

What neutron stars can tell us about QCD phase transitions

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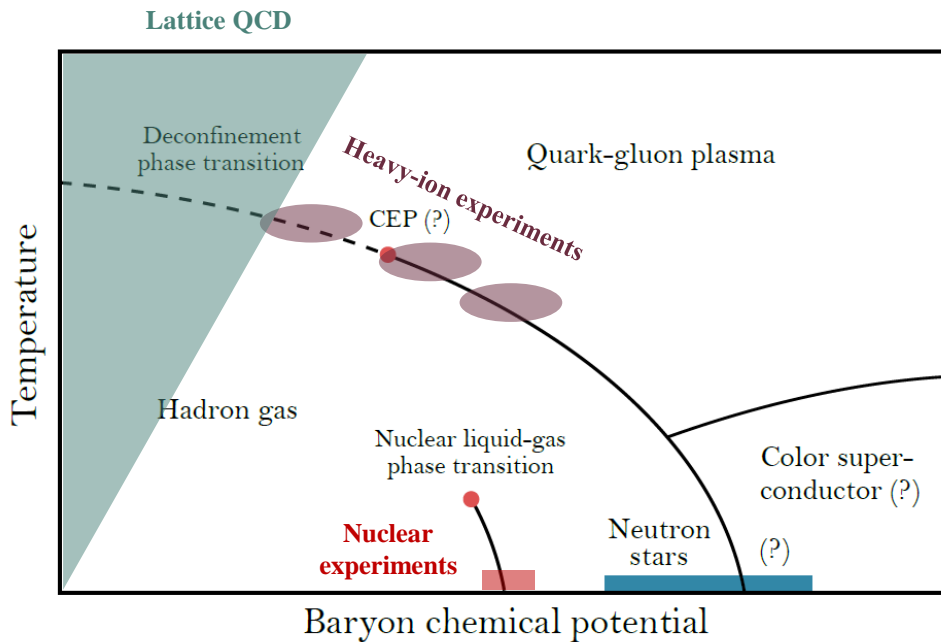


Collaborators: Prof. György Wolf, Wigner Research Centre for Physics
Prof. Jürgen Schaffner-Bielich, Goethe Universität Frankfurt

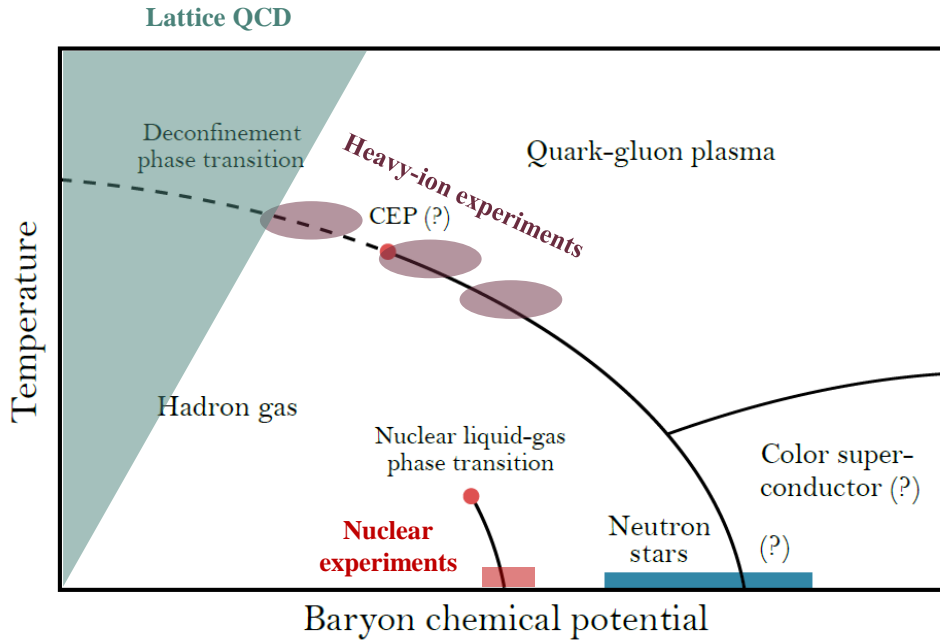


Zimányi Winter Workshop, Budapest, 2023.12.7.

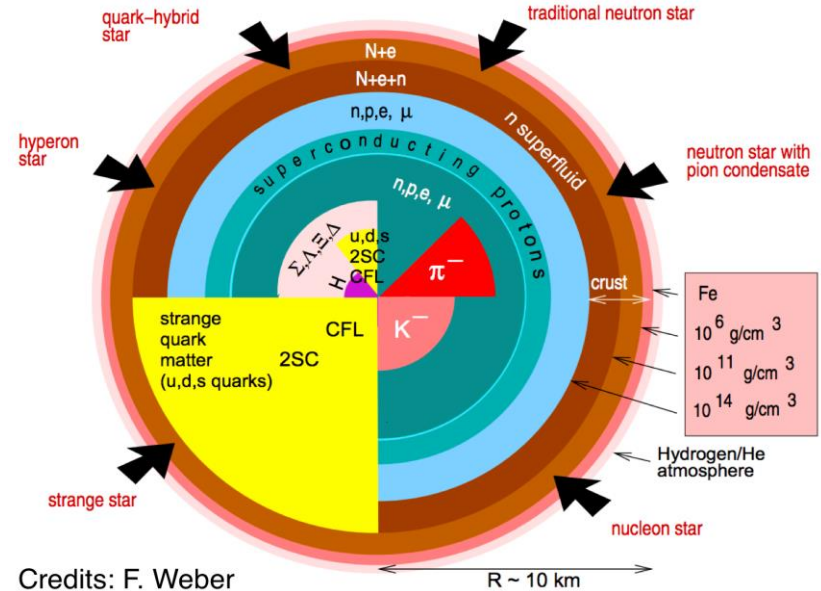
Why study neutron stars?



Why study neutron stars?



→ is there **quark matter** inside the heaviest neutron stars?



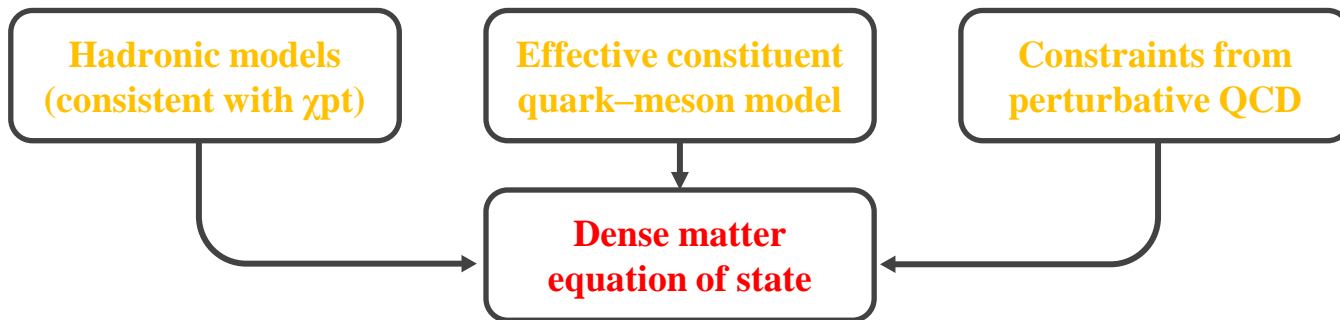
Bayesian inference

**Hadronic models
(consistent with χ pt)**

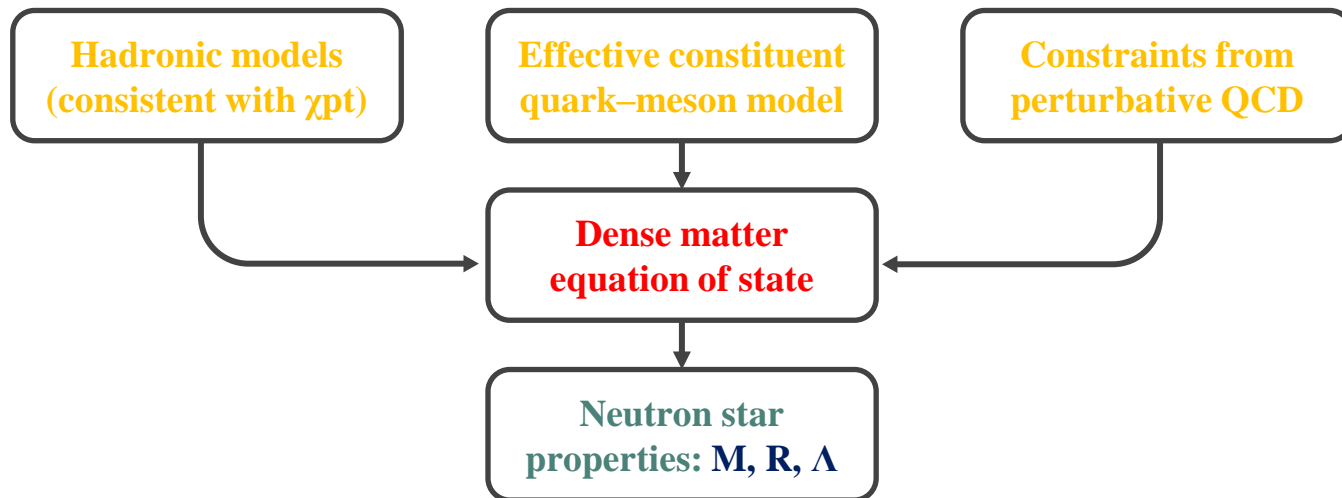
**Effective constituent
quark–meson model**

**Constraints from
perturbative QCD**

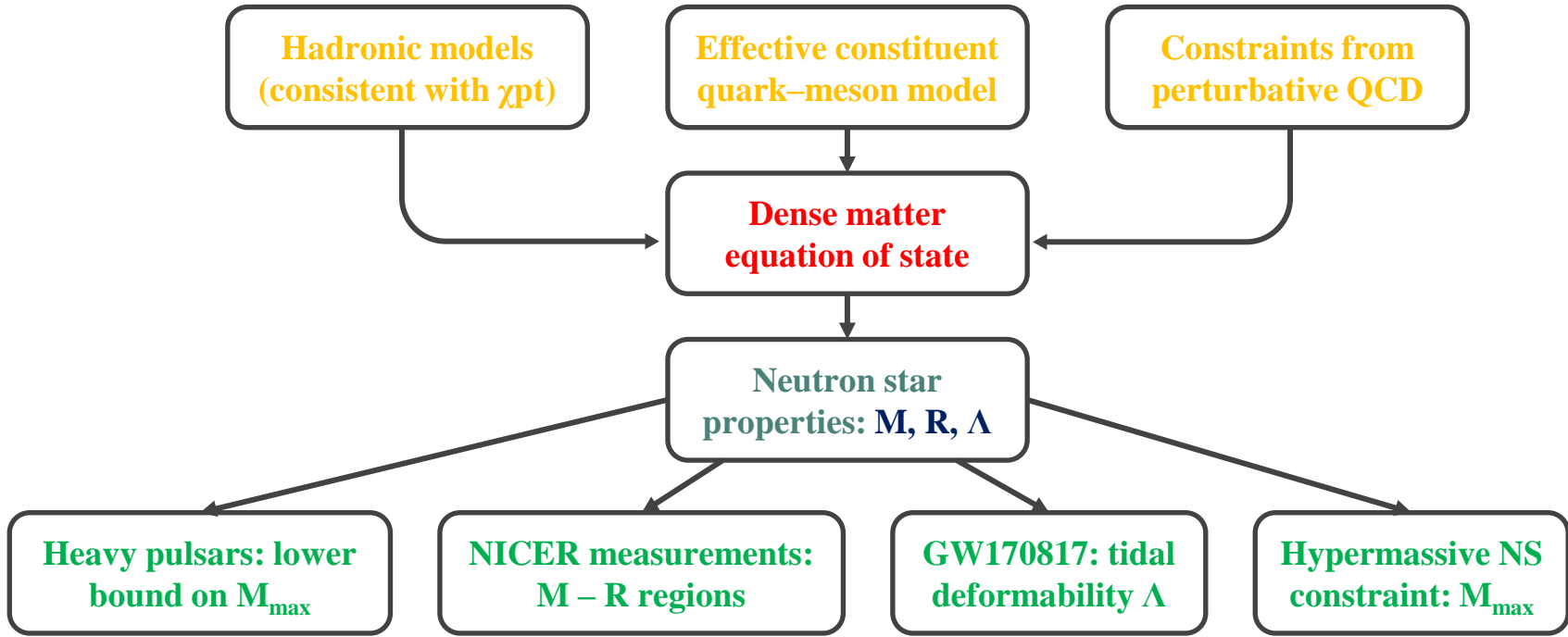
Bayesian inference



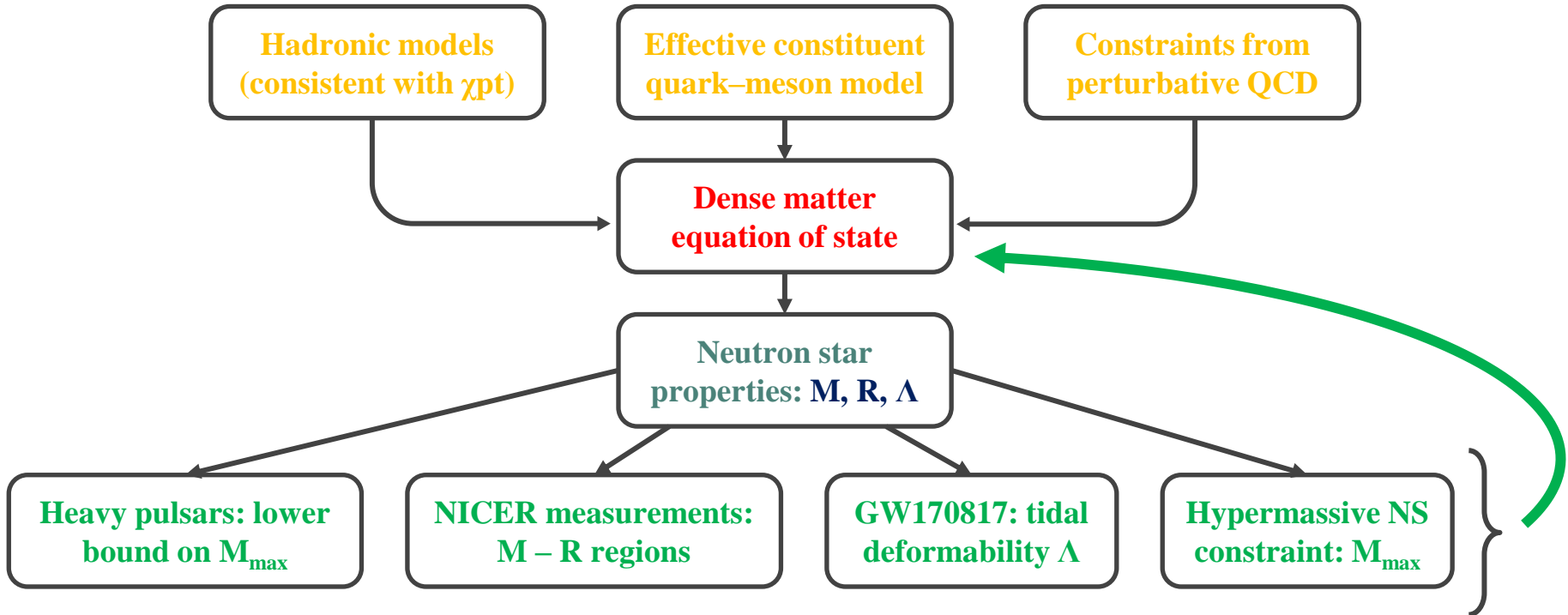
Bayesian inference



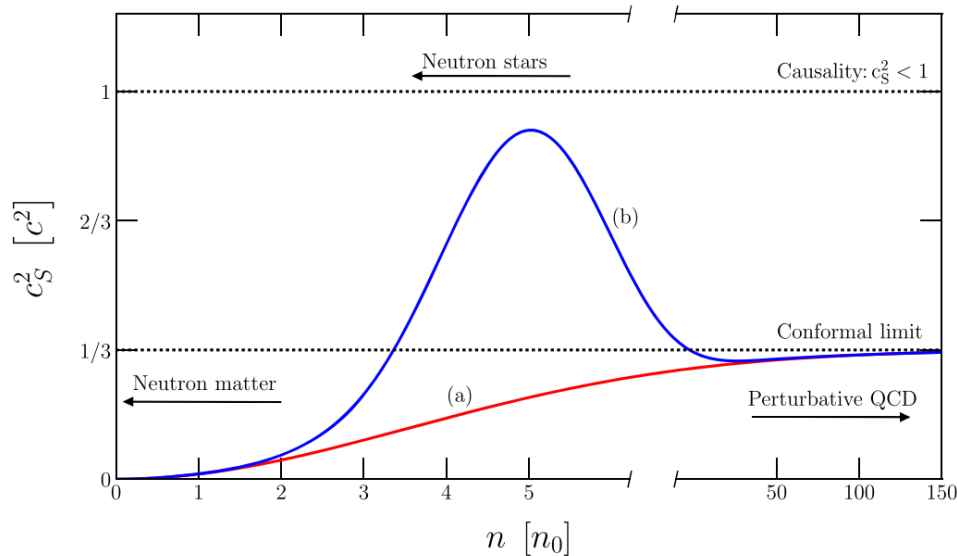
Bayesian inference



Bayesian inference



Speed of sound and conformality



Source: I. Tews, et al. In: *Astrophys.J.* 860, 149 (2018)

Important measure: **speed of sound**

$$c_s^2 = \frac{dp}{d\varepsilon}$$

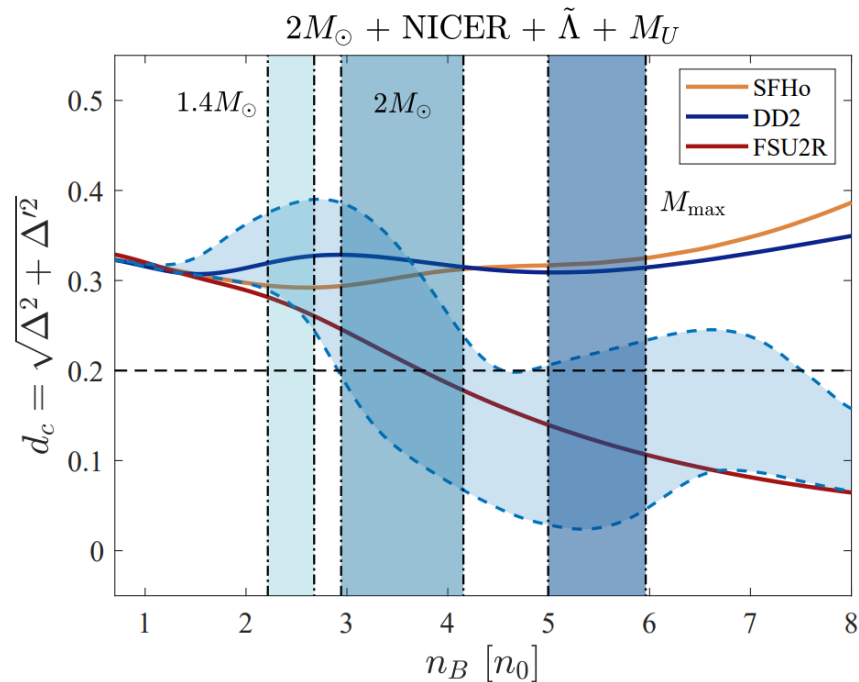
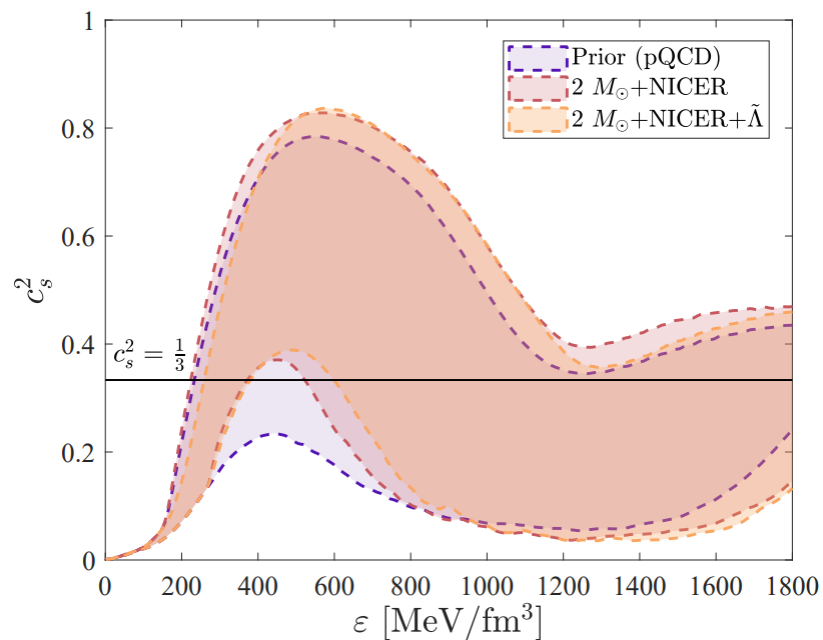
In the **conformal limit** (high density):

$$p \rightarrow \frac{1}{3}\varepsilon \quad c_s^2 \rightarrow \frac{1}{3}$$

Empirical **conformality measures**:

$$\Delta = \frac{1}{3} - \frac{p}{\varepsilon} \quad d_c = \sqrt{\Delta^2 + \Delta'^2}$$

Speed of sound and conformality



Thank you for your attention!