

# Closing Remark

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Nucleosynthesis and Evolution of Neutron Stars (XRB2025)

Yukawa Institute for Theoretical Physics, Kyoto University, Kyoto, JAPAN

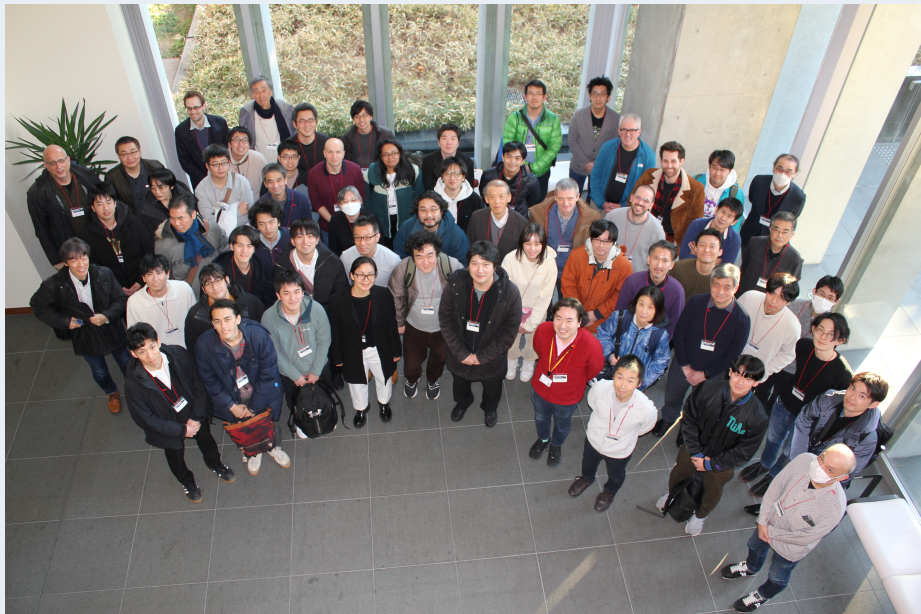


# Did You Enjoy?



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I Enjoyed Although I Am An Outsider!

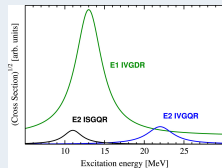
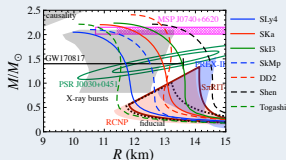
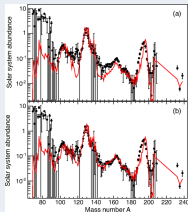


- They are interdisciplinary topics
  - Astrophysics Theory & Observation
  - Nuclear Physics Theory & Experiment
  - Hadron Physics Theory & Experiment
  - Search for New Physics Dark matter, Modified gravity, ...

# My Point of View as A Nuclear Theorist

## Low-energy nuclear physics is coming to a golden era

- Nuclear equation of state is gradually pin down (?)  
← New experiments (PREX & CREX) opened a big discussion
- GW170817 gave a constrain of nuclear EoS via the  $M$ - $R$  relation
- Measurements of exotic neutron-rich nuclei are available  
→ r-process nucleosynthesis
- Photonuclear reaction can gradually be calculated  
→ High-energy cosmic ray



Sotani, Nishimura, and Naito. *Prog. Theor. Exp. Phys.* **2022**, 041D01 (2022)

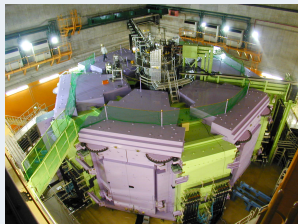
Roca-Maza and Paar. *Prog. Part. Nucl. Phys.* **101**, 96 (2018)

Lorusso, Nishimura, *et al.* *Phys. Rev. Lett.* **114**, 192501 (2015)

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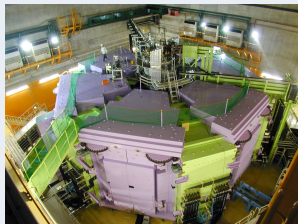
- New facilities are/will be started
  - FRIB (MSU) Started to be operated
  - HIAF (IMP) Almost (?) ready to be operated
  - RIBF (RIKEN) Will be upgraded ← We had a nice workshop last week
  - FAIR (GSI) Under construction
- Using these facilities, we can achieve more exotic nuclei to study nuclear many-body problems & nuclear interaction



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That's all??

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(high-density, finite  $T$ , many hyperons, pion/kaon condensations, . . . )  
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Now, it is a good timing to consider the collaboration among us!

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    - Search for New Physics Dark matter, Modified gravity, ...
  - As a nuclear theorist, these topics are interesting due to
    - Application
    - Extreme conditions not achievable on the terrestrial experiments
- application but also fundamental input (Good example: GW170817)

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- To keep communication, regular meetings are important from local, domestic, to global!

## Advertisement: UKAKUREN Workshop (2025-03-24–26, KEK Tsukuba)

- Domestic workshop on nuclear astrophysics including...
  - Nucleosynthesis
  - r-process
  - X-ray burst
  - Nuclear data and experiments
  - Meteorite
  - Early Universe
  - Stellar evolution



**Organizers** W. Aoki (NAOJ), Y. Hirayama (KEK), M. Ishigaki (NAOJ), C. Ishizuka (Inst. Sci.), T. Kawabata (Osaka), M. Kimura (RIKEN), S. Kimura (KEK), M. Mukai (KEK), S. Nagataki (RIKEN), N. Nishimura (Tokyo), T. Suda (Tokyo U. Tech.), K. Terada (Osaka), Y. X. Watanabe (KEK), H. Yamaguchi (Tokyo)



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- but unfortunately I cannot attend...  
(because I organize another workshop at the same time in Kobe)
- **Enjoy workshop and Tsukuba!!**



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- Symposium on equation of state of nuclear matter, held every year
- Topics including...
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  - Microscopic calculations of neutron-rich dense nuclear matter
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  - Theory of compact stars, including NS mergers and SNe
  - Supernova theory for neutrino emission and nucleosynthesis
- The website is now available
- The first circular will be distributed soon



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- **See you in Kobe!!**



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- **All the organizers**

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- UKAKUREN (宇宙核物理連絡協議会)



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- **And all the participants**

## Important Announcement

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Thank you very much for your cooperation
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**Thank you very much for participation!!**  
**See you again!!**  
**Have a nice trip back to your institute!!**