

VII Graduate Course Education

1. Department of Astronomical Science, School of Physical Sciences, SOKENDAI (The Graduate University for Advanced Studies)

SOKENDAI (The Graduate University for Advanced Studies) was established in 1988 as an independent graduate university without undergraduate courses via partnerships with inter-university research institutes for the sake of advancing graduate education.

There used to be four schools – Cultural and Social Studies, Mathematical and Physical Sciences, Life Science, and Advanced Sciences before the reorganization of the School of Mathematical and Physical Sciences into the schools of Physical Sciences, High Energy Accelerator Science, and Multidisciplinary Sciences in April 2004. Now the total of six schools are offering doctoral education and research opportunities.

NAOJ has been accepting three-year doctoral-course students since FY 1992 and five-year students since FY 2006 for the Department of Astronomical Science at the School of Physical Sciences. (The School of Mathematical and Physical Sciences was reorganized into the School of Physical Sciences in April 2004.)

(1) Objective of the Department of Astronomical Science

The Department of Astronomical Science aims to train students, through observational, theoretical, or instrument development research in astronomy or in related fields, in an environment with the most advanced observational instruments and supercomputers, as researchers who work at the forefront of world-class research; experts who carry out development of advanced technology; and specialists who endeavor in education and public outreach activities equipped with advanced and specialized knowledge.

Numbers of students to be admitted:

Two (per year in the five-year doctoral course)

Three (per year in the three-year doctoral course)

Degree: Doctor of Philosophy

(2) Admission Policy

The Department of Astronomical Sciences seeks students with a strong interest in astronomy and the Universe; a passion for unraveling scientific questions through theoretical, observational, and instrument development research; and students who have not only basic academic skills, but also theoretical and creative aptitude required for advanced research.

(3) Department Details (Course Offerings)

Optical and Near Infrared Astronomy

[Educational and Research Guidance Field]

Ground-based astronomy / Optical and infrared telescope system / Planets / Sun, stars and interstellar matter / Galaxies and cosmology

Radio Astronomy

[Educational and Research Guidance Field]

Ground-based astronomy / Radio telescope system / Sun, stars and interstellar matter / Galaxies

General Astronomy and Astrophysics

[Educational and Research Guidance Field]

High-precision astronomical measurement / Astronomy from space / Data analysis and numerical simulation / Earth and planets / Sun, stars and interstellar matter / Galaxies and cosmology

(4) Course-by-Course Education Program to Cultivate Researchers in Physical Sciences with Broad Perspectives

The School of Physical Sciences began its “Course-by-Course Education Program to Develop Student Research Capability and Aptitude” in FY 2009 as a part of MEXT’s Program for “Enhancing Systematic Education in Graduate Schools”. Currently the School is carrying out its succeeding program, “Course-by-Course Education Program to Cultivate Researchers in Physical Sciences with Broad Perspectives” since FY 2012, offering four specific courses to the students: the Basic Course, the Advanced Research Course, the Project Research Course, and the Development Research Course. In FY 2015, the Department of Astronomical Science accepted five students in the Basic Course and two students in the Advanced Research Course. The Department also offered the e-learning class “Introduction to Observational Astronomy II” as a school-wide common basic subject, as well as the “Exercise in Scientific English” class, in order to provide a good foundation for students at the graduate school.

In order to better prepare students for the international stage, the Department hosted the Asia Winter School during January 26 to 28, 2016, as well as the 2015 Summer Student program at Mitaka, Mizusawa and Okayama campuses to allow undergraduate students a chance to experience research at the Department of Astronomical Science. In addition to the existing Research Assistant system, the Department also provided Associate Researcher positions for the students of the Department of Astronomical Science.

(5) Number of Affiliated Staff (2016/3/31)

Chair of the Department of Astronomical Science	1
Optical and Near Infrared Astronomy Course	
Professors	9
Associate Professors	13
Lecturer	1
Assistant Professors	14
Radio Astronomy Course	
Professors	8
Associate Professors	9
Assistant Professors	16
General Astronomy and Astrophysics Course	
Professors	7
Associate Professors	13
Assistant Professors	14
<hr/> Total	<hr/> 105

(6) Graduate Students (32 students)

1st year (5 students)

Name	Principal Supervisor	Supervisor	Research Theme
Ando, Misaki	Iono, Daisuke	Saito, Masao Espada, Daniel	Observing Colliding Galaxies Using ALMA
Kambara, Nagaaki	Sekii, Takashi	Watanabe, Tetsuya	Local helioseismology
Kikuta, Satoshi	Imanishi, Masatoshi	Kodama, Tadayuki	Observational study of the formation and evolution of galaxies and supermassive blackholes
Matsuno, Tadafumi	Aoki, Wako	Arimoto, Nobuo	Observational study of metal-poor stars to reveal the history of the near-field Universe
Yoshida, Masaki	Suematsu, Yoshinori	Hara, Hirohisa	On the Structure and Heating Mechanism of Solar Chromosphere and Corona

2nd year (2 students)

Name	Principal Supervisor	Supervisor	Research Theme
Michiyama, Tomonari	Iono, Daisuke	Kodama, Tadayuki Nakanishi, Koichiro	Observing Starburst Galaxies Using ALMA
Yamamoto, Moegi	Kodama, Tadayuki	Iwata, Ikuru	Searching for distant clusters with Subaru/HSC

3rd year (7 students)

Name	Principal Supervisor	Supervisor	Research Theme
Okutomi, Koki	Aso, Yoichi	Flaminio, Raffael	Development of laser interferometer module towards DECIGO
Onoue, Masafusa	Kashikawa, Nobunari	Miyazaki, Satoshi	Studies on High-z quasars by wide-field imaging observation
Nagasawa, Ryosuke	Hanada, Hideo	Matsumoto, Koji	Development of software for precise LLR data analysis and study of Lunar rotation
Baba, Haruka	Aoki, Wako	Usuda, Tomonori	Development of infrared instruments and observational research for the search of earth-like planets
Ryu, Tsuguru	Hayashi, Saeko	Usuda, Tomonori	Direct-imaging for intermediate mass giants with RV trends
Uchiyama, Hisakazu	Kashikawa, Nobunari	Matsuda, Yuichi	The study of large-scale structures based on wide-imaging observations of Subaru telescope
Taniguchi, Kotomi	Saito, Masao	Oishi, Masatoshi	Establishment of new chemistry for carbon-chain molecules in star-forming regions

4th year (10 students)

Name	Principal Supervisor	Supervisor	Research Theme
Yang, Yi	Hayashi, Saeko	Usuda, Tomonori	Observation and Research on Circumbinary Planets
Ishikawa, Shogo	Kashikawa, Nobunari	Kodama, Tadayuki	Measurement of dark halo mass by clustering analysis of star-forming galaxies
Onishi, Kyoko	Iguchi, Satoru	Iono, Daisuke	Observational study towards black-hole mass: resolving the coevolution process of black hole and galaxy
Onitsuka, Masahiro	Usuda, Tomonori	Takato, Naruhisa	The observational study of the atmospheres of the exoplanets and the brown dwarfs
Sakurai, Junya	Miyazaki, Satoshi	Kobayashi, Yukiyasu	Study of large scale structures in the universe through wide field imaging
Shimakawa, Rizumu	Kodama, Tadayuki	Arimoto, Nobuo	Physical conditions of star-forming galaxies at the epoch of galaxy assembly and their environmental dependence
Suzuki, Taiki	Oishi, Masatoshi	Saito, Masao	Research on Organic Molecules in the Universe
Pathak, Prashant	Takami, Hideki	Minowa, Yosuke	Development of Adaptive Optics system and Coronagraph for Subaru Telescope, and observational study of extrasolar planets
Kobayashi, Hiroshi	Osuga, Ken	Tomisaka, Kohji	Radiation Hydrodynamics Simulations of Clumpy Outflows from Black-hole Accretion disks
Suzuki, Tomoko	Kodama, Tadayuki	Iono, Daisuke	Star formation activities at the epoch just before the peak epoch of galaxy formation probed by [OIII] emitters

5th year (8 students)

Name	Principal Supervisor	Supervisor	Research Theme
Aoki, Sumire	Arimoto, Nobuo	Kodama, Tadayuki Takada, Tadafumi	The origin of the morphology of elliptical galaxy
Saito, Yuriko	Imanishi, Masatoshi	Kashikawa, Nobunari Hayashi, Saeko	Investigating the supermassive black hole to spheroidal stellar mass ratio at $z \sim 3$
Matsuzawa, Ayumu	Iguchi, Satoru	Saito, Masao	Research of pointing performance verification method of ALMA at sub mm wavelength and absorbing plasma around SMBH
Oh, Daehyeon	Aoki, Wako	Takami, Hideki	Observational Research on formation of exoplanets and brown dwarfs
Min, Cheul Hong	Honma, Mareki	Shibata, Katsunori	Research for a symbiotic star using VERA
Giono, Gabriel	Suematsu, Yoshinori	Hara, Hirohisa	Study of Optical Tests in Ly- α for CLASP Instrumentation
Shino, Nagisa	Honma, Mareki	Shibata, Katsunori	Testing the formation scenario of massive stars by CH ₃ OH maser
Sukom, Amnart	Tomisaka, Kohji	Hayashi, Saeko	Study of star and planetary formation process and the exoplanets based on infrared observations

Research Student (4 student)

Name	Supervisor	Research Theme
Yang, Yongzhang	Hanada, Hideo	Research of the interior of the moon and the planet based on an application of rotation theory
Cheng, Chen	Nakamura, Fumitaka	Observational Research of Nearby Star-Forming Regions
De Leon, Jerome Pitogo	Usuda, Tomonori	Near-Infrared Observations of Protoplanetary Disks and Exo-Planets
Chida, Hikaru	Honma, Mareki	Probing very Early Stage of Radio Source Evolution in 3C 84 with VERA

2. Education and Research Collaboration with Graduate Schools

Name	Affiliated Institute	Supervisor	Thesis
Kurose, Ippei	The University of Tokyo	Ohashi, Nagayoshi	Observational Study of Star Forming Regions
Sakai, Iori	The University of Tokyo	Kobayashi, Yukiyasu	Development of equipment and data analysis related to JASMINE
Sasaki, Hirokazu	The University of Tokyo	Kajino, Toshitaka	Neutrino oscillation in super novas
Tatsuuma, Misako	The University of Tokyo	Kokubo, Eiichiro	Theoretical Study of Formation and Evolution of Planetary Systems
Fujii, Yoshinori	The University of Tokyo	Flaminio, Raffaele	Development of the vibration isolation system for the KAmioka GRavitational-wave Antenna
Fujita, Ayato	The University of Tokyo	Gouda, Naoteru	Dynamical Structure and its Evolution of the Milky Way
Isoe, Mari	The University of Tokyo	Kokubo, Eiichiro	Theoretical Study of Formation and Evolution of Planetary Systems
Ito, Yuta	The University of Tokyo	Gouda, Naoteru	The dynamical structure of the Galaxy
Kimura, Yasuhisa	The University of Tokyo	Hara, Hirohisa	Study of Sub-arcsec Transition-Region Structures at the Footpoints of Active-Region Loops
Kuramochi, Kazuki	The University of Tokyo	Kobayashi, Hideyuki	A test of in-beam phase referencing with VERA
Kuwahara, Sho	The University of Tokyo	Mizuno, Norikazu	Triggered star formation of the young massive clusters by the cloud-cloud collisions
Kato, Yuta	The University of Tokyo	Mizuno, Norikazu	Star forming activity in the $z=2-3$ proto-clusters with Infrared Space telescope
Sakai, Daisuke	The University of Tokyo	Kobayashi, Hideyuki	Dynamical study of the Galactic center region with VLBI observations
Hirai, Yutaka	The University of Tokyo	Kajino, Toshitaka	Origin of the r-process elements in galactic chemodynamical evolution model
Lee, Minju	The University of Tokyo	Kawabe, Ryohei	Environmental effects on galaxy evolution in protoclusters
Marchio, Manuel	The University of Tokyo	Flaminio, Raffaele	Development, characterization and improvement of the mirrors for the KAGRA gravitational wave detector
Shu, Shibo	The University of Tokyo	Sekimoto, Yutaro	Development of MKID camera
Aso, Yusuke	The University of Tokyo	Ohashi, Nagayoshi	Environmental effects on star and disk formation
Ohashi, Satoshi	The University of Tokyo	Mizuno, Norikazu	Chemical evolution of the star-forming cores in the giant molecular clouds
Saito, Toshiki	The University of Tokyo	Kawabe, Ryohei	Star Formation and SMBH Activities in Merging Galaxies from High-density Molecular Gas Tracers
Shibagaki, Shota	The University of Tokyo	Kajino, Toshitaka	Revealing the origin of r-process elements with astrophysical simulations
Shibata, Takashi	The University of Tokyo	Kokubo, Eiichiro	Theoretical Study of Formation and Evolution of Planetary Systems
Sekiguchi, Sigeyuki	The University of Tokyo	Sekimoto, Yutaro	Development of broadband polarization MKID camera for Cosmic Microwave Background B-mode observations
Tagawa, Hiromichi	The University of Tokyo	Gouda, Naoteru	Early cosmic merger of multiple black holes
Koyamatsu, Shin	The University of Tokyo	Ohashi, Nagayoshi	Formation and Evolution of Protoplanetary Disks
Sekine, Masakazu	The University of Tokyo	Sekimoto, Yutaro	Development of superconducting device for wideband observation of CMB B-mode polarization
Hara, Takuji	The University of Tokyo	Gouda, Naoteru	Construction of the galaxy model with phase space distribution
Hara, Chihomi	The University of Tokyo	Kawabe, Ryohei	Structures and Kinematics of Dense gas and Molecular Outflow in YSOs.
Fujii, Kosuke	The University of Tokyo	Mizuno, Norikazu	Observational Study of the triggered star formation in the Large Magellanic Cloud
Kiyokane, Kazuhiro	The University of Tokyo	Mizuno, Norikazu	Observational Study of Star Formation process with radio observations

3. Commissioned Graduate Students

Doctoral Course	Affiliated Institute	Period	Supervisor	Thesis
Silva, Andrea	Department of Physics and Astronomy, Tufts University	2015/4/1~ 2016/3/31	Iono, Daisuke	ALMA Observations of Starburst Galaxies
Matsuo, Mitsuhiro	Kagoshima University	2015/4/1~ 2016/3/31	Saito, Masao	Observations of molecular clouds in the outer galaxy with a wideband digital spectrometer
Ui, Takahiro	Hiroshima University	2015/4/1~ 2016/3/31	Yamashita, Takuya	Observational study of the young planet 2MASSJ0525+0125
Oya, Masahito	Nihon University	2015/4/1~ 2016/3/31	Watanabe, Junichi	Development of precise adaptive optics for direct observation of extrasolar planets
Sekiguchi, Takanori	The University of Tokyo	2015/4/1~ 2015/9/30	Flaminio, Raffaele	Development of Vibration Isolation System for KAGRA

Master's Course	Affiliated Institute	Period	Supervisor	Thesis
Mori, Takahiro	Tokyo University of Agriculture and Technology	2015/4/1~ 2016/3/31	Watanabe, Junichi	Wideband Laser frequency comb for IR Doppler observation
Aoki, Misa	International Christian University	2015/4/1~ 2015/9/30	Aoki, Wako	Study of Galactic chemical evolution based on abundance analysis of metal-poor stars
Kozuki, Yuto	Osaka Prefecture University	2015/4/1~ 2016/3/31	Noguchi, Takashi	100 GHz SIS Mixer with wide RF and IF bandwidth
Sunaga, Naoki	Shizuoka University	2015/4/1~ 2015/9/30	Kajino, Toshitaka	Primordial nucleosynthesis in the early universe
Tschiya, Chie	The Open University of Japan	2015/4/1~ 2016/3/31	Watanabe, Junichi	Effect of Earth's motion to expansion of radiant points in meteor showers
Fukagawa, Nao	International Christian University	2015/10/1~ 2016/3/31	Kodama, Tadayuki	Inflow and Outflow of Gas in Galaxies and Its Mass Dependence

4. Degrees Achieved with NAOJ Facilities

Name	Degree	Thesis
Oh, Daehyeon	Doctor of Philosophy, SOKENDAI	Direct Imaging Analysis of the Circumstellar Disks and Planetary-mass Companions on Wide Orbit Around a Disk-host Star
Giono, Gabriel	Doctor of Philosophy, SOKENDAI	Novel Instrumentation to Reach the 0.1 % Polarization Accuracy for the Chromospheric Lyman-Alpha Spectro-Polarimeter
Nagasawa, Ryosuke	Master of Science, SOKENDAI	Development of software for precise LLR data analysis and study of Lunar rotation