

# ITYF Seminar

The Japan Aerospace Exploration Agency (JAXA) International Top Young Fellowship (ITYF) was established as a new fellowship program in 2009 with the purpose of inviting world's top-level young researchers to work at the Institute of Space and Astronautical Sciences (ISAS)/JAXA.

ITYF fellows are expected to contribute to the following activities in ISAS/JAXA in addition to producing outstanding academic achievements in their areas of specialization.

- Active interaction with researchers inside and/or outside ISAS to create new academic trends.
- Active participation or initiative in planning new space science mission projects.
- Active participation in developing research networks of ISAS and the related foreign institutes.

We also expect positive impact of ITYF fellow's activities on ISAS researchers and students.

This seminar will be held to share their activities.

Members of ITYF committee will participate to review their activities. Also, this seminar is open to everyone at ISAS.

## [Date, Time and e.t.c]

Date and Time: 15th January 13:30-16:20

Venue: Meeting room A (1257)

Chair: Prof. Takashi Kubota, Director of Research Department

## [Schedule, Theme and Abstract]

13:30-14:00 Dr. Stephane Bonardi

Title: Swarm of soft reconfigurable robots for space colonization: a bio-inspired approach

Abstract:

Unmanned exploration of remote environments using robotic platforms represents the first step towards human presence on extraterrestrial planets. In addition to data collection, these robots could be used to create in situ stations and shelters for the first explorers and to develop the required infrastructures for resources harvesting. The robots would play the role of the constructors, of the structural elements, and of the co-inhabitants alongside with humans. I am currently developing novel robotic solutions for future space missions inspired by social insects, such as ants and bees, which exhibit impressive resilience, versatility, and adaptation capabilities on Earth. In this talk, I will discuss the current state of my research and the future directions that I am planning to follow towards the ambitious goal of extraterrestrial space settlements.

14:00-14:30 Dr. Kiwamu Izumi

Title: Building gravitational wave detectors; a ground-based and a spaceborne

Abstract: Starting from 2015 with the first detection of gravitational waves from a binary black hole merger, gravitational wave astronomy is becoming a center of astronomy. While the network of the ground-based detectors formed by LIGO and VIRGO is gearing up towards their third observing run in this year to accumulate more gravitational wave events, yet another detector is planning to join the network from Japan; KAGRA.

In the meantime, ESA has started its official effort to launch a spaceborne gravitational wave detector, LISA, in 2034. In this context, I have been contributing to experimental aspects of KAGRA with the goal of enhancing the ground-based detector network, and also begun design studies for possibly providing LISA with hardware components from Japan. I will report these research activities and the prospect in this talk.

14:30-15:00 Dr. Ryan M. Lau

Title: Exploring the Dusty and Dynamic IR Sky with Spitzer, JWST, and Beyond

Abstract: Thermal infrared (IR) emission from dust is a key probe of the formation and death of short-lived, massive stars. In this talk, I will discuss results from our mid-IR transient survey with the Spitzer Space Telescope and our future plans with the upcoming James Webb Space Telescope (JWST) in exploring the dusty and dynamic behavior of massive stars. Mid-IR observations conducted in our Spitzer Infrared Intensive Transients Survey (SPIRITS) program are unveiling the mid-IR signatures of dust-enshrouded transients and variables that are undetected in optical surveys. With the unprecedented sensitivity and spatial resolution of JWST in the mid-IR, we will conduct follow-up spectroscopy of these mid-IR transient in a Guaranteed Time Observation (GTO) program to characterize their nature. I will also discuss our accepted JWST Early Release Science (ERS) program, where we will investigate the formation mechanism and chemical composition of dust formed in the colliding winds of Wolf-Rayet (WR) binaries. Such systems may have a significant impact on the dust abundance in both the local and early Universe. After Spitzer and JWST, SPICA will shape the future of space-based IR astronomy and has the potential to conduct time-domain studies out to the far-IR. With its  $12 \times 10'$  field-of-view and ability to obtain simultaneous  $17 - 36 \mu\text{m}$  low-resolution spectroscopy and  $34 \mu\text{m}$  imaging, the SPICA Mid-infrared Instrument (SMI) will be an efficient tool for mid/far-IR transient discovery and characterization. In a SPIRITS-like survey, SPICA can therefore play a crucial and unique role in the growing field of IR time-domain astronomy.

15:00-15:40 Dr. Sarah Crites

Title: Evolution of the Solar System as Revealed by Remote Sensing of Small Bodies

Abstract: Because they lack atmospheres, hydrospheres, global volcanism, or plate tectonics, small airless bodies like the Moon, asteroids, and Phobos and Deimos hold the key to understanding many solar system and planetary crustal evolution processes. These include volatile and organic transport in the inner solar system, magma ocean development and crystallization, and the processes which act to obscure the signal from these major events, including later volcanism, impact modification, mass wasting, and space weathering. I will describe some of the work I have done during my time as a member of the ISAS community to gain new insights from these unique bodies both from existing remote sensing data and samples, and by pushing forward the next generation of measurements through future missions both large and small.

15:40-16:20 Dr. Carlos Noda

Title: New insights on solar polarimetry as preparation for future solar missions: Sunrise/SCIP

Abstract: The Sunrise Chromospheric Infrared spectro-Polarimeter is an instrument under development in Japan in collaboration with international partners in Spain and Germany. It aims to perform polarimetric observations of magnetically sensitive spectral lines in the near infrared, between 770 and 850 nm. We seek to seamlessly understand the solar phenomena at low atmospheric layers taking advantage of the almost atmospheric free conditions the Sunrise balloon (35 km cruise) will provide. More importantly, the instrument aims to improve our knowledge of the Sun thanks to a new configuration where multiple spectral lines are observed simultaneously. Thus, it is crucial to perform different steps before the flight. On the one hand, it is helpful to characterise and determine the capabilities of those lines through theoretical studies. On the other hand, we should improve or update the available numerical tools for inferring the physical properties of the Sun from the future Sunrise/SCIP observations. Thus, I focused my research on those topics last year, and I will summarise my progress so far in this presentation.