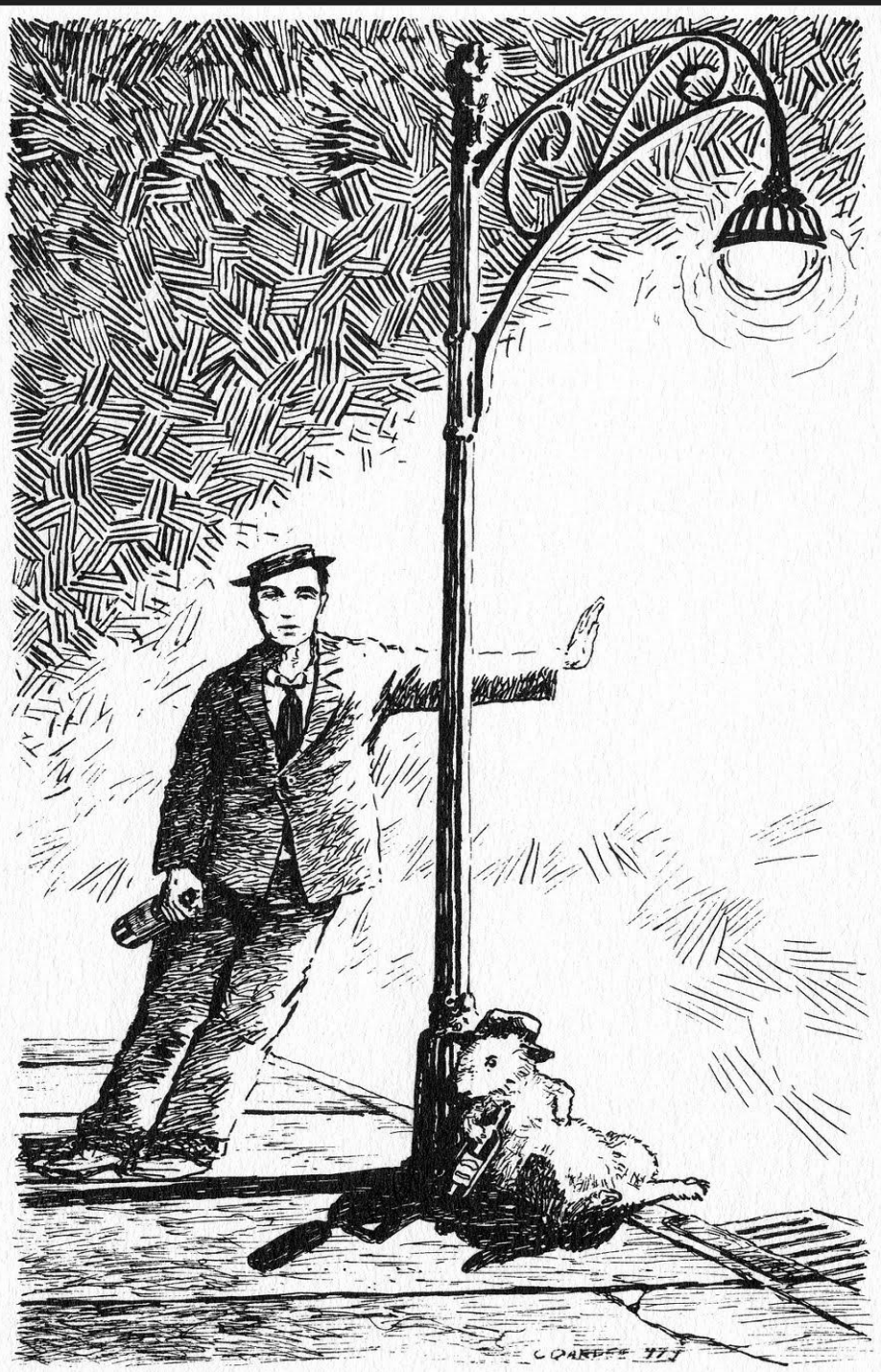
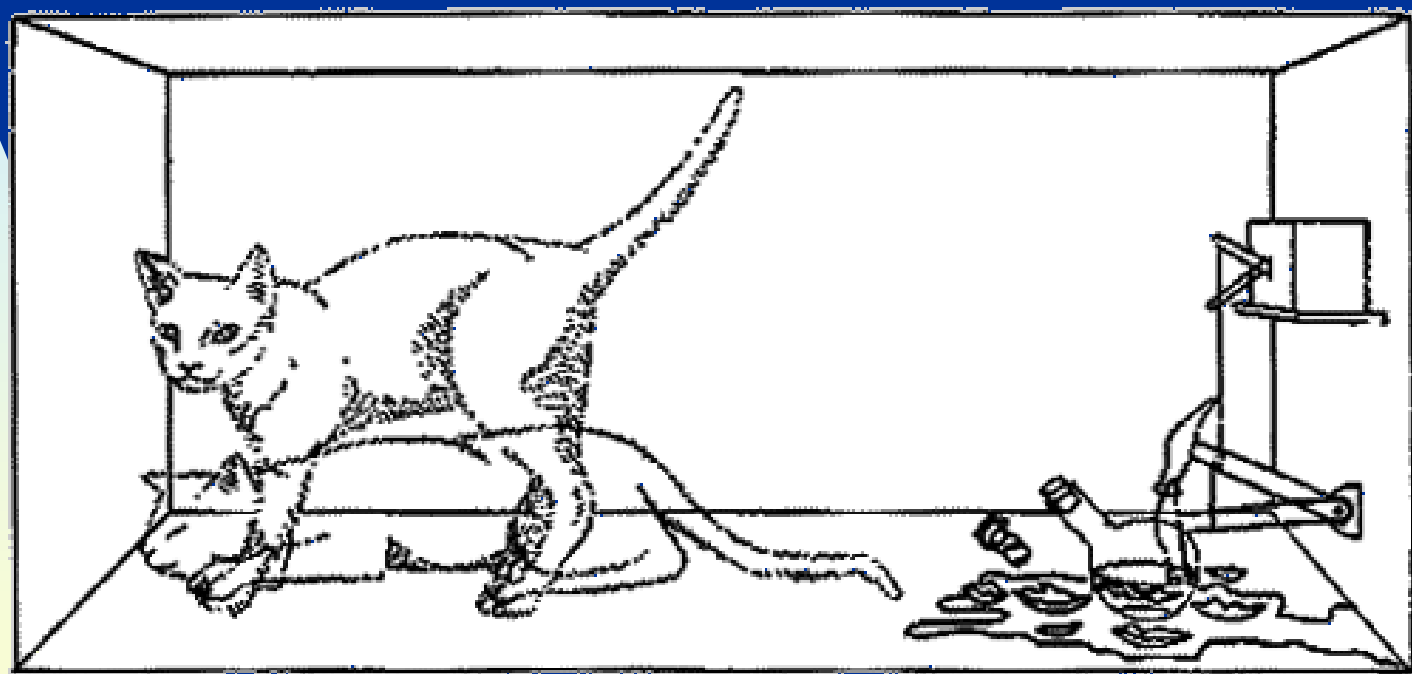


Kvantový svět





MAKROSVĚT A MIKROSVĚT

makrosvět

- **obecná relativita**
- **dominuje gravitace**
- **zakřivený svět**

mikrosvět

- **kvantová teorie**
- **ostatní síly**
- **výměnné částice**

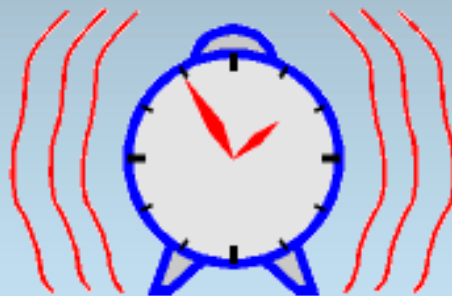
vznik Vesmíru
teorie všeho?
teorie strun?



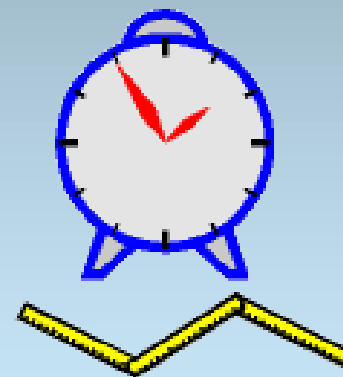
vnímání času



dělení objektů



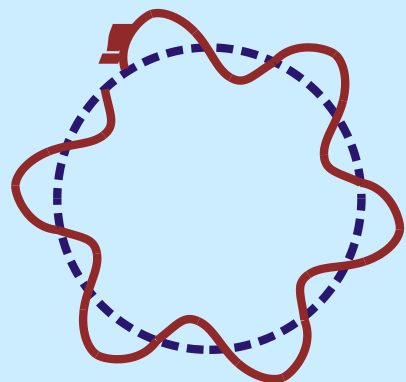
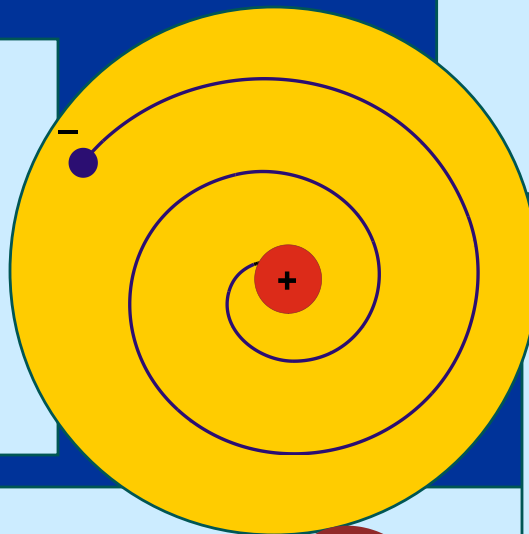
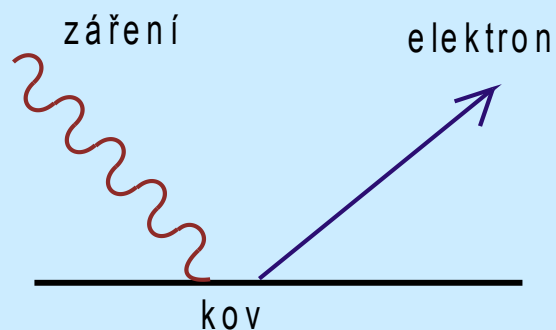
vlna – částice



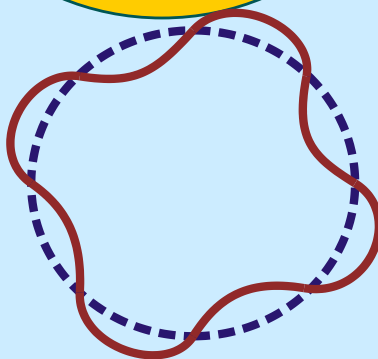
akt měření

MIKROSVĚT

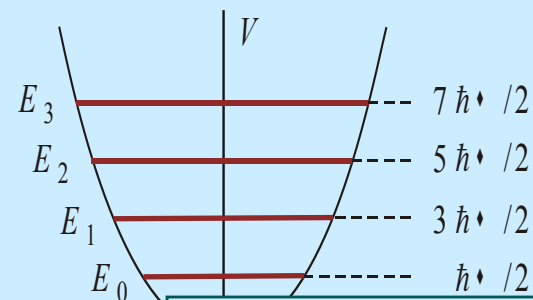
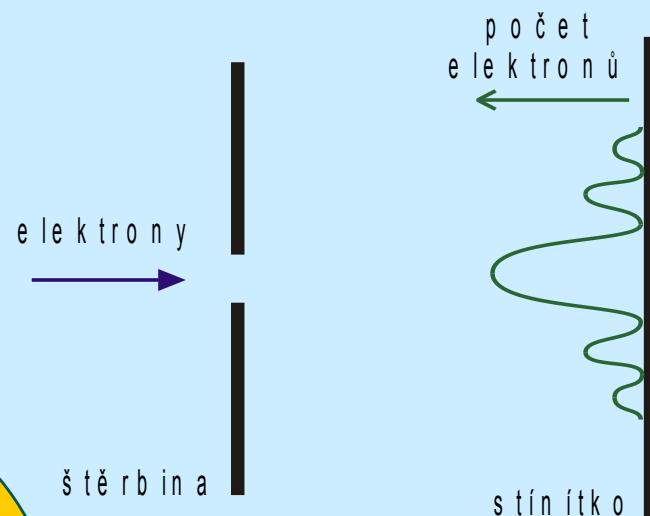
aplikace makroteorií vede na paradoxy
paradox dělení
paradox atomu



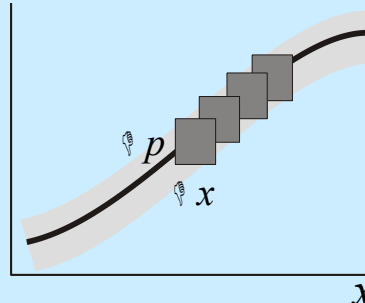
Tlodořanení možná

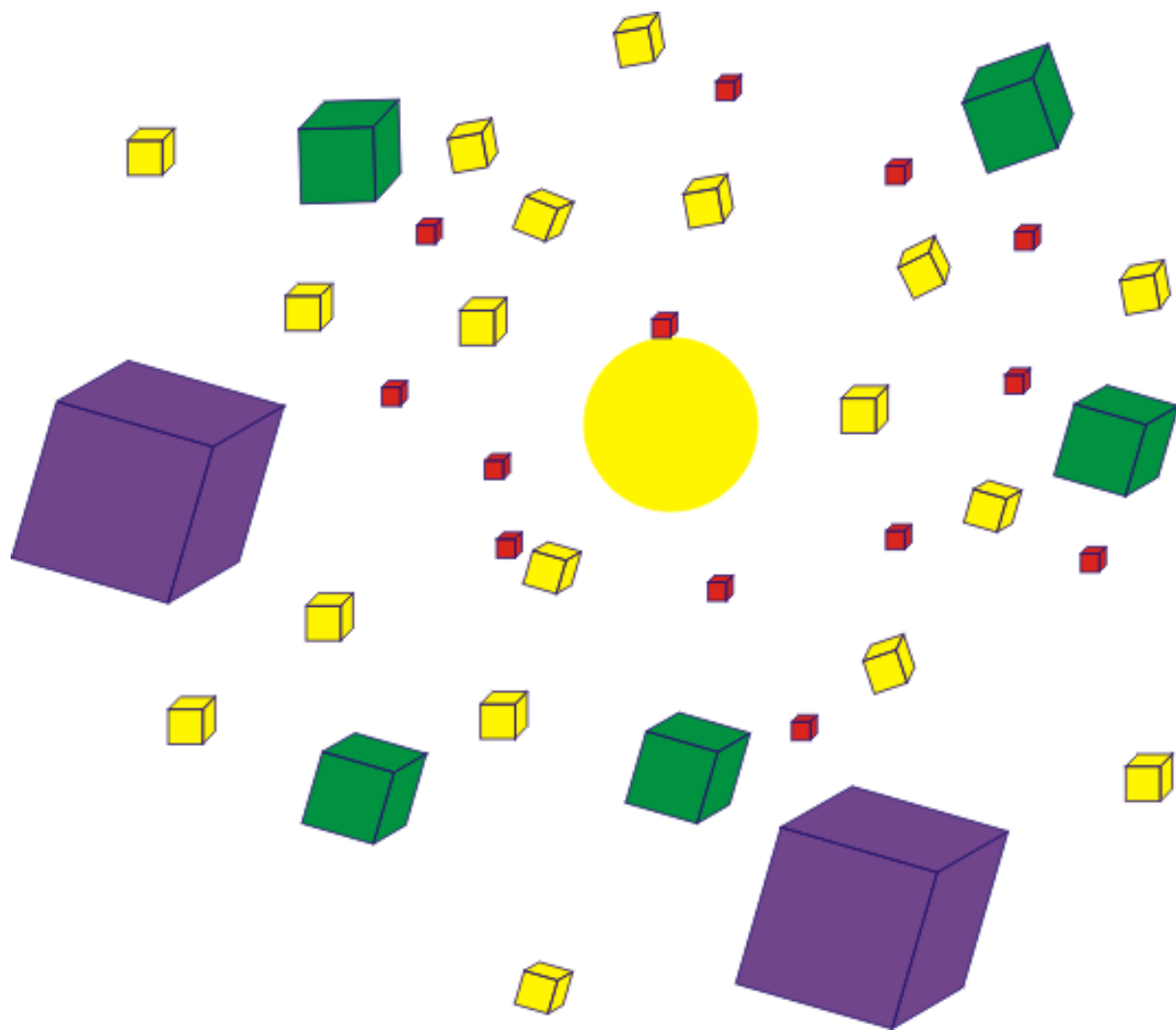


Tlodořajenožné



p





Záření s danou frekvencí (barvou) může měnit svoji energii pouze po kvantech

MIKROSVĚT

- **nekomutativnost aktu měření $AB \neq BA$**
- **diskrétní hodnoty**
- **dualismus vlna – částice**
- **relace neurčitosti**
- **nedeterminismus**
- **statistická interpretace**
- **interakce jako virtuální výměnná částice**

elektromagnetická interakce

slabá interakce

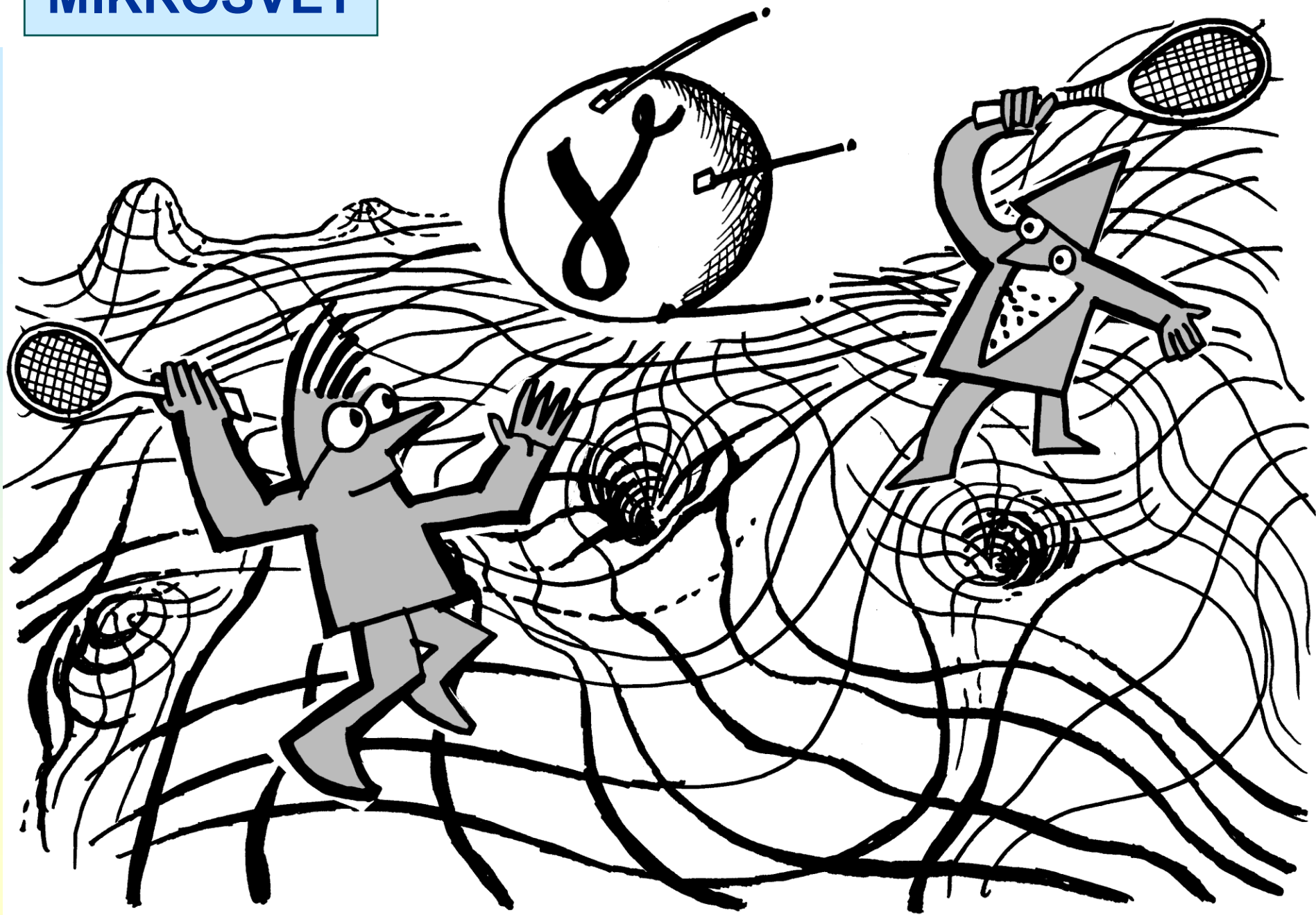
silná interakce

foton

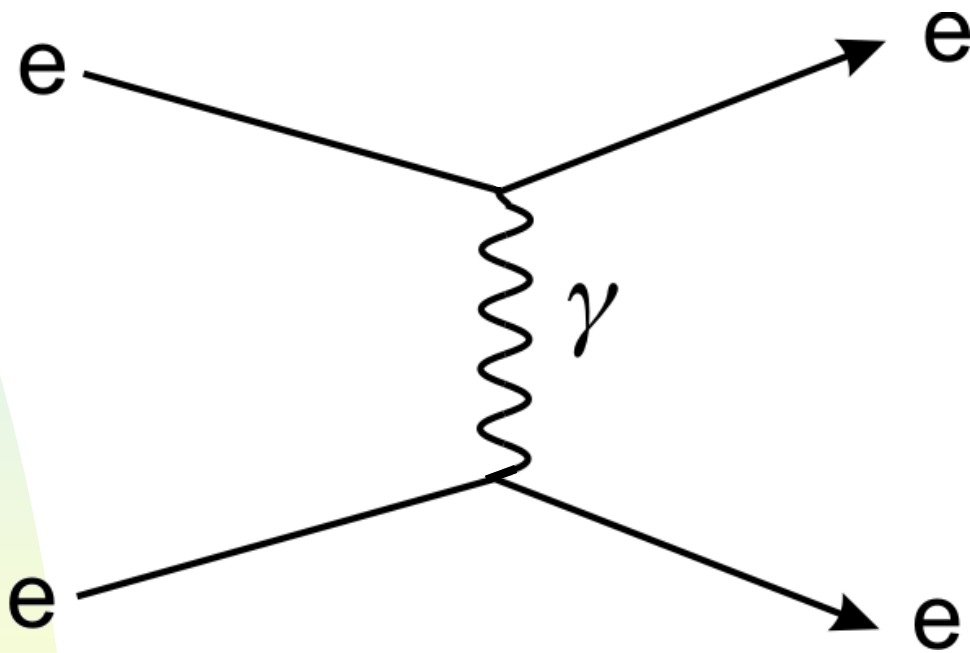
W^+ , W^- , Z^0

gluony

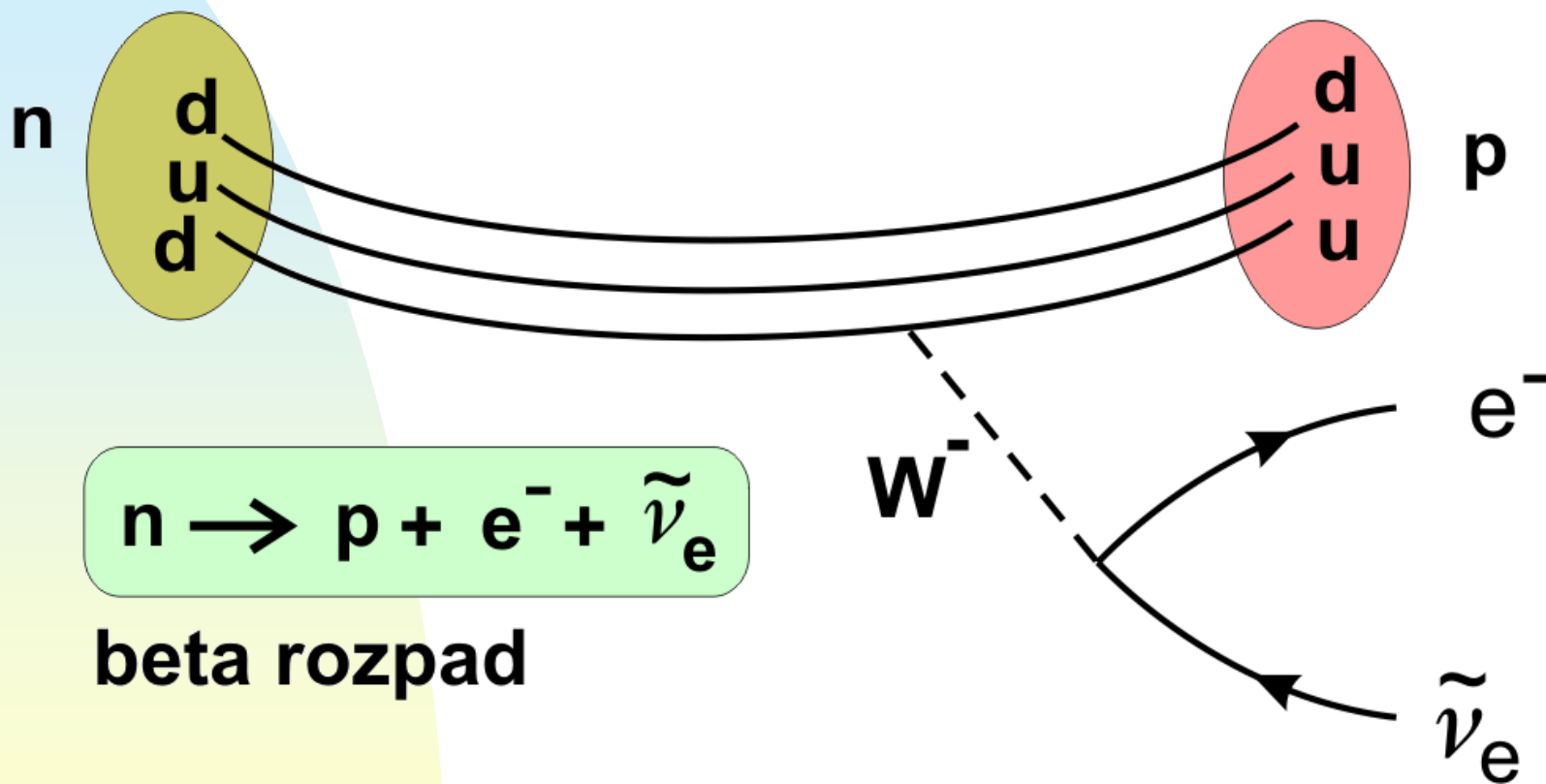
MIKROSVĚT



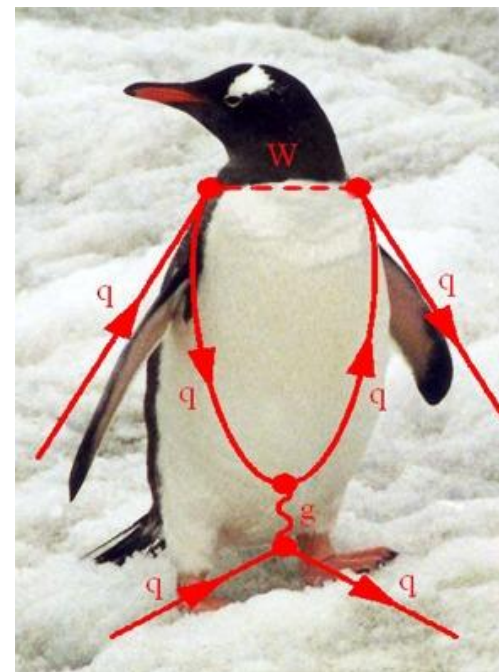
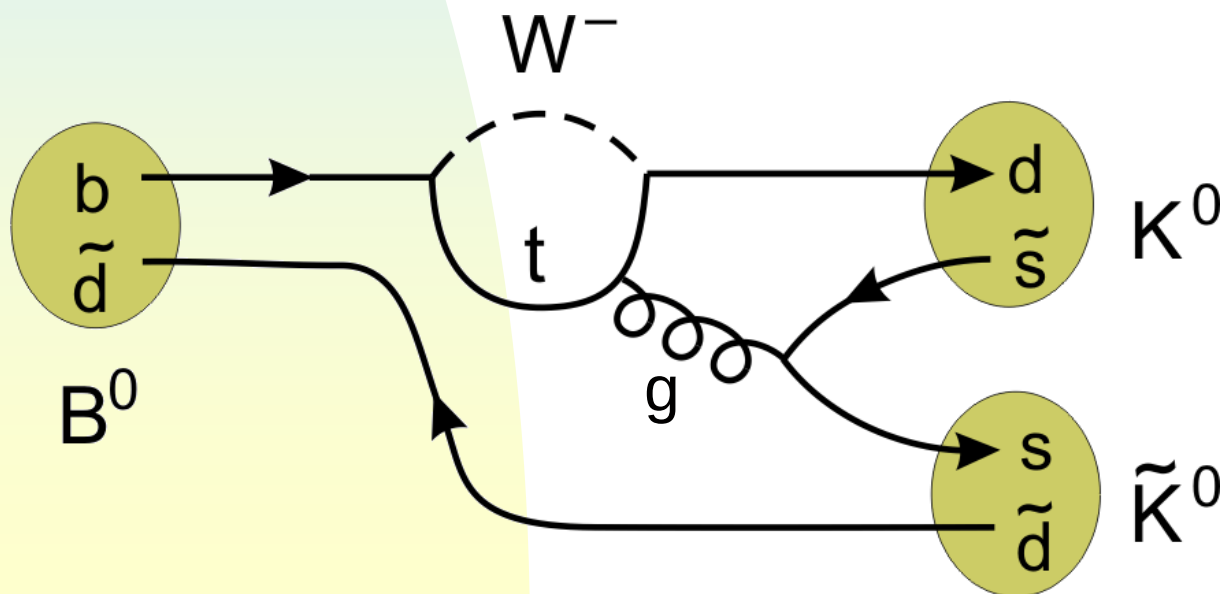
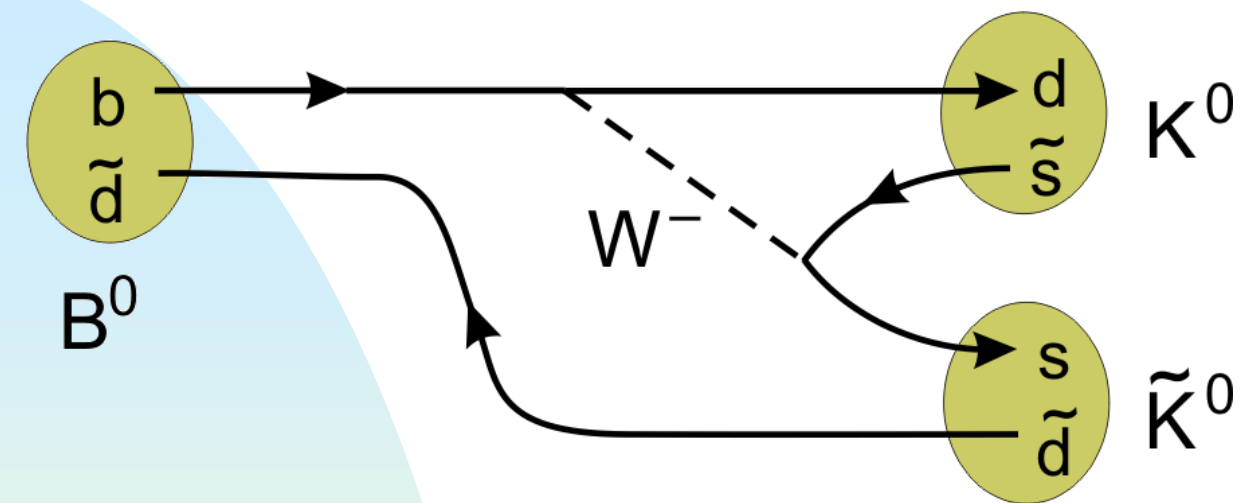
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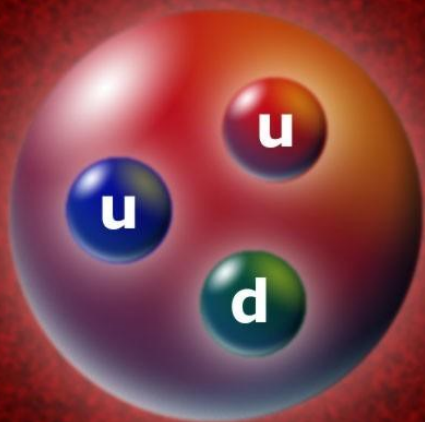


MIKROSVĚT

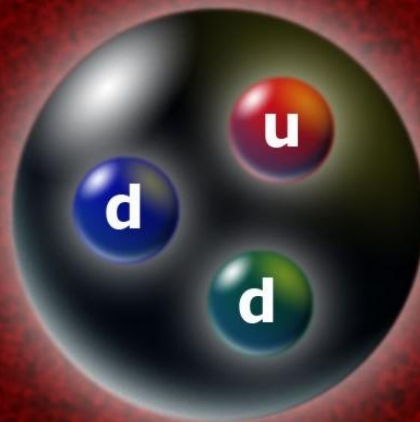


MIKROSVĚT





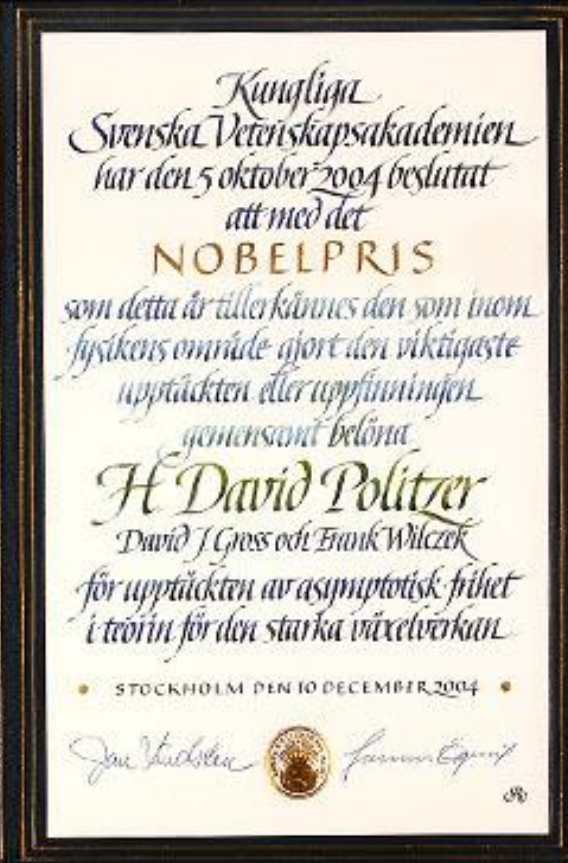
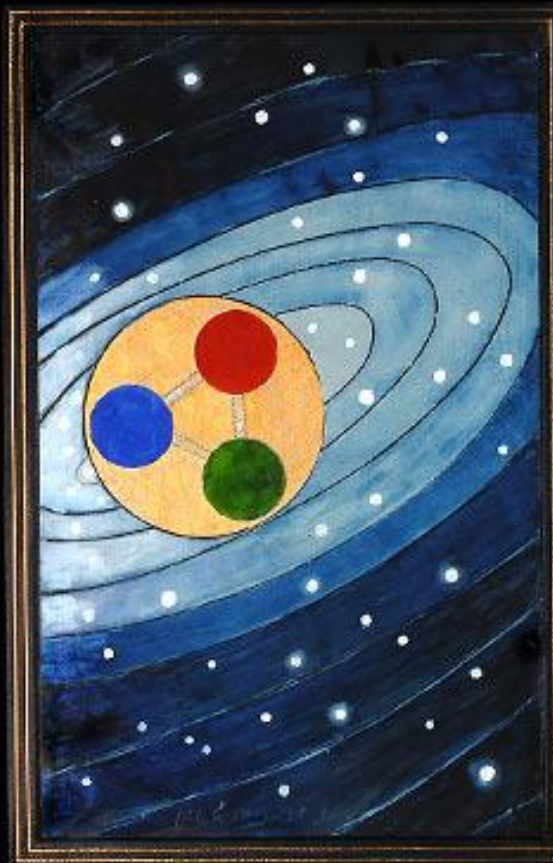
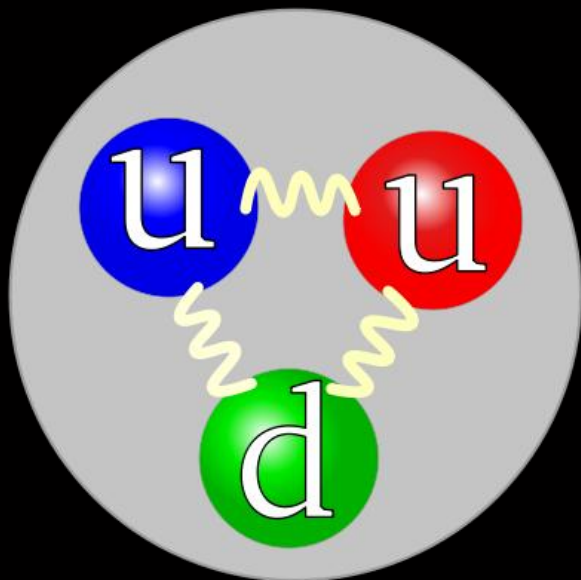
proton

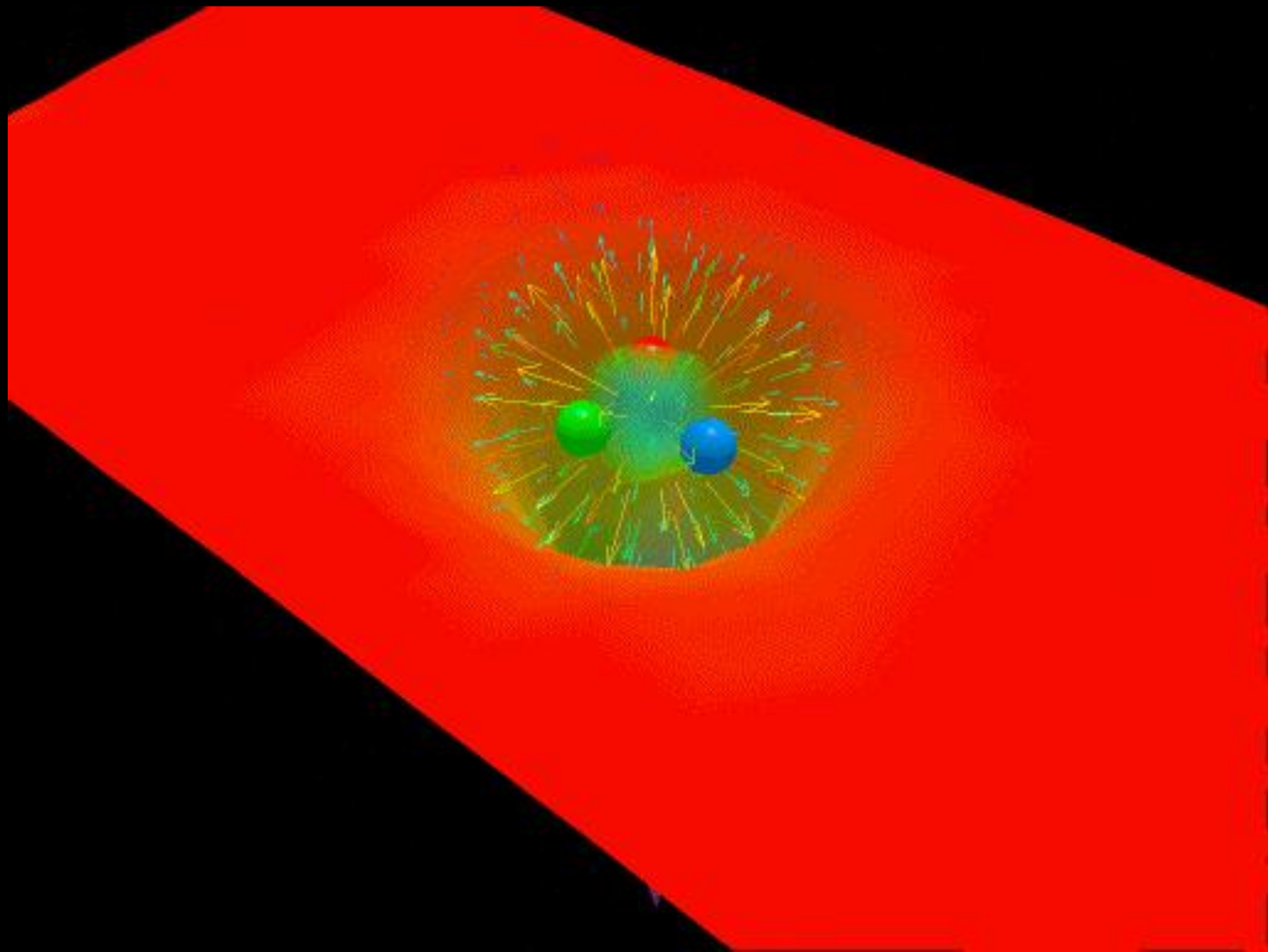


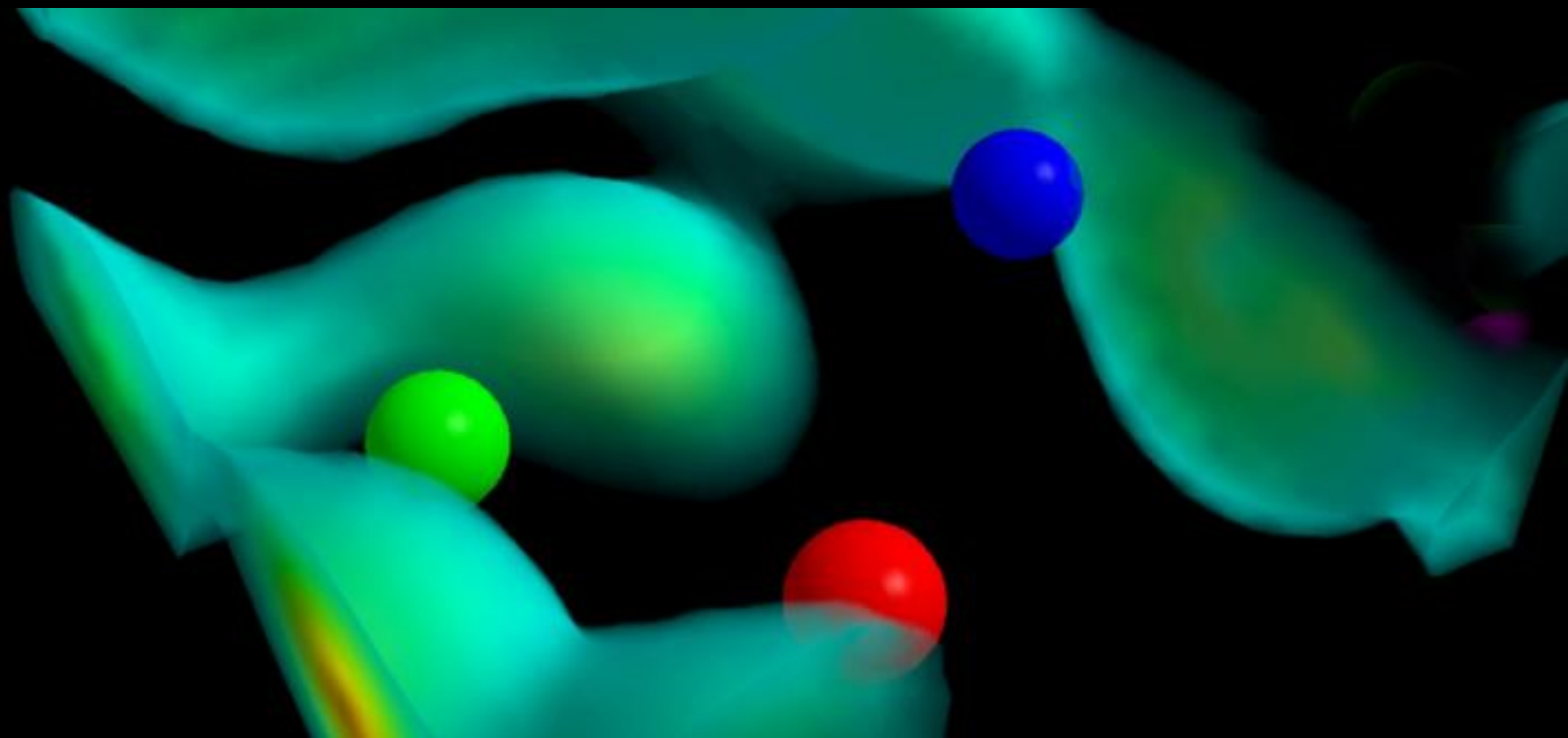
neutron

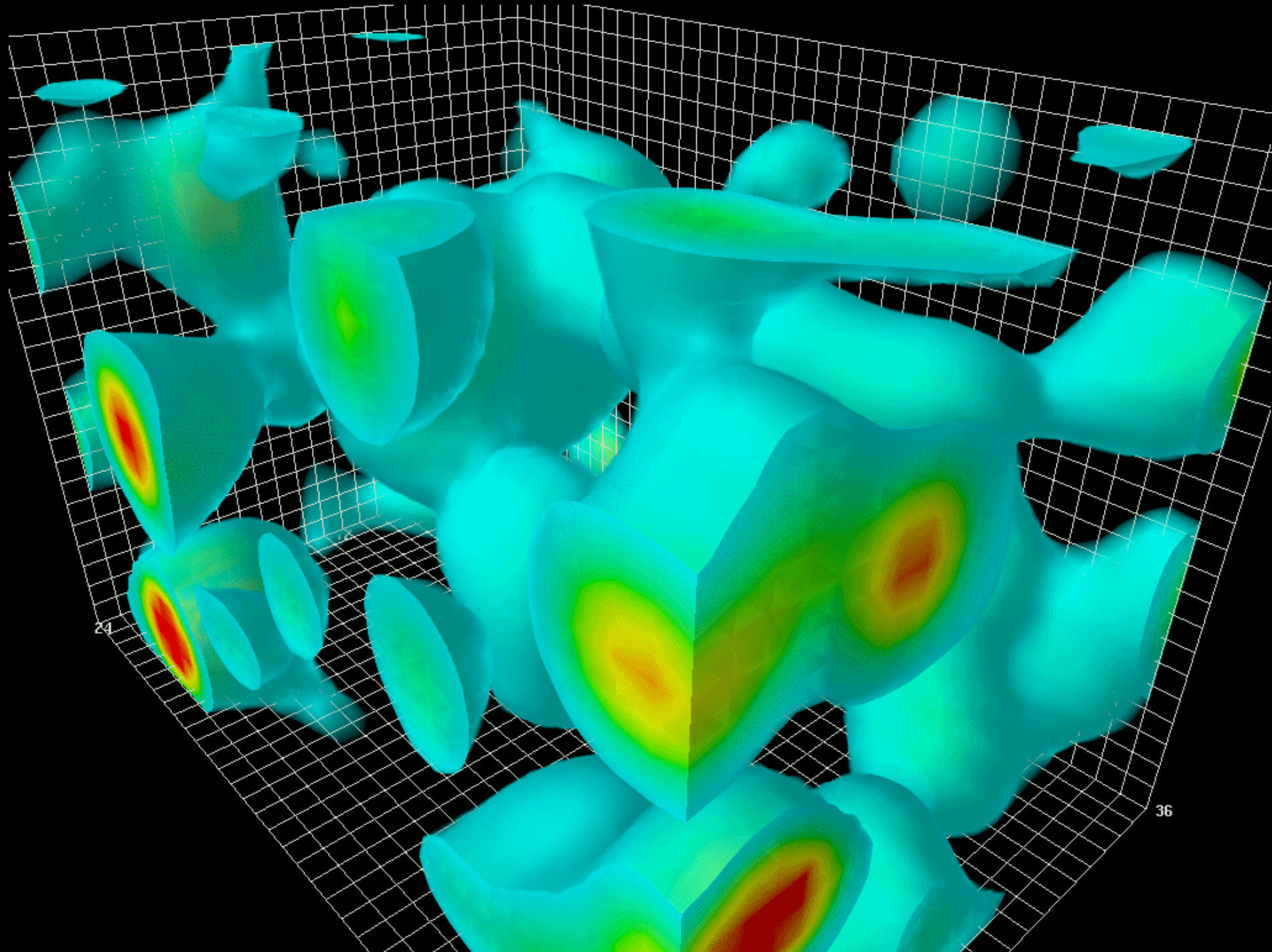


pion



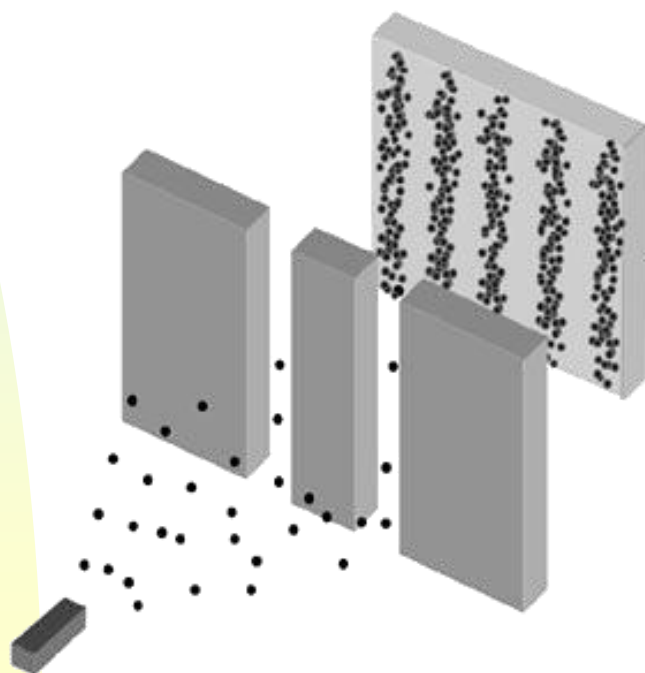
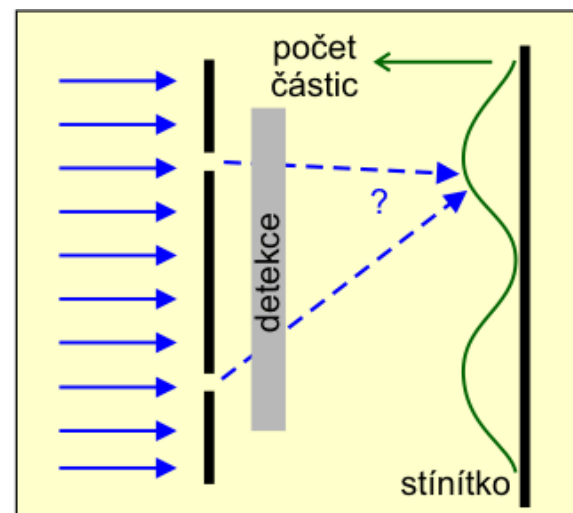
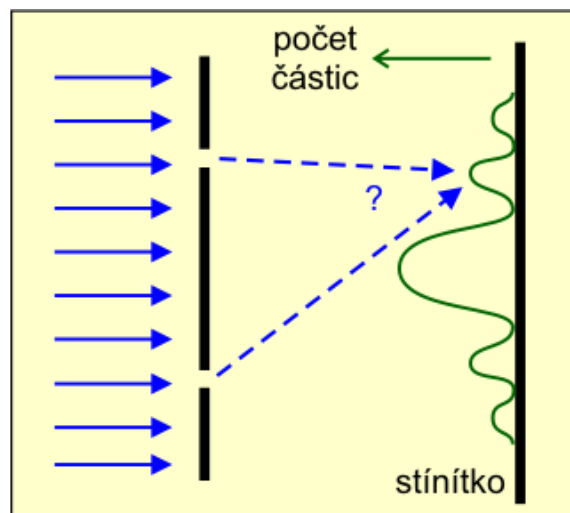
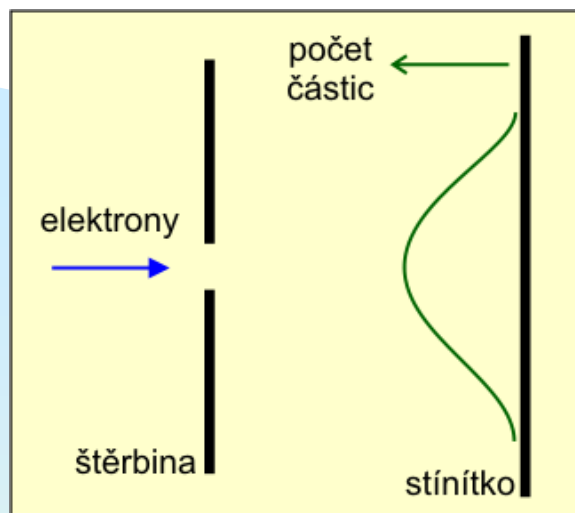






24

36

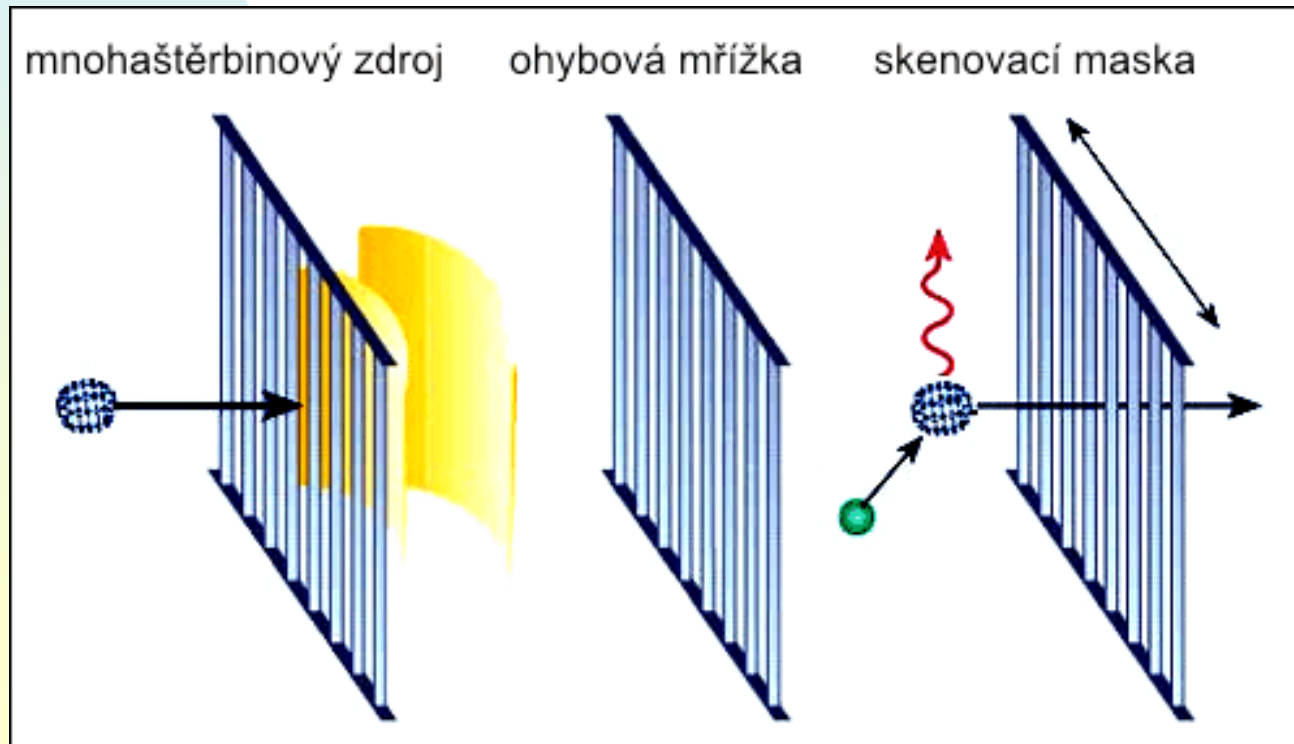


1991: **Olivier Carnal a Jürgen Mlynek** (University of Konstanz, Německo)
dvě štěrby, atom

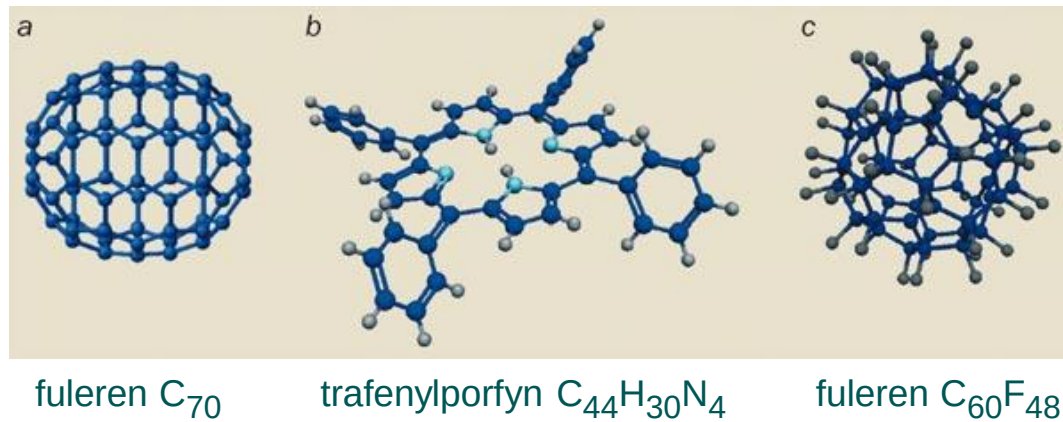
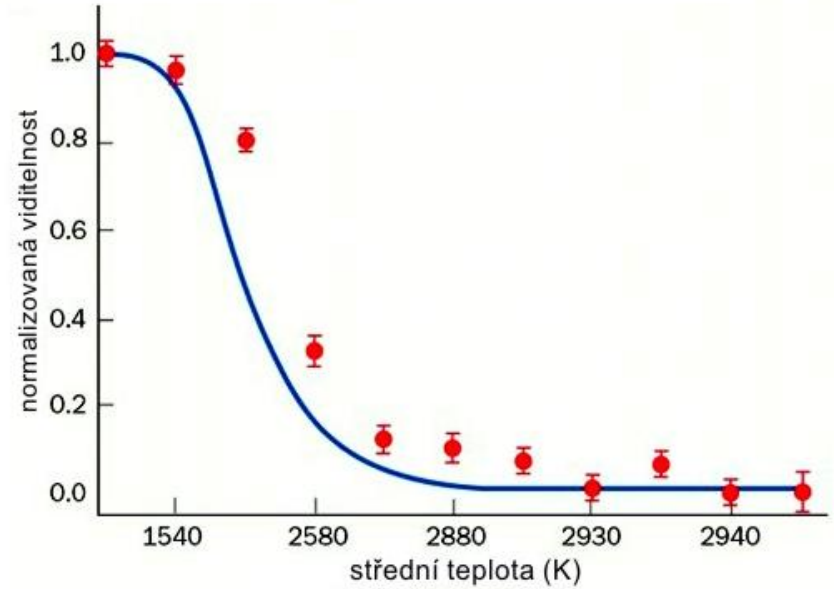
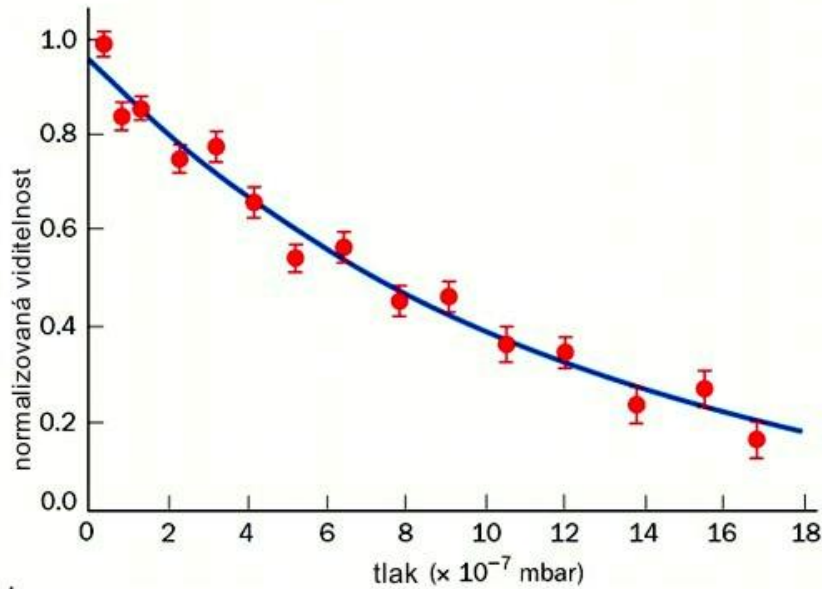
1991: **David Pritchard** (MIT): narušení obrazce laserem,
Talbotův interferometr, sodíkové atomy

1995: **Markus Arndt, Anton Zeilinger**, (University of Vienna, Rakousko),
Talbotův interferometr, $C_{60}F_{48}$; 1 632 AMU

2007: **Serge Haroche** (College de France, Paříž)
Ramseyův interferometr, Rydbergovy atomy



1995: **Markus Arndt, Anton Zeilinger**, (University of Vienna, Rakousko),
Talbotův interferometr, $C_{60}F_{48}$; 1 632 AMU



Relace neurčitosti

$$\Delta x_k \Delta p_k \geq \frac{\hbar}{2}$$

$$\Delta x_k \Delta v_k \geq \frac{\hbar}{2m}$$

- absolutní nula?
- absolutní vakuum?
- temná energie?

