

1st Circular of

International Symposium on Three-Nucleon Force Frontiers (3NFF2027)
-- 70th Anniversary of Fujita-Miyazawa Three-Body Forces –

17th-20th of May, 2027 in KYOTO, JAPAN

1. About the Symposium

This is the first announcement of the International Symposium on Three-Nucleon Force Frontiers -- 70th Anniversary of Fujita-Miyazawa Three-Body Forces – (3NFF2027) which will be held on the 17th-20th of May, 2027 in Kyoto, Japan.

Background and Motivation

In 1957, Jun-Ichi Fujita and Hironari Miyazawa proposed the pioneering model of the three-nucleon force (3NF) based on the two-pion exchange mechanism (*Prog. Theor. Phys.* 17 (1957) 360). This seminal work marked the dawn of the quantitative study of 3NFs.

Twenty years ago, in 2007, the international symposium "New Facet of Three-Nucleon Force – 50 years of Fujita-Miyazawa Three-Nucleon Force (FM50)" was held in Tokyo to celebrate the 50th anniversary of this model. At that time, while we marveled at the "state-of-the-art" developments, the study of 3NFs was essentially limited to few-nucleon systems with mass numbers up to around 10. It was also a time of great anticipation for the then-emerging facilities such as RIBF and J-PARC, which were just on the horizon of their full-scale operations.

20 years of Progress : From FM50 to 3NFF

Since FM50, the field has witnessed a dramatic evolution. The refinement of Chiral Effective Field Theory (χ EFT) has provided a systematic foundation for many-nucleon forces, while ab-initio calculations have extended their reach to medium-heavy nuclei. Simultaneously, Lattice QCD has begun to provide a first-principles link between the underlying quark-gluon dynamics and the nuclear Hamiltonian.

Experimentally, high-intensity secondary beam experiments at RIBF and other global facilities have unveiled new facets of 3NFs in nuclei far from stability. At J-PARC and related facilities, significant progress is being made in investigating two and three-baryon interactions in the strangeness sector.

Furthermore, the observation of two-solar-mass neutron stars has placed 3NFs and three-baryon forces at the heart of astrophysical challenges and the Equation of State (EoS) of dense matter.

ERATO TOMOE Project and Future Perspectives

Currently, our understanding is being further accelerated by the **JST ERATO Three-Nucleon Force Project – TOMOE** –, which aims to establish high-precision nuclear forces including 3NFs and to enhance numerical tools with high predictive power, thereby bridging the gap between fundamental and applied nuclear sciences.

This symposium, 3NFF, aims to review the remarkable journey of the last 70 years, identify the remaining challenges in the "post-FM50" era, and discuss the future frontiers of three-body forces across all scales—from quarks to neutron stars.

The topics to be discussed will be

- **Fujita-Miyazawa 3NF:** Historical heritage and future perspectives
- **Theoretical Frameworks:** Lattice QCD, Effective field theory, and advanced numerical methods
- **Few-Nucleon Systems:** Precision studies to determine 3NF properties
- **Nuclear Frontiers:** Structure and reactions of stable and unstable nuclei
- **Extreme Matter:** Hypernuclei, EoS, and astrophysical challenges
- **Quantum Simulations & Applications:** Cold atomic systems, nuclear data, and nuclear medicine

The symposium will consist of invited talks, selected oral presentations and posters. The names of the invited speakers and the titles of their talks will be announced in the next announcement.

Updated information about this symposium and latest news will be available from the symposium web-site:

<https://ribf.riken.jp/TOMOE/3NFF/index.html>

[Symposium Site]

Kyoto International Conference Center: <https://www.icckyo.or.jp/en/>

2. Organization Information

[General Chair]

K. Sekiguchi (Kyoto/ RIKEN)

[Organizing Committee]

K. Sekiguchi (Kyoto/RIKEN)

T. Fukahori (JAEA, scientific secretary)

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M. Horikoshi (OMU)

T. Nakatsukasa (Tsukuba)

K. Ogata (Kyushu)

H. Sakai (RIKEN, honorary member)

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H. Otsu (RIKEN, Chair)

K. Sekiguchi (Kyoto/RIKEN)

N. Shimizu (Tsukuba)

S. Yoshida (Utsunomiya/RIKEN)

3. Other information

Further information will be announced in the 2nd circular.

4. Correspondence

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