atome unteilbar?

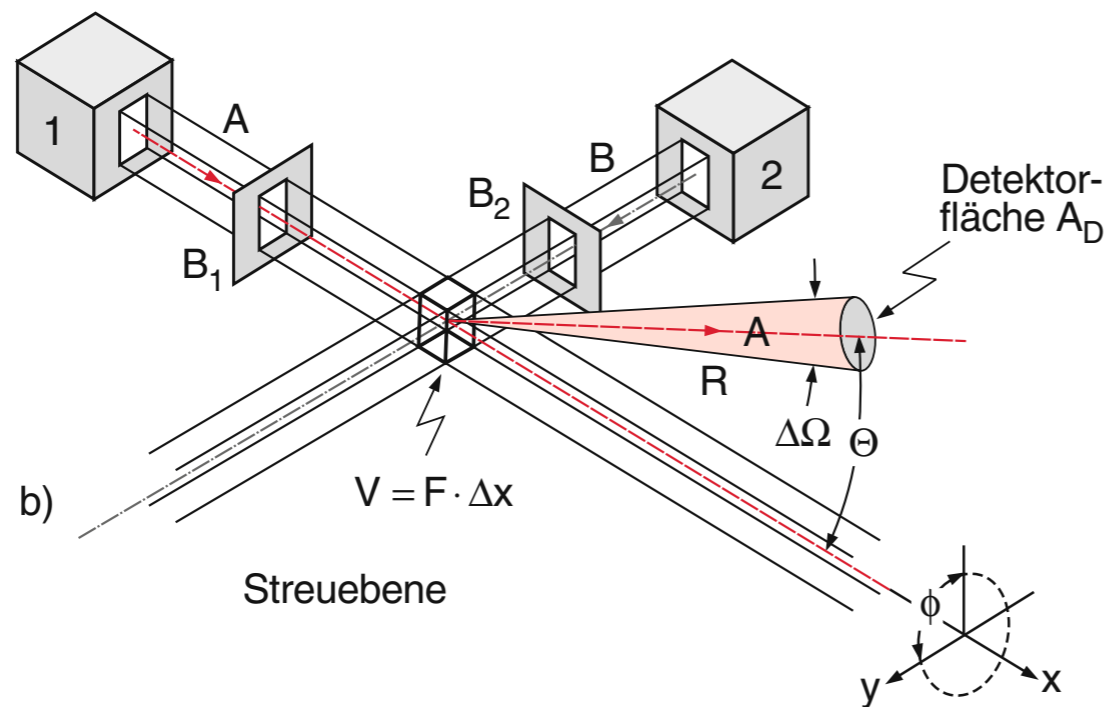
# Streuung und Streuquerschnitt



# Messung von Streuquerschnitten



integraler Streuquerschnitt



differentieller Streuquerschnitt

**Abb. 2.81.** (a) Messung des integralen Streuquerschnitts  $\sigma$ .  
(b) Messung des differentiellen Streuquerschnitts  $d\sigma/d\Omega$

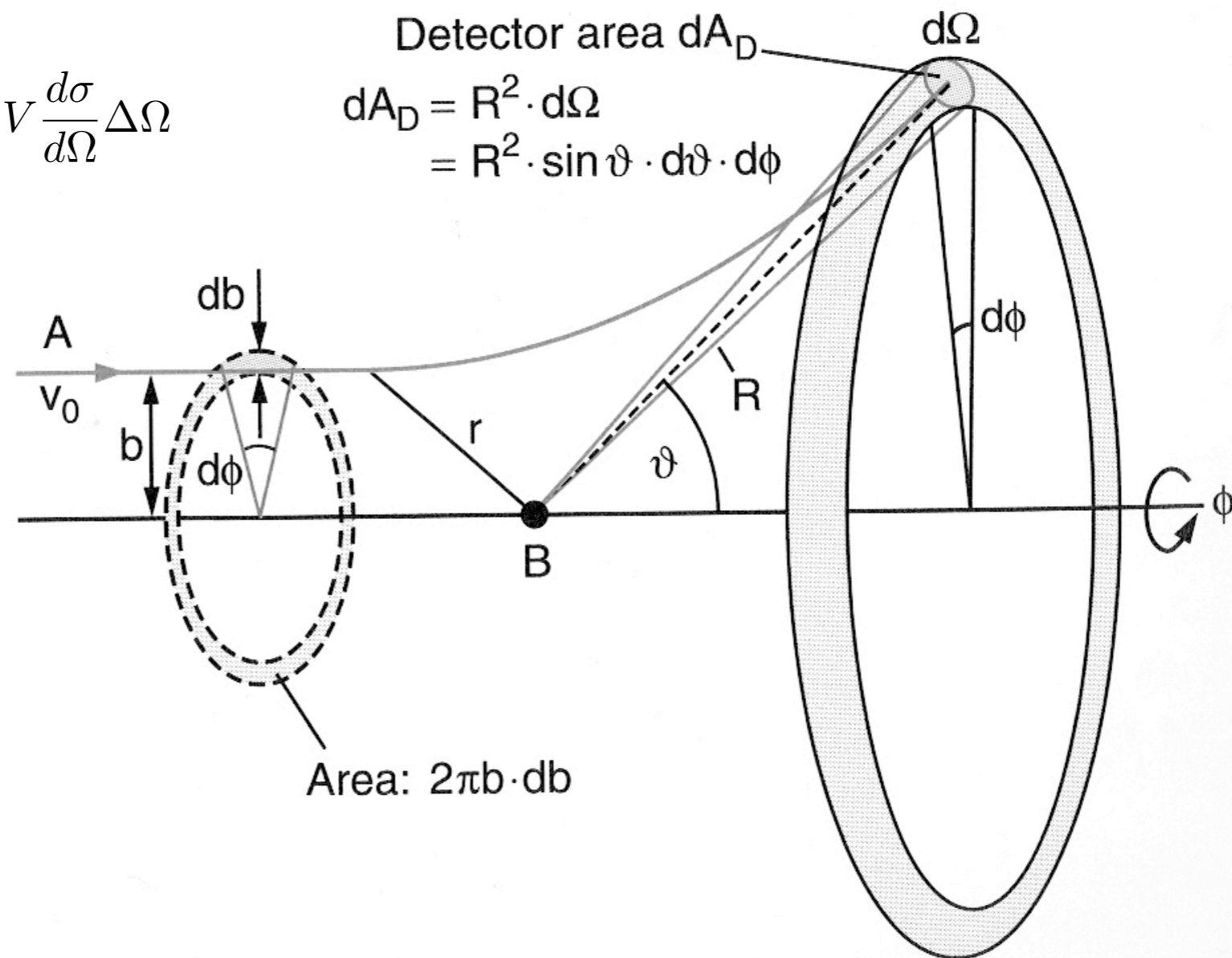
# Rutherford Streuung - Diff. Stauquerschnitt

differential scattering cross-section

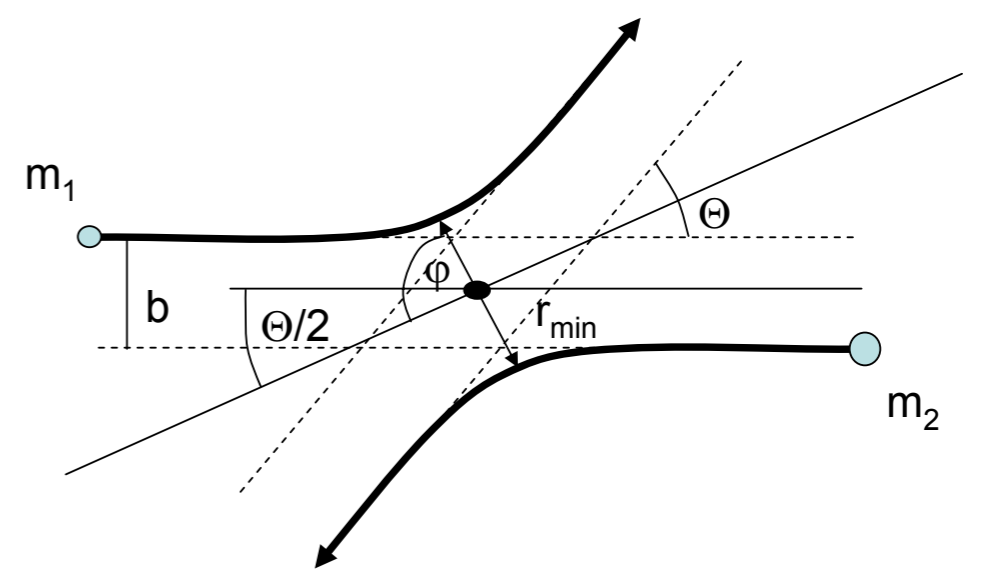
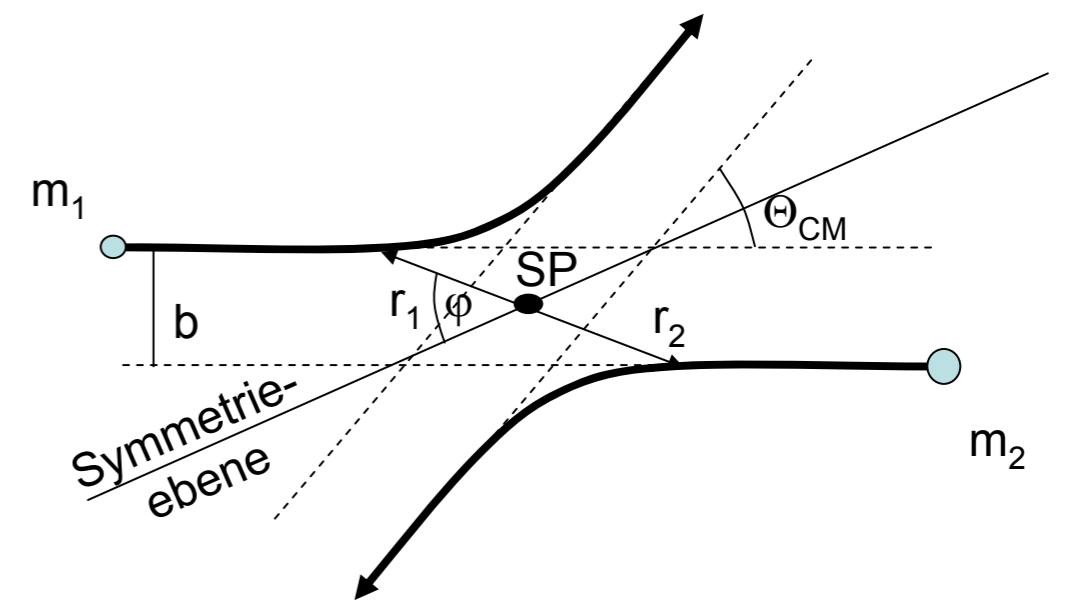
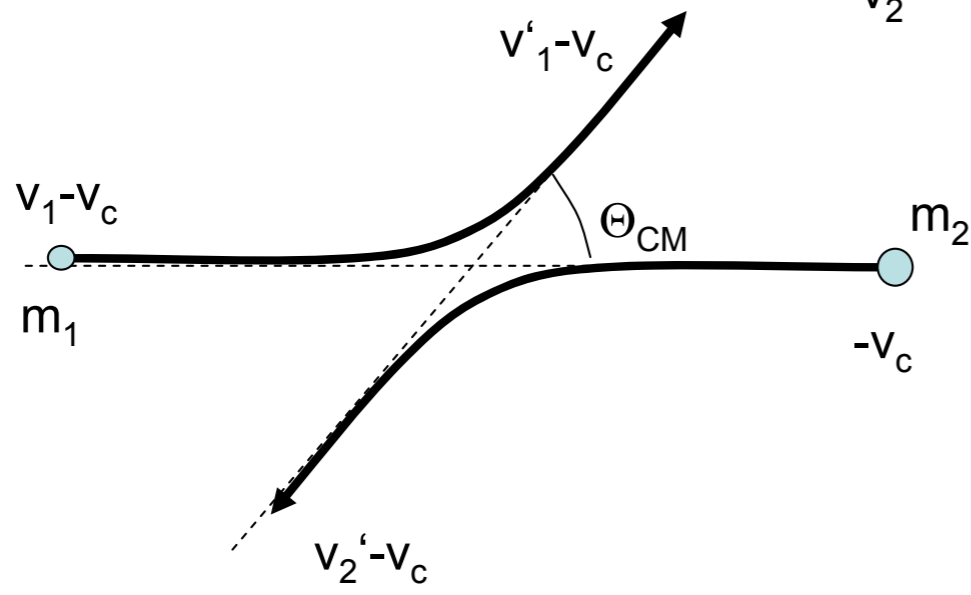
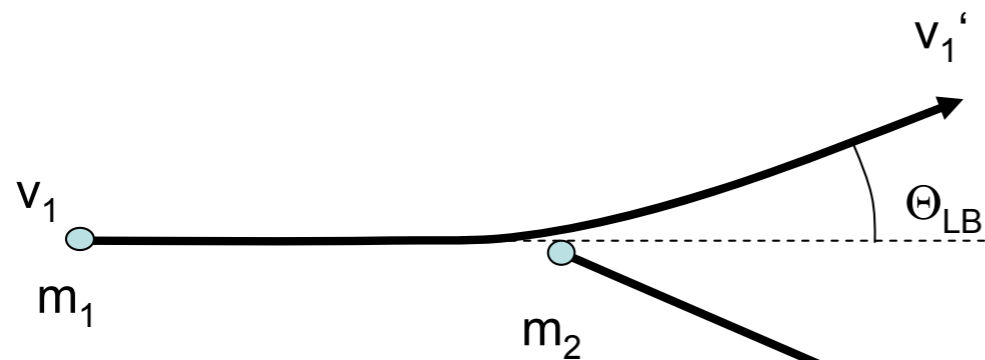
$$\frac{\Delta \dot{N}}{\dot{N} A} = \frac{n_B}{A} V \frac{d\sigma}{d\Omega} \Delta\Omega$$

Detector area  $dA_D$

$$dA_D = R^2 \cdot d\Omega$$
$$= R^2 \cdot \sin \vartheta \cdot d\vartheta \cdot d\phi$$

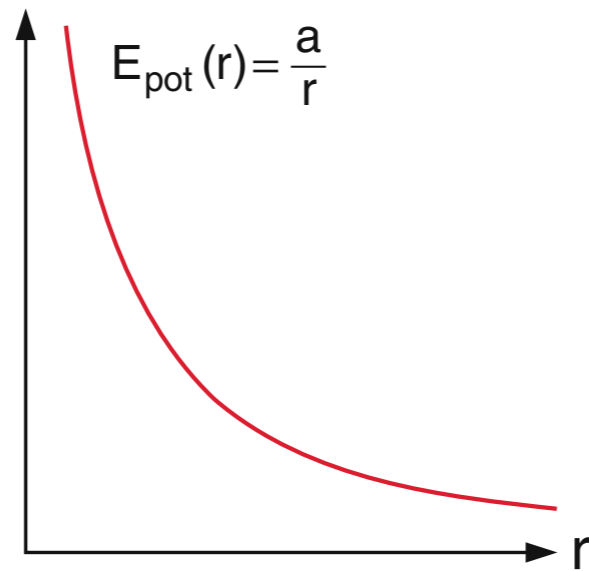


# Schwerpunktsystem

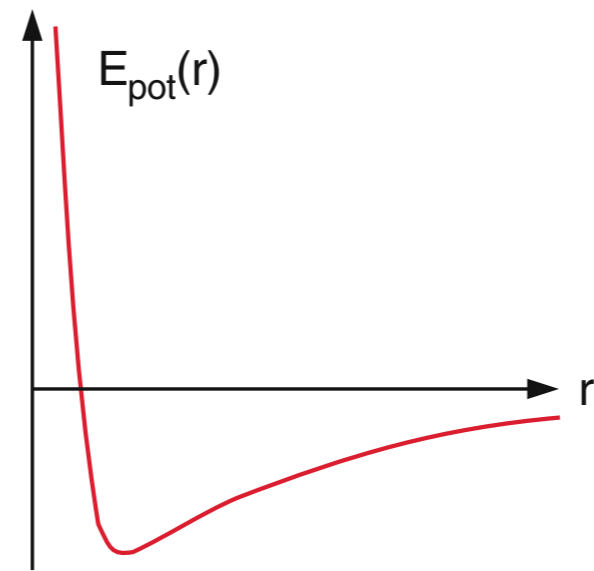


# Potentiale und Ablenkwinkel

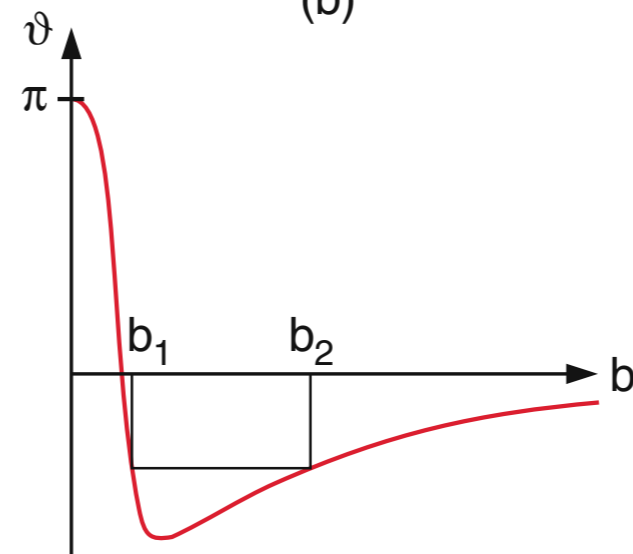
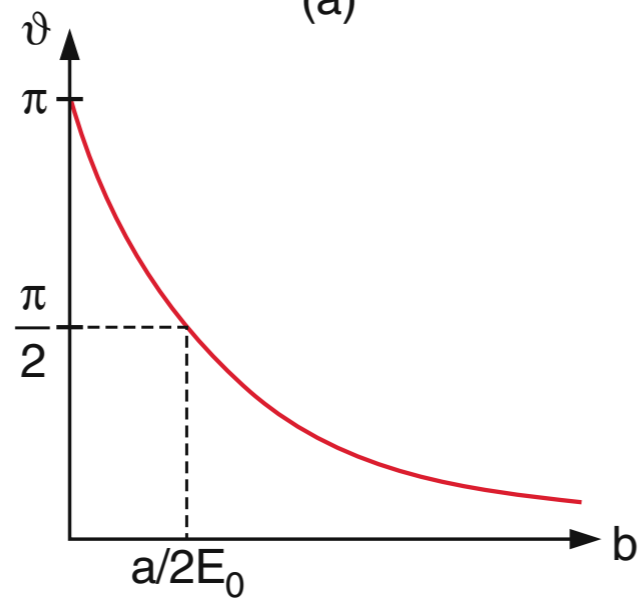
---



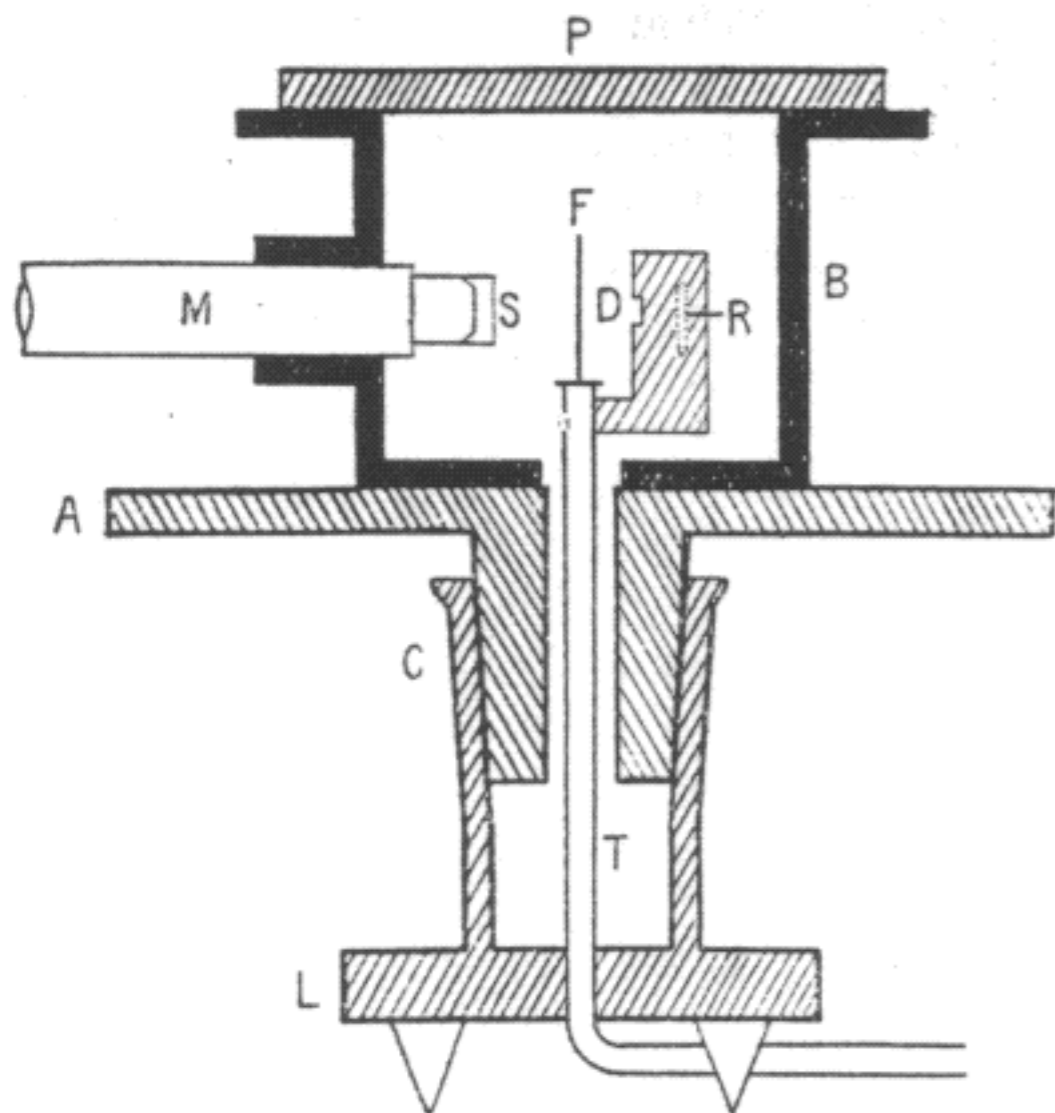
(a)



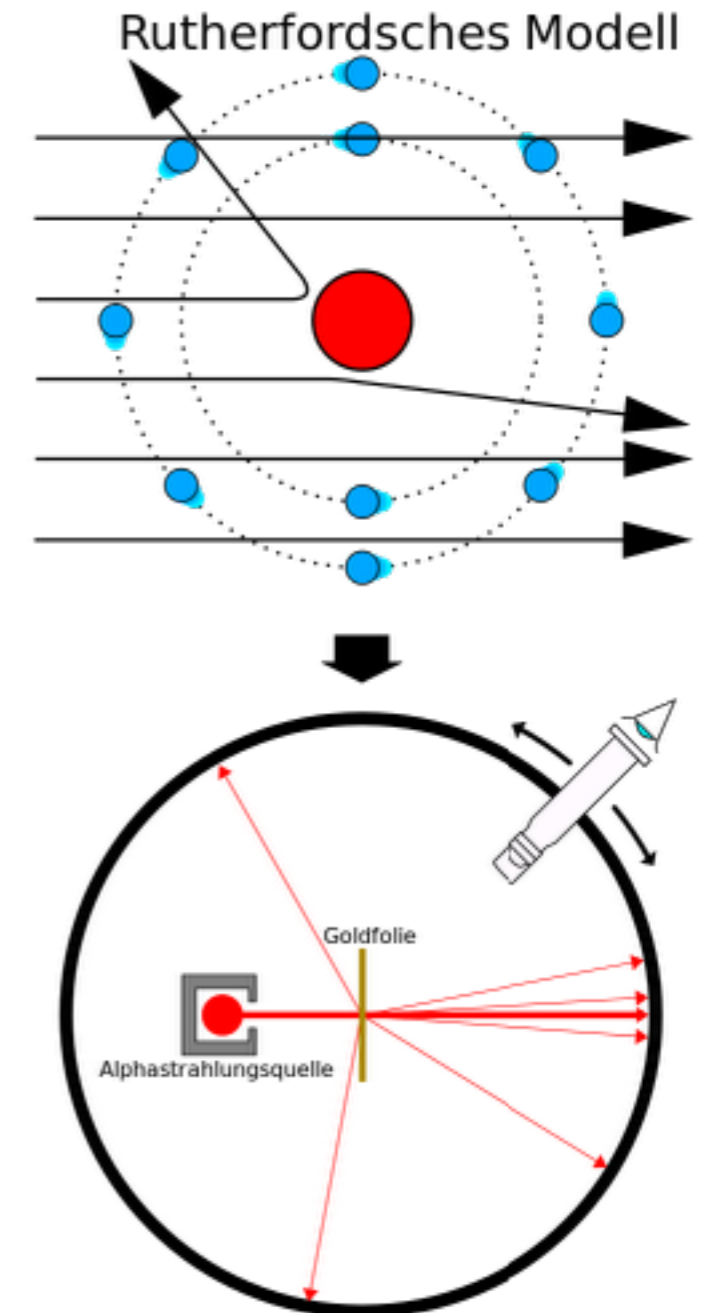
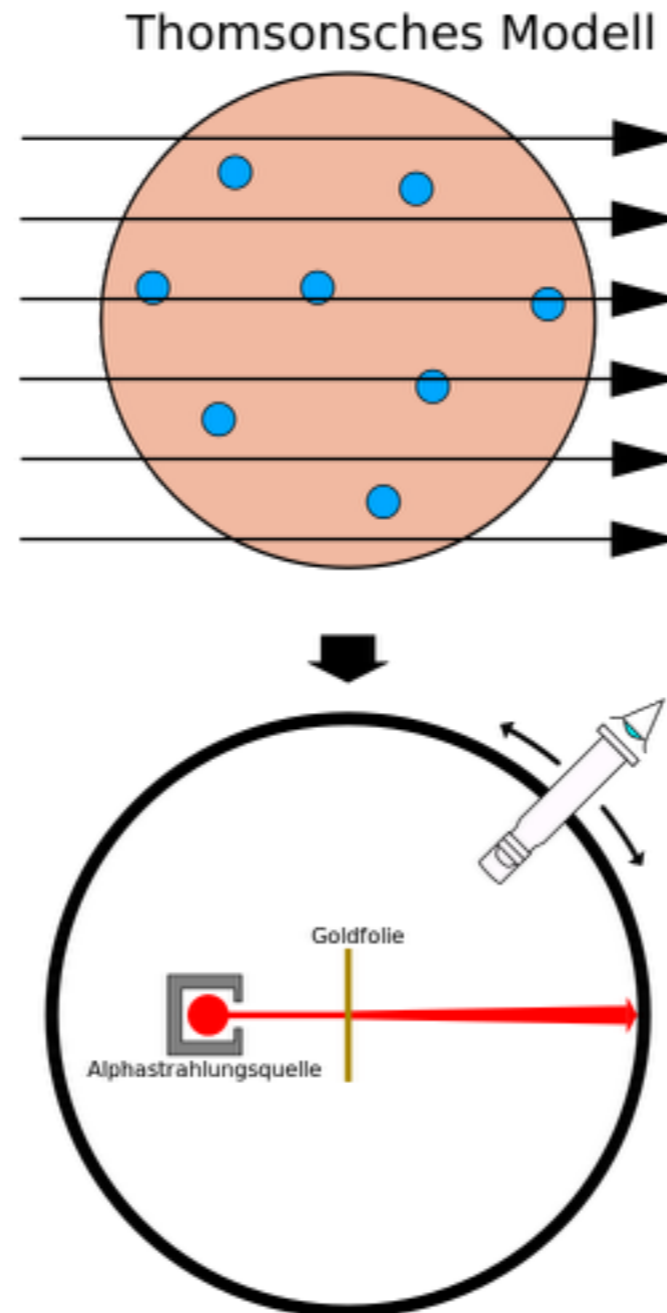
(b)



# Geiger-Marsden Experiment

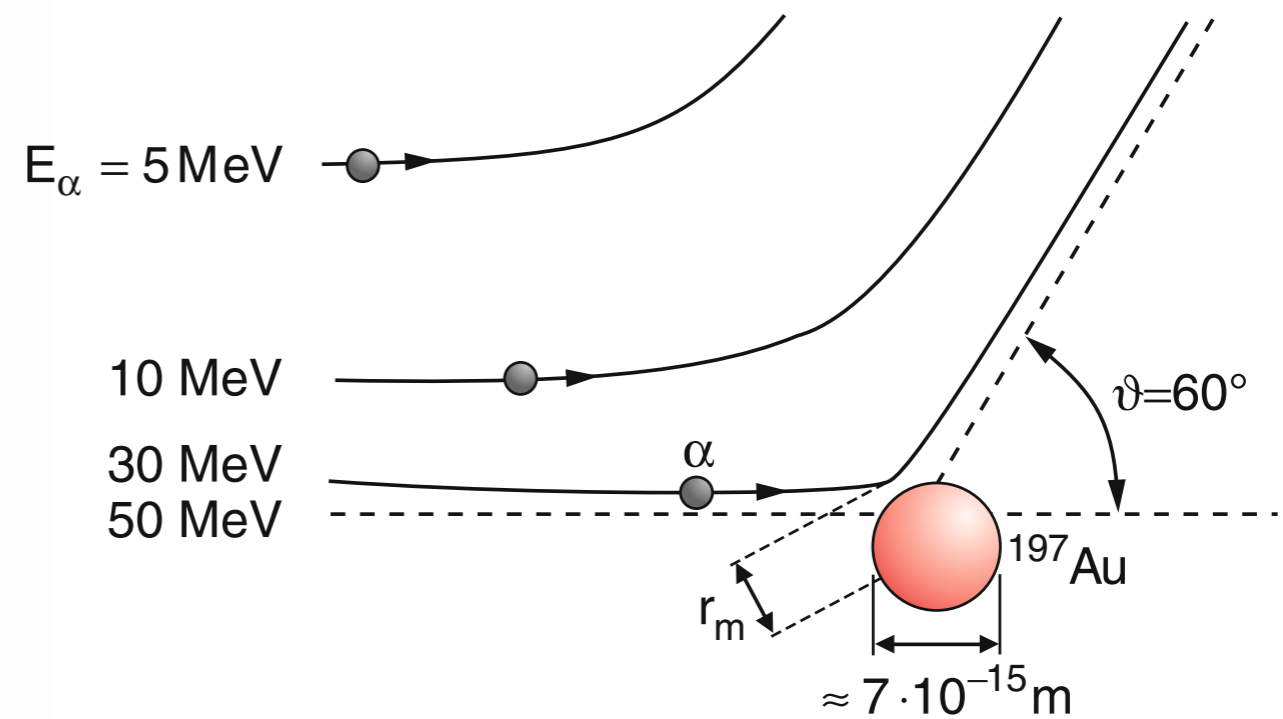
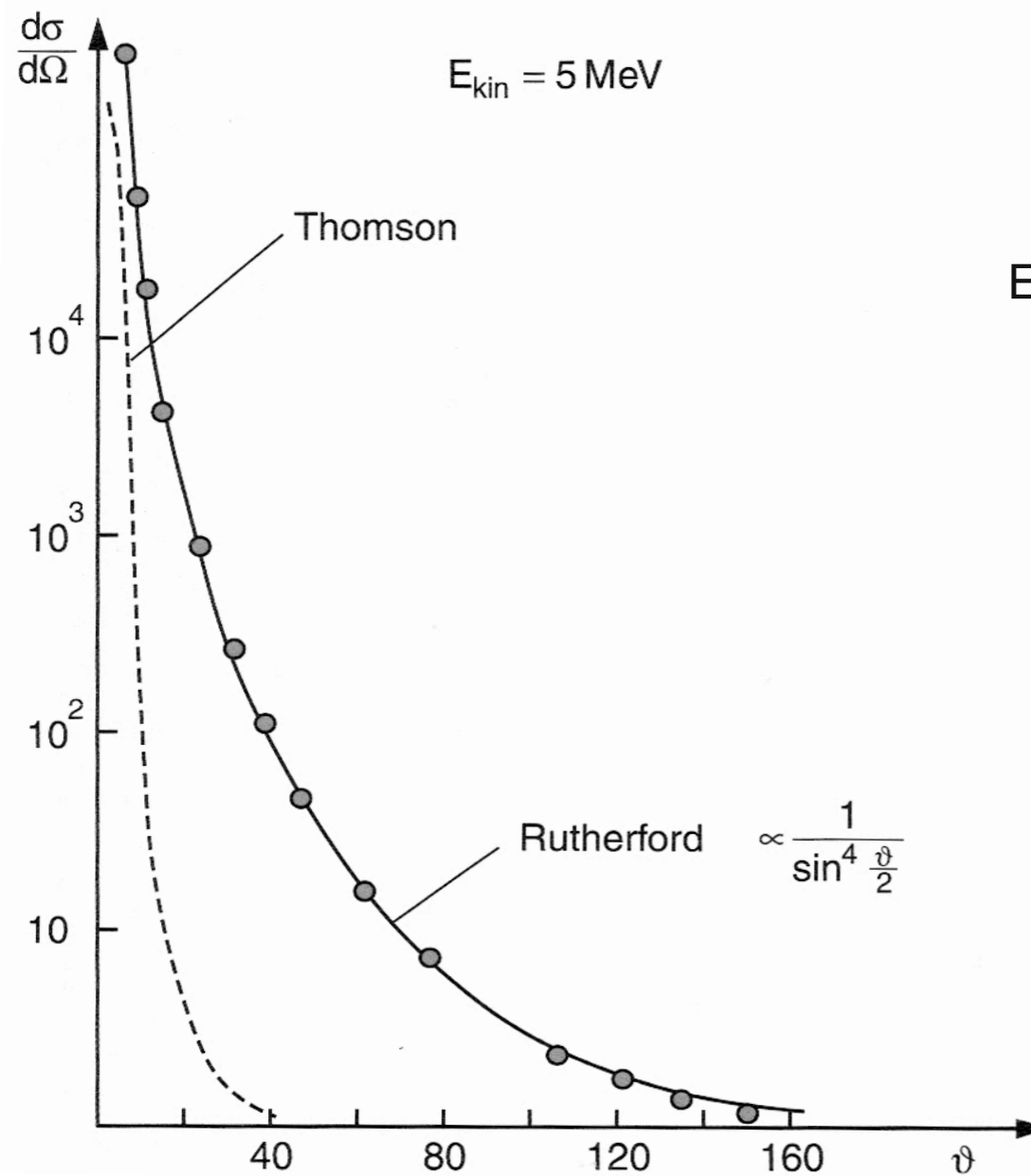


This apparatus was described in a **1913** paper by Geiger and Marsden. It was designed to accurately measure the scattering pattern of the alpha particles produced by the metal foil (F). The microscope (M) and screen (S) were affixed to a rotating cylinder and could be moved a full circle around the foil so that they could count scintillations from every angle.



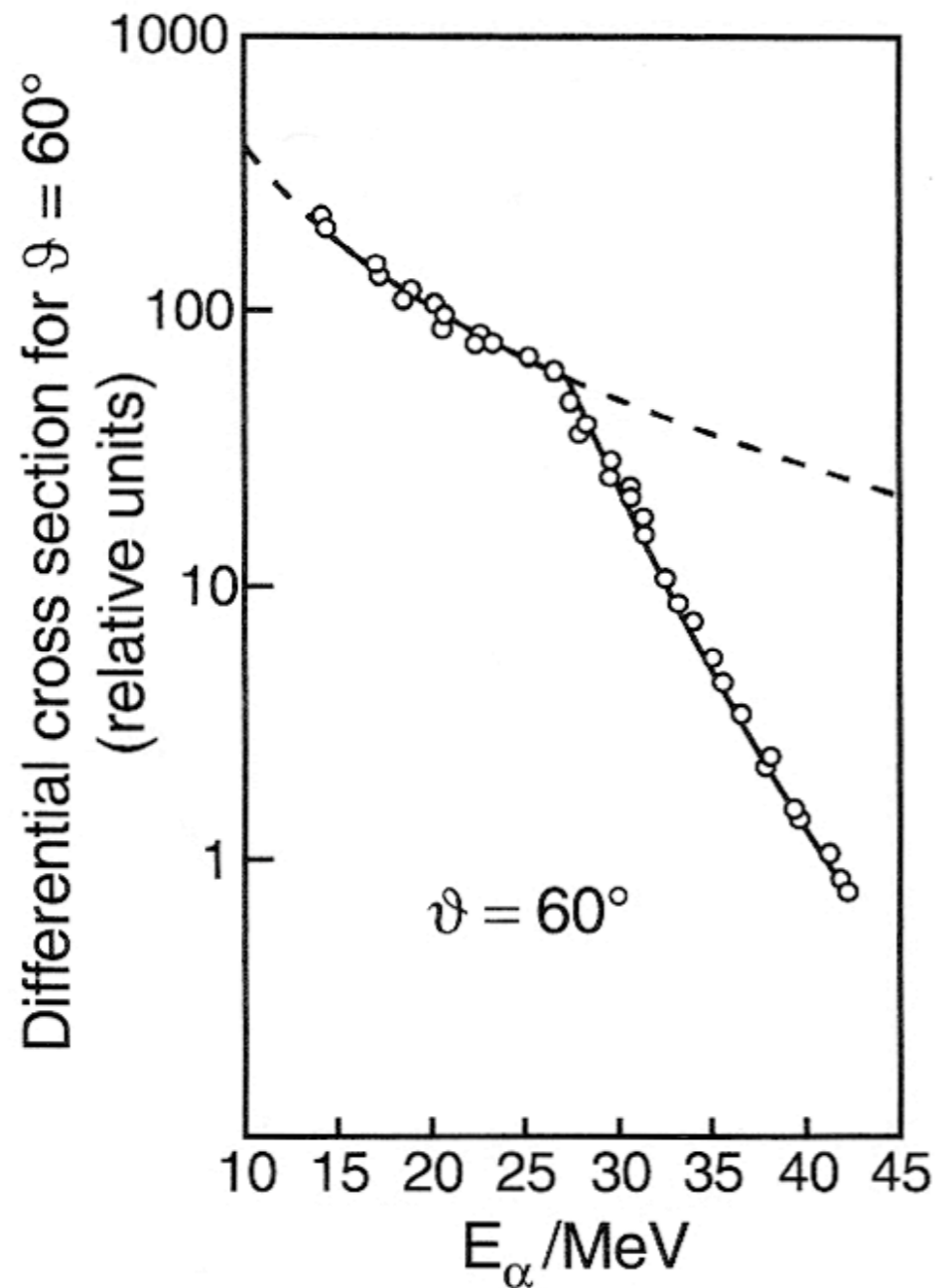


# Rutherford Streuung



# Rutherfordstreuung bei hohen Energien

deviations from Rutherford's formula at high energies



deviations at large scattering angles

