

The University of Tsukuba Newspaper

50th Anniversary of University of Tsukuba Special Issue Excerpt version

“Changing entrenched social systems”

Interview with President NAGATA Kyosuke



University of Tsukuba will celebrate its 50th anniversary on October 1st this year. The University has been a new concept university open to the world, with internationality and interdisciplinarity as its founding principles, and has pioneered the adoption of the “faculty organization-education program separation system,” in which students and faculty belong to different organizations. For the 50th anniversary of the university's opening, this paper interviewed President NAGATA Kyosuke about the achievement of the university's founding principles and its future prospects.

(Interviewer: TAKEMOTO Aika and KATO Midori; Photo: AONO Shimpei; August 2, the Administration Center)

President NAGATA became the ninth president of the University of Tsukuba in April 2013, and was re-elected by the President Nomination Committee in 2014, 2018, and 2020, leading the university for the past 10 years.

He praised the internationality of the university, saying, “It has really been promoted over the past decade or so.” He said that internationalization has become visible organizationally, with the establishment of the Department of Global Activities (now the Bureau of Global Initiatives) and other measures.

Regarding interdisciplinarity, he said, “The university has been open in every aspect from early on.” He also expressed his “personal regret” at the discontinuation (in 2007) of the formation of schools with degree-based education programs across the humanities and sciences, and said, “I think we need to rework undergraduate education system.”

He also mentioned “changing entrenched social systems” as one of the remaining issues in the founding principles. He added, “We will change entrenched social systems such as the overconcentration of power in Tokyo and university rankings. Unless we do so, the University of Tsukuba is not considered to be completed.”

“It is People Who Create the Future”

Interview with President NAGATA (detailed version)

Dealing sensitively with contemporary society

—Fifty years have passed since University of Tsukuba opened its doors to the public. How do you evaluate the University of Tsukuba's achievements and current status?

The internationality and interdisciplinarity that the university has promoted since its opening have finally taken shape over the past decade or so. For example, the Department of Global Activities (now the Bureau of Global Initiatives) was probably the first of its kind at a national university. The organization has become more visible.

Basic research and interdisciplinary research have borne fruit, as evidenced by the Nobel Prize awarded to Professor Emeritus SHIRAKAWA Hideki and the development of industry-academia collaborative research, respectively.

However, what I personally regret is the discontinuation of the formation of schools with degree-based education programs across the humanities and sciences. Such a system is now required in Japan and around the world. I am wondering if undergraduate education system needs to be remade.

What has not been addressed at all in the founding principles is to solve the dissatisfaction with “entrenched” social systems through new concepts. Without that, the University of Tsukuba will never be complete. In the next 50 years, we want to break down concepts such as the overconcentration of power in Tokyo and university rankings. As a result of believing in these concepts, Japan has fallen behind the world in science and technology, and the Japanese economy has stagnated.

—What is required for the University of Tsukuba in the future?

What is good about the University of Tsukuba is that it is flexible and does not adhere to systems that have been established in the past. It has developed and switched to a system that suits the situation. Reforms are sometimes accompanied by failures, but we must continue to “deal with the changes occurring in contemporary society,” which is one of the founding principles of the university.

Interdisciplinary Research That Grows Naturally

—What do you think about the future of interdisciplinary research?

Interdisciplinary research is not something that is created by design, but something that grows naturally. A good example is Professor SANKAI Yoshiyuki (Institute of Systems and Information Engineering), who developed the robot suit HAL. He is an engineer, but without the help of the researchers of medicine, he would never have been able to do that.

In problem-solving, neither science nor humanities is relevant anymore. It is important to create an environment where people can talk about research across disciplines so that people from various fields can join hands when necessary.

Evaluating the Individuality of Universities

—How do you evaluate the Universities of International Research Excellence program?

I appreciate the fact that the government has established a fund to provide money for research. The government suddenly invested 500 billion yen in the supplementary budget for FY2020. In addition, a support system for core regional universities and universities with strengths in specific research fields has also been initiated, with the government allocating 200 billion yen. This is probably the first time in Japan's history that such a large budget has been allocated for research.

The University of Tsukuba also applied for this program, although the result this time was disappointing. We hope that in the next and subsequent rounds of judging, the judges will focus on points that highlight the university's individuality.

—What kind of school will the University of Tsukuba Malaysia that you plan to establish be?

There have been cases where Japanese universities have expanded overseas, but so far they have only been able to offer local degrees. The University of Tsukuba Malaysia will be able to offer degrees of Japan, i.e., the University of Tsukuba. This will be the first overseas campus of a university in Japan.

At the Malaysia Campus, we would like to nurture human resources who can speak Japanese, Malay, and English, so that they can come to the graduate schools of the University of Tsukuba and other Japanese universities. We hope to contribute to the internationalization of education and research in Japan.

—At a regular press conference in July of this year, you touched on admissions reform. There were reports that “more emphasis will be placed on interviews and essays.”

The ratio of international students will increase rapidly. Therefore, we would like to make the same examinations for both international students and Japanese students. Also, with the declining birthrate, the number of children in Japan is decreasing. If we do not conduct entrance examinations that find new individuality instead of taking students based on deviation scores, the level of universities as a whole will decline. That is why we want to reform the entrance examination.

Human Resource Development Unique to Tsukuba

—How will the University of Tsukuba contribute to the world?

We believe that it is science and technology that will solve the problems at hand, and it is people who will create the future. We would like to contribute to the world by demonstrating our research capabilities and fostering human resources that are unique to Tsukuba.

In terms of education, students are being nurtured with a unique mindset that can only be found at the University of Tsukuba. For example, many graduates of the University of Tsukuba like working in the field. Even when they are engaged in diplomacy, they choose to work for the Japan International Cooperation Agency (JICA) rather than at Kasumigaseki and go overseas.

We hope that in the future we will continue to see people like MITOMA Kaoru, a soccer player, working at the top level of the world. In the U.K., there are cases where people do not go to university, but instead play soccer diligently and become professionals. The success of university-educated players like MITOMA is changing the local common sense.

We are proud that this university is producing human resources who will use their abilities to contribute to society, even if they specialize in many different fields.

“Failure breeds success”

The Development of Conductive Polymer Research in University of Tsukuba

Interview with Professor Emeritus and Nobel Laureate **Dr. SHIRAKAWA Hideki**

Professor Emeritus SHIRAKAWA Hideki of University of Tsukuba was awarded the Nobel Prize in Chemistry in 2000 for the discovery and development of conductive polymers that conduct electricity. His research overturned the conventional wisdom that plastics do not conduct electricity. The results of his endeavors are widely utilized in devices, such as personal computers and smartphones. As the university is celebrating its 50th anniversary, we asked Dr. SHIRAKAWA about his research life at the University of Tsukuba and his expectations for the future of the University of Tsukuba.

(Interviewer: AONO Shimpei; Photo: YOSHIKAWA Momiji; August 24, Aoba Ward, Yokohama City)



◆ **He was appointed as an Assistant Professor at the Institute of Materials Science at the University of Tsukuba in November 1979. There was a chair of associate professorship for his research.**

My specialty is polymer chemistry, especially in a field of polymer synthesis. However, my research required me to investigate the structure and properties of the synthesized materials, too. The Institute of Materials Science is extremely interdisciplinary, and there is a range of professors, including experts in theoretical or experimental physics, electronic engineering electronics. I was able to resolve my questions when I knocked on their doors. There are numerous research institutes in Tsukuba City, and I found that it was easy to conduct collaborative research projects.

It was great that I was able to take the initiative in my research in the University of Tsukuba, since it is a new concept university that reforms the lectureship-based credit system.

◆ **His appointment at the University of Tsukuba was triggered by a direct negotiation by the Dean of the Institute of Materials Science.**

I was a research assistant at the Tokyo Institute of Technology before my appointment at the University of Tsukuba. It is common that a researcher gets a post by a professor in his domain, but I was directly approached by Professor OKAZAKI Makoto, the Dean of the Institute of Materials Science. At that time, I returned from the University of Pennsylvania, where I studied conductive polymers and began to branch into research on physical properties. I guess these activities have attracted his attention. I told him that I would like to accept the offer. Looking back about it, the direct approach to the post also typifies this new concept university.

◆ **When the experiment results do not match his expectations, he tends to become more motivated to conduct research.**

It is true that I am pleased when I obtain the desired results in my research project, but the experiment of my research did not progress as expected were most useful in term of conducting experiment. Experiments fail nine times out of ten. Thinking of the cause of a failure can make progress in the research. Sometimes, a completely differently topic may be found.

The Nobel Prize in Chemistry was also prompted by the accidental formation of a thin film of a substance during an acetylene experiment. The intended experiment was a failure because the amount of catalyst was thousand times higher. However, research on conductive polymers has begun serendipitously based on this substance.

◆ **After retired from the University of Tsukuba, he has conducted science experiment classes to children, with the belief that “an experiment is worth a thousand watches”.**

I have delivered monthly experimental classes on conductive polymers at the National Museum of Emerging Science and Innovation (Miraikan, Koto Ward, Tokyo) since my retirement from the University of Tsukuba. The classes were suspended for a while because of the COVID-19 pandemic but were resumed in January 2023. The most important thing is to conduct experiments by themselves to be familiar with science and technology. It can also deepen their understanding of various laws. Hence, this is what “an experiment is worth a thousand watches” means. I would like to continue sharing the pleasures of experiment with children.

◆ **He believes that the resolution of global issues such as marine pollution caused by microplastics requires an increase in public interest in science.**

Problems such as microplastics occur because scientists and media have not been able to convey the negative aspects of plastics to public but have focused only on the convenience of this material. It doesn't matter whether one has studied the humanities or science subjects when considering the relationship between society and science and technology. Since everyone is a user of science and technology. Students should receive liberal arts education until their second undergraduate year before majoring in specialized fields. Improving science education and science-related report, increasing public interest in science should help prevent and resolve these problems.

◆ **He hopes that the University of Tsukuba will further develop its interdisciplinary and internationality.**

The concept of the University of Tsukuba included interdisciplinarity and internationality. I hope that the university will continue to reform and retain the mindset of never forgetting its original spirit. It is usual that research as well as friendship, does not go well. There must be a reason for a failure. I would like the students the University of Tsukuba always be conscious that they can advance further if they contemplate the reasons for their failure.

SHIRAKAWA Hideki

- Born in 1936
- Graduated from the Department of Chemical Engineering, Faculty of Engineering, Tokyo Institute of Technology in 1961
- Receive PhD in Engineering from the Graduate School of Engineering, Tokyo Institute of Technology in 1966
- Research assistant at the Chemical Resources Laboratory, Tokyo Institute of Technology in 1966
- Post-doctorate researcher at the University of Pennsylvania in 1976
- Associate professor at the Institute of Materials Science at the University of Tsukuba in 1979
- Professor at the Institute of Materials Science at the University of Tsukuba in 1982
- Became Professor Emeritus in 2000
- Awarded the Nobel Prize in Chemistry for the discovery and development of conductive polymers in 2000
- Member of the Japan Academy since 2002

Targeting 5,000 International Students by 2030: The Globalization Journey of University of Tsukuba

Since its inception, University of Tsukuba has always prioritized “internationality” as one of its foundational pillars. Half a century after its establishment, one must ask: How much has the university globalized and what systems and infrastructure have been established in its pursuit? We sat down with Dr. IKEDA Jun, Vice President and Executive Director for Global Affairs, to discuss the present situation and the road ahead.

(Contributors: SIDASH Bohdan, YAMAMOTO Takayo, KINUGASA Yuki, TAKEMOTO Aika, KATO Midori, AONO Shimpei)

Multilingual Campus

Spanning 1 km from east to west and 4 km from north to south, Tsukuba’s expansive campus is a melting pot for languages. Walk around and you will overhear conversations in Chinese, English, Korean, Spanish, etc. This linguistic diversity is mirrored in the student body, which has various global backgrounds.

As of May 1, 2023, the student population is at 17,418, which includes both undergraduate and postgraduate students. Of these, 2,399 were international students with college student visas. This places the University of Tsukuba among the top-ranking national universities in terms of the number and proportion of international students.

While a majority(78%) of these international students originate from Asia—53% from China, 5% from South Korea, 4% from Indonesia and so on—the university is home to individuals from 115 countries and regions.

In terms of global outreach, the previous year saw 1,099 students from the University of Tsukuba embark on international journeys—876 on short-term exchanges and 223 as international students—with the U.S., South Korea, Canada, Malaysia, and France being the primary destinations.

Further solidifying its global ties, the university forged 378 agreements with international educational and research institutions as of September 8. Moreover, to facilitate student exchange and offer support, 12 overseas offices have been established in countries such as the U.S. and Malaysia.

Financing education abroad can be daunting, but University of Tsukuba’s students have options. Apart from the university’s signature “Habatake! Scholarship,” students can also avail financial assistance from the Japanese government and various private entities. Based on data from the Division of Student Exchange, around 30% of the students who ventured abroad last year benefited from such financial aid. Notably, the “Habatake! Scholarship” extended the support to 273 students in the last fiscal year.

Support does not end with finances. The Division of Student Exchange staff offered counseling to prospective overseas students. Additionally, the Student Commons houses a “Study Abroad Counseling Desk,” staffed by students with international study experience, ready to give peer advice. For international students arriving at Tsukuba, a suite of support services awaits them, including the option for all to reside in student housing if they so choose.

At the Division of Student Exchange’s “Ask Us Desk,” students can easily approach student staff with everyday challenges, whether it is locating a classroom or navigating Japanese documents. As a distinguished national university, the University of Tsukuba aims to bolster its international student count, inclusive of Short-term Exchange students, to 5,000 by 2030.

Ms. IGARASHI Chieko, who heads the Division of Student Exchange, emphasizes that achieving this target requires collective effort. “To reach our goal, relevant departments must collaborate closely. This involves ramping up our presence at study abroad fairs, hosting campus tours for international high school students, and more,” she states.

44 Ukrainian Students Evacuated to the University of Tsukuba: The Largest Intake at a National University

University of Tsukuba has been accepting Ukrainian students displaced because of the Russian invasion since last July. By the end of FY2022, the university had accepted 44 students, the highest number among national universities. This paper interviewed three of them: Andrii Kyrlyiuk, who was the first to arrive in Japan and joined the College of International Studies, Daria Mileikina and Hanna Yermolaieva, both of whom joined the College of Social Sciences in last August.

Mr. Kyrlyiuk continued his studies in international relations, much like he did in Ukraine. He highlighted a course on inter-Asian relations where students, grouped into teams, debated issues such as Indonesia’s food crisis in English and presented the results to each other. “Many of the participants were international students from Asia, so I was able to learn more about Asia,” he remarked.

Ms. Mileikina has immersed herself in the cultural scene, joining the K-pop copy dance club “Koguma.” Attending practice sessions more than thrice a week, she fostered close ties with her Japanese peers. “Initially, I was apprehensive about fitting in, but now we often dine and hang out together,” she shared. Currently, they are rigorously preparing for a performance at the University of Tsukuba’s annual festival, Sohosai, in November.

Ms. Yermolaieva expressed gratitude for the unwavering support from the Division of Student Exchange staff. Recounting an incident when her air conditioner malfunctioned, she shared how a staff member promptly assisted, coordinated the repair, and even interpreted for her with the contractor. “The support we receive always goes above and beyond,” she commented appreciatively.

All three students harbor a shared sentiment: “We ardently hope for an end to the conflict and a peaceful Ukraine.”

On the university’s notable intake of evacuee students, Ms. IGARASHI Chieko, Head of the Division of Student Exchange, stated, “The University of Tsukuba has a rich history of hosting international students. This experience equipped us to swiftly and efficiently address the challenges of accepting these students.”

Halal food and a place of worship within the University

A long queue forms in the hallway on the first floor of Building 2B during lunchtime on weekdays. Conversation in English is audible, and some women wear hijabs to cover their hair. Café MARHABAN is located just beyond this hallway. This eatery has, since 2012, specialized in serving halal food that Muslims are allowed to eat.

Popular menu items at this restaurant include an authentically spiced curry that changes every day and a distinctive menu of the day.

MARHABAN’s owner TAKADA Yuji, had opened a soup restaurant elsewhere on campus and was approached by the University of Tsukuba to offer Muslim cuisine. He said, “Above all, I value the balance of flavors and health.” Numerous Japanese students and faculty members also frequently visit his restaurant.

A student from Indonesia, daily visitor at MARHABAN, stated, “It is very useful for Muslims because we don’t have to worry about our meal for lunch.”

Moreover, the Global Village is a type of student housing complex shared by local and international students. This residential complex encompasses two meditation rooms that can serve as a place for worship. Muslims pray in these rooms during the Islamic month of Ramadan (the month of fasting) every year.

Interview with Vice President IKEDA Jun: Envisioning the Next 50 Years of Global Evolution



We spoke with Dr. IKEDA Jun, Vice President and Executive Director for Global Affairs, about the university’s journey toward internationalization and his vision for its future.

(Interviewers: YAMAMOTO Takayo, KINUGASA Yuki, KATO Midori; Photo: KINUGASA Yuki)

Since its inception, the University of Tsukuba has prioritized international engagement. Prior to its official opening, representatives from the university embarked on an overseas inspection, shaping its campus and organizational structures based on prominent U.S. universities of the era. This led to unique features such as a gateless campus and clustered colleges.

In recent years, the university’s globalization efforts have been significantly bolstered, notably by being chosen for several initiatives by the Ministry of Education, Culture, Sports, Science and Technology (MEXT). Among these are the “Project for Establishment of Core Universities for Internationalization (Global 30)” in 2009, the “Project for Promotion of Global Human Resource Development” in 2012, and curiously, the “Top Global University Project (Project for supporting the creation of Super Global Universities: SGU),” which dates back to 2002.

The Global 30 initiative led to the establishment of undergraduate programs that were taught entirely in English. Moreover, the SGU program introduced the “Campus-in-Campus” system. This initiative fosters ease of movement and collaboration for students and faculty at the University of Tsukuba and its partner institutions abroad. When it comes to World University Rankings, institutions with a history shorter than 50 years are also evaluated as “under 50.” As the University of Tsukuba marks its 50th anniversary, it is on the cusp of embracing a new chapter, teeming potential and aspirations.

Looking ahead, the university aims to elevate the representation of international students in its undergraduate programs from 3% to 30%. Such a shift would truly internationalize campus experiences. In line with this, there is a pressing need to expand courses taught in English and bring in more international faculty members.

Strengthening ties with international alumni is also an agenda. The hope is for these alumni to serve as connectors, bridging the University of Tsukuba with communities worldwide and facilitating the exchange of insights, while also providing support to current international students.

I wish for our students to experience the world. Facing challenges in foreign land, turning to others, undeniably fosters personal growth. However, even for those who do not venture overseas, meaningful interactions with international students on our campus can offer fresh perspectives. Through such experiences, I envision our students evolving into exceptional global citizens.

A Complete Picture of University of Tsukuba's Faculty Organization: "KEI"

A key feature of education and research at University of Tsukuba is the "faculty organization–education program separation system," which separates the faculty organization from the educational organization. In principle, the faculty members belong to the "KEI (Institution)" of the faculty organization and teach students in their respective undergraduate or graduate programs. Unlike the faculty members at other universities, who are often affiliated with faculties or graduate schools that are educational organizations themselves, this separation makes it easier to promote interdisciplinary research and reform. The current "KEI" system was launched in 2012 with 10 fields of study. In 2018, the Institute of Transdisciplinary Research, consisting of two research centers, was added. We interviewed the heads of the "KEI" about their specialties and research prospects for a better picture.

Interview with Vice President SHIGETA Yasuteru



What kind of existence does the faculty organization "KEI" have for the University of Tsukuba?

We asked Dr. SHIGETA Yasuteru, Vice President and Executive Director for Research, about the aims and significance of this organization.

(Interviewer & Photo: AONO Shimpei)

—**What is the "KEI"? What kind of activities does it engage in?**

Each KEI (institute) consists of some departments with similar specialized fields, and faculty members are assigned to one of them. From these institutes, faculty members are dispatched to educational organizations such as GAKURUI (undergraduate) and graduate programs, where they are in charge of education. This system allows for flexible reforms as personnel and research policies can be decided by each institute rather than the vertically divided organization, such as the course system seen in conventional universities. This is a system that distinguishes the University of Tsukuba.

—**What is the role of the head of each department?**

The dean of each institute is one of the members of the university's executive board and serves as a link between the president and faculty members. They also have personnel authority. While placing importance on intradirectorate discussions, the dean also oversees various research fields within the institute and takes the initiative in dealing with them, allowing well-balanced and highly flexible personnel decisions.

—**What are the advantages of having departments in each of the major fields of study?**

If faculty members are assigned to each specialized department, the direction of research and education will be narrowed as time goes by. On the other hand, by creating institutes for a broad range of fields, the direction of research and education can be evaluated with objectivity. Having faculty members with different specialties in the same institutes will lead to the development of interdisciplinary fields. Another advantage of having faculty members in a flexible organization is that the educational activities can be conducted flexibly.

—**What kind of organization do you want to develop in the future?**

We would like to promote internationalization further. One of the international indicators by which universities are evaluated is partly based on the enhancement of education in English. To achieve this, it is necessary to reform both institutes and graduate programs by increasing the number of foreign faculty members.

Challenges to Contemporary Issues **Institute of Humanities and Social Sciences** 195 members

SEKINE Hisao, Dean

The institute is staffed by faculty members with expertise in various fields within the humanities, such as philosophy, literature, linguistics, history, and anthropology, and in the social sciences, including economics, law, political science, and sociology. In addition, some faculty members are engaged in research in the sciences, such as digital humanities and environmental sciences, showcasing the Institute's diverse research spectrum. To effectively tackle contemporary issues, it is imperative that faculty members foster interdisciplinary collaborations.

In light of this, we inaugurated the Institute for Comparative Research in Human and Social Sciences (ICR) in 2014, with participation from all faculty members. The ICR Steering Committee convenes monthly to share updates on research projects and future plans. Through these discussions, the ICR endeavors to bridge the gaps between different disciplines, facilitating the emergence of novel research ventures.

Noteworthy Research at the Institute of Humanities and Social Sciences

A Local Kingdom in Ancient Mesopotamia

Professor SHIBATA Daisuke specializes in research on the history of ancient Mesopotamia, predominantly drawing information included from cuneiform texts written on clay tablets. His primary focus is on the politics, society, and culture of the 2nd and 1st millennia BCE.

In 2005, he undertook the task of deciphering cuneiform texts unearthed by a Japanese mission at the site of Tell Taban in northeastern Syria. Most of these texts comprise archival records from a local kingdom that flourished between the 13th and 11th centuries BCE, complemented by monumental inscriptions commissioned by that kingdom's rulers. These discoveries have shed light on a previously unknown, unique local government in ancient Mesopotamian history.

Professor Shibata is currently the director of the Research Center for West Asian Civilization at Tsukuba University, founded in 2021. The center includes experts across various disciplines such as history, archaeology, linguistics, and geology, all of whom are passionately dedicated to research on Western Asia. Together, they endeavor to unravel the numerous complexities of Western Asian civilizations.

He expressed, "Our goal is to position the University of Tsukuba, a leading institution for ancient Western Asian studies in Japan, alongside prominent research institutions in Europe, North America, and Western Asia, such as Ludwig-Maximilians-Universität München."

Graduate School for Working Adults **Institute of Business Sciences** 46 members

OISHI Kazuhiko, Dean

The Institute of Business Sciences is committed to advancing education and research in law and business administration to address the myriad challenges faced in today's business landscape through a multidisciplinary social sciences lens. There are four groups, namely, the "Corporate Law Research Group" and the "Legal Professionals Research Group," dedicated to legal studies, and the "Management System Science Research Group" and the "International Management Professionals Research Group," focused on management studies.

These groups collectively steer the evening graduate school designed for working adults, incorporating a roster of practicing lawyers and seasoned practitioners among its faculty. The interaction with working professional students enhances the learning environment and fosters the growth of faculty members. The real-world problems identified by the students provide invaluable insights to the faculty and enrich dialogues between researchers and practitioners refining educational methodologies.

Noteworthy Research at the Institute of Business Sciences

Application of the Latest Technology in Investigative Research from a Human Rights Perspective

Associate Professor OZAKI Aimi, a member of the Legal Research Group, specializes in criminal procedure law and delves into the implications of modern technologies, such as global positioning systems (GPS) and facial recognition technology, primarily focusing on privacy protection and human rights.

In her 2017 paper titled "Worn GPS Investigations and Privacy," she highlighted the significant privacy intrusions associated with affixing a GPS device to a suspect's vehicle for continuous monitoring. However, she noted that the short-term utilization of GPS, such as in tracking a fleeting vehicle, is acceptable.

Her outstanding contributions in this realm earned her the "Outstanding Young Researcher Award" from the Digital Forensics Research Association. She remarked, "In law school, I get to hear directly from practicing attorneys how their research is being handled in the field of practice. It is a very blessed research environment."

Creation of New Academic Fields

Institute of Pure and Applied Sciences 205 members

HATTORI Toshiaki, Dean

The Institute of Pure and Applied Sciences comprises faculty members engaged in research in natural sciences, such as mathematics, physics, and chemistry, and applied sciences, such as applied physics and materials science. It includes five research centers, including the Tomonaga Center for the History of the Universe. In addition, the University of Tsukuba and the Université Grenoble Alpes in France have established a joint research laboratory on semiconductors at the Tsukuba campus for collaborative research.

Since last year, the institute started organizing “Interdisciplinary Seminars” where faculty members from different fields discuss each other’s research. We hope that this will lead to the creation of new academic fields.

While conducting research that meets societal needs is important, conducting research based on researchers’ curiosity is also crucial. In the future, we aim to establish a system within our institute that can serve as the basis for other studies and meet the needs of society.

Noteworthy Research at the Institute of Pure and Applied Sciences

Preventing Global Warming by Utilizing Hydrogen

Professor KONDO Takahiro is exploring new materials suitable for hydrogen production, storage, and transportation.

Burning hydrogen only produces water and does not emit carbon dioxide, which causes global warming. For this reason, there is a global race to develop technologies for the utilization of hydrogen.

Hydrogen is a gas at room temperature and does not liquefy until it reaches -253°C . To increase convenience, storage technology that is more compact than gas cylinders and can store large amounts of hydrogen is needed.

In 2017, Professor KONDO generated the world’s first “borophane sheet (hydrogen boride sheet),” which exhibits excellent hydrogen storage performance. In July of this year, he also developed a new catalyst made of sulfur and boron, which is used in the electrolysis of water to produce hydrogen. He asserted that the catalyst is cheaper and more efficient than the conventional catalysts using noble metals.

Professor KONDO says, “In addition to improving the performance of the developed material, we would like to advance research that will lead to more efficient transportation.”

Social Implementation of Advanced Technology

Institute of Systems and Information Engineering 197 members

YOSHISE Akiko, Dean

The Institute of Systems and Information Engineering is a distinguished faculty organization dedicated to providing education and research in science and engineering across interdisciplinary domains. Our core aim is to seamlessly integrate “information,” “systems,” and “society.” The institute encompasses four engineering departments, namely, Policy and Planning Sciences, Computer Science, Intelligent Interaction Technologies, and Engineering Mechanics and Energy, and promotes world-class research.

A defining feature of our institute is its capacity to harness cutting-edge technology and realize societal applications from the research outcomes. As an extension of this endeavor, the institute encourages the Digital Transformation (DX) initiative within the university. In an effort to enhance administrative efficiency, technical staff, administrative staff, and students have synergistically developed a system that streamlines the accounting and asset data processing as per its designated use. Additionally, we are in the process of developing a tool to simplify the evaluation of students’ graduation credits. With these initiatives, we aim to set a precedent for the broader university community in embracing the DX initiative.

Noteworthy Research at the Institute of Systems and Information Engineering

Blood Pressure Measurement without Disturbing Sleep

Assistant Professor MAEDA Yuka is at the forefront of research aiming to measure important biological metrics like blood pressure without causing any discomfort to the subject.

Events such as nocturnal hypertension—where blood pressure spikes during sleep—and early morning hypertension, occurring before and after waking up, pose crucial risks for stroke and myocardial infarction. Effective monitoring of these events necessitates blood pressure measurements every 30 min throughout the sleep cycle. However, conventional blood pressure monitors, which tighten around the arm, tend to disrupt sleep. This project aspires to overcome such limitations using sensors affixed to the subject’s clothing and the bed to detect vibrations induced by the heartbeat, among other factors, subsequently obtaining blood pressure and other biometric data. As blood pressure elevates, arterial walls become rigid, accelerating the transmission speed of vibrations. By measuring the vibrations coursing through blood vessels at two different body points and noting their arrival time, it becomes feasible to estimate blood pressure variances.

Assistant Professor MAEDA acknowledged the invaluable insights gained from discussions with other faculty members during an exchange meeting as significantly beneficial to the project.

A Wide Range from Basic to Applied

Institute of Life and Environmental Sciences 207 members

Professor SUGAYA Sumiko and Professor NAKADA Kazuto

The Institute of Life and Environmental Sciences delves into a broad spectrum of fields encompassing earth, environment, organisms, and agriculture. These fields are investigated from multiple perspectives, including geoscience, biology, chemistry, agricultural science, engineering, and economics. The researchers at the institute who specialize in areas such as oceanography and mountain sciences frequently engage in discussions and collaborations. Often, these collaborations extend beyond our institute to include teams from the Institute of Medicine and Institute of Health and Sport Sciences. Such interdisciplinary interactions pave the way for innovative discoveries.

A distinguishing feature of our institute is the synergy between basic and applied research. To instance, the challenge of transporting ripe fruits without them softening during transit prompted the basic research into developing fruits resistant to softening. The implementation of these research findings into our daily lives and society gives rise to new research topics, creating novel avenues of basic research.

Noteworthy Research at the Institute of Life and Environmental Sciences

Microorganisms also "talk" to each other

Biofilms, which are communities of bacteria, can be found in various forms, from dental plaque that can cause tooth decay, to the familiar slime in kitchens and bathtubs.

Professor NOMURA Nobuhiko's team made a pivotal discovery that microorganisms within biofilms "talk" to each other by exchanging specific chemical substances. This form of communication regulates the population of the microorganisms in the biofilm, enabling them to adjust to environmental shifts. Furthermore, the team found that these communicative chemicals are occasionally enclosed in membrane vesicles (MVs). These lipid particles with diameters ranging from tens to hundreds of nanometers (one billionth of a meter) serve as messengers to relay information to designated receivers.

Professor NOMURA stated that biofilms also exist in the human intestines, where bacteria utilize MVs to bolster the immune system of the host. Deciphering and managing this microbial dialogue holds promise for promoting health and wellbeing.

Contributing to Well-being

Institute of Human Sciences 107 members

IDA Yoshiyasu, Dean

The Institute of Human Sciences brings together faculty from three distinctive academic divisions: Education, Psychology, and Disability Science. Our objective is to spearhead research initiatives aimed at enhancing individual and communal well-being.

A booklet detailing research by the Institute's scholars will be published shortly. This booklet is divided into three main sections: education, disability, and psychology, examining educational theory through the lens of diversity. Approximately 10 institute members have contributed to each section, bringing the total number of authors to around 30. One of the standout features of the book is its cross-disciplinary approach, as evident by education field researchers contributing to the psychology section. Our goal is to ensure that the institute continually evolves, steering clear of complacency and consistently producing innovative research.

Noteworthy Research at the Institute of Human Sciences

Creating an Environment Where Immigrant Youth Could Thrive

In 2020, **Dr. TOKUNAGA Tomoko**, an Associate Professor in the Division of Education, embarked on a study involving 11 immigrant high school and vocational school students in Japan. The focus was on understanding how the COVID-19 pandemic impacted their lives and career aspirations.

This was executed as a "Youth Participatory Action Research (YPAR)" project, wherein young participants collaborated with researchers to engage in research and take action. Two immigrant youths were actively involved throughout the entire research process, including developing research questions and conducting interviews.

Findings indicated that the pandemic intensified economic challenges and feelings of isolation in these youths. However, many demonstrated resilience by leveraging online resources from both Japan and abroad, and by maintaining connections with friends from their home countries via social networking services.

Dr. TOKUNAGA reflected, "Having youth with similar backgrounds involved in the project allowed us to genuinely understand the needs and voices of immigrant youth. Our aim is to amplify the voices of these young immigrants in society, helping foster a

sense of belonging and empowerment.”

High standard in Research and Physical Fitness

Institute of Health and Sport Sciences 126 members

NISHIYASU Takeshi, Dean

The Institute of Health and Sport Sciences promotes comprehensive education and research in the fields of physical education, sports, and health. This covers a diverse range of disciplines from the natural sciences to the humanities and social sciences. About 30 faculty members of the Bureau of Physical Education and Sports (previously known as the Sports and Physical Education Center) oversee physical education for university-wide subjects.

When it comes to research, the institute identifies 39 specific areas under three broad categories: “Physical Education and Sports Studies,” “Health and Human Performance Studies,” and “Coaching Studies.” The first area incorporates humanistic and sociological approaches; the second is rooted in natural scientific methods; and the third delves into training and coaching methods tailored to individual sports. The research scope encompasses major sports like gymnastics, track and field, swimming, martial arts, and various ball games. The faculty boasts members with rich practical experience in their respective fields.

The University of Tsukuba takes pride in its high standards. This is evident not only in its Olympic and intercollegiate sports achievements but also in its commitment to cutting-edge research. Our aim is to be a global leader in the realm of sports science.

Noteworthy Research at the Institute of Health and Sport

Exploring the Added Value of Sports

Assistant Professor DAIGO Ebbe, an expert in sports management, is delving into the phenomena of sports spectating and charity sports events.

Her past research has shown that spectators with experience in a particular sport derive greater enjoyment when watching that sport. Their prior experience allows them to physically empathize with athletes, enhancing their viewing experience. These spectators particularly appreciate and better grasp the players' emotions and skills, especially when minimal information is presented, as it piques broader interest. Conversely, those unfamiliar with the sport benefit from additional context and information about the athletes and the game, amplifying their enjoyment.

Furthermore, Assistant Professor DAIGO and her research team are keen to devise ways to not just add value to sports through such services but also to create value within the sports realm.

Our Strength is the Fusion of Tradition and Innovation

Institute of Art and Design 59 members

HAYASHI Michiko, Special Advisor to the Dean

The Institute of Art and Design comprises faculty members specializing in the fields of philosophy and history of arts, fine art, arts and design science, design, world heritage studies, and Kansei science. The strength of our institute is the fusion of tradition, which has been inherited since the days of Tokyo Higher Normal School, and innovation, which proactively incorporates new artistic fields.

While many art universities repeatedly reorganize and change the names of their research field, the University of Tsukuba has kept the framework of each field almost unchanged since its inception and still emphasizes basic education, such as drawing. Meanwhile, the university has pursued new forms of expression, such as combining plastic arts with various media.

The institute promotes interdisciplinary research and cross-disciplinary collaboration, which is not limited to the university. For instance, in collaboration with special needs schools for the visually impaired as well as art galleries and museums, it has held exhibitions of sculptures that can be touched and enjoyed by the visually impaired.

Noteworthy Research at the Institute of Art and Design

Exploring *Tempera* Techniques

Assistant Professor HOSHI Mika is investigating the evolution of the technique of tempera paint, which uses an emulsifying substance such as egg as a fixing material.

Tempera was the predominant technique in Europe during the Gothic period (12th-14th century), before oil paintings became the mainstream. Assistant Professor HOSHI studied the German-Austrian technique when she was a graduate student at the University of Tsukuba, and then went to Florence, Italy to study. She was surprised to find that even within the same tempera technique, the techniques differed greatly from period to period and region to region.

The German-derived technique she learned during her graduate school days involved alternating layers of white tempera paint and oil paint, while the technique she learned in Italy involved making tempera paints of all colors. It is also free in the way it is painted.

Unlike oil painting, tempera does not deteriorate over time and attracted renewed attention in the 19th and early 20th centuries. Various techniques were developed at this time, and they differ from country to country and region to region.

Assistant Professor HOSHI said, "Next year, I will begin a full-scale study of the changes in tempera techniques in Europe and the United States. I would also like to research the applicability of this technique to my own painting."

Always Keep “Face to Face with Life”

Institute of Medicine 472members

KAWAKAMI Yasushi, Dean

The Institute of Medicine encompasses three primary fields of study revolving around the central theme of “life”: the Department of Biomedical Sciences, the Department of Clinical Medicine, and the Department of Health Innovation and Nursing.

The Department of Biomedical Sciences dedicates itself to basic medical research, aiming to unravel the causes of diseases and understand the underlying mechanisms of various life processes. Alternatively, the Department of Clinical Medicine focuses on translational research that bridges the gap between laboratory findings and patient care; furthermore, the faculty members provide medical care at affiliated hospitals. Meanwhile, the Department of Health Innovation and Nursing investigates social issues like the healthcare system and the distribution of medical expenses.

Given the life-centric nature of the aforementioned departments, faculty members engage in their research with a profound sense of fulfillment and responsibility. They are continually honing their ability to acknowledge the diverse values of patients and adapt the quality of medical care accordingly, which is a crucial aspect of clinical practice.

Looking ahead, we aim to promote *in silico* medicine using artificial intelligence to explore the fundamentals of life processes without animal or test-tube experiments.

Noteworthy Research at the Institute of Medicine

Putting Mice into Artificial Hibernation

Professor SAKURAI Takeshi, the deputy director of the International Institute for Integrative Sleep Medicine (IIIS), discovered that stimulating a specific group of neurons in the hypothalamus can induce a hibernation-like state in mice, characterized by a decrease in body temperature and metabolism.

The mice emerged from this state after a few days, showing no discernible abnormalities. Professor SAKURAI and his team named these neurons “Q neurons.”

Conditions like stroke and myocardial infarction cause oxygen deprivation in tissues due to blood vessel or heart malfunction. The prospect of inducing a hibernation state in humans could potentially mitigate oxygen consumption, thereby delaying tissue damage.

Professor SAKURAI elaborates, “Humans possess neurons analogous to Q neurons. Achieving a state of hibernation in humans could remarkably benefit future space travel by reducing the resources required for oxygen and food, and decelerating the deterioration of physical functions during long journeys.”

Promoting Interdisciplinary Research with Information as the Core

Institute of Library, Information and Media Science 54 members

TOSHIMORI Atsushi, Dean

The Institute of Library, Information and Media Science encompasses a wide range of academic fields from information retrieval and natural language processing to history, philosophy, and psychology. Although it shares some commonalities with the Institute of Systems and Information Engineering, most of its research focuses on practical and applied aspects.

This institution originated from the 2002 amalgamation of the University of Tsukuba and the University of Library and Information Science, with “information” as its keyword and identity. By hosting faculty members from a wide range of academic fields in a single institution, the institution has encouraged synergistic effects, such as the promotion of collaborative research and sharing of approaches and perspectives from other fields. We have already ensured its breadth as an interdisciplinary field, and we look forward to developing and communicating a specific image as the Institute of Library, Information and Media Science discipline.

Noteworthy Research at the Institute of Library, Information and Media Science

Bringing Librarian Capabilities to Information Retrieval

Professor JOHO Hideo specializes in information retrieval. He explores and analyzes the underlying technology and human search behavior.

In recent years, he focused on “collaborative search,” where multiple people work together to search, and “conversational search,” where people search in a conversational style.

In his research on “collaborative search,” Professor JOHO analyzed the conversations that occur during such searches. He found that a conversation leader was created therein, which changed along with each topic.

Therefore, he explores an effective way to integrate artificial intelligence (AI) as a conversational partner for easier information retrieval, because an AI with a wealth of information would lead the conversation. In the future, the goal is to enable “conversational search” to emulate a librarian who helps users find books by asking them clarifying questions.

Professor JOHO said: “The University of Tsukuba is one of the top universities in Japan in the field of information retrieval research. A virtuous cycle is being created that will attract even more students and young faculty members who are interested in information retrieval.”

A Wide Range of Research

Institute of Transdisciplinary Research 95 members

SHIGETA Yasuteru, Vice President and Executive Director for Research

The Institute of Transdisciplinary Research primarily comprises faculty members affiliated with the Center for Computational Science (CCS) and the Life Science Center for Survival Dynamics, Tsukuba Advanced Research Alliance (TARA). These centers were established in 2018 as independent departments. The director of each center holds a position at the same level as that of a dean in each institute, and the distance between the affiliated faculty members and the director is closer than that in other institutes. They differ from the other research centers in that affiliated faculty members are requested by educational organizations to provide education like those in each institute.

The CCS brings together various disciplines, including physics, life sciences, meteorology, high-performance computing, and data science, allowing interdisciplinary collaborative research solely within the center.

The two centers are categorized as world-class research centers (R1) of the University of Tsukuba and are financially supported by the university based on their results. As independent institutes, they are highly flexible in conducting research and can propose various research projects and enhance their staff. The existence of such centers contributes to the improvement of research capabilities at the University of Tsukuba. Another unique feature is the ability to conduct substantial educational activities utilizing the results of cutting-edge research.

(The number of members in each institute is as of May 1st.)