

UCEAP 2025 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="#">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 its proficiency</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>
<a href="#">Information Science</a>	<a href="#">Ken-ichi KAWARABAYASHI</a> (Professor)	<p>The main focus of this laboratory is on "algorithms" and "discrete mathematics". We do not conduct research with applications in mind from the beginning. Rather, we seek for thorough basic research with an emphasis on theoretical research. In algorithm research, we conduct theoretical analysis for improving time complexity and for algorithmic correctness, as well as developing techniques for implementations (to speed up and scale). In discrete mathematics research, we explore deep mathematical theories and develop techniques that can be applied to other fields, including algorithms.</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</b> Basic Mathematics and Algorithms</p> <p><b>2) Required study field(s)</b> Mathematics or Computer 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>
<a href="#">Physics</a>	<a href="#">Yasushi OKADA</a> (Professor)	<p>Development of Advanced Optical Microscopy Techniques and their Application in Cell Biology Research</p> <p>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.</p> <p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</b> Basic knowledge of microscope optics and/or cell biology</p> <p><b>2) Required study field(s)</b> Biophysics, cell biology or 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, machine learning, molecular cloning</p> <p><b>4) Selection and evaluation criteria, if any</b> 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.</p>

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<a href="#">Physics</a>	<a href="#">Satoru NAKATSUJI</a> (Professor)	<p>The research activities in our lab focus on the design and synthesis of new quantum materials, followed by comprehensive post-synthesis characterization via chemical and structural analysis, electrical and thermal transport measurements, and bulk thermodynamic probes. We then seek for potential applications of such new materials through fabrication of thin-film devices.</p> <p>Undergraduate research projects within our group can span a broad spectrum of topics. The projects may be focused on exploring new physics or more application-orientated, with an emphasis on real-world technology development.</p>
		<p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</b> Condensed matter physics; previous experiences in bulk material synthesis or thin-film fabrication are preferred but not required; some experience with programming languages and simulation software (e.g., Python, C++, LabView, MATLAB)</p> <p><b>2) Required study field(s)</b> Physics, Applied Physics, Engineering Physics</p> <p><b>3) Academic background or research project experience to be considered at selection</b> The candidates are required to demonstrate strong performance in core physics courses, such as quantum mechanics and statistical mechanics, and have basic knowledge of condensed matter physics. Prior lab experience either through coursework or undergraduate research assistantship is a plus.</p> <p><b>4) Selection and evaluation criteria, if any</b> Priority will be given to candidates who are interested in pursuing graduate study in experimental condensed matter physics.</p>
<a href="#">Physics</a>	<a href="#">Takuro IDEGUCHI</a> (Associate Professor)	<p>Ultrafast spectroscopy, bioimaging, laser physics.</p> <p>We are developing new spectroscopy and microscopy techniques based on modern optical technology. We also use machine learning methods for analyzing measured data.</p> <p>The developed systems are to be used in the fields of biology, medicine, chemistry and physics.</p>
		<p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</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>
<a href="#">Earth &amp; Planetary Science</a>	<a href="#">Masataka KINOSHITA</a> (Professor)	<p>In the Nankai Trough, frequent slow earthquakes (fluctuations with a longer duration than normal earthquakes) occur, some of which are closely related to the subduction of seamounts. Hyuga-Nada, having no magnitude-8 class earthquake, is subducted by the Kyushu-Palau Ridge, a long line of seamounts. We believe that the seamount subduction fractures surrounding strata and reduce their strength, resulting in strain release as slow earthquakes. We will install fiber-optic strain gauges, water pressure gauges, seismometers and thermometers near the subducted seamount to detect deformation around the seamount and the occurrence of slow earthquakes. Numerical modeling will be used to evaluate the effect of seamount subduction on the occurrence of slow earthquakes. Since slow earthquakes can be related to the readiness of a large earthquake, we will start observations and monitoring now toward the next Nankai Trough earthquake that is anticipated to occur with a probability exceeding 70% within the next 30 years.</p>
		<p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</b> Certification of the 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> 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>
		<p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</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="#">Chemistry</a>	<a href="#">Keisuke GODA</a> (Professor)	<p>At Goda Lab, our primary mission is to develop "serendipity-enabling technologies" that align with Louis Pasteur's famous quote, "Chance (serendipity) favors the prepared mind." Our focus is on developing innovative tools for molecular imaging and spectroscopy by integrating photonics, nanotechnology, microfluidics, and data science. By utilizing these tools, we aim to discover unknown phenomena, elucidate mechanisms, and explore new applications in science, industry, and medicine. We employ theoretical, experimental, and computational techniques to tackle critical problems. Additionally, we are committed to cultivating the next generation of global leaders who will shape the world in the 21st century. We foster an international and interdisciplinary research environment that values flat human relationships, and we actively seek out talented individuals from any university or company, regardless of their field of study.</p>
		<p><b>1) Prerequisite knowledge and/or specific skill(s) and its proficiency</b>  1. Applicants must possess foundational knowledge in molecular imaging, spectroscopy, photonics, nanotechnology, microfluidics, and/or data science, as our lab extensively works on integrating these domains to develop innovative tools.  2. Demonstrated skills in theoretical, experimental, and computational techniques are highly beneficial.  3. Ability to work in an international and interdisciplinary research environment with a cooperative mindset is crucial.  4. Applicants should be ready to engage actively in discovering unknown phenomena, elucidating mechanisms, and exploring new applications in science, industry, and medicine.</p> <p><b>2) Required study field(s)</b>  1. We encourage applications from candidates majoring in fields related to, but not limited to, physics, chemistry, biology, data science, materials science, electrical engineering, mechanical engineering, chemical engineering, bioengineering, or a closely related field.  2. Given the interdisciplinary nature of our work, individuals from various scientific and engineering disciplines who possess a strong interest and background in the areas we focus on are welcome to apply.</p> <p><b>3) Academic background or research project experience to be considered at selection</b>  1. Applicants should have a strong academic record with coursework or research experience that aligns with the areas of molecular imaging, spectroscopy, photonics, nanotechnology, microfluidics, and data science.  2. Experience in working on projects or research that involves theoretical, experimental, and computational techniques to solve critical problems is highly desirable.  3. Participation in projects that demonstrate the ability to discover, elucidate, and explore in science, industry, and medicine is an added advantage.</p> <p><b>4) Selection and evaluation criteria, if any</b>  1. Academic Excellence: Strong GPA and coursework in relevant fields.  2. Research Experience: Prior involvement in projects or research in areas like molecular imaging, spectroscopy, photonics, nanotechnology, microfluidics, and data science.  3. Technical Skills: Proficiency in theoretical, experimental, and computational techniques related to our lab's focus.  4. Interpersonal Skills: Ability to thrive in an international, interdisciplinary research environment with strong communication and collaboration skills.  5. Alignment with Lab's Mission: Demonstrated interest and commitment to developing technologies that enable discovery and exploration in science, industry, and medicine.  6. Leadership Potential: Evidence of potential to become a future global leader in academia, industry, or entrepreneurship.</p>