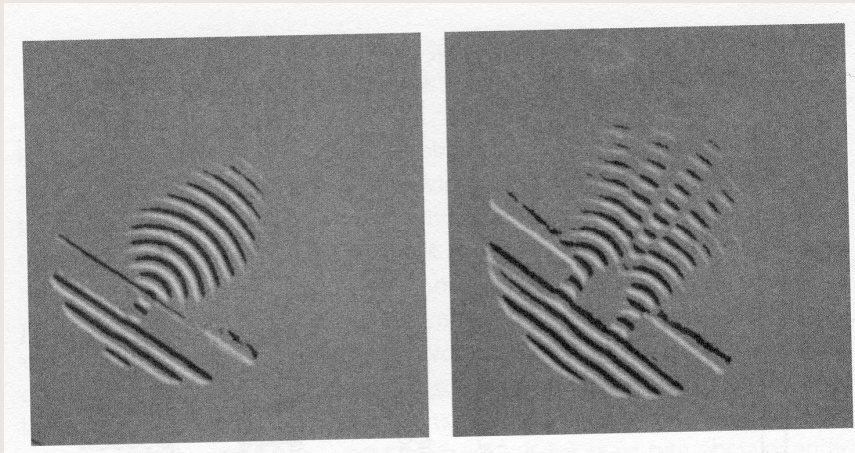
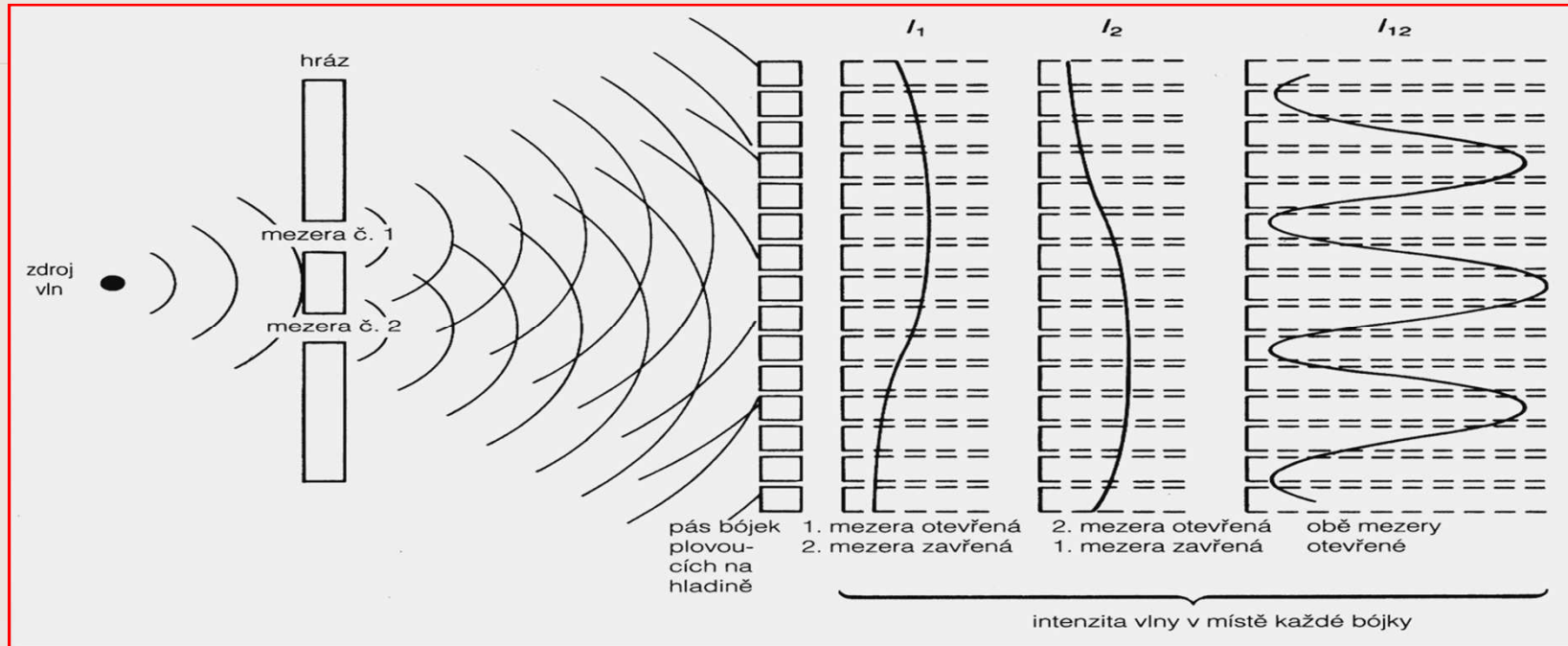


Dvojtěrbinový experiment: vlny na vodě



$$I_{12} = (h_1 + h_2)^2 = I_1 + I_2 + 2h_1h_2$$

střední intenzita vln je úměrná
kvadrátu amplitudy výchylek vln

Dvojštěrbinový experiment: světelné vlny

$$E = E_0 \sin \omega t$$

$$E = E_0 \sin(\omega t + \varphi)$$

$$I = \langle S \rangle \propto \langle E_1^2 \rangle + \langle E_2^2 \rangle + 2 \langle \mathbf{E}_1 \cdot \mathbf{E}_2 \rangle$$

$$I = I_1 + I_1 \pm 2I_1$$

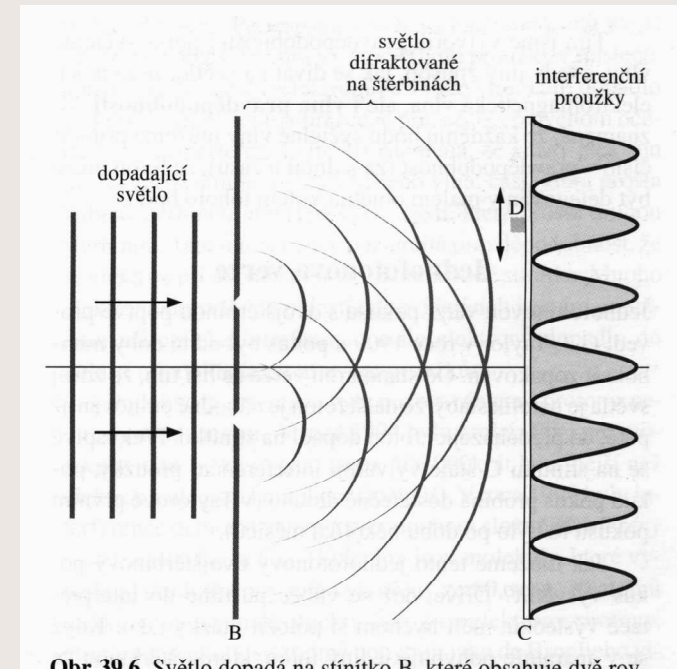
$$I = E^2 = 4E_0^2 \cos^2\left(\frac{1}{2}\varphi\right)$$

Konstruktivní

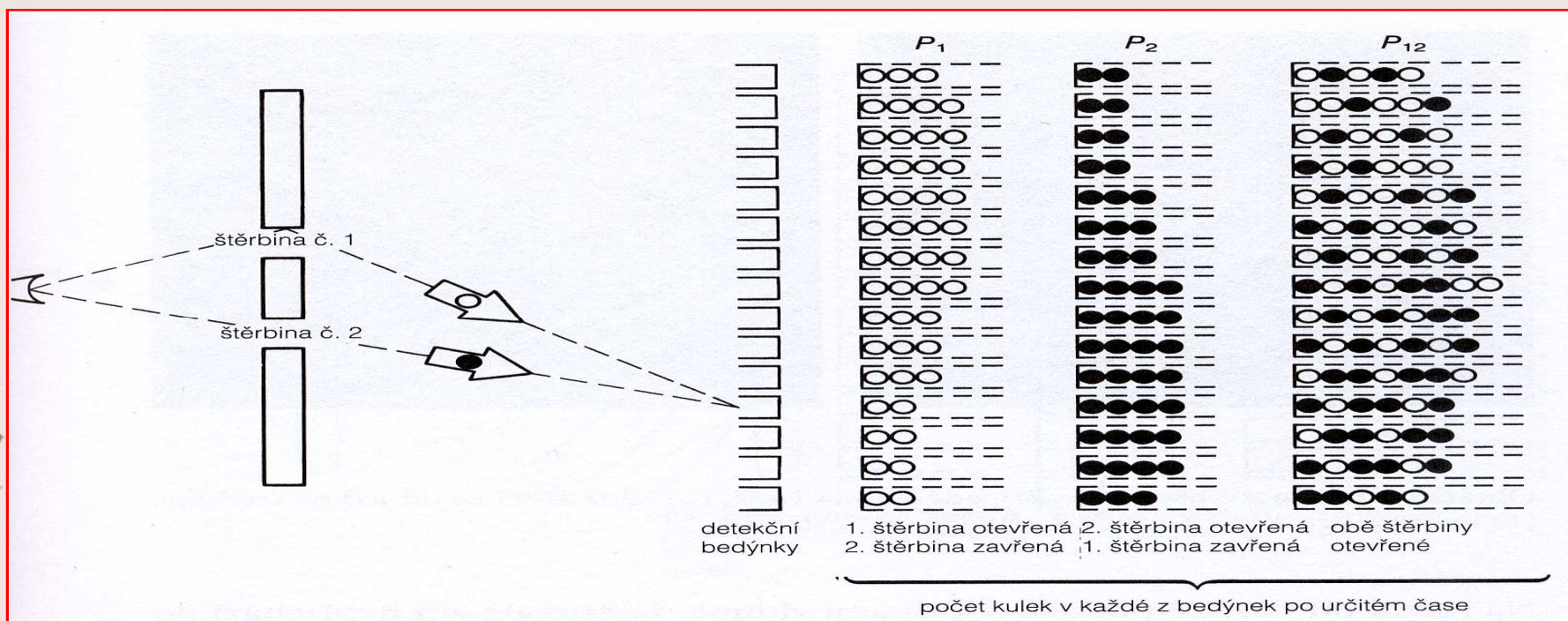
$$I = 4I_1$$

Destruktivní

$$I = I_1 + I_1 - 2I_1 = 0$$

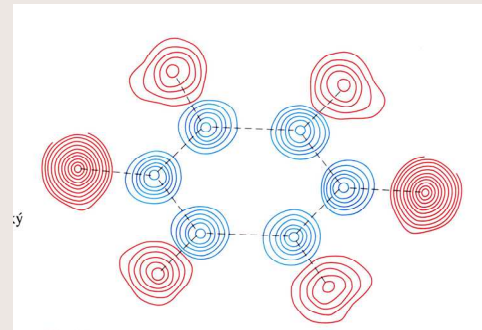
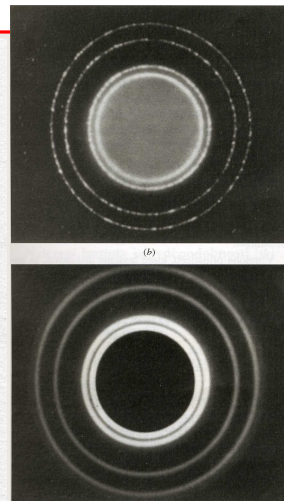
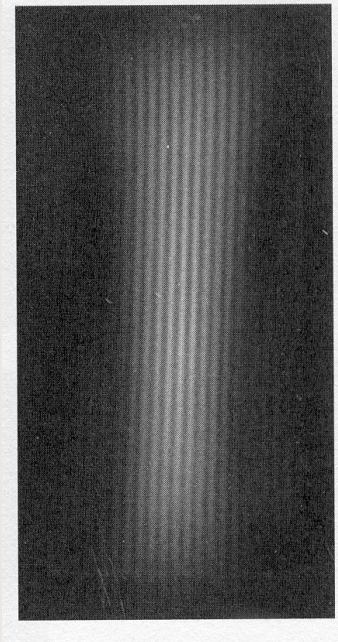
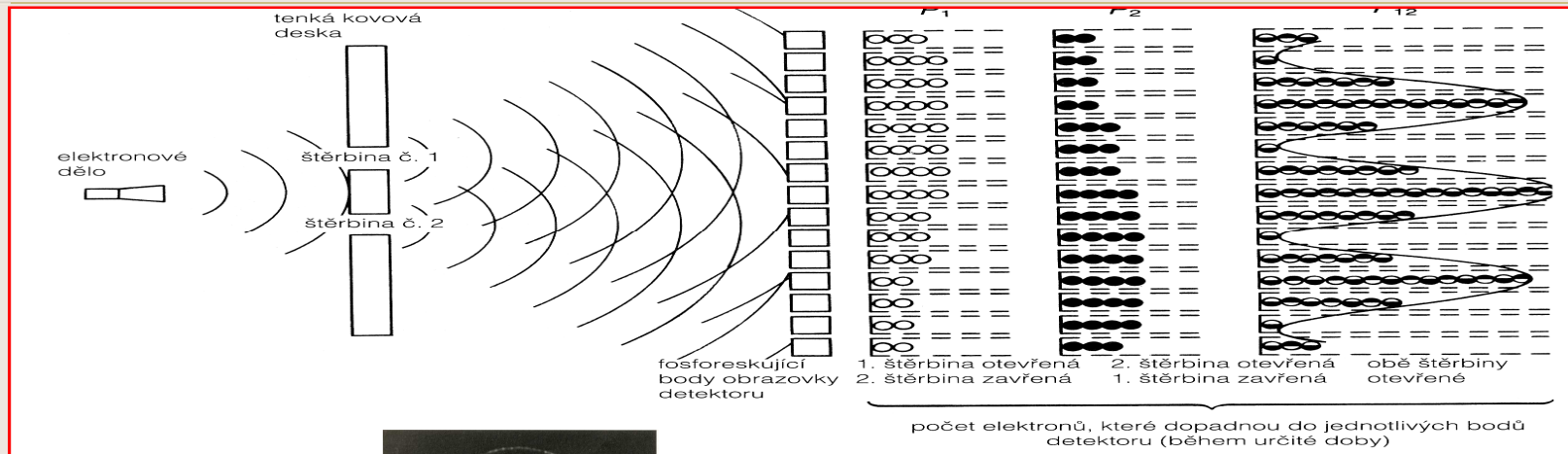


Dvojštěrbinový experiment: kulky

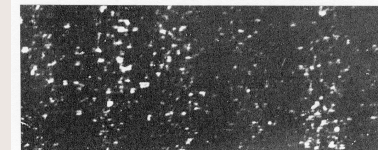


$$P_{12} = P_1 + P_2$$

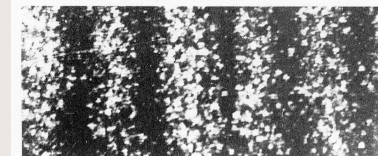
Dvojštěrbinový experiment: elektrony



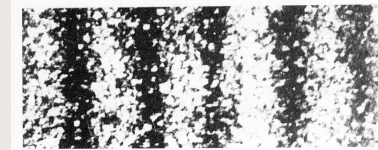
0,02 s



10 s



60 s



120 s

$$P_{12} = (a_1 + a_2)^2 = P_1 + P_2 + 2a_1a_2$$

De Broglieho vlny

- **Louis de Broglie** – 1924 hypotéza, že částicím můžeme přiřadit vlnové vlastnosti
- **Dualismus vlna – částice**
- **Vlna: $\nu, \lambda \rightarrow E, p$: $E = h\nu = hc/\lambda$ $p = h\nu/c = h/\lambda$**
- **Částice: $E, p \rightarrow \nu, \lambda$: $\nu = E/h$ $\lambda = h/p$**
- Interference protonů, neutronů, molekul (I_2 - 1994), fullerénů (C_{60}, C_{70} – 1999)
- Světelná vlna: $E(x, y, z, t)$
- De Broglieho vlna: $\Psi(x, y, z, t)$ – vlnová funkce

$$\Psi(x, y, z, t) = \psi(x, y, z)e^{-i\omega t}$$

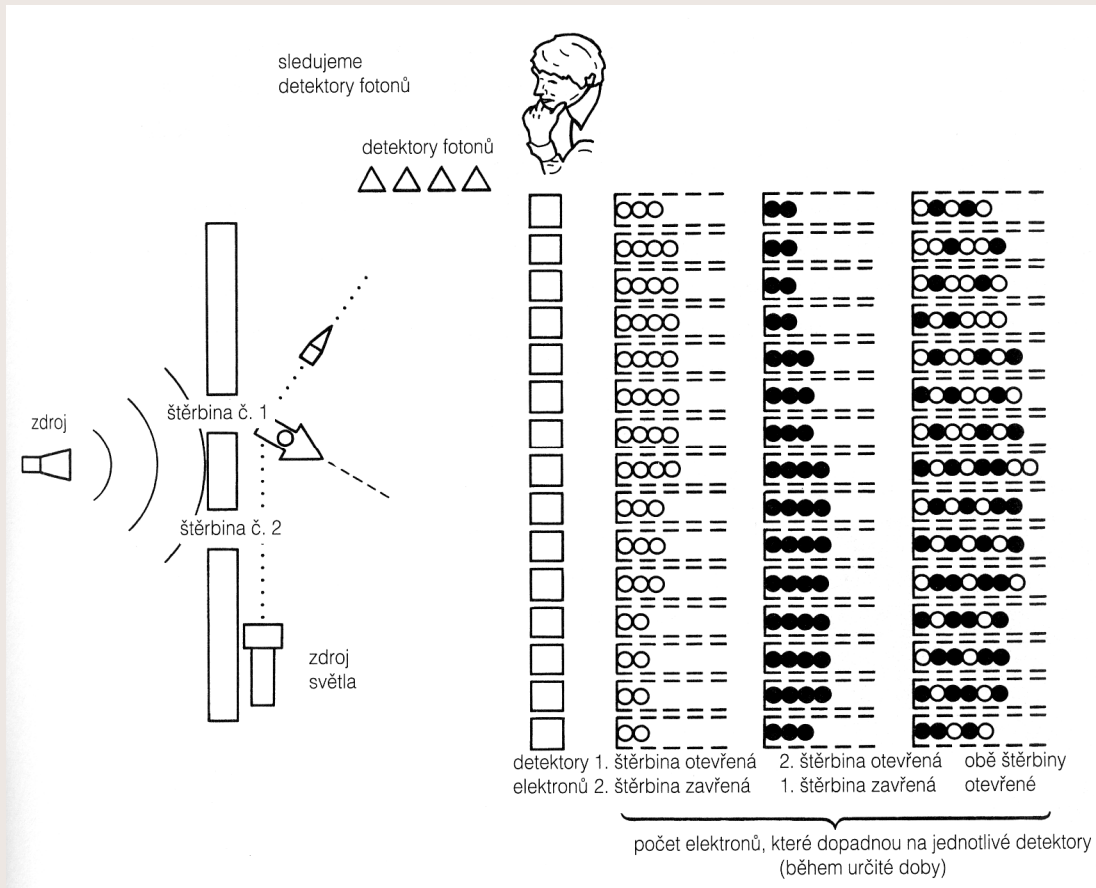
- **Hustota pravděpodobnosti**

$$|\psi|^2$$

Schrödingerova rovnice

$$\frac{d^2\psi}{dx^2} + \frac{2m}{\hbar^2} [E - E_p(x)]\psi = 0$$

Heisenbergův princip neurčitosti



$$\Delta r \Delta p \geq h$$

Heisenbergův princip neurčitosti

