QUANTUMCHROMODYNAMICS

In the *Standard Model* the elementary constituents of hadronic matter are *quarks* and *gluons*.

quarks : **3** colors + **6** flavors (u,d,s,c,b,t)

gluons : **8** colors, no flavors

dynamics:

$$\mathcal{L}_{QCD} = i\bar{\psi}\gamma^\mu D_\mu \psi - \frac{1}{4} G^a_{\mu\nu} G^{\mu\nu}_a - \bar{\psi} m \psi$$

$$D_\mu = \partial_\mu - i\frac{g}{2}\lambda^a A^a_\mu$$

$$G^a_{\mu\nu} = \partial_\mu A^a_\nu - \partial_\nu A^a_\mu + g f^{abc} A^b_\mu A^c_\nu$$

quark masses: (origin unknown)

$m_u \sim 4$ MeV $\quad m_d \sim 7$ MeV $\quad m_s \sim 150$ MeV

$m_c \sim 1.5$ GeV $m_b \sim 4.5$ GeV $m_t \sim 175$ GeV