

## UCEAP 2023 Summer Lab Research in Science - Hosting Laboratories

UCEAP nominees must read the descriptions and requirements for each lab closely before submitting their documents to the School of Science, UTokyo, for the final selection process.

Department	Hosting Faculty Member(Title)	Research Topic & Research Description
		Special Academic Conditions Required for Research
<a href="#">Earth &amp; Planetary Science</a>	<a href="#">Kanakano Seki (Professor)</a>	<p>Study of acceleration mechanisms of relativistic electrons in the radiation belt based on analysis of the plasma observation data by satellite</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Certification of the English ability and basic computer (programming/visualization) skills to conduct research of the required study field.</p> <p><b>2) Required study field(s):</b> Space physics, plasma physics, geophysics, or physics</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> At least one recommendation letter from a researcher(s) with eminent research background</p> <p><b>4) Selection and evaluation criteria, if any:</b> None</p>
<a href="#">Earth &amp; Planetary Science</a>	<a href="#">Masataka Kinoshita (Professor)</a>	<p>In the last decade or two we have obtained a series of deep-sea drilling and monitoring, seafloor observation, and seismic exploration datasets. We put focuses on integration of these data toward the assessment of physical properties, both along and above the seismogenic fault zone of the subducting plate boundary of Nankai Trough or other subduction zones. During this program, I introduce the data and methods, some of which you can use to speculate your own model if you want.</p> <p>*Overpressure estimation from Vp anomaly in seismic profiles (e.g. Matlab) *Borehole pressure data time-series analysis *Stress orientation from borehole breakouts *Slip tendency from geometry of faults *Thermal response of fault zone</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Certification of the English ability to communicate on Earth science and that of a good deal of experience in marine geology and geophysics</p> <p><b>2) Required study field(s):</b> Basic physics, plate tectonics, geophysics (basic level)</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Basic skill on mathematics (differential equation). Better to have experience on computer programming (including macro scripting, etc.).</p> <p><b>4) Selection and evaluation criteria, if any:</b></p>

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<a href="#">Earth &amp; Planetary Science</a>	<a href="#">Yosuke Aoki</a> (Associate Professor)	<p>Modeling earthquake and volcano deformation using space geodetic data</p> <p>Earthquake and volcanic activity involves faulting or migration of volcanic fluids below Earth's surface, and they can be detected as the deformation of the Earth's surface. This internship investigates the distribution of slip distribution due to an earthquake or images migration of magmatic fluids associated with volcanic activity. Choice of earthquake or volcano topic is up to the trainee.</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Some experience of scientific computing with Linux or Macintosh system is required.</p> <p><b>2) Required study field(s):</b> Basic physics and mathematics. Some knowledge about Geology is a plus but not required.</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Geophysics, Geology, Mathematics, Physics, or related field</p> <p><b>4) Selection and evaluation criteria, if any:</b> Passion and enthusiasm for Earth Science</p>
<a href="#">Earth &amp; Planetary Science</a>	<a href="#">Shingo WATADA</a> (Associate professor)	<p>Application of a wave interferometry technique to seismic waves and tsunamis.</p> <p>A student will learn the novel data processing method which retrieves virtual seismic waves and tsunamis from continuous ground motion and ocean bottom pressure records. These virtual waves will be compared with numerical simulations.</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Basic knowledge of computer programming (C, C++, or Python).</p> <p><b>2) Required study field(s):</b> Basic (1st and 2nd year) physics and mathematics</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Background in earth science (geophysics, geology) is preferred but not required</p> <p><b>4) Selection and evaluation criteria, if any:</b> Priority will be given to junior class students who are interested in future graduate study in seismology and related subjects at the University of Tokyo.</p>
<a href="#">Information Science</a>	<a href="#">Hiroshi IMAI</a> (Professor)	<p>Privacy and Security Aspects on Massive Social Networks</p> <p>This research will use algorithmic and combinatorial optimization techniques to protect information diffusion and leakage from social networks. Randomized and quantum algorithms may be explored in this direction.</p> <p>The research will be guided by Prof. Vorapong Suppakitpaisarn <a href="http://www.vorapong-sup.net/">http://www.vorapong-sup.net/</a> and by Prof. Hiroshi Imai at the Lab Web.</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Applicants must have strong background in discrete mathematics, data structure, and algorithms.</p> <p><b>2) Required study field(s):</b> Computer Science, Electrical and Computer Engineering</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Applicants who have conducted special discrete mathematic projects, have solved problems in online programming platform such as Project Euler, or have joined programming competitions such as Code Jam or Top Coder will be specially considered.</p> <p><b>4) Selection and evaluation criteria, if any:</b> We may ask applicants to solve discrete mathematic problem in limited amount of time.</p>

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<a href="#">Chemistry</a>	<a href="#">Robert E. CAMPBELL</a> (Professor)	<p>Protein engineering and chemical biology for the development of fluorescent biosensors of neural activity and metabolism</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Applicants should have some familiarity with introductory organic chemistry, protein biochemistry, spectroscopy, and cell biology.</p> <p><b>2) Required study field(s):</b> Protein engineering and chemical biology.</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Some previous experience in a chemistry or biochemistry laboratory would be ideal.</p> <p><b>4) Selection and evaluation criteria, if any:</b> We are committed to fostering a diverse, inclusive, and equitable laboratory environment.</p>
<a href="#">Chemistry</a>	<a href="#">Keisuke GODA</a> (Professor)	<p>Molecular imaging and spectroscopy for biological and medical applications</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Basic understanding of physics, chemistry, and/or biology is required. Prior experience in optics, microfluidics, digital image processing, and/or nanotechnology is a plus.</p> <p><b>2) Required study field(s):</b> One of the following fields: physics, chemistry, biology, computer science, bioengineering, mechanical engineering, electrical engineering, chemical engineering, medicine, etc.</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Basic understanding of physics, chemistry, and/or biology is required. Prior experience in optics, microfluidics, digital image processing, and/or nanotechnology is a plus.</p> <p><b>4) Selection and evaluation criteria, if any:</b> Strong curiosity and motivation to explore unknown domains of nature and exploit new applications</p>
<a href="#">Chemistry</a>	<a href="#">Shu Kobayashi</a> (Professor)	<p>Organic synthesis based on new design of useful catalysts. The research focuses on synthesis and application of newly designed catalysts to efficient and useful synthetic organic reactions.</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Knowledge of organic chemistry and basic experimental technique of synthetic organic chemistry</p> <p><b>2) Required study field(s):</b> Organic chemistry, analytical chemistry</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> It is better for the student to have a basic knowledge of organic chemistry.</p> <p><b>4) Selection and evaluation criteria, if any:</b></p>
<a href="#">Mathematics</a>	<a href="#">Yasuyuki Kawahigashi</a> (Professor)	<p>Operator Algebras. This is a kind of infinite dimensional linear algebra related to quantum mechanics.</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Basic linear algebra</p> <p><b>2) Required study field(s):</b> Mathematics</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Some knowledge on quantum physics would be better.</p> <p><b>4) Selection and evaluation criteria, if any:</b> None</p>

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<a href="#">Physics</a>	<a href="#">Yasushi OKADA</a> (Professor)	<p>Super-resolution live cell imaging. We are developing new microscopes and their applications for the live cell imaging of neurons and other cells in culture. We are interested in various transport processes in cells, including axonal transport and nuclear transport, as well as organelle (membrane) trafficking.</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Basic knowledge of cell biology and/or microscopy.</p> <p><b>2) Required study field(s):</b> Biophysics, cell biology, and basic optics.</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> Animal cell culture, microscopy, live cell imaging, image processing.</p> <p><b>4) Selection and evaluation criteria, if any:</b> None</p>
<a href="#">Physics</a>	<a href="#">Haozhao LIANG</a> (Associate Professor)	<p>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</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Knowledge on quantum mechanics</p> <p><b>2) Required study field(s):</b> Theoretical physics or Computational physics</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> It is better for the student to have a basic knowledge of nuclear physics</p> <p><b>4) Selection and evaluation criteria, if any:</b> None</p>
<a href="#">Physics</a>	<a href="#">Takuro IDEGUCHI</a> (Associate Professor)	<p>Ultrafast spectroscopy, bioimaging, laser physics. We are developing new spectroscopy and microscopy techniques based on modern optical technology. We also use machine learning methods for analyzing measured data. The developed systems are to be used in the fields of biology, medicine, chemistry and physics.</p> <hr/> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b> Basic knowledge of optics</p> <p><b>2) Required study field(s):</b> Physics, Chemistry, Electrical engineering or information science</p> <p><b>3) Academic background or research project experience to be considered at selection:</b> None</p> <p><b>4) Selection and evaluation criteria, if any:</b> None</p>

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<a href="#">Physics</a>	<a href="#">Yasuhiro NAKAJIMA</a> (Associate Professor)	<p>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.</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and proficiency level:</b>            Basic knowledge of physics.</p> <p><b>2) Required study field(s):</b>            Physics</p> <p><b>3) Academic background or research project experience to be considered at selection:</b>            Preferrable to have experiences on computer programming and physics lab</p> <p><b>4) Selection and evaluation criteria, if any:</b>            Interests in experimental particle physics and/or particle astrophysics.</p>