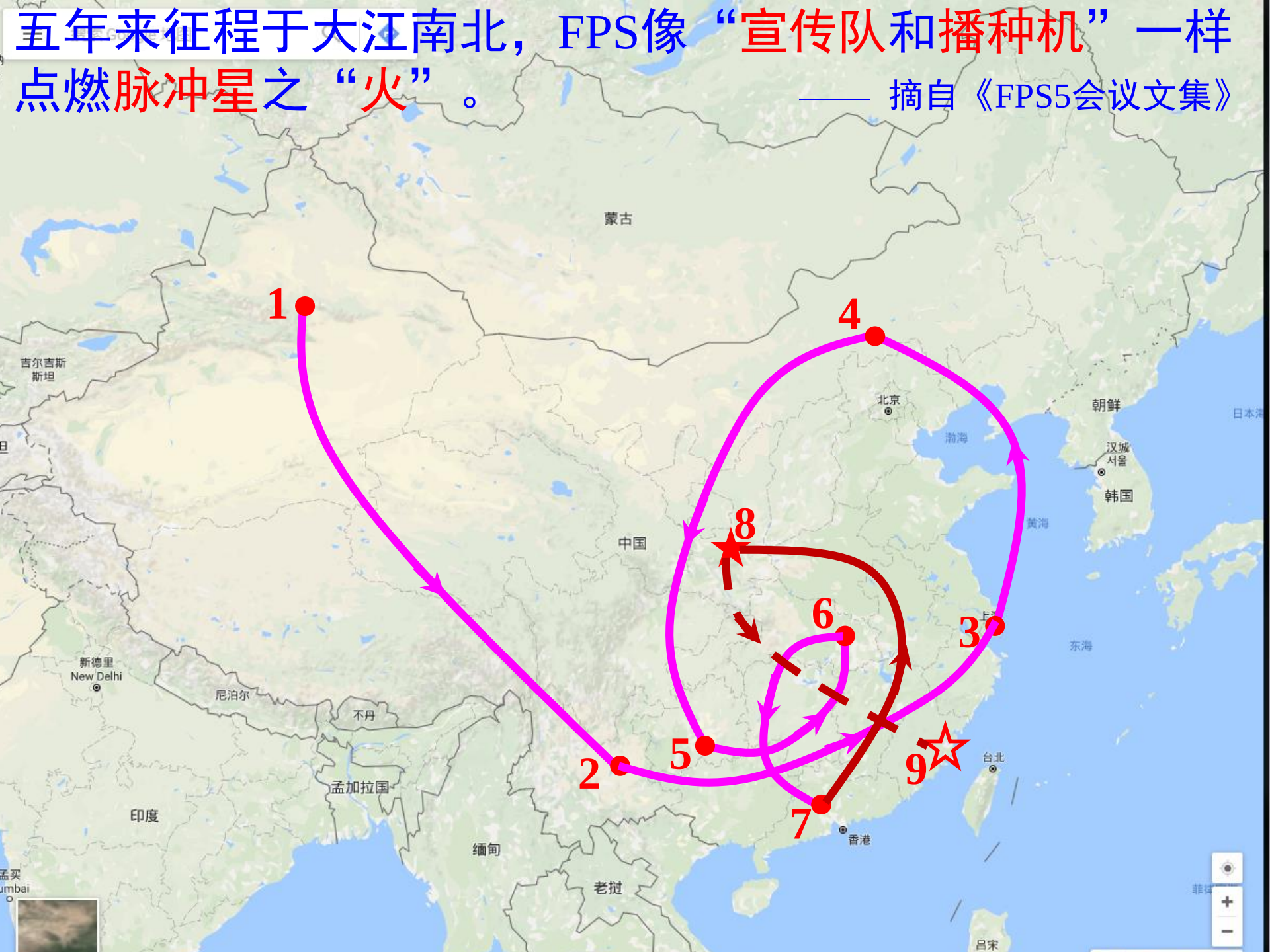
五年来征程于大江南北，FPS像“宣传队和播种机”一样点燃脉冲星之“火”。

—— 摘自《FPS5会议文集》




https://m.bilibili.com/video/av24352252.html

Organizers (TBC)

Taotao Fang (XMU)
Weimin Gu (XMU)
Huiqing Hong (XMU)
Jinchen Jiang (PKU)

Ang Li (XMU, Chair)
Tong Liu (XMU)
Jiguang Lu (NAOC)
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Nucleon Star and Strangeon Star:

from a symmetrical perspective

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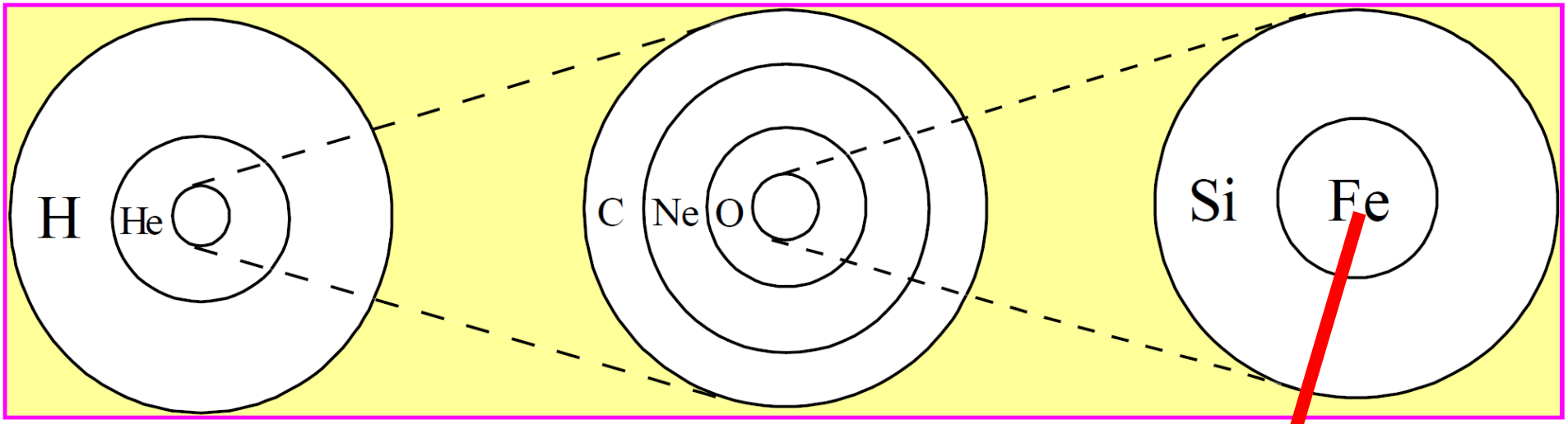
"FPS8"

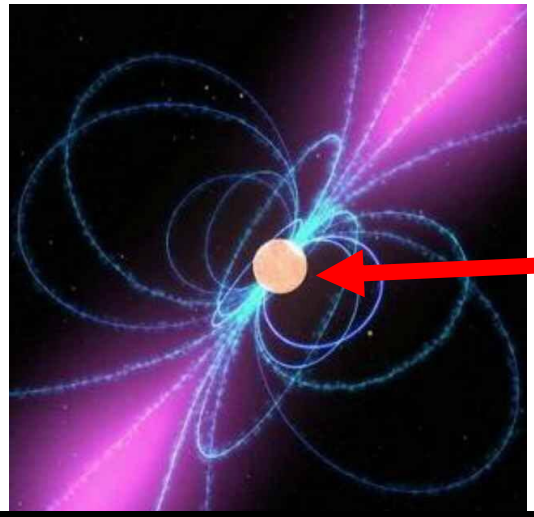
June 26-28, 2019; National Time Service Center, Xi'an

Focus: What's the nature of pulsar?

One of the most challenging problems in phys./astroph.

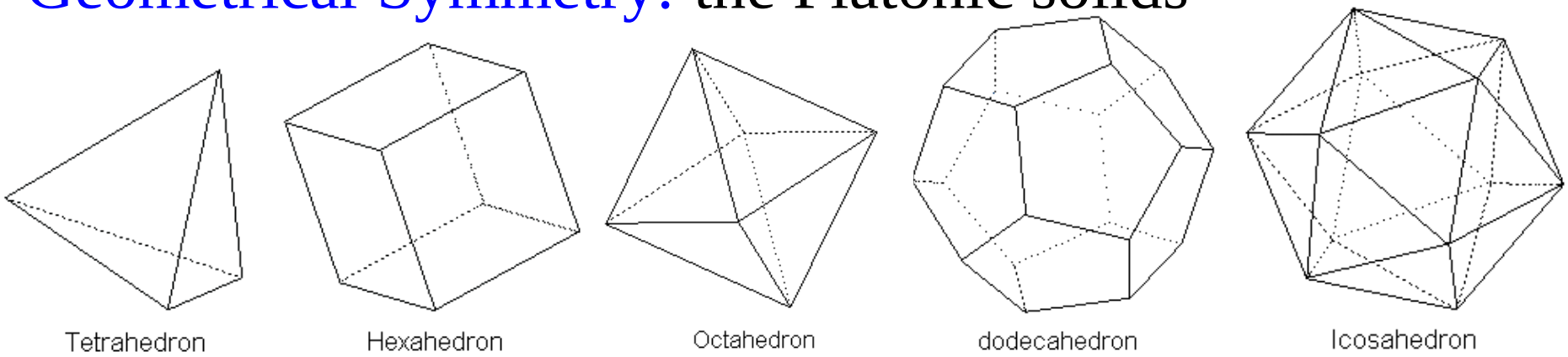


A pulsar is created here, being suggested to be an NS, but the real structure is still a matter of debate!



Symmetry: from *Plato* to *Flavour*

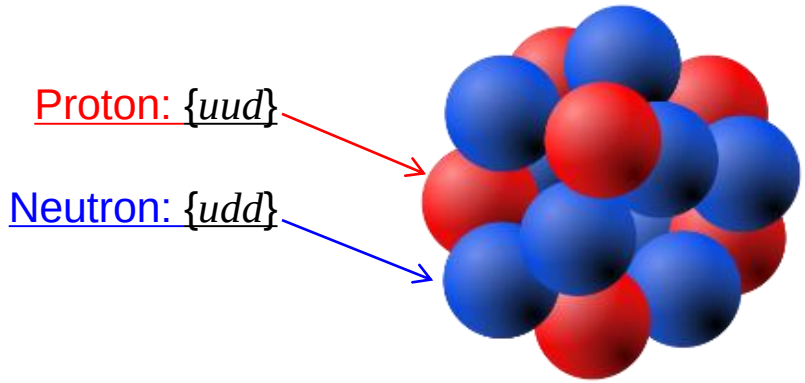
- Geometrical Symmetry: the Platonic solids



4:*fire* **6**:*earth* **8**:*air* **12**:*quintessence* **20**:*water*

Plato's Theory of Everything

- Quark-flavour Symmetry: **2**-flavoured ***v.s.*** **3**-flavoured



$$\Delta m_{\mathrm{uds}} \ll E_{\mathrm{scale}} < \Lambda_{\chi}$$

Nucleus: **2**-flavoured!

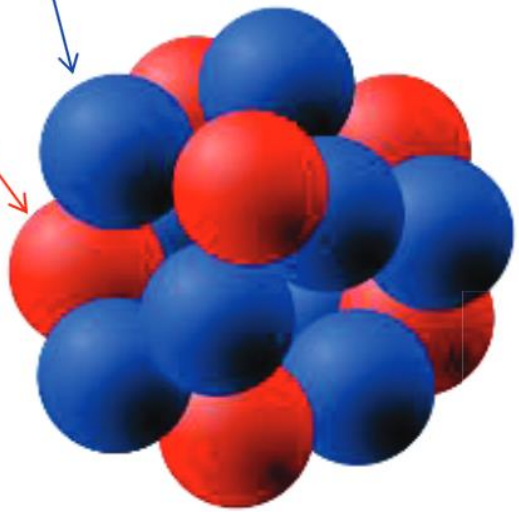
why not **3**-flavoured?

What is a strangeon?

- A **Gigantic Nucleus** is conjectured to be ***3-flavored***!

2-flavoured world v.s. 3-flavoured world

The constituent unit of nucleus is called nucleon
(proton + neutron)



"micro-SM"

$A_c \sim 10^{9?}$

Small Big

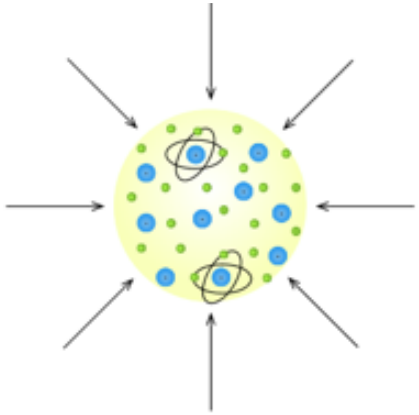
"macro-SM"

Very similarly,
strangeon is the constituent unit of 3-flavoured nucleus!

民间俗语：女大十八变嘛！

Basic units: nucleon/strangeon?

- Core collapse SN： Neutronization ***v.s.*** Strangeonization

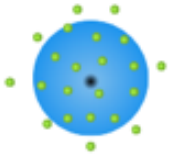


Bigger is different: compression of normal baryonic matter by gravity

(for electrons)

$$p_F \propto n^{1/3}$$

$$\varepsilon_F \propto \begin{cases} \text{NR}: & n^{2/3} \\ \text{ER}: & n^{1/3} \end{cases}$$



Energetic electrons inside a gigantic nucleus

Two ways to kill electrons

Neutronization: $e^- + p \rightarrow n + \nu_e$
degrees of freedom: *nucleons*

Strangeonization: $2f(u,d) \rightarrow 3f(u,d,s)$
degrees of freedom: *quarks*

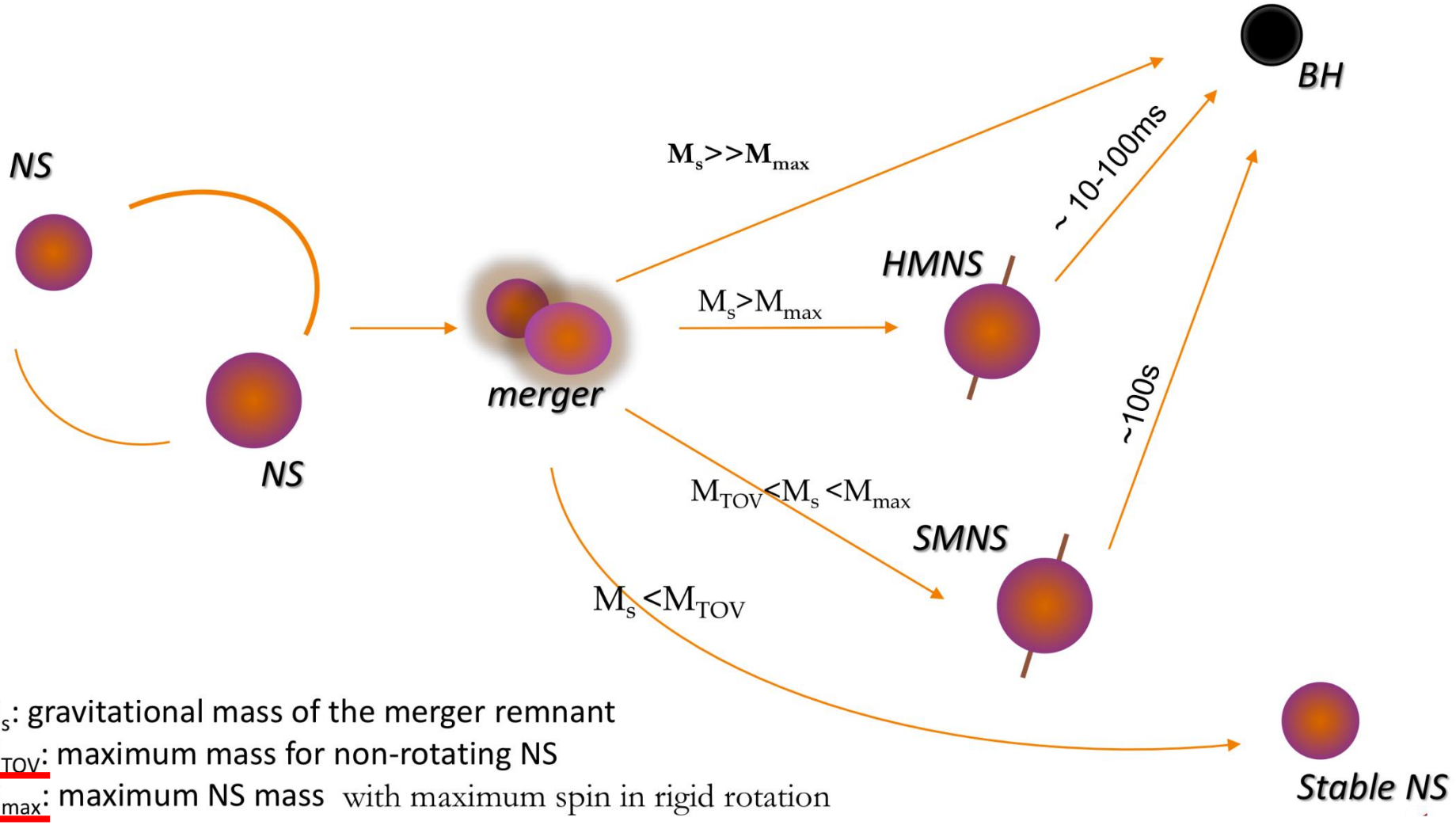
Neutron star or Strangeon star?

from a symmetrical perspective

TABLE 2. Compact star models: a comparison.

Models	Basic unit	Flavour	Asymmetry	Quark coupling, EoS	Surface binding
Neutron Star	nucleon	**2** (u & d)	$\delta > 0.8$	strong, stiff if no hyperon	gravity
Strange Quark Star	quark	**3** (u, d & s)	$\delta < 10^{-4}$	weak, softened with s	self strong force
Strangeon Star	strangeon	**3** (u, d & s)	$\delta < 10^{-4}$	strong, stiff in any case	self strong force

To test in era of GW astronomy



M_s: gravitational mass of the merger remnant

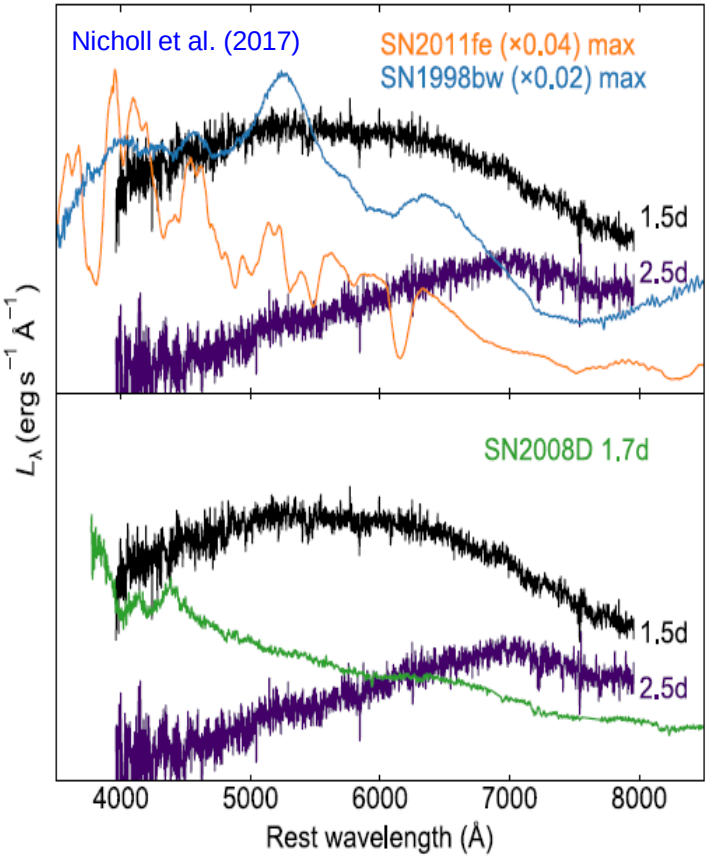
M_{TOV}: maximum mass for non-rotating NS

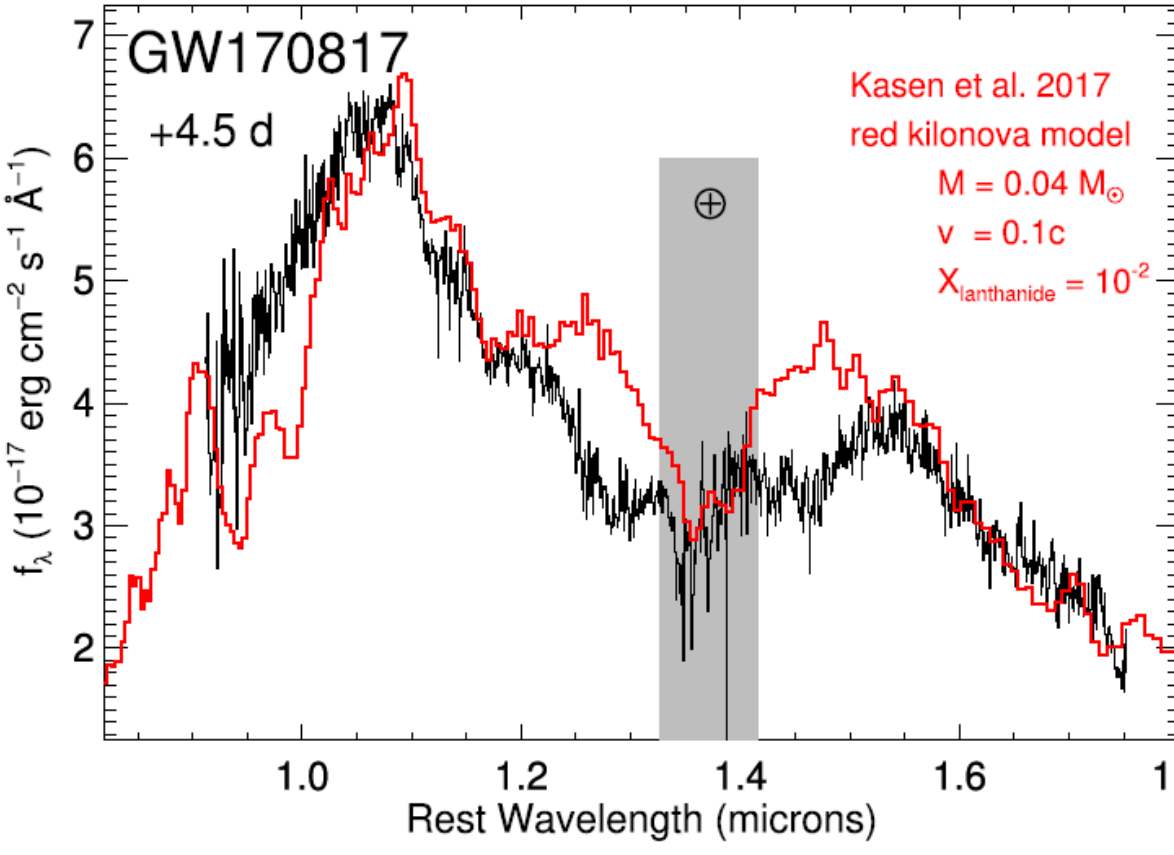
M_{max}: maximum NS mass with maximum spin in rigid rotation

from Bing Zhang's talk

To test in era of GW astronomy

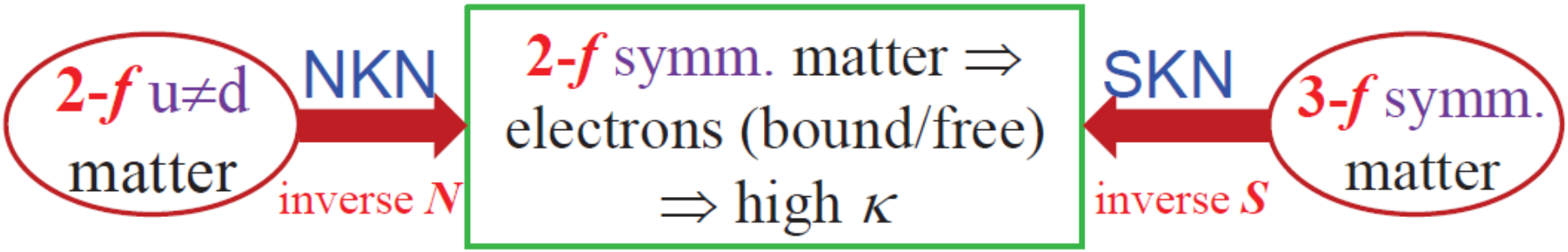
GW170817 spectra: 1, to be much redder than a supernova $\Rightarrow$ high κ; 2, no line features resolved.





To test in era of GW astronomy

- No detection of SN-like blue component of KN hints higher $\kappa/(\mathrm{cm}^2\mathrm{g}^{-1})$ of radiative medium



- Neutron KN: Post-merger = BH $\Rightarrow$ $\kappa \sim 20$

  Post-merger = NS $\Rightarrow$ $\kappa \sim 5$

- Strangeon KN: Post-merger = SS $\Rightarrow$ $\kappa \sim 1$?

Conclusions: ET? You can guess…

Strangeon Star **Neutron Star**

THANKS!