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This issue features Associate Professor Koichi Mikami, whose research, informed by Science and Technology Studies, explores the possibility of "science and technology to be done in collaboration with experts in humanities and social sciences."

The Search for a New Way of Approaching Science and Technology

Guiding experts toward "creative collaboration" in science and technology

"We tend to think of science and technology as the work of scientists and engineers only. But I want to find a way to change that and let experts in humanities and social sciences to take part in their making," says Mikami. He began to envision this 'new' paradigm through his research in Science and Technology Studies. Having joined Keio University, his journey to realize this vision has already begun.

What is "Science and Technology Studies"?

In 2018, the news that gene-edited twins were born in China took the world by storm. People criticized the birth of these twins whose genetic information had been altered to prevent HIV infections. Could the scientist responsible guarantee the children's future health and safety? Is it even ethical to edit someone's genome in the first place?

"I can understand why some people felt that might be justified as a form of medical treatment. However, this does not mean that it is okay on a societal level to edit the genomes of fertilized eggs," explains Koichi Mikami, a specialist in Science and Technology Studies at Keio's Faculty of Science and Technology. "Science and Technology Studies" or "STS" is a field that examines the intersections between science, technology, and society, and Mikami's research focuses particularly on life sciences and biotechnology.

In the past, science was thought to be a discovery of "the truth." This meant that no matter who did the "science," the results (and conclusions) would be the same. However, after being forced to recognize the enormous influence that scientific advancement can have on society due particularly to the Second World War, people started discussing what science is and how scientists should behave. Such discussion led to "Science Studies." As the field broadened to include questions about technology, the name was changed to "Science and Technology Studies." With this expansion, the field also began to consider how scientific discoveries impact society. When scientists began sequencing the entire human genome in the 1990s, many people expressed concerns about the magnitude of the ethical, legal, and social implications (ELSI) that this achievement might yield through identifying a person's future diseases or other information.

"Historically, the role of humanities and social sciences has been limited either to put a stop to scientific and technological progress, or to assist it from the sidelines." (Figure 1)

Values about science and technology are culturally dependent

Mikami first became interested in the relationship between science, technology, and society in 2005 when he studied abroad in England as a Master student.

"It was around the time when hybrid cars were beginning to appear on the market. In Japan, they were hailed as a next-generation eco-friendly vehicle. In England, though, some people were saying that diesel cars were better. Up until that point, I had thought that values of science and technology were universal, so learning about national differences in technological preference was fascinating." Hybrid cars work well in Japan's driving culture where people are constantly starting and stopping their cars in towns. In England, where drivers can leave their engines running for long time on straight rural roads, however, diesel engines were considered more efficient.

That made Mikami want to do research on different national and cultural values attached to science and technology. He

The old view of ELSI 1

The old view of ELSI 2

Fig.1 Ethical, Legal, and Social Implications (ELSI)
Because experts in humanities and social sciences would undertake ELSI analysis to point out social problems with science and technology, they were often thought of as standing in the way of further progress (The first old view of ELSI). On the other hand, ever since the Human Genome Project, scientific research has been presumed unstoppable, so people in humanities and social sciences have been needed to support, from the sidelines, scientific advancements to be accepted by society (The second old view of ELSI). In contrast, Mikami hopes to build a mechanism in which scientists can work alongside experts in humanities and social sciences (The view of ELSI to be instituted).

especially wanted to look into a topic in which these differences would be most stark, such as biomedicine. At the time, "regenerative medicine" was a huge topic of discussion, so he chose it as his focus. Mikami explains, "People tend to stick to things that they are familiar with when it comes to caring their bodies. This means that cultural influences or patterns from one's upbringing will be quite evident." Mikami came to this conclusion after conducting a survey on his fellow international students, many of whom asked their family to ship not only medicine but even toothbrushes from Japan, rather than purchasing these items locally in the UK.

Revealing the truth about regenerative medicine through interviews

Mikami's research methodology involves interviewing as wide a variety of people connected to his chosen topic as possible. This includes researchers, people belonging to government agencies, or companies (Figure 2). When doing this, he first investigates presentations being given at academic conferences so that he can list up interview participants that best reflect general research trends for the given field in each country.

In his research on regenerative medicine, Mikami was surprised to find that the goals of the science changed drastically based on a person's perspective on a medical system. "iPS cell-based therapies likely hold a strong appeal with a Japanese audience because the cells are taken directly from an individual and therefore enables regenerative medicine to be personally tailored.

Personalized regenerative medicine is not as popular elsewhere. In the UK, there is an emphasis on standardization,

The view of ELSI to be instituted

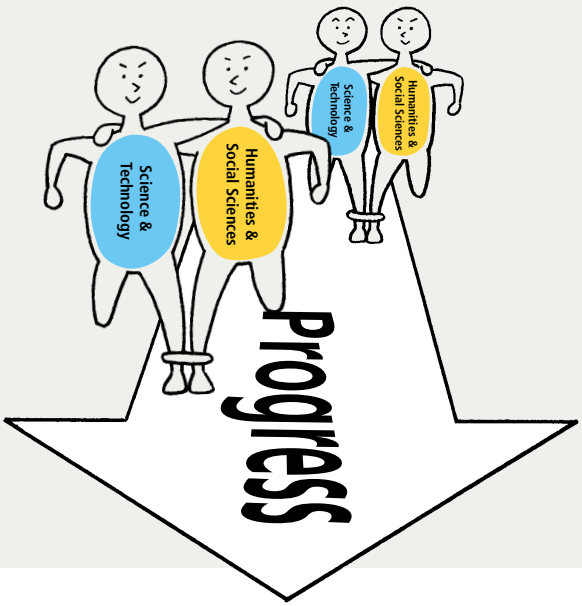
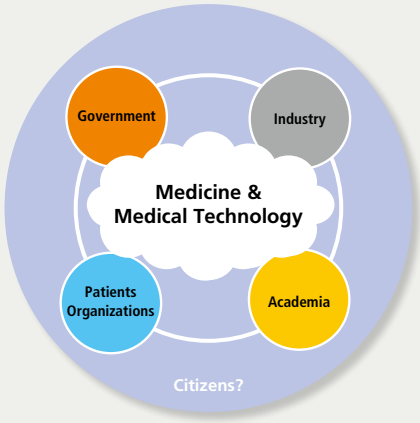


Fig. 2 Parties participating in scientific and technological research
When science and technology make progress, the academic community, governments, and corporations are often heavily involved, but input from the public tends to be very little. In contrast, Mikami's research suggests that in medicine and medical technology, segments of the public, namely patient organizations, have been heavily involved too. Particularly for rare diseases, as the number of their patients are very small, these organizations play vital roles in advancing their research. However, little attention is paid to input from other ordinary citizens.

Rare diseases as a special case

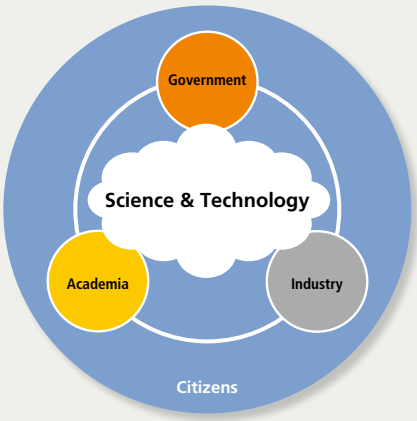


which allows for mass production so that medical care can be delivered at low-cost for the largest number of patients across the country. This has made the trajectory of stem cell therapy popular there instead." Mikami's findings helped him see clear distinctions between the attitudes in Japan and the UK. The experience of studying about iPS cell-based therapy then led Mikami to research the challenges of rare diseases and the role of patient organizations in addressing them.

The humanities and social sciences should be co-creators in science and technology

As Mikami was working on his research, he came to a realization. "When I approached and asked someone to talk about what they do, they sometimes responded as if I were about to judge their work. This is because up until today, experts in humanities and social sciences have only been involved as third-party observers in science and technology, arbitrating whether something was 'good' or 'bad' once the research was complete. I thought that this has to change." In 2019, when Mikami became a faculty member at Keio University, he was given the chance to bring about this change. Mikami meets regularly with a group of researchers who specialize in different areas of science, such as biology, chemistry, and informatics in order to foster new scientific projects in artificial cells, molecular robotics, and others.

Industry, Academia, Government, and the Public



In this effort, Mikami uses his background in humanities and social sciences to gather a wide range of viewpoints and information about scientific research being conducted and try to organize them into a roadmap for the group, thereby facilitating productive discussions about the future direction of the projects. "I've taken it upon myself to be a go-between for these projects. I think it's vital that people are able to debate the types of needs and issues a project might face so that science and technology can be integrated successfully into society. Experts with different academic backgrounds often have different ways of thinking and doing research, so the meetings are full of stimulating discussions."

When this team's projects lead to new discoveries in the future, Mikami says "I want to be involved in research studying how the scientific knowledge or technologies produced can be meaningful in society. Each and every one of us, myself included, is working individually on research that we find fascinating. Coming together as a group without changing that is when we will truly achieve 'creative collaboration,' or what is sometimes called 'co-creation.'" The results that this will bring about will make significant change in the relationship between humanities, social sciences, science, and technology.

Mikami is also passionate about educating students at Keio University. "The Faculty of Science and Technology is full of students who will be future researchers or who work at companies using their specialized knowledge. It's worrying if these people are convinced that they 'are doing everything right.' I will be thrilled if my classes can be the inspiration for them to look at science and technology from diverse perspectives and see it as a complex practice in society." This is Mikami's motivation as he goes up to the class podium every day.

(Interview and text writer: Akiko Ikeda)