UTRIP 2025 (June 25 - August 5)
Hosting Laboratories Information & Project Topics

Physics members

Hosting Faculty Member(Title)	Research Topic & Research Description Special Academic Conditions Required for Research
Yasushi OKADA (Professor)	Development of Advanced Optical Microscopy Techniques and their Application in Cell Biology Research Our laboratory specializes in developing cutting-edge optical microscopy technologies, like super-resolution microscopy, and their applications in molecular cell biology. Interns will gain hands-on experience in technical development, delving into microscope optics, probes, or image processing, or directly in cellular biology research, such as live-cell imaging and single-molecule measurements in living cells or in vitro.
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Basic knowledge of microscope optics and/or cell biology **2）Required study field(s)** Biophysics, cell biology or basic optics **3）Academic background or research project experience to be considered at selection** Animal cell culture, microscopy, live cell imaging, image processing, machine learning, molecular cloning **4）Selection and evaluation criteria, if any** Candidates will be evaluated based on their level of enthusiasm, specificity of interests, and how well their aspirations align with the direction and objectives of our laboratory.
Synge Todo (Professor)	In our research group, we study Monte Carlo method, information compression by tensor-network representation, statistical machine learning, etc. We aim to elucidate the states of matter, phase transition phenomena, and dynamics of various quantum many-body systems. We also study the theory of quantum computers and quantum machine learning algorithms. Possible UTRIP research topics are phase transition phenomena in many-body systems or quantum computer algorithms using numerical simulations based on the Monte Carlo method, tensor network methods, etc.
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Basic knowledge of statistical physics and quantum mechanics. Basic skills in programming in Python, C++, or Julia **2）Required study field(s)** Statistical physics, quantum information, or computational physics **3）Academic background or research project experience to be considered at selection** None **4）Selection and evaluation criteria, if any** None
Haozhao LIANG (Associate Professor)	Quantum many-body theories for properties of atomic nuclei The research focuses on applying and developing quantum many-body theories to investigate the novel properties of stable and unstable nuclei and the impacts on astrophysical nucleosynthesis.
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Knowledge on quantum mechanics **2）Required study field(s)** Theoretical physics or Computational physics **3）Academic background or research project experience to be considered at selection** It would be better to have some basic knowledge of nuclear physics or atomic physics **4）Selection and evaluation criteria, if any** None

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Yasuhiro NAKAJIMA (Associate Professor)	Our group is conducting experimental studies of particle and astroparticle physics with neutrinos. Possible research topics for students include, but are not limited to; developing a new kind of neutrino detector, testing a new method to search for neutrinoless double-beta decay, and simulation of a large water Cherenkov detector for improved neutrino detection.
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Basic knowledge of physics. **2）Required study field(s)** Physics **3）Academic background or research project experience to be considered at selection** Preferrable to have experiences on computer programming and physics lab. **4）Selection and evaluation criteria, if any** Interests in experimental particle physics and/or particle astrophysics.
Takuro IDEGUCHI (Associate Professor)	Ultrafast laser spectroscopy, Bioimaging
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Basic knowledge of optics **2）Required study field(s)** Physics, Chemistry, Biology, Engineering, or Information science **3）Academic background or research project experience to be considered at selection** None **4）Selection and evaluation criteria, if any** None
Kuniaki KONISHI (Associate Professor)	We are investigating new physical phenomena caused by the interaction of light with nano- and micro-scale ultra-fine artificial structures fabricated by state-of-the-art microfabrication techniques, and their application to optical control (Metasurface and Meta-optics). Furthermore, based on condensed matter physics, we are exploring the scientific principles of laser processing to understand why light can break things, and are developing new methods for fabricating micro three-dimensional structures using state-of-the-art ultrashort pulsed lasers. This UTRIP program provides an opportunity to experience the fundamentals of metamaterials or laser processing research.
	1）Prerequisite knowledge and/or specific skill(s) and its proficiency Basic knowledge of optics, lasers, and solid state physics. English language skills for communicating. **2）Required study field(s)** Optics, Solid State Physics **3）Academic background or research project experience to be considered at selection** It is better for the student to have previous experience of conducting optical experiments and working with lasers. **4）Selection and evaluation criteria, if any** Priority will be given to junior class students who are interested in future graduate study in Japan