

# NEWSLETTER OF THE ASIA OCEANIA NEUTRON SCATTERING ASSOCIATION

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The 29<sup>th</sup> EC Meeting was the first in-person EC meeting in three years since the 23<sup>rd</sup> EC meeting in Kenting, Taiwan in 2021. The meeting was held in hybrid format from the National Battery Research Institute in Indonesia on November 22<sup>nd</sup>, 2022.

## ***President's Message***

It is my great honor to serve the Asia-Oceania Neutron Scattering Association (AONSA) as a President in the period from 2022 to 2023. It has been a challenging time for both the neutron facilities and scientists in our region, because of the COVID-19 pandemic started early 2020. I would like to express my sincere gratitude to the former President, Prof. Dongfeng Chen, for his extraordinary service to AONSA during such difficult years. Without his devoted efforts, AONSA could not have maintained its activity to the standard level. Also, I would like to welcome the new EC board members, Profs. S. M. Yusuf, David Cortie, Jae-Ho Chung, and Hsiung Chou, without whom I cannot do anything.

In the last two years, many of the AONSA activities were affected by the pandemic. Our executive committee (EC) meetings were held online in the last two years, and thus we lost in-person communications for a while. Our Young Research Fellows (YRFs) could not initiate their programs. Our Neutron School was postponed multiple times. The International Conference on Neutron Scattering (ICNS) was also postponed for one year. They are, however, not just bad news. Due to the online format, the EC meeting now has more participants than ever. Just recently, AONSA neutron school was held online and attracted roughly 400 online audiences at maximum, far more than those we accepted in the on-site schools. YRFs still show their strong willingness to participate in the program.

And now, our borders are opening. Many of the neutron facilities in our region, such as ANSTO and J-PARC, are now accepting international users. Although there are still some difficulties to travel across borders, including increased cost for the air travel, this year is a restarting year for the in-person international

collaborations. Hence, this is a chance to recruit young talents to the field of neutron science by disseminating the importance of in-person collaborations which naturally happen in the neutron science community. The last two years may not be so serious for seniors, but for graduate students and young postdocs, the two years are a major part of their scientific career. We will do our best to help them get them back. We reinstate the YRF program, AONSA neutron school, and other possible programs to promote young scientists in the region. Also, we will start a new Prize in 2024, aiming at awarding mid-career scientist(s) in our region for his/her/their extraordinary achievement(s) in neutron science. This way, AONSA will continue cultivating the stronger neutron community in the region. I am looking forward to working with you on those activities.

***Taku J Sato***  
*Tohoku University*  
*President of AONSA*



Prof. Taku J Sato obtained his Bachelor (1991) and Master (1993) degrees from Tokyo Institute of Technology, and his Ph.D (Physics) from University of Tokyo (1996). He was a staff scientist at National Research Institute for Metals (now known as National Institute for Materials Science) from 1996 to 2004 during which he was also a guest researcher at NIST Center for Neutron Research (2001-2003). From 2004, he became an associate professor at the Institute for Solid State Physics, University of Tokyo, and then in 2012 he moved to the Institute of Multidisciplinary Research for Advanced Materials (IMRAM), Tohoku University. He is currently a full professor and division chair at IMRAM.

## Report on the 28<sup>th</sup> Executive Committee Meeting

The 28<sup>th</sup> AONSA Executive Committee meeting was held on 18 June Saturday, 2022, using the ZOOM platform to host the event online. With the ongoing effects of the COVID-19 pandemic still affecting travel, the last four AONSA EC meetings have been online by necessity.

In total, 19 delegates joined the meeting from different time zones, representing the neutron user societies of several AONSA member regions, together with observers from the facilities directors meeting. The incoming president of AONSA, Professor Taku Sato opened the meeting with a welcoming remark. After the members introduced themselves, the draft minutes of the previous 27th EC meeting were summarized by the previous secretary (Jae-Ho Chung, Korea University). The treasurer (Hsiung Chou, National Sun Yat-Sen U) presented a detailed update on the AONSA finances and provided some valuable insights into options to improve the financial sustainability of the organization, which were supported by the other members of the EC. The process to begin the call for nominations, and the selection process for the AONSA Prize and AONSA Young Research Fellows was discussed and is being led by SM Yusuf (NSSI).

A significant development discussed at this meeting is the implementation of a new “mid-career” science prize funded by AONSA to award scientific excellence. This was proposed by Taku Sato, who drafted the wording for the award and selection criteria. The committee strongly supported this initiative and agreed this would be implemented for the first time in 2023. There was a

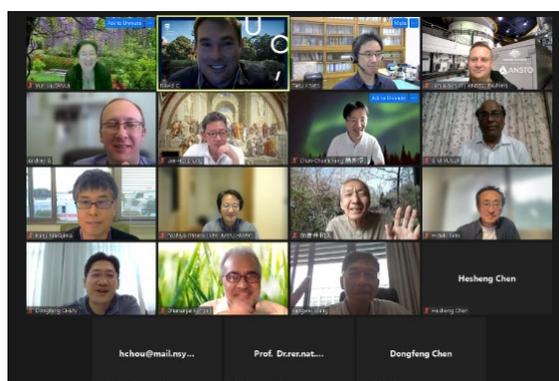
lengthy discussion in terms of how to balance the criteria to enable a diverse range of applicants in terms of age, gender and region.

The issue of how to implement the AONSA Neutron School in 2022 was also discussed, given that this had not run since 2019. The EC strongly suggested that it should run, even if only in online form, in 2022, and several mechanisms were discussed to allow this to proceed.

The meeting also included a summary of the recent facilities directors meeting. The full minutes are available on the AONSA website, and the report files / slide-packs are available by request from the AONSA secretary (myself).

On a positive note, with the gradual lifting of the pandemic restrictions starting to occur across the region, there was great optimism at the meeting that future events could be held face-to-face. The decision was taken to hold the next meeting in hybrid form in Indonesia, subject to further discussion with the INSS host organization.

*David Cortie*  
*University of Wollongong*  
*AONSA Secretary*



## Report on the 29<sup>th</sup> Executive Committee Meeting

The 29<sup>th</sup> AONSA Executive Committee Meeting was held in a hybrid form on 25 November 2022. The face-to-face component was hosted in Indonesia by the National Battery Research Institute, in the group of Evvy Kartini. The online (hybrid) component ran using ZOOM to enable a wide range of delegates to attend. In total 21 delegates and observers attended the meeting in person, or online.

Professor Taku Sato opened the meeting with a welcoming remark, and the delegates introduced themselves.

A highlight of the meeting was provided by Fang Wei (CSNS) who presented a report on the highly successful online AONSA neutron school for 2022 which had over 100 participants.

The vice president S M Yusuf provided a report on the selection of the AONSA Prizes and YRF and the awards which were approved by the executive. There was some concern expressed by the committee that the diversity and equity of panel members and award winners remain low and the executive discussed some initiatives to address this.

One initiative the EC decided to adopt to improve diversity was to broaden the size of the EC committee by inviting new observers, including junior researchers from a diverse range of backgrounds to join the EC. Since 2020, AONSA has had diversity statement. This statement recognizes that diversity covers a broad range of factors including regional background, ethnicity, gender amongst others. It was pointed out that, motivated by this statement some of the member societies (eg. ANBUG, JSNS) have now implemented their own statements and their own initiatives. However, the EC recognized that the rate of progress within AONSA was slow and new

initiatives were needed to accelerate progress. There was the decision to collect details statistics and surveys from each of the AONSA Member societies to better understand the current membership demographics, and how this varied from region to region. Another initiative was the decision to implement a trial “1:1” policy for member societies to nominate equal ratios of male and female committee nominees for selection panels, and ultimately to use this same mechanism for award nominees.

The committee drafted the timetable of AONSA activities for 2023, which includes the AOCNS conference.

Date	Events
June 2023, Exact date TBD	Facility Directors' Meeting (Zoom) + EC
November 2023, Exact date TBD	30 <sup>th</sup> AONSA EC Meeting (TBD), (Hybrid in China)
18-23 November	4 <sup>th</sup> Asia Oceania Neutron Scattering Conference, Royal Garden Hotel, Dongguan, China

Finally, the member societies of AONSA present updates, including ANBUG, CNSS, INSS, JSNS, KNUBA NSSI (S. M. Yusuf), TWNSS (H. Chou). The full minutes of the meeting will be made available on the AONSA webpage.

As a final note, it was wonderful to return-to-face to face meetings after the long hiatus caused by the COVID-19 pandemic. We are very grateful to the NBRI group who were wonderful hosts and provided the meeting facilities. We also appreciated the opportunity to tour some of the National Research and Innovation Agency facilities. Some

photos are attached.

Near the conclusion of the meeting, there was a vibrant discussion within the committee about whether future meetings should be face-to-face, online or both. There was general support to stay with the hybrid mode, as this is believed to strike the best balance to allow for lowering our carbon footprint from travel, whilst allowing a wide range of members to attend. We look forward to this type of meeting in the future.

*David Cortie ,  
University of Wollongong  
Secretary of AONSA*



## Report on the AONSA Prize 2023

### AONSA Prize 2023 is Awarded to Prof. Yasuhiko Fujii



Citation: “*For his outstanding achievements in the structural and dynamical study of phase transitions of condensed matter by neutron scattering, promotion of the neutron science in Japan as well as the national user program for neutron scattering facilities, and dedicated contributions for the promotion of neutron science in the Asia- Oceania region.*”

The Asia-Oceania Neutron Scattering Association (AONSA) awards the AONSA Prize once every two years to a person or persons to recognize their outstanding research career with a significant impact or contribution to the use or development of neutron science and technology in the Asia-Oceania Region. The AONSA Prize was established in 2010. The Prizes were awarded to: Prof. Noboru Watanabe (KEK) in 2011, Prof. Balebail Anantha Dasannacharya (BARC) in 2013, Prof. John William White (Australian National Univ.) in 2015, Prof. Nobuo Niimura (Ibaraki Univ.) in 2017, Prof. Mahn Won Kim (KAIST) in 2019, and Prof. Robert A. Robinson (ANSTO) in 2021.

The Selection Committee (SC) for the AONSA Prize 2023 (consists of seven members from member associations, ANBUG, CNSS, INSS, JSNS, KNBUA, NSSI, and TWNSS) received several nominations before the nomination deadline (September 15, 2022). In order to give a wide publicity of the 7th AONSA Prize nominations, the last date for receiving nominations was extended twice (from August 15, 2022 to August 31, 2022, and then to September 15, 2022). All the nominations were reviewed intensively by the members of the SC. All of the nominees are highly qualified and having excellent standing in neutron science and have made significant contributions to the field of neutron scattering in the Asia-Oceania region. Finally, the SC unanimously nominated Professor Yasuhiko Fujii, Japanese Society for Neutron Science as the recipient of AONSA Prize 2023. The Executive Committee of AONSA approved the nomination in its 29th AONSA Executive Meeting held in Indonesia on November 25, 2022 in hybrid mode. The recipient will be awarded a certificate, a medal and a monetary prize (US\$5,000) at the Prize Ceremony to be held during the 4<sup>th</sup> Asia Oceania Neutron Scattering Conference, Dongguan, China, December 2-8, 2023.

Prof. Yasuhiko Fujii has made very important contributions to promote the neutron scattering and application in Asia, as well as to the activities of AONSA for many years. He has an outstanding research career, in which expertise in neutron scattering is central, including in neutron scattering method development. He served as Presidents of neutron scattering society in his region. He instigated and was the founding member of his

local regional organization that drives substantial community effort in neutron scattering development in the region, including of AONSA. The SC makes a recommendation for Prof. Yasuhiko Fujii for the AONSA Prize considering his achievements: - Inspiring and motivating the next generation of successful neutron scatterers who are, in turn, nurturing future generations. This leaves a legacy of regional expertise who continue to value the importance of neutron scattering. - Initiating a wide range of truly outstanding neutron scattering capabilities and centres of expertise that contribute to furthering neutron scattering science through the AONSA region, alongside leadership and vision in the scientific areas and expertise development which underpins his success.

Prof. Fujii received his Doctor of Science from Osaka University in 1973. He served as Professor, University of Tsukuba, Professor and Chair, Neutron Scattering Laboratory, ISSP University of Tokyo, Director, Neutron Science Research Center, JAERI, Deputy Director and Director General, Quantum Beam Science

Directorate, JAEA, and Director, Research Center for Neutron Science and Technology, CROSS. Prof. Fujii is an AONSA founding member and served as the Board member, vice-President and President during the first seven years of AONSA. Besides, his AONSA service, Prof. Fuji was also the chair of the commission of neutron scattering in IUCr during 2002 -2005. He was the Japanese representative for the US-Japan Cooperative Research Program on Neutron Scattering between DOE- USA and The University of Tokyo since 1993 for a decade. In regard to the contributions in Japan, Prof. Fujii was the key founding member of JSNS in 2001 and served as first President of JSNS for four years. He also served as the President of the Physical Society of Japan during 2015-2016.

***S. M. Yusuf***  
*BARC*

*Chair of the Selection Committee*  
*Vice President of AONSA*

## Report from the Chinese Neutron Scattering Society (CNSS)

Chinese Neutron Scattering Society (CNSS) established 11 working groups to promote the Neutron Scattering technology and application. Some working groups have made significant progress, such as Detector Group, Monte Carlo Simulation System for Neutron Transport Group, Lithium Battery Technology Group and Engineering Stress Research Group. The Monte Carlo Simulation System Group independently developed the JPTS-JMCT software platform which is similar to the MCNP software commonly used internationally. It is a three-dimensional neutron-photon Monte Carlo particle transport software with high accuracy in the shielding calculation required by a neutron spectrometer. The Engineering Stress Research Group organized the Advanced Characterization Technology for Materials Branch of the International Conference on Advanced Materials 2022 and invited more than 50 experts at home and abroad to discuss topics such as large scientific facilities, new characterization technologies, and in-situ equipment development.

The website of the Asia-Oceania Conference on Neutron Scattering 2023 (AOCNS-2023) (<http://aocns2023.ihep.ac.cn/>) was published in July 2022. The call for abstracts will be open in December 2022. Six panels will be established to review the abstracts, including Condensed Matter Physics, Materials Science and Chemistry, Soft Matter Systems, Engineering, and Industrial Applications, Fundamental Physics and Sources, Methods, and Techniques. AOCNS-2023 will be held in Dongguan, Guangdong province from December 2 to 8, 2023.



AOCNS-2023 website: <http://aocns2023.ihep.ac.cn/>

Three neutron facilities in China run well, and more scientific results were obtained. The status of neutron sources in China is as follows:

In the high-round runs of the China Spallation Neutron Source (CSNS), more than 4100 users registered in the CSNS User Service System, more than 850 user proposals have been completed, and more than 180 articles have been published in journals such as Science, Nature Nanotechnology, Nature Communication, Advanced Materials, and JACS. Of the eight user instruments, MPI and ANIS have been put into operation, Engineering Diffractometer is ready for commissioning, three instruments will be completed by 2022 and other two will be completed by 2023. CSNS Phase II Project, including 11 experimental terminals, and increasing the accelerator and target station power to 500kw, has been approved to be included in the 14th 5-Year Plan of China. The feasibility study report has been reviewed. The construction will start earlier next year.

Up to date, 14 neutron instruments at China

Advanced Research Reactor (CARR) have been constructed. The installation of the new neutron guides CNGC has just been completed. A new cold neutron imaging facility has been set up and is under cold commissioning. Some new sample environment devices have been successfully developed, such as the in-situ high temperature creep equipment, the sample holder for irradiated samples and so on. The residual stress inside the heavy wheels for high-speed trains were successfully measured on the Engineering Diffractometer, which sets a good example for the application of neutron techniques in industry.

A  $^3\text{He}$  system for polarized neutrons has been developed and equipped on the neutron spin echo spectrometer of the China Mianyang Research Reactor (CMRR). They conducted laboratory

searches for exotic spin- and velocity-dependent new interactions. The experiment method has noise reduction features, and new constraints for Vector-Axial(VA) and Axial-Axial(AA) were obtained. The new constraints on VA improved by as much as more than four orders, on AA by as much as two orders in the corresponding force range, respectively. The paper has been published in Phys. Rev. Lett. 129 (2022) 5, 051802. The first neutron spin echo quasi elastic spectrometer was developed in China, which achieved energy resolution better than 100 neV.

***Hesheng CHEN***

*Institute of High Energy Physics*

***Dongfeng CHEN***

*China Institute of Atomic Energy*

## Report from the Japanese Society for Neutron Science (JSNS)

### Status of JSNS

As of September 22, 2022, the number of the JSNS members is 624 including 63 students. In addition, there are 33 senior members. The number of supporting members is 27.

### JSNS Activities (since Feb. 2021)

### 2021 JSNS Prizes

#### **JSNS Science Prize:**

##### **Hideki Seto**

Institute of Materials Structure Science / J-PARC Center, High Energy Accelerator Research Organization (KEK)

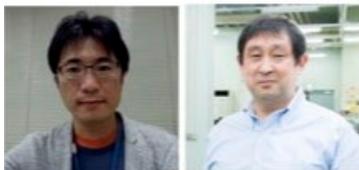


*“Application and development of neutron scattering techniques for soft matter science research”*

#### **JSNS Technology Prize:**

##### **Takuya Hosobata and Yutaka Yamagata**

Ultrahigh precision Optics Technology Team, RIKEN Center for Advanced Photonics



*“Development of ultrahigh precision curvature metallic substrate for neutron focusing mirror”*

#### **JSNS Young Researcher Prize:**

##### **Takuya Okudaira**

Division of Particle and Astrophysical Science, Graduate School of Science, Department of Physics, Nagoya Univ.



*“Development and advanced research of high-*

*performance <sup>3</sup>He neutron spin filter at J-PARC”*

#### **JSNS Young Researcher Prize:**

##### **Koichi Mayumi**

Neutron Science Laboratory, The Institute for Solid State Physics (ISSP), University of Tokyo



*“Molecular structure and dynamics investigation of polyrotaxane by means of neutron scattering”*

### 2022 JSNS Prizes

#### **JSNS Outstanding Achievement Prize: Masashi Iizumi**

Former Board Executive Director of JAEA



*“Contribution to the earlier days of neutron scattering research in Japan, the upgrade of the research reactor JRR-3 and the foundation of US-Japan collaboration on neutron scattering”*

#### **JSNS Science Prize:**

##### **Yoshie Otake**

Neutron Beam Technology Team, RIKEN Center for Advanced Photonics



*“Development and utilization of the ultra-compact neutron source and the non-destructive infrastructure analysis methods”*

#### **JSNS Young Researcher Prize:**

##### **Wu Gong**

J-PARC Center, Japan Atomic Energy Agency



*“Research on texture control and mechanical characteristics of the advanced structural materials by means of pulsed neutron*

*diffraction”*

## Events

**The 21<sup>st</sup> Annual Meeting of the Japanese Society for Neutron Science** was held virtually during December 1-3, 2021, in Kumatori, hosted by the Institute for Integrated Radiation and Nuclear Science (KURNS), Kyoto University. The conference chairperson was Prof. Masaaki Sugiyama and the program chairperson was Prof. Masahiro Hino, both from KURNS.

The number of registered participants were 275, including 58 students. There were 50 oral and 110 poster presentations distributed over the three meeting days. Plenary speakers were Prof. Toshiji Kanaya (Kyoto Univ.) and Prof. Christian Pfleiderer (TU Munich). Invited speakers were Dr. Masatoshi Arai (ESS) and Dr. Ken Andersen (ORNL).

**The 2021 JSNS General Assembly** was held on the 1<sup>st</sup> day of the annual meeting, where the society business matters were reported and discussed and the 2021 JSNS Prize recipients were honored. The prize winners presented their award lectures during the annual meeting.

**The 5<sup>th</sup> Neutron and Muon School at J-PARC MLF** was held online during December 6-9, 2021, as a KEK-IINAS School. The schoolmaster was Prof. K. Kubo of the International Christian University, and the executive committee chairperson was Prof. H. Seto of the Institute of Materials Structure Science, KEK. Both the lectures and hands-on training were given remotely. There were in total 94 applicants, including 55 applicants for the

hands-on training. 25 of them could participate in the virtual hands-on training on four neutron and one muon instruments. There was max. 94 to min. 37 zoom accesses per day to the online lectures.

**The 11<sup>th</sup> International Workshop on Sample Environment at Scattering Facilities (ISSE 2022)** was held in-person during August 28 – Sept. 1, 2022 in Nasu, Japan. The chairperson of the local organizing committee was Seiko Ohira-Kawamura of J-PARC Center, JAEA. This workshop is the 11th meeting in a series, which was initiated by Michael Meisner at Berlin in 1999. The workshop is held under the patronage of [the International Society for Sample Environment \(ISSE\)](#). 83 participants (including 5 online speakers), 30 from abroad, joined the in-person meeting, and there was intense exchange of information and lively discussions on the sample environment at world leading neutron and synchrotron facilities .



**The 22<sup>nd</sup> Annual Meeting of the Japanese Society for Neutron Science** was held in-person during October 26-28, 2022 in International Convention Complex Makuhari Messe, hosted by the Institute for Solid State Physics (ISSP), University of Tokyo. The conference chairperson was Prof. Osamu Yamamuro and the program

chairperson was Prof. Takatsugu Masuda, both from the Neutron Science Laboratory of the ISSP, University of Tokyo.

The number of the registered participants were 152, including 25 students. There were 50 oral and 92 poster presentations distributed over the three meeting days. Plenary speakers were Prof. Kohzo Ito (Department of Advanced Materials Science, The University of Tokyo) and Prof. Hidekazu Tanaka (Department of Physics, Tokyo Institute of Technology).



**The 2022 JSNS General Assembly** was held on the 1<sup>st</sup> day of the annual meeting, where the society business matters were reported and discussed and the 2022 JSNS Prize recipients were honored. The prize winners presented their award lectures during the annual meeting.

**The 6<sup>th</sup> Neutron and Muon School** at J-PARC MLF and JAEA JRR-3 was held in hybrid format during Dec. 12-16, 2022. The schoolmaster was Dr. Kazuhisa Kakurai of the Neutron Science and Technology Center, CROSS,

and the organizing committee chairperson was Dr. Ryoji Kiyonagi of J-PARC Center, JAEA. There were 18 on-site participants for the on-site hands-on-training on BL01: 4SEASONS, BL02: DNA, BL14: AMATERAS, BL09: SPICA, BL19: TAKUMI, S1: ARTEMIS, U1A: Muon U1 at J-PARC MLF and SANS-U at JAEA JRR-3 and in addition around 80 remote connections in total were counted for the school lectures presented in hybrid format.



Finally the next **23<sup>rd</sup> Annual Meeting of the Japanese Society for Neutron Science** will be held in person during September 13-14, 2023 in Sapporo at Hokkaido University. Meeting Chair will be Prof. Takashi Kamiyama from the Hokkaido University.

***Kazuhisa Kakurai,***  
*(CROSS)*

## Report from the Korea Neutron Beam Users Association (KNBUA)

### Summary of activities in 2022

Two neutron summer schools were held in August 2022 at the Korea Atomic Energy Research Institute (KAERI) in Daejeon, Rep. of Korea. The Cold Neutron Summer School covered the subjects related to the Small Angle Neutron Scattering and Reflectivity, while the Neutron Diffraction Summer School discussed the neutron powder diffraction method and data analysis. 30 students and researchers joined each



summer school to learn neutron scattering.

The HANARO symposium 2022 was held on September 29 at KAERI in Daejeon, Rep. of Korea. Two plenary lectures were delivered by Prof. Jin-Sook Ryu (Ulsan University) and Dr. Gwang-Min Sun (HANARO Center, KAERI), respectively, in this morning session. After the lunch break, 27 oral talks and 69 posters were presented in the diverse subjects covering neutron beam applications, neutron activation analysis, radioisotopes, irradiation test, and research reactor, etc.

General Assembly 2022 of the Korea Neutron Beam Users Association was held in conjunction with the HANARO Symposium 2022. The HANARO status and budget status were



reported and discussed. One of the important agendas of the Assembly was the nomination and approval of the next KNBUA President. Professor Sungkyun Park of the Pusan Nat'l University was nominated as the new president of KNBUA, which was approved by the attending members. He will serve for the two-year term, which immediately begins closing the terms served by the past President, Prof. Jae-Ho Chung (Korea University).

*Soo-Hyung Choi (Hongik University)*

### Student travel support program

Members of the KNBUA activated the support program to cover the travel expenses for neutron scattering experiments overseas. As part of the research grant provided by the National Research Foundation (NSF) of Korea, "Center for Materials Research using Neutron Beams (No. 2020K1A3A7A09077712)," of which Prof. Jae-Ho Chung of Korea University is the Primary Investigator, students affiliated with South Korean universities and institutions can be supported with travel expenses for their neutron scattering experiments at overseas facilities. While the grant money is to be used mostly for the

research groups already participating in the Center, some portion will be used for students whose supervisors do not participate but are approved of neutron beamtimes.

The grant term originally began in June 2020 when the coronavirus pandemic was interfering with international travels. Although originally scheduled to end in December 2022, the term was extended by six months to June 2023. Last August when the extension was finally approved, letters of information were sent to the user offices of six largest facilities including ANSTO, J-PARC MLF, SNS & HFIR, NCNR, ISIS and PSI. So far, three students from Ulsan National Institute of Science & Technology or

Kongju National University benefited from the program for their experiments at PSI and SNS, respectively.

In this year, international airfares increased dramatically while those to Oak Ridge, USA, more than doubled. Since many research groups were granted beamtime at SNS of the Oak Ridge National Laboratory, the travel support money quickly ran out. We expect to submit another three-year proposal in the summer of 2023. If successful, a similar travel support program will be able to continue.

*Jae-Ho Chung (Korea University)*

## ***Report from the Neutron Scattering Society of India (NSSI)***

The XIX School on Neutrons as Probes of Condensed Matter (NPCM-2022) has been organized by BARC and UGC-DAE Consortium for Scientific Research, Mumbai in association with NSSI during November 14-19, 2022, in Mumbai, India to enhance awareness about neutron scattering techniques and discuss the recent research in condensed matter physics by neutron scattering. The school has been attended by about 60 participants consisting of many PhD students and few faculty members from universities and research institutes in India. The school comprised lectures on basic principles and applications of neutron scattering techniques by expert scientists from BARC and UGC-DAE-CSR, Mumbai. It also consisted of tutorials as well as hands on experiments using the neutron scattering facilities at Dhruva reactor, BARC, Mumbai. Prof. Amlan Pal, Director, UGC DAE CSR and Dr. S M Yusuf, Director, Physics Group, BARC, among others, spoke at the inaugural session of the school.

Another important event organized during the NPCM-2022 was the 2<sup>nd</sup> NSSI lecture. It has been delivered (online) by Prof. Brendan Kennedy, The University of Sydney, Australia. He was former President of AONSA and of the Australian Neutron Beam Users Group (ANBUG). He delivered the lecture on “Phase Transitions in Oxides: Using neutron scattering to observe both the obvious and not-so-obvious changes”. The session was chaired

by Prof. D. Pandey, President NSSI.

During NPCM-2022, the annual general body meeting of NSSI has also held. It has been attended by many members of NSSI. During the meeting, the second NSSI neutron newsletter dated November 2022 has been released.



Inauguration of NPCM-2022



Participants of NPCM-2022

***S. M. Yusuf***  
*Neutron Scattering Society of India*

## Report from the Taiwan Neutron Science Society (TWNSS)

TWNSS 2022 Annual Meeting was held on November 18-20, 2022, in Kinmen. Kinmen is a group of islands governed as a county by Taiwan and is full of battlefield history, thus becoming a tourist attraction. It is worth mentioning that, the island of Kinmen is the place that produces the famous Kinmen's kaoliang liquor which is one of the most popular wine in Taiwan. In this year's annual meeting, there are 122 participants including 5 international speakers from Australia and Japan and 98 TWNNS members.



This meeting was held in an expanded way during the post-pandemic phase. Therefore, the meeting more emphasized the interaction between members in person after nearly three years of separation. At the beginning of the activities, Prof. Taku Sato delivered a very nice plenary speech on the “Long-range magnetic order in quasicrystalline magnets”. Then, Prof. Rob Robinson, Prof. Hung-Duen Yan and Prof. Wen-Hsien Li delivered a talk about “Celebrating twenty years of the Taiwan-Australia collaboration in neutron scattering” to make a remarkable start for the annual meeting.

Furthermore, we have also organized the parallel sessions respectively focusing on the condensed matter physics and soft-matter materials with neutron science and application on the second day, along with a neutron facility talk session on the last day. In addition, we further arranged the Kinmen historical tour engagements after the talk sessions, during which the participants and speakers can have nice chances to exchange their neutron experiences each other or even

talk about future collaborations.



Besides the annual meeting activity, the Kinmen County Government and the Taiwan Neutron Science Society together organized an innovative science popularization activity at Kinmen High School on November 18. The events that happened during this activity really gave a nice opportunity not only to promote the popular science education, to improve the scientific literacy of elementary, middle, and high school students in Kinmen, but also to enhance the teachers' scientific knowledge. On the other hand, scientific hands-on activities were also included during the science popularization activity.



**2022 TWNNS Annual Meeting and Conference on Neutron Scattering**

**Plenary Speakers:**  
 Prof. Hung-Duen Yan, Prof. Rob Robinson, Prof. Taku Sato, Prof. Wen-Hsien Li, Prof. Yuh-Shyan Lee

**Keynote Speakers:**  
 Dr. Yoshiki Ozeki, Prof. Min-Liang Chou, Dr. Yuh-Shyan Lee, Prof. Norman Li, Prof. Martin Pfaender, Dr. Chen-Ming Wu

**Date:** 2022/11/18-2022/11/20  
**Venue:** Kinmen Senior High School  
**Registration:** 2022/09/01-9/10  
**Registration Fee:** Student NTD 1500, Regular NTD 3000

**Remittance:** Account Name: 社團法人台灣中子科學學會, Bank Name: Bank SinoPac, Account No.: 044-018-0009116-1, Contact number: 0928221206, Prof. Yang, E-Mail: chunchuanyang@gmail.com  
**Official Website:** https://reurl.cc/5YxKuj

**PRPC**

**Chun-Chuen Yang,**  
*National Central University*  
*(President of TWNNS)*

## Report from the Russian Neutron Society (ROSNEUTRO)

Russian neutron society (ROSNEUTRO) is a non-profit society founded by scientists in 2004 to represent Russian neutron scattering community at the international scientific boards and organizations. ROSNEUTRO numbers nearly 300 members representing four Russian neutron scattering facilities as well as neutrons user community. It promotes the use of neutron scattering in a wide range of research fields including but not limited to condensed matter physics, material science, life science and industrial applications.

### ROSNEUTRO team

In 2022, the new team in charge of ROSNEUTRO was formed. Dr. A.F. Gubkin from M.N. Mikheev Institute of metal physics became a President while ex-President Prof. S.V. Grigoriev took a position in the Executive committee. The Executive Committee consists of 9 members representing neutron facilities located in Russia (IBR-2 research reactor, JINR, Dubna; PIK reactor complex, NRCKI-PNPI, Gatchina; IR-8 research reactor NRCKI, Moscow; IVV-2M research reactor, «INM» SC Rosatom) and user community (MEPHI University).

### Highlight of the year

The most important result of the year was reactor PIK (100 MW, NRCKI-PNPI, Gatchina) reaching 7 MW power as a step of ongoing commissioning procedure.

### Workshops and conferences

A number of local conferences were organized by Russian neutron facilities. The largest ones were JINR Annual User Meeting that hosted about 150 participants from Russia and abroad, «SPEKTRINA: Workshop on inelastic neutron

scattering» (40 participants) and 14<sup>th</sup> Ural seminar «Radiation damage physics of metals and alloys» (45 participants).

### Notable results:

#### Pressure-induced colossal rise of magnetic ordering temperature in geometrically frustrated oxide $Mn_3O_4$

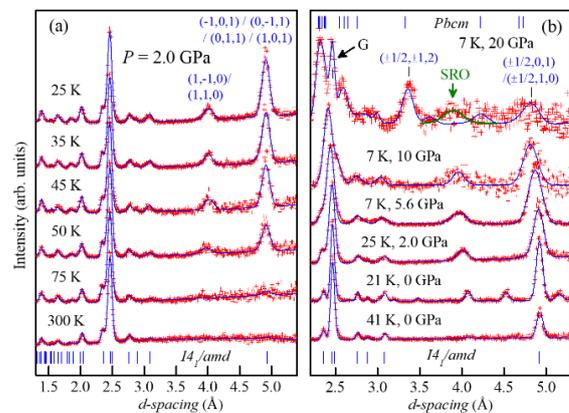


Fig. 1. Neutron diffraction patterns of  $Mn_3O_4$  measured at selected pressures and temperatures and fitted by the Rietveld method.

The magnetic oxide  $Mn_3O_4$  is an unusual geometrically frustrated functional material with tetragonally distorted structure of spinel type, which demonstrates pronounced magnetocaloric, magnetoelastic and magnetodielectric effects. Crystal and magnetic structures of  $Mn_3O_4$  have been studied by means of neutron diffraction under applied high pressures up to 20 GPa in the temperature range 15-300 K (see Fig. 1). For pressures above 2 GPa a suppression of the low temperature modulated AFM phases and stabilization of ferrimagnetic phase was revealed. Simultaneously, the magnetic ordering temperature drastically rises from  $T_{NI} \approx 43$  K to 100 K in the pressure range 0 – 10 GPa. The magnetic structure

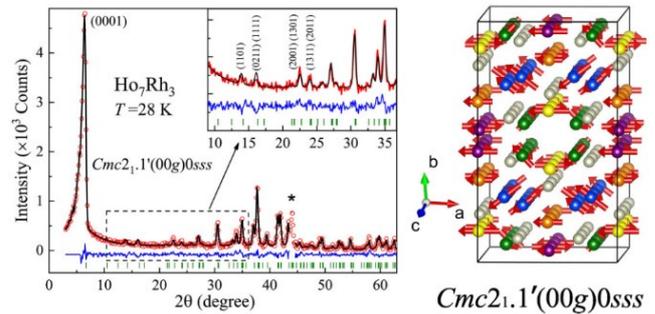
of the high-pressure orthorhombic phase was determined at  $P=20$  GPa. In this phase at  $T_N = 275$  K the long-range AFM order with a propagation vector  $k = (1/2, 0, 0)$  is formed on the  $Mn^{3+}$  sublattice, while  $Mn^{2+}$  sublattice remains magnetically disordered. Therefore, the magnetic ordering temperature rises more than 6 times, which is unique case among known magnetic oxides.

[1] D.P. Kozlenko et al, Physical Review B 105, 094430 (2022).

### Magnetic incommensurability, short-range correlations, and properties of $Ho_7Rh_3$

Many members of a family of  $R_7T_3$  intermetallic compounds exhibit complex incommensurate magnetic structures described by a combination of two-dimensional irreducible representations. In this work, a study of the incommensurate magnetic structure of  $Ho_7Rh_3$  has been performed by a Rietveld refinement of the neutron diffraction data using the magnetic superspace group approach. An incommensurate antiferromagnetic structure of the spin density wave (SDW) type was observed, described by the magnetic superspace group  $Cmc2_1.1(00g)0sss$  and

the propagation vector  $\mathbf{k}_{IC} = (0\ 0\ 0.389)$  (see Fig. 1). Further cooling leads to the spin reorientation transition and squaring-up transformation of the SDW magnetic structure below  $T_{t1} = 22$  K. The spin reorientation transition is accompanied by the emergence of a ferromagnetic component in the incommensurate magnetic structure upon cooling below  $T_{t2} = 9$  K. Neutron diffraction revealed the existence of a short-range antiferromagnetic order



up to temperatures twice as high as  $T_N$ .

Fig. 1 (left) Neutron diffraction pattern of  $Ho_7Rh_3$  measured just below the Néel temperature. (right) Schematic visualization the refined magnetic structure.

[1] A.F. Gubkin et al, Physical review B 106, 134419 (2022)

**A.F. Gubkin,**  
*M.N. Mikheev Institute of metal physics*  
*(President of ROSNEUTRO)*

## Report on the 23rd and 24th Asia-Oceanian Facility Directors Meetings

Asia-Oceania Facility Directors Meetings (FDM) were held twice in 2022. The 23<sup>rd</sup> FDM were held on June 17<sup>th</sup> using the online ZOOM platform. The 24<sup>th</sup> FDM were held on November 24<sup>th</sup> in a hybrid mode, in Indonesia and using online ZOOM platform. We would like to thank our Indonesia colleagues, Prof. Evvy Kartini and others, for hosting the 24<sup>th</sup> FDM. After almost three years of only online communication due to COVID19, it is good that people can also meet in person now. The attendees of the meetings are the facilities directors (or their representatives), some of AONSA EC members, the local host and experts from our neutron communities.

Facilities update reports were delivered, by Young-Soo Han (HANARO), Fangwei Wang (CSNS), Toshiya Otomo (J-PARC/KEK), Jamie Schulz (ANSTO), Masayasu Takeda (JRR-3/JAEA), Kai Sun/Tianfu Li (CARR/CIAE), Ranjan Mittal (DHRUVA), Abu Rivai (G. A. Siwabessy), Andrei Gubkin (IVV-2M), Egor Lychagin (IBR-2), Vladislav Tarnavich (PIK). In general, all neutron facilities in our region have been developing/running well, therefore providing strong support to neutron user communities. Some exciting news from different facilities was reported, including instrument up-gradings, new sample environments, new instruments, increasing of beam time and also progress on new big projects. Some scientific research, ranging from batteries, condensed matter physics, materials science, biomacromolecules and soft matter, were highlighted.

Two AONSA Young Research Fellows members have conducted their program in ANSTO. The AONSA neutron school was held in CSNS with more than 1400 online participants.

Other topics on International Conference on Neutron Scattering, shortage of HOPG supplier, compact neutron sources and neutron sources in other regions were also discussed.

**Tianfu LI**

*(CARR, CIAE and the 24<sup>th</sup> FDM Chair)*

**Jamie Schulz**

*(OPAL, ANSTO, and the 23<sup>rd</sup> FDM Chair)*



Group photo of the 23<sup>rd</sup> FDM meeting



Group photo of the 24<sup>th</sup> FDM meeting

## Report from the China Spallation Neutron Source (CSNS)

In September of 2022, the CSNS beam power was enhanced to 140kW, exceeding the designed value by 40%, as shown in Figure 1. In February of 2020, the CSNS power of proton beam on the target reached the design goal of 100 kW. In March 2022, the accelerator beam power was increased to 125kW. 108 user proposals selected from 418 submissions has been approved in the second half of 2022, with a passing rate of 24.9%. So far, more than 70 user proposals have been completed.

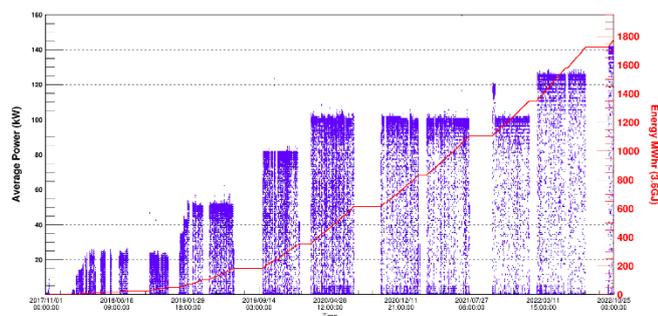


Fig. 1 Historical CSNS beam power. After September of 2022, CSNS is operated at 140 kW.

The second user instrument— Atmospheric Neutron Irradiation Spectrometer (ANIS) obtained the first neutron beam on Apr. 2, 2022, and then began commissioning. In comparison of LANSCE and JEDEC energy spectra near 1 MeV region, ANIS neutron energy spectrum is closer to the real atmospheric neutron energy spectrum. The first batch of user experiments have been tried. After careful calibration, ANIS will open to users in the first half of next year.

Combined with X-ray absorption fine structure and theoretical calculation, the relevant mechanism of a new strategy for optimizing the catalytic performance of electrochemical lithium insertion lattice was studied. The results were

published on *Nature Communications*, entitled "RuO<sub>2</sub> electronic structure and lattice strain dual engineering for enhanced acidic oxygen evolution reaction performance". (Nat. Comm. 2022, 13:3784)

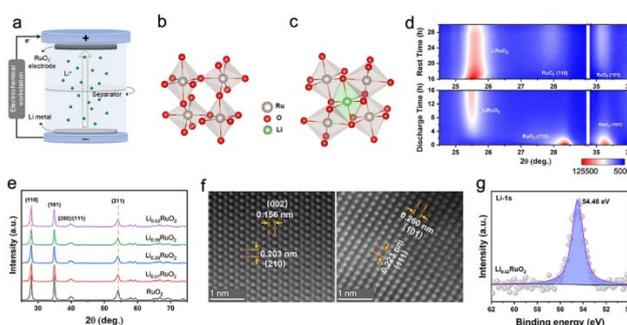


Fig. 2 Structural and compositional characterizations. a) Schematic illustration of the preparation of lithium intercalated RuO<sub>2</sub>. b) RuO<sub>6</sub> octahedron before lithium intercalation. c) RuO<sub>6</sub> octahedron after lithium intercalation. d) Operando XRD of RuO<sub>2</sub> during electrochemical lithiation under a constant current density of 10 mA g<sup>-1</sup>, followed by 14 h relaxation. e) Ex situ XRD patterns of the pristine RuO<sub>2</sub> and the L<sub>x</sub>RuO<sub>2</sub>. f) The HAADF-STEM images of the pristine RuO<sub>2</sub> (left) and the Li<sub>0.52</sub>RuO<sub>2</sub> (right). g) The high-resolution Li 1s XPS of Li<sub>0.52</sub>RuO<sub>2</sub>.

The review meeting on the feasibility of the CSNS-II had been held in Sept. 31, 2022, organized by the central governments. The CSNS-II Project will build nine new neutron spectrometers, one muon beam station and one 1.6 GeV proton terminal, in addition of increasing the source beam power to 500 kW. Up to now, the physical simulation and design of the 11 experimental terminals have been completed, and part of the engineering design has been carried out, including the guide, chopper, detector, sample chamber, sample environment, etc. With optimistic estimate, CSNS-II will start constructing in the middle of

2023.

Fig. 3 Group photo of the Annual Meeting 2022 on CSNS



Target Station and Spectrometers

The 2022 CSNS Target Station and Spectrometers Annual Meeting was held in

Qingyuan, Guangdong, from September 16 to 17. More than 150 experts of domestic neutron/photon sources attended the meeting. The meeting focused on the CSNS experimental research scheme and plan, the development of experimental methods and technology, and the key research work of next year. The safety, stability and efficiency of the device and user training were discussed in detail. The challenges to the target station and spectrometers under the upgraded beam power to 500 kW were also discussed.

**Fangwei Wang**  
*Institute of Physics*  
*(Deputy Director of CSNS)*

## Report from the Dhurva Reactor

### Modulation of Diffusion Mechanism and its Correlation with Complexation in Aqueous Deep Eutectic Solvents

Aqueous mixtures of deep eutectic solvents (DESs) have gained traction recently as an effective template to tailor their physicochemical properties. But detailed microscopic insights about the effects of water on molecular relaxation phenomena in DESs are not entirely understood. DESs are strong network forming liquids due to the extensive hydrogen bonding and complex formation between their species and therefore water can behave as a controlled disruptor altering the microscopic structure and dynamics in DESs. In this study, the role of water on the diffusion mechanism of acetamide in the aqueous mixtures of DES synthesised using acetamide and lithium perchlorate is investigated using molecular dynamics (MD) simulation and quasielastic neutron scattering (QENS) techniques. MD simulation revealed the acetamide dynamics comprise localised diffusion within transient cages and jump diffusion process across cages. The jump diffusion process is observed to be strongly enhanced by about a factor of 10 as the water content in the system is increased. However, both MD simulation and QENS results showed that the geometry of the localised dynamics is unaltered by addition of water but the localised diffusion becomes significantly faster and more heterogeneous with increasing water concentration. The water concentration in the DES is observed to control the solvation structure of lithium ions, with the ions becoming significantly hydrated at 20 wt% water. The formation of inter-water and water-acetamide hydrogen bonds is observed. The increase in water concentration is found to increase

the number of H-bonds, however their lifetimes are found to decrease substantially. Similarly lifetimes of acetamide-lithium complexes are also found to be diminished by increasing water concentration. A power-law scaling relationship between lifetimes and diffuse ion constants is established elucidating the extent of coupling between diffusive processes and hydrogen bonding & microscopic complexation. This study demonstrates the ability to use water as an agent to probe the role of structural relaxation and complex lifetimes on diffusive processes at different time and length scales.

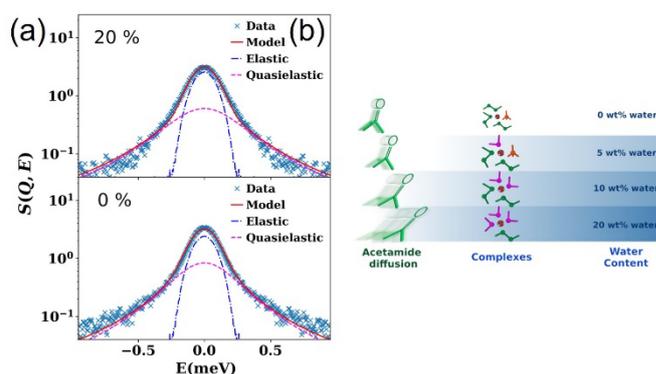


Figure 1 (a) QENS spectra of pure DES and DES + 20% D<sub>2</sub>O at  $Q$ -value of  $1.4 \text{ \AA}^{-1}$  along with the model fitting based on localized translation diffusion mechanism; the associated elastic and quasielastic components are also indicated. (b) The diffusion of acetamide becomes faster with addition of water, mainly driven by the changes in the formation of complexes and hydrogen bonds in the aqueous DES [1].

[1] H. Srinivasan, V. K. Sharma, and S. Mitra, Modulation of Diffusion Mechanism and Its Correlation with Complexation in Aqueous Deep Eutectic Solvents, *J. Phys. Chem. B* **126**, 9026 (2022).

### Estimating Packing Fraction of Correlated Nano-Ellipsoids in Spray-Dried Microgranules

Packing of particles in confined space is

fascinating. The packing of monodisperse spheres, interacting via short-range repulsive forces is well-understood where the system exhibits different structures such as crystals, glasses, jammed solid-like states, and many-particle heterogeneous systems. However, it becomes intriguing when the shape of the particles deviates from spherical symmetry. In case of shape-anisotropic particles, rotational degrees of freedom play a crucial role in their positional arrangements and that substantially complicates the jamming characteristics, particularly in a strongly correlated system. The jamming behaviour of anisotropic particles, especially in nanometric length scales, has significant relevance to several practical problems in condensed matter and biological systems. In order to understand the jamming characteristic of a densely packed system, one needs to evaluate the positional correlations of the jammed particles and quantitatively estimate the packing fraction. Hematite nano ellipsoids of different aspect ratio (AR) were synthesized. Here, AR is defined as the ratio of the length of major axis to the length of minor axis of the ellipsoidal particles. To realize the 3D jammed structure of the colloidal suspensions of hematite nano ellipsoids, evaporation induced assembly was employed utilizing a rapid aerosol drying technique, popularly known as spray-drying. A novel approach is formulated [1] to determine the packing fraction of jammed nano-ellipsoids in a such microspheres by accessing a wide wave-vector transfer ( $Q$ ) range using medium resolution small-angle neutron scattering (MSANS) (at GT lab, Dhruva reactor) and small-angle X-ray scattering (SAXS) data. The method has been elucidated through a quantitative analysis of structural correlation of nano hematite ellipsoids, which were packed in the form of a 3D microgranule using rapid evaporative assembly. The conventional analysis of scattering data

misleads to erroneous estimation of packing fraction because of smearing out of the structural correlation by orientation distribution among the ellipsoids. This anomaly in the estimation of packing fraction is overcome by evaluating an inter-particle distance distribution function of jammed nano-ellipsoids. The figures below show micro-granule comprised of jammed ellipsoids and the combined MSANS/SAXS data and an illustration of evaluating the inter-particle distance distribution function of jammed ellipsoids, respectively.

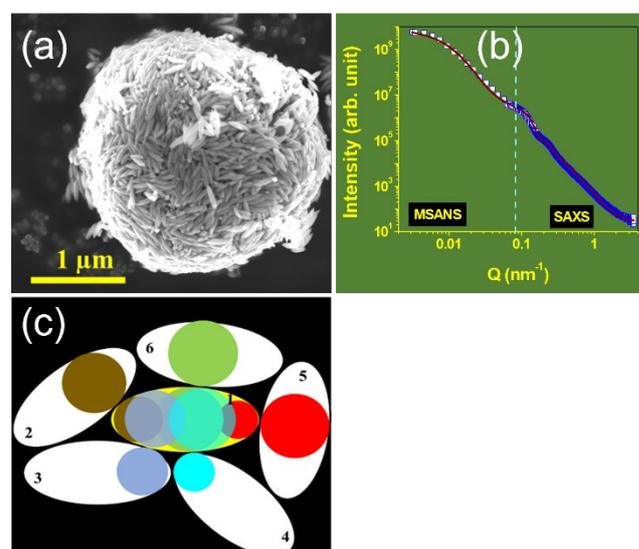


Figure 2 (a) Field emission scanning electron micrograph, showing spray-dried micro-granules, synthesized by evaporative assembly, comprised of highly correlated hematite nano-ellipsoids. (b) Scattering data from the microgranules over nearly three decades in wave vector transfer ( $Q$ ). (c) An illustration demonstrating the effective structural correlation between ellipsoids by considering inscribed spheres which are in contact of neighboring ellipsoids. For example, Ellipsoids-1 and 5 interact via red spheres and so on [2].

[2] Jamming of Nano-Ellipsoids in a Microsphere: A Quantitative Analysis of Packing Fraction by Small-Angle Scattering Avik Das, Ranajit Mondal, Debasis Sen, Jitendra Bahadur, Dillip K. Satapathy, and Madivala G. Basavaraj, *Langmuir* **38** (2022) 3832–3843.

## Report from the JRR-3

**JAEA (Department of Research Reactor and Tandem Accelerator and Materials Sciences Research Center):** JRR-3 was scheduled to be operated for seven cycles from May to December in 2022. Operation of the reactor was suspended for 18 days in the third cycle by malfunction of primal coolant water flow alarm system and resumed operation at the beginning of the fourth cycle. General user programs are carried out for 169 days. One hundred seventy-five user proposals were accepted by the proposal review committee in 2022. JAEA internal proposals were 104 and that of general user proposals 71.

Call for the general user proposals in 2023A proposal round was opened during the month of November by an online proposal submission system (JRR-3 RING). This system is not ready for researchers who neither read nor write Japanese. If you are interested in the proposal, please directly contact JRR-3 Users Office ([jrr3-uoffice@jaea.go.jp](mailto:jrr3-uoffice@jaea.go.jp)) presently. The next proposal round starts in next May.

In this year, we upgraded several neutron instruments and installed some sample environment equipment: one cryogen-free 10T superconducting magnet, three cryogen-free top-loading-type refrigerators, and two single-shot-type  $^3\text{He}$  inserts and so on. The equipment enables not only experiments under the simultaneous conditions of low temperature, high magnetic field, and high pressure but addresses the issue of helium shortage and the resulting liquid-helium price hike. Additional detector systems that cover ultra-low angle and middle-angle were installed in the small-angle neutron scattering instrument (SANS-J). The systems allow high-efficient multi-scale measurements and help to solve the serious beam time shortage in SANS-J. Vertical 6-axis articulated

robot arm system was installed in the prompt gamma-ray analysis system (PGA). The system was developed during long shutdown of JRR-3 and is fully operational this year. The system enables automatic analysis up to 14 samples. Recently, PGA was employed for analysis of the hydrogen concentration of collected samples of an asteroid Ryugu thirty hundred million kilo meters away from the earth by HAYABUSA 2 project.



Photograph of cryogen-free type sample environment equipment newly installed in JRR-3

**ISSP:** In the 2021 and 2022 proposal rounds, we have accepted 176 and 166 proposals and assigned beam time to 107 and 145 experiments, respectively. These were almost completed, and many interesting results have been obtained. In some instruments, neutron intensity was 5-10 times increased due to the improvements (installation of supermirror guide tubes, focusing analyzers, etc.) that were performed during the long shutdown period. Call for the proposal of 2023 round was opened in November from 1 to 30. We also join J-JOIN mentioned above.

*Osamu Yamamuro (ISSP, U. Tokyo),  
Shigeru Wada (JAEA),  
and Masayasu Takeda (JAEA)*

### Calendar of AONSA Activities in 2022-24

Date	Events
<b>Year 2022</b>	
24 November	23rd Facility Directors' Meeting (Zoom)
25 November	29 <sup>th</sup> AONSA EC Meeting (Indonesia)
21-23 November	12 <sup>th</sup> AONSA Neutron School (CSNS, China)
<b>Year 2023</b>	
June TBD	Facility Directors' Meeting (Zoom) + EC
TBD November	30 <sup>th</sup> AONSA EC Meeting (TBD), (Hybrid in China)
2-8 December	4 <sup>th</sup> Asia Oceania Neutron Scattering Conference, Royal Garden Hotel, Dongguan, China
<b>Year 2024</b>	
June TBD	FDM + EC
TBD November	30 <sup>th</sup> AONSA EC Meeting (TBD), (India )
TBD	Neutron School