

Sustainable Global Environmental Studies Program

We conduct education and research on the past, present, and future history and changes of the atmosphere, hydrosphere, geosphere, and biosphere that make up the Earth's environment, as well as their interactions, from the earth's interior to outer space, to develop human resources with interdisciplinary knowledge and thinking ability. Specifically, education and research are conducted on the structure, behavior, evolution, and diversity of organisms in the Earth's environment, and the mechanisms of transmission, expression, and regulation of genetic information. Based on the knowledge obtained from these studies, we conduct education and research on (1) genetic engineering for the industrial production of useful materials, (2) analysis of the relationship between biological functions and the internal and external environment, (3) conservation and restoration of the environment using chemical and biological methods, (4) changes in the crustal structure, (5) prediction of natural disasters, and (6) disaster prevention technology. Furthermore, we also work on issues aimed at the formation of a sustainable society.

Educational field	Education and Research	Supervisors	Related lectures
Geosphere material system science	We conduct education and research for unveiling the origins of underground resources and changes in the global environment during 4.6 billion years of the Earth history. The primary targets of our study are solid substances that record the Earth history such as minerals, rocks, and sedimentary strata. From the targets, we explore the material cycle, chemical reaction, heat history, and environmental changes of the Earth from its birth to the present on the basis of accurate age dating.	Prof. Yasuo Ishizaki ishizaki@sus.u-toyama.ac.jp Prof. Shin-ichi Sano ssano@sus.u-toyama.ac.jp Associate Prof. Ken-ichi Yasue yasueken@sus.u-toyama.ac.jp	Advanced volcanology Earth and life history Advanced neotectonics
Disaster prevention science	Hokuriku area has been suffering from various natural disasters: heavy snow fall, winter thunderstorm, storm surge, earthquakes, etc. In order to mitigate the damage by such disasters, our research advances our understanding of the dynamics of the Earth's atmosphere, hydrosphere and lithosphere. This major is also committed to providing students with the opportunities to apply their research to problems in local communities.	Prof. Tohru Watanabe twatnabe@sus.u-toyama.ac.jp Prof. Kazuaki Yasunaga yasunaga@sus.u-toyama.ac.jp Prof. Kazuma Aoki kazuma@sci.u-toyama.ac.jp Prof. Konosuke Sugiura sugiura@sus.u-toyama.ac.jp	Advanced physics of the Earth's interior Advanced dynamic meteorology Atmospheric radiation Advanced geoglaciology

		<p>Prof. Bunmei Taguchi taguchi@sus.u-toyama.ac.jp</p> <p>Prof. Masahiro Hori mhorii@sus.u-toyama.ac.jp</p> <p>Associate Prof. Wataru Shimada shimada@sci.u-toyama.ac.jp</p> <p>Associate Prof. Atsushi Hamada hamada@sus.u-toyama.ac.jp</p>	<p>Advanced ocean and climate dynamics</p> <p>Advanced remote sensing</p> <p>Advanced snow and ice science</p> <p>Advanced atmospheric physics</p>
Earth systems science	<p>We conduct geological and geophysical field investigations, computational analyses, and laboratory experiments of rocks and sediments, mainly with paleomagnetic and rock-magnetic methods, in order to clarify internal structures and their evolution in the solid Earth, and tectonic movements and environmental changes through geologic time in the Earth system. We aim to develop talented people who understand complex interaction among various components of the Earth system.</p>	<p>Prof. Naoto Ishikawa ishikawa@sus.utoyama.ac.jp</p> <p>Associate Prof. Kazuo Kawasaki kawasaki@sus.utoyama.ac.jp</p>	<p>Advanced paleomagnetism and rock magnetism</p> <p>Resource and environmental geophysics</p>
Regulatory biology	<p>Education and research are conducted on adaptive significance of biological rhythms and sleep system, endocrine system, and behavioral system of an individual organism or population in changing external environments.</p>	<p>Prof. Kouhei Matsuda kmatsuda@sci.utoyama.ac.jp</p> <p>Lecturer Norifumi Konno nkonno@sci.utoyama.ac.jp</p> <p>Lecturer Tomoya Nakamachi nakamachi@sci.utoyama.ac.jp</p>	<p>Advanced Biochemistry for Organic Molecules</p> <p>Advanced endocrinology</p> <p>Advanced behavioral physiology</p>
Life information science	<p>We conduct education and research on molecular mechanisms of cell differentiation and organ development in higher plants, structure, and expression of plant genome. The perception and transduction of environmental signals such as light and hormones are also studied.</p>	<p>Prof. Ichirou Karahara karahara@sci.utoyama.ac.jp</p> <p>Lecturer Daisuke Tamaoki tamaoki@sci.utoyama.ac.jp</p>	<p>Advanced plant morphology</p> <p>Advanced plant cell biology</p>
Living structure science	<p>We analyze various processes in the biological developments, morphogenesis, structural features, phylogenetic relationships, diversity, behavioral ecology and evolution through comparative study in living structures. Thus, we conduct education and research to understand the fundamental principles and rules.</p>	<p>Associate Prof. Yuji Yamazaki yatsume@sci.utoyama.ac.jp</p> <p>Associate Prof. Kiyoto Maekawa kmaekawa@sci.utoyama.ac.jp</p> <p>Associate Prof. Tutomu Tsuchida tsuchida@sci.utoyama.ac.jp</p>	<p>Living structure science</p> <p>Advanced evolutionary developmental biology</p> <p>Advanced biology of symbiosis</p>

Environmental and analytical chemistry	<p>Our group focuses on exploring techniques from chemical approaches in solving and clarifying environmental problems. For example, we are developing simple and rapid analytical methods to measure harmful components related to environmental pollution. The dynamics of these components are then studied, and based on these findings, we perform basic research to remove the pollutants from waste water. Furthermore, our research also includes geochemical monitoring of CO₂ which consists of water rock interaction in geothermal fields. We also clarify and evaluate material cycling systems and mechanisms and changes in oceanic and terrestrial water systems, using major ions, trace elements, and stable isotopes.</p>	<p>Prof. Jing Zhang jzhang@sci.utoyama.ac.jp</p> <p>Prof. Hideki Kuramitsu kuramitz@sci.utoyama.ac.jp</p> <p>Prof. Keiji Horikawa horikawa@sci.utoyama.ac.jp</p>	<p>Advanced marine geochemistry</p> <p>Advanced water analysis</p> <p>Isotope studies in environmental science</p>
Environmental Biology	<p>We conduct research on the functions of organisms, which are important components of the biosphere, from the molecular to ecosystem level. In particular, education and research will be conducted on the effects of environmental factors such as light, water, metal ions, and chemical substances on the physiological functions of organisms, the effects of global environmental change, and interactions between individual organisms and between species.</p>	<p>Prof. Daisuke Tanaka tanakada@sci.utoyama.ac.jp</p> <p>Prof. Hiroshi Ishii hishii@sci.utoyama.ac.jp</p> <p>Associate Prof. Hiroyuki Kamachi kamachi@sci.utoyama.ac.jp</p> <p>Associate Prof. Kenji Kashiwagi kashiwagi@sci.utoyama.ac.jp</p> <p>Lecturer Akihiro Sakatoku sakatoku@sci.utoyama.ac.jp</p>	<p>Advanced microbiology</p> <p>Advanced plant ecology</p> <p>Advanced plant physiology</p> <p>Advanced stratigraphy</p> <p>Advanced environmental molecular biology</p>
Advanced Conservation Ecology	<p>From the perspective of the use and conservation of natural ecosystems, agricultural lands, plantations, and other green spaces, I will guide environmental research for Ph.D students.</p>	<p>Prof. Naoya Wada wada@sci.utoyama.ac.jp</p>	<p>Advanced Conservation Ecology</p>