

# Quark stars

A theorized exotic star consisting of free quarks

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# Motivation

- Could a «soup» of free quarks possibly exist inside some neutron stars?

## Goal

- To compare measurements of mass and radius of stars with theoretical models of quark stars

# Theory

- General relativity

⇒ Equation of hydrostatic equilibrium

$$\frac{dP}{dr} = -(\rho + P) \frac{Gm(r) + 4\pi Gr^3 P}{r[r - 2Gm(r)]}.$$

- Quantum field theory

⇒ Partition function for quarks (fermions)

$$\ln Z = 2V \int \frac{d^3p}{(2\pi)^3} \left[ \beta\omega + \ln \left( 1 + e^{-\beta(\omega-\mu)} \right) + \ln \left( 1 + e^{-\beta(\omega+\mu)} \right) \right]$$