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Feature

A World Driven by Informatics

10 years of challenges and advances



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Disasters, worldwide outbreaks of infectious diseases, and extraordinary advances in technology.

We have entered an age of unpredictability, marked by accelerating social change.

Information is the most powerful weapon for confronting our uncertain future, so how can we design it in a way that truly and tangibly benefits society?

This report looks at the past and future of informatics.

[Feature] A World Driven by Informatics

10 years of challenges and advances

Interview

Director-General, NII

KITSUREGAWA, Masaru

Interviewer

OTSUKA, Ryuichi

Editorial Board Member,
Tokyo Head Office
The Yomiuri Shimbun

The “endless challenges” of “super-exciting times”

National Institute of Informatics (NII) Director KITSUREGAWA, Masaru is set to step down from his position at the end of March 2023 after leading NII since 2013. Even as new waves of innovation descend on the field of information technology, we asked him to look back over his 10 years at NII, which he describes as “a bold run at a managerial position by a rank amateur.”

A “super-exciting” 10 years

— We’ve seen a wide variety of advances in digital technology over the past 10 years. How did you experience this past decade?

The year before I became NII director, 2012, was symbolic. The Obama administration in the U.S. announced the Big Data R&D Initiative and I was startled to find that the performance of AI image recognition had leaped to a ridiculously high level. The convergence of data and AI seemed to suddenly accelerate. The scene was set for a remarkable decade.

As NII director, I felt like I was passing through a door into a space that allowed me to experience this su-

per-exciting era from the very beginning.

— NII has been involved in many different projects. What have been its main accomplishments?

Starting in the mid-2000s, before the big data wave, I was a professor at The University of Tokyo, where I coordinated projects with titles like “Info-polosion”^{*1} and “Information Discovery.”^{*2} I was also selected for FIRST,^{*3} a research support program limited to 30 scholars, to work on the development of the fastest database engine. I was aware of NII, because of the assistance I had received from (former NII Director) SAKAUCHI, Masao and Prof. ADACHI, Jun, but I had zero knowledge of its projects.

Just before I became director, NII's International Advisory Board asked me what I would do if I became director. My answer was that I wanted to provide "big data as a service," which must have sounded quite fantastic. When I arrived in 2013, I found that such a goal was far from achievable. Basically, all we had was SINET4, an academic information network that connected universities. It was only more recently that we started to see other achievements. The most notable one perhaps is our Research Data Cloud (RDC) platform, which we started building from the ground up in 2017. Five years later, we're still developing it. And it remains at the forefront internationally.

Resolving regional disparities by upgrading SINET

— What do you feel when you reflect on these achievements?

When you asked me to review the past 10 years, I tried to create a timeline. Looking back, I realize just how many things we managed to do by working steadily year by year. Firstly, from 2013 to 2016, we upgraded SINET4 to SINET5. With SINET4, the data bandwidth between Tokyo and Osaka was only 40 Gbps. In other parts of Japan, bandwidth could be as low as a few Gbps. I wondered why our connectivity in Japan was so slow, when the U.S., Europe, and China all had 100 Gbps.

With SINET5, we managed to connect the entire country with 100 Gbps lines. The key to achieving high speeds was the use of "dark fiber," spearheaded by Prof. URUSHIDANI, Shigeo. The upgrade to SINET5 was a fundamental and very significant shift. The idea of using bypass lines enabled us to establish powerful networks outside of major metropolitan areas and to solve the problem of regional disparities. Our goal was to enable data 100 Gbps connections between anywhere in Japan! We knocked the ball out of the park on this.

SINET continued to get more advanced, with mobile SINET and a Russian circuit in 2019. SINET6 became fully operational in 2022. Bandwidth between Tokyo and Osaka is now 400 Gbps. In March 2022, our network team worked very hard in the face of a semiconductor shortage.

— In 2015 you established the Center for Cloud Research and Development.

There are many cloud vendors such as Amazon, but universities were unsure about what services to buy or how to buy them. That's why I asked Prof. AIDA, Kento to create a "one-stop shop" for teaching academics anything they needed to know about utilizing cloud services. That's what this center is all about. Thanks to his exhaustive conversations with vendors, we can offer all the information needed for comparing the pros and cons of each cloud service.

— The following year, 2016, you created a security support center.

All the university professors we spoke to expressed concern about security issues.

However, since security within universities is not part of NII's responsibilities, we can't get directly involved in it. What we can do is monitor the behavior of the data communications in and out of universities. If we notice



a problem, we can notify them and advise that they disconnect or reboot a system—that kind of thing.

This assistance was very much appreciated. Thanks to the efforts of Prof. TAKAKURA, Hiroki, whom we invited to head the center, and the support of Prof. OKABE, Yasuo of Kyoto University, we can offer a quality of service that is on a par with that of private-sector services.

Industry–academia collaboration and the challenge of medical big data

— In 2017, you created the Research Center for Open Science and Data Platform and finally set about building a research data platform (now the NII Research Data Cloud (RDC)).

Until 2016, we had our hands full convincing the Ministry of Education, Culture, Sports, Science and Technology (MEXT) to migrate to SINET5, so it was not until 2017 that we could finally start tackling the research data platform.

NII RDC is made up of three basic elements, for data management, publication, and discovery. SINET serves as the foundation for data distribution; RDC is the foundation for data sharing and utilization. Collectively, these two make up the data platform. Although it is still developing slowly, thanks to the hard work of Prof. YAMAJI, Kazutsuna, the data platform has evolved to the point that it can be used on a trial basis by 60 institutions.

We were also able to establish centers for medical big data, fintech,

and social problem-solving by actively partnering with academic societies and private companies. Then in 2020, the 20th anniversary of NII's establishment, we launched a series of symposiums on remote learning during the COVID-19 pandemic. Looking back, it has been a decade of taking on one new challenge after another. A big reason we've been able to do so much is the hard work of the faculty in our service division, who work in harmony with the NII's mission, and in particular, worked

generously and tenaciously.

— What were NII's most important achievements in these 10 years?

I would rank the top four NII achievements as the following: ❶ SINET; ❷ security; ❸ research data platform; and ❹ real-world applications and contributions. SINET (❶) is a service that already existed, but we kept advancing it at a rapid pace. In contrast, our security (❷) and research data platform (❸) services were new initiatives.

Our success in real-world applications and contributions (❹) was the fruit of collaboration with academic societies and private companies. For example, we partnered with academic societies to develop a medical image database with hundreds of million images (e.g., CT, X-ray). For

10-year timeline as NII Director created by Prof. KITSUREGAWA

2013	Assume the role of director and have to study.
2014	Invite a person from the MEXT as a head of the NII's Budget and Accounts Division.
2015	The Center for Cloud Research and Development is established.
2016	Migration from the SINET4 to SINET5 academic information network is completed. The Center for Cybersecurity Research and Development is established (later reorganized). The Research Center for Financial Smart Data is established (with Sumitomo Mitsui DS Asset Management Company). The Cognitive Innovation Centre is established (with IBM Japan).
2017	The Research Center for Open Science and Data Platform is established (data infrastructure development). The Research Center for Medical Big Data is established.
2018	The Center for Robust Intelligence and Social Technology is established (with LINE Corporation).
2019	Mobile SINET and SINET Russian lines
2020	"Distance Education Symposiums" are launched in response to the COVID-19 pandemic. AI analysis of CT images, etc. Support for the Emperor of Japan's first participation in an online conference (on flood prevention)
2021	"Distance Education Symposiums" are continued under the new title "Digital Transformation (DX) Symposiums for Educational Institutions."
2022	Full-scale operation of SINET6 begins. Center for Advanced Mobile Driven Research is established (5G). Center for Research Data Ecosystem Development is established.
2023	Step down.

A decade with faculty who resonated with our mission

Japan, this was a daring, pioneering effort to match multiple medical societies with computer imaging laboratories. The success of this initiative owes a great deal to the creativity and support of Dr. SUEMATSU, Makoto, the first president of the Japan Agency for Medical Research and Development (AMED).

— These four achievements can be summarized in the figure below, with each one described by a data-related verb. For example, ① is about “transmitting” data over the SINET academic information network, while ② is about “protecting” data to enhance security.

Yes. This summary is easy to understand, I think.

Achievement ③, the research data platform, is about the functions of “managing” and “sharing” data. Whereas the network is simple, because it only involves “transmitting” data, the data platform serves a variety of purposes, so it is hard to

describe with a single verb. Achievement ④, real-world applications and contributions, is easy to understand if we view it as “utilizing” data.

The true meaning of “don’t chase after what others are doing, just try to be original”

— We’ve heard about the fruits of NII’s projects, but what are the other essential requirements of research?

I always thought that the most important thing about research is basically to say nothing, but I have adopted

some new principles. One example is international references.

When considering whether to promote an associate professor to professor, we made it a rule to consult the opinions of accomplished overseas researchers. I too have written many assessments at the request of overseas institutions. NII also has to compete globally, of course.

— I’ve also heard that you put a lot of emphasis on pure and essential research.

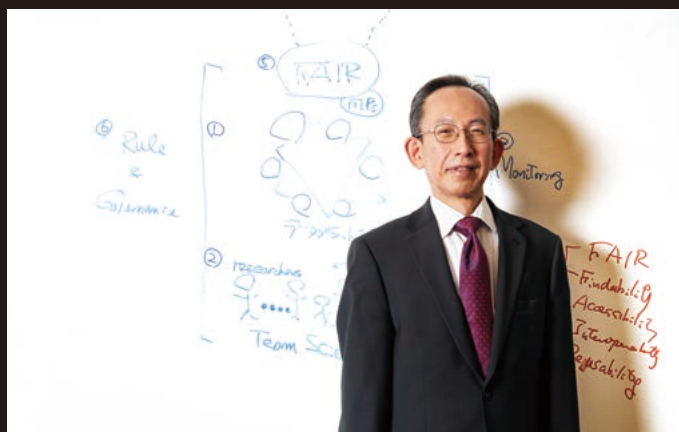
I’ve always thought that we should stop chasing after what others are doing, and instead pursue research in areas that no one else seems to be working on. China, for example, is building great strength in fields such as AI, producing research papers at a rapid rate. Even if we tried to catch up to them, they have much more financial power.

— You often say that it’s more important to try and be original than to try and be the best.

That’s right. I do think it’s very important to get experience running out in front of the pack, even in the face of difficulties, inefficiencies, or failures. But you have to do this while you’re young, otherwise you’ll never be able to do it. That’s why I like to invite professors who have earnestly and steadily pursued pure research.

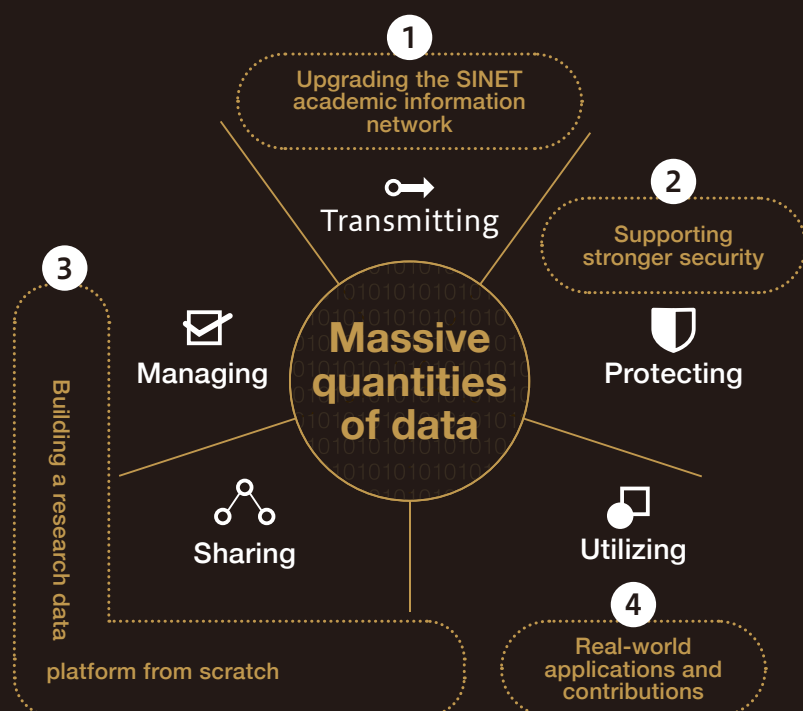
“Everything is for the prosperity of the nation”

— As the head of an organization like NII, what principles or



As selected by Prof. KITSUREGAWA:

NII’s top 4 achievements of the past 10 years



(Created by: OTSUKA, Ryuichi)

Are you brave enough to take on a challenge that no one else has tackled?

attitudes do you always keep in mind?

One thing is that instead of working for the benefit of NII, all our decisions should be based on whether we are contributing to national prosperity. Over my first few years as director, I made this point repeatedly, in New Years' addresses and other speeches.

Before coming to NII, I had zero experience of organizational management. Although I am still inexperienced, (former NII director) Prof. SAKAUCHI taught me that it is important to have criteria when making decisions. I have thought about this in my own way too.

— People often mention your ability to secure large budgets and funding as one of your key successes. What is the secret for doing this?

Maybe it's got to do with the fact that I come from a family of Kansai merchants (laughs). It's true that the NII budget has grown significantly over the past 10 years, but I don't think that is due to any power of mine. It's more to do with the fact that we had to develop services that are essential for academia. Also, we happened to ride the digital revolution wave.

Still, I always had to think seriously about securing funds, because you cannot bring NII projects like SINET and the research data platform to fruition without sufficient financial resources.

It also helps that we received significant funds from the private sector, for example for the LINE Corporation endowed chair. As the example of U.S. university presidents shows, drumming up donations is an important task for the head of an organization

like NII. I only did what is natural for a director.

A “bold spirit” with courage, without fear of failure

— Professor KITSUREGAWA is known for his many memorable expressions. We compiled some of them into “The KITSUREGAWA Lexicon.” The first one I want to ask you about is “boldness.”

It's important to try and do things that no one has done before, with the courage to initiate action without fear of failure. Many of the new things we tried at NII originated with this kind of “bold spirit.”

The distance education symposiums that we started in March 2020 as the COVID-19 pandemic unfolded (mentioned earlier) is one example.

Universities all over Japan were suddenly under pressure to switch all their lectures from face-to-face to online format. Naturally, many malfunctions were likely to occur. Our idea was to “fail first” and share the lessons we learned with everyone. In other words, it's okay to fail, but we must never forget to reflect on our mistakes.

We planned the symposiums after consulting with professors at the computing centers of the “National Seven Universities.” The number of participants was remarkable. To begin, we ran the symposiums once a week, which required desperate day-to-day efforts. But the participants expressed great appreciation for the meetings in their questionnaire responses. I had never felt so much gratitude in my life. These questionnaires were a treasure to me.

However, I pushed the seven university professors too hard. One angrily





The KITSUREGAWA Lexicon

Originality

When the professor was young, his advisor at The University of Tokyo taught him, "Don't be second best, but don't try to be number one either. Push yourself to be original by taking on challenges that no one else is tackling." Now he is pushing young people to do the same.

but that idea ended up not going anywhere.

There's no need for pessimism

— "Warmth" is another memorable term from "The KITSUREGAWA Lexicon."

In my view, our primary objective should be to help the most vulnerable and suffering people. I want to see IT be used to help create a warmer, more compassionate society. For example, our initiative to start the online

Digital is just a means to an end, not the goal, so it should be approached with humility

The KITSUREGAWA Lexicon

Boldness

Many of the great entrepreneurs of Silicon Valley were bold young people who daringly took on daunting challenges. "A society and system that appreciates boldness (in the positive sense) is essential for the future of Japan." "I feel blessed to have worked with professors who allowed me to approach my research work with boldness."



※4

told me that he was at risk of working himself to death! I came to regret what I had done. I think I was too bold.

— I believe there was another "bold" proposal that didn't go anywhere.

While on a visit to the Imperial Palace, I looked north and noticed how large the wall of the NII building appeared. I immediately got the urge to use the wall for projection mapping, to display the name of the high school

student who won the gold medal at the International Olympiad in Informatics in huge characters. I consulted the local municipality, but there were various concerns, such as the risk of distracting drivers and causing accidents, so we ended up dropping the idea.

Another case related to the fact that the NII building has very little space for laboratories. Although we are fast entering the age of robots, it is impossible to conduct research without sufficient space. We therefore seriously considered the possibility of buying the rights to the air above the expressway that runs close to NII, allowing us to secure more floor space and expand the building to 40 floors,

The KITSUREGAWA Lexicon

Warmth

Warmth is one of the professor's two main keywords, along with "boldness." "If left unchecked, competitiveness in the world of IT will intensify, making the life of many people difficult and unhappy. However, IT can also be a means for supporting the underprivileged. We need to inject more warmth and compassion into IT."

The KITSUREGAWA Lexicon

Fail fast

"In Japan, people tend to criticize even the slightest failures, but IT is such a fast-changing world that small failures are inevitable. If you feel afraid of failure, you can never make progress. That's why it's so important to try, despite your fears, and if your efforts end in failure, you can always learn something."



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symposiums during the COVID-19 pandemic was inspired by the desire to get the seven biggest universities to try out ideas and make mistakes so they could share their experiences and lessons with smaller universities that don't have the resources to learn so fast.

— Japan has been conspicuously slow to adopt digital technology. Although we had declared ourselves a state-of-the-art IT nation, even creating various process charts, the

COVID-19 pandemic exposed our deficiencies. What went wrong? We need to seriously reflect on this.

IT is a simple yet difficult field. I constantly point out that we need to remember that building digital systems is more expensive than building bridges and tunnels. For this reason, we should not create service software unnecessarily. It may sound strange for the director of NII to say that we should not build software.

There is no need to be pessimistic, however. I feel confident that we can always be successful. For example, the Fugaku supercomputer, the SI-NET academic information network, and NII's research data platform are all world-leading systems. I would like to inspire Japan with the example of these three successes.

Valuing life with a hint of recklessness

— What is your message to young people?

Computers are cheaper now than when I was a university student, so anyone can buy one. We are living in an amazing time. You can do almost anything you want, by yourself, and rapidly too. I want to see young people striving hard at something, boldly, with a hint of recklessness. It's also important to make many international friends.

— What do you say to researchers?

I want to see them live a more fulfilling life. Although it's important to do research and write many papers, there

is more to life than work. Put your health, your spouse, your parents, and your family ahead of your work. I have felt this very strongly since I had a major surgery about five years ago, after years of being too careless.

— Do you have any final words you would like to share?

I want to say that despite my inexperience, the people at NII always supported me. It is thanks to their support that I have made it this far. I tend to have a short temper, so I get frustrated and angry on occasions. And when I am busy, my explanations are short. Even now, my secretary often complains of not understanding what I am saying. I feel very humbled by the patience of the people who have worked under me, and very grateful for their hard work. I am very thankful for all of them.

*1 Info-plosion project

One of the largest projects adopted by MEXT as a Grant-in-Aid for Scientific Research on Priority Areas. This project, the first of its kind in the world, aimed at developing new technologies for processing the explosive growth in information. It continued from 2005 to 2010.

*2 "Information Discovery" project

This project, launched by the Ministry of Economy, Trade and Industry in 2007 and continued until 2010, aimed at developing a domestic search engine for Japan.

*3 FIRST program

Abbreviation of "Funding Program for World-Leading Innovative R&D on Science and Technology," launched by the Cabinet Office. This ambitious project provided a total of ¥9 billion in funding over four years for up to 30 researchers, for research in any field.

*4 From the LINE sticker of Bit (NII Character)

The KITSUREGAWA Lexicon

Adult-like

In contrast with "bold," this describes the attitude you need to adopt when forced to accept a decision (e.g., by a government agency) that goes against your wishes. "In extreme cases, it can feel like sorrow for the managerial post. Even if you feel like resisting, it is pointless to waste energy on something you can't change. It's better to 'take it on the chin,' 'like an adult,' and redirect all your energy to your bold, creative side."



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A Word from the Interviewer

When I asked Prof. KITSUREGAWA what his next goal was, he replied, "There are so many issues that seem wrong to anyone. There are so many things I want to do."

The first thing he mentioned was "education to nurture sturdy, solid children." His theory of "data-driven education" has become national policy, but he wants to continue helping to foster the next generation of children.

He also seems to harbor boundless dreams, such as "using data to reduce the number of disaster victims," "making management more scientific," and "developing algorithms for jurisprudence." Seeming to anticipate the future, Prof. KITSUREGAWA has continually taken on new challenges with his spirit of "boldness" and "warmth." I look forward to seeing what fruits his efforts will yield in the next phase of his career.



OTSUKA, Ryuichi

Editorial Board Member, Tokyo Head Office, The Yomiuri Shimbun

Graduated in 1979 from the Department of Earth Physics, School of Science, The University of Tokyo. Since joining the Yomiuri Shimbun in 1981, has covered international relations, science and technology, environment, and information technology, in the newspaper's Science Department, International Department, and Geneva, Washington, and New York bureaus. Joined the Editorial Board in 2009.

The KITSUREGAWA Lexicon

IT seller

Professor KITSUREGAWA refers to himself unpretentiously as an "IT seller" rather than an "IT researcher." "Perhaps because I was born in Osaka, I regard the term 'seller,' as in 'sweets seller' or 'ramen seller,' as an expression of someone's occupation, so I think of myself as an 'IT seller,' quite unconsciously."

Boldly Pioneering “Informatics Beyond the Horizon”

President,
Osaka University
NISHIO, Shojiro

Interviewer
Journalist
TAKAHASHI, Mariko

The leadership role expected of NII

In the past 10 years, the National Institute of Informatics (NII), which supports the foundations of informatics in Japan, has driven this discipline not just from an academic perspective, but also in terms of education. For example, with the DX (Digital Transformation) Symposiums for Educational Institutions that it ran from January 2022, NII offered a taste of the future by enabling people to attend lectures in the metaverse. NISHIO, Shojiro, one of Japan's leading information scientists, reveals the core value of NII's societal and scientific contributions to Japan.

A groundbreaking national research institute specializing in informatics

— To review the past 10 years of NII, let's first go back to when its formation. The preparations to set up NII began in earnest in 1998, when the Science Council of the (then) Ministry of Education, Science and Culture issued a proposal titled “Policy for Promoting Informatics Research.” I was a member of this Council at the time. A comment by another member has stuck in mind. It was something like, “I'm very pleased that the institute will be created, but I'm surprised at how small it is. Given that it's a national institute, it should be much bigger.”

That's a fair opinion, but the financial situation was already difficult at that

time. The National Center for Science Information Systems (formerly The University of Tokyo Center for Bibliographic Information), created in 1986 as an Inter-University Research Institute by the ministry, was being reorganized and expanded at that time. Under that scenario, those were the best efforts that were possible.

The radical thing was that a national research institute devoted exclusively to informatics was being created. In those twilight years of the 20th century, there was a series of new developments in Japanese academia focused on informatics. In 1998, when the proposal was made, Kyoto University reorganized its graduate school, setting up its Graduate School of Informatics. Before that, there were subjects and postgraduate courses with names like “Infor-

mation Engineering” and “Information Science,” but the use of the name “Informatics” was new. I recall that the new graduate school's official postal envelope included an explanation titled “What is the study of Informatics?”

— You are a graduate of Kyoto University, but you were teaching at Osaka University when NII was founded.

Yes, I was at the Osaka University Graduate School of Engineering. At that time, the mainframe computer centers that had been set up as national joint-use facilities at Japan's seven national universities (the former imperial universities) were being successively reorganized into information technology centers. At Osaka University, the Cybermedia Center was formed by merging the Computation Center and Education Center for Information Processing in 2000, just as the NII was established. I was appointed as the founding director of the Cybermedia Center. I was curious to see how the relationship between these seven university IT centers and NII would develop.

— How did it develop?

The relationship was better than we expected. SINET (an academic information network), which provided high-speed data connections within and beyond Japan, had been under development since the days of the National Center for Science Information Systems. Then, it was being progressively upgraded. Mutually beneficial relationships were established between Japan's academic institutions and NII.

NII's heightened presence under the leadership of Director KITSUREGAWA

— After the first director of NII, INOSE, Hiroshi, suddenly passed

away, SUEMATSU, Yasuharu, and then SAKAUCHI, Masao served as directors. Then 10 years ago, KITSUREGAWA, Masaru assumed the post.

The appointment of Prof. KITSUREGAWA as NII director seemed very reasonable. As a data engineering researcher, he has always promoted bold, high-impact research. I have also observed his outstanding leadership in academic activities up close.

NII worked to build stronger ties with universities from the very beginning, but it was under Prof. SAKAUCHI that relations improved significantly. For example, when the price of e-journals was soaring, putting a major cost burden on universities, he stepped up to represent Japanese academia in negotiations with the big overseas publishers. This was very reassuring for universities. NII also worked hard to promote institutional repositories as windows for exposing Japan's academic achievements to the world, investing considerable funds in the effort. The number of repositories, mainly of universities, stands at over 800—one of the highest levels of any country. These kinds of activities have brought NII and Japan's institutions closer together. Reliance on NII has become stronger, without doubt. Under Prof. KITSUREGAWA, NII enhanced SINET services—improving functionality, performance, and reliability. Innovative new services such as data retrieval were also steadily added. On top of this, the DX Sym-

posiums for Educational Institutions, hosted by NII since March 2020 in response to the COVID-19 pandemic, have been held over 50 times. They have been a positive driving force for promoting digital transformation in education. Over the past 10 years, NII has transformed itself from being a “collaborative research institute in the field of informatics” to a “joint-use institute for all academic fields.” In doing so, it has made a remarkable contribution to education.

— We could say that NII's presence has grown bigger over the past decade. How would you sum up the last 10 years in terms of Japan's informatics research capabilities?

My general impression is that there are more young and mid-career re-

searchers competing at the top level now. However, growth in Japan has been much weaker than in other developed countries. Also, while there is still some engineering-related IT research focused on increasing system performance and the like, there seem to be fewer studies that generate paradigm shifts through novel ideas.

Another concern is that fewer people are taking on leadership roles in the international community. For example, there seem to be fewer researchers getting actively involved in editing prominent journals or chairing top-ranked international conferences.

A lack of human resources and a decline in friendly rivalry between industry and academia

NII's contributions to education have notably increased



— I understand that both you and Prof. KITSUREGAWA have served as presidents of the Information Processing Society of Japan (IPSJ). When I reported on the IPSJ as a young science writer in the 1980s, it had many corporate researchers. The semiconductor industry, as well as the Japanese information processing industry, seems to be much less lively nowadays. Are the IPSJ and other academic societies struggling?

It's true that the number of corporate members of the IPSJ has dropped significantly. This trend is not limited to IT; the same thing is happening in other fields.

One reason is the major change in how industrial R&D is organized.

Many companies used to have their own R&D departments, employing many researchers. At the same time, researchers in academia and industry tended to have a healthy relationship. They had slightly different values, but they engaged in debate and friendly competition. This situation helped Japan to keep its R&D at a first-class level.

Technological development in the private sector now seems to be less focused on research and more on immediate profits. Although joint research between industry and universities is growing, there are few people in the corporate sphere capable of discussing issues from the perspective of a researcher. Universities just tend to unilaterally pursue solutions to the problems brought to

them by companies. So, increasingly, there is little or no collaboration in such "joint research" projects.

— **Something needs to be done.**

Typically, industry-academia partnerships are focused on how to solve a specific problem for a company. It is vital that we shift the focus from asking "how" to asking "what" and "why," with a medium to long-term perspective. That is, we need to examine what problem should we seek to overcome and why the problem should be tackled. Osaka University has started taking a new approach, which we call "co-creation," in which companies and universities work together to create something. To revitalize Japan's information processing industry, I believe that this kind of co-creation, which starts with problem exploration and pure research on an organization-to-organization basis, will be increasingly important.

Another function that universities need to fulfill is human resource development, not just for the IT industry but for the whole industrial economy. Japan came in 29th out of 63 countries in the 2022 IMD World Digital Competitiveness (WDC) ranking, its lowest ever position. Especially worrying is that Japan was ranked 62nd out of 63 for digital and technical skills.

Our last chance to foster more IT professionals

— **Why is it so difficult to produce IT specialists in Japan?**

Essentially, the problem stems from a lack of investment in human resources and research in the IT field as a whole, both at the national level and the industrial level.

Although there are plenty of university faculties and departments that have the word "information" in their names, most of them only train stu-

More people need to be urgently trained to work with new technologies



NISHIO, Shojiro

Graduated from the Faculty of Engineering, Kyoto University in 1975.

In 1980, earned a PhD (Eng.) from the Graduate School of Engineering of the same university, has served in current position since August 2015, and has served as Science Adviser in the Ministry of Education, Culture, Sports, Science and Technology, Director of the Cybermedia Center at Osaka University, Dean of the Graduate School of Information Science and Technology at Osaka University, and Executive Vice President of Osaka University.

dents in how to apply IT to specific tasks. It's estimated that core IT personnel accounts for less than 20% of the total number of students enrolled in such faculties and departments at national, public, and private universities.

And often in Japan, humanities and social sciences graduates are placed in jobs as software engineers after some simple in-house training, a fact that makes the ranking mentioned earlier unsurprising. In terms of both quantity and quality, there is a very serious shortfall of IT professionals with a mastery of core IT theory and practical skills.

China recognized the importance of developing high-quality IT specialists 15 years ago. One of China's top universities, Shanghai Jiao Tong University, has established a School of Software and a School of Cybersecurity separately from its general computer science schools and departments, to develop more advanced software specialists and accelerate the growth of their human resources in IT. These faculties can also accommodate several hundreds of students per year. In the U.S., the number of IT professionals trained per year quadrupled in the 10 years from 2006.

In contrast, the situation in Japan is disastrous. It's no wonder that our industrial competitiveness has declined.

— Something needs to be done to turn things around.

Yes. To improve things, the essential first step is to significantly increase undergraduate admission capacity and the number of faculty and staff for IT courses. It's also important that faculties serve as regional bases to contribute to IT education at elementary and junior high schools, as well as to reskilling and recurrent education for adults. As a first step,

funding to develop digital human resources was set aside in the second supplementary budget of fiscal 2022. We hope that these funds will be used for steadily and sustainably implementing effective support measures. This is really our last chance.

The key to pushing Japan's IT industry forward

— Is there anything on the horizon that might reverse the tide for the Japanese IT industry?

The field of quantum computers, which is still in its infancy, may offer some hope. The U.S. and China are currently the dominant players, but if Japan can establish cooperative partnerships between industry and academia in areas such as "quantum solutions" that utilize quantum computing, as we've done in the past, we might be able to make a substantial leap.

— Finally, what do you expect to see from NII in the coming years?

Innovation and product development in IT based on the fruits of informatics research are progressing at a speed that is incomparably faster than in other fields. It is very difficult to predict developments 10 years ahead in this field, but I expect to see NII boldly pioneering informatics beyond the horizon, for the next decade and longer.

At the same time, after our COVID-19 pandemic experience, we are also acutely aware that informatics is expected to help shape a new society. Regardless of whether the pandemic continues or ends, I'm confident that countries that can transform their systems to create a mature society that enables dialogue and work to be conducted online will be able to establish a fair IT platform that is full of creativity. The key to achieving this goal is to utilize big data, develop ultra-high-perfor-

mance networks, establish information security systems, and to train IT professionals to take on all these tasks.

I believe that through close collaboration with universities, NII will continue to play a leading role in creating IT platforms.

A Word from the Interviewer

I didn't realize that the term "informatics" was coined only quite recently. Is "information science" the science of information? And is "informatics" the study of information? Even more basic, what is "information"? These are questions I've struggled with when writing articles. Different people have quite different ideas of what "information" means. In any case, everyone senses the rapid advancement of "information technology." The important thing is to use IT to create a better society. I now realize that in the context of this goal, "informatics" is a more appropriate term than "information science."

As we've heard, Japan is facing many challenges in the realm of IT, but we can be confident that NII will strive to try and brighten the future.



TAKAHASHI, Mariko

Journalist, former Science Coordinator, The Asahi Shimbun

Graduated from the Department of Physics, School of Science, The University of Tokyo. After joining the Asahi Shimbun in 1979, worked as a reporter in the Science News Section of the Tokyo Head Office, as a staff writer and editor of Kagaku Asahi ("Science Asahi"), as an editorial writer (on science, technology, and medicine), as Deputy Editor and Science Editor (Section Chief) of the Science News Section, before leaving the newspaper in 2021. Publications include "Discovering Gravitational Waves!" (Shincho Sensho).

Diversity is Driving Progress in Informatics

Professor, Digital Content and Media Sciences Research Division, NII
Vice Director-General, NII
AIZAWA, Akiko



Professor, Information and Society Research Division, NII
Research Director, NII
ECHIZEN, Isao

Pioneering efforts to get through the unpredictable decade ahead

Despite its relatively small size, the National Institute of Informatics (NII), Japan's core informatics research institute, has been productive in many different areas of research, ranging from pure research in informatics to joint research projects with private companies focused on real-world applications. These activities are supported by a diverse range of people and a free environment that enables researchers to pursue their work autonomously. We spoke to AIZAWA, Akiko, a Vice Director-General of NII and ECHIZEN, Isao, a NII Research Director, about how the NII has evolved over the past 10 years in terms of research and education.

Growing diversity of people and research is opening up the future potential of informatics

From pure research to industry-academia collaboration

— We are looking back at NII's research achievements and accomplishments over the past 10 years. Remarkable developments and advances in IT have occurred in this time. I assume that NII has greatly expanded its areas of research.

AIZAWA: It's true that NII has expanded its range of research, but it has retained a consistent focus on pure research. There are three categories of IT in the Grants-in-Aid for Scientific Research (KAKENHI) screening process. The first of these, "Information Science and Information Engineering," can be considered a field of pure research. This basically corresponds to "fundamental theory," such as algorithms and mathematical informatics, and "infrastructure," such as platform software and high-performance computing. NII has always paid close attention to the developments and enhancements in this category.

Although informatics has a shorter history than physics or chemistry, its



boundaries are rapidly expanding, so the “map” of informatics is constantly changing. For this reason, I think it is important to concentrate on the core academic foundations of the discipline.

ECHIZEN: It is at times like these that the fundamentals are most important. As I see it, NII has been pursuing research to explore the question “What is information?” from a long-term perspective, coming up with essential answers to the question.

While working seriously on the fundamentals of IT as scaffolding, we have also promoted industry–academia collaboration. For example, we established the Center for Robust Intelligence and Social Technology (CRIS) in collaboration with LINE Corporation. This research organization aims to develop a robust knowledge base to use in solving real-world problems. In this effort, NII serves as a hub, using its expert judgment to find outstanding researchers and to pursue commissioned research and joint research. In terms of linking the private sector and academia, this is a pioneering initiative. We have established several centers

for industry–academia collaboration, including the Research Center for Financial Smart Data with Sumitomo Mitsui DS Asset Management and the Cognitive Innovation Centre with IBM Japan. We have also partnered with multiple medical academic societies on the use of medical big data. In response to the demands of the times, we are cultivating existing research communities and creating new ones. This approach stems from the leadership of (NII Director) KITSUREGAWA, Masaru.

— What challenges do you see when you look ahead to the next decade?

AIZAWA: We are living in truly unpredictable and confusing times. It’s difficult to say here and now what kind of research will be required in the future, but one of NII’s strengths is that it has a system that allows us to continually recruit people in new fields. Our excellent PIs (principal investigators, the researchers who organize research labs) keep a close eye on new trends to help us expand our range of research interests.

We often hear that there is a shortage of human resources in the information field, but if people move to peripheral fields, the center of the discipline will get hollowed out. It is important that we retain sufficient human resources at the core of informatics. This is another objective that Prof. KITSUREGAWA has instilled in us.

ECHIZEN: NII is an ideal environment for young researchers. For one thing, they get plenty of time to settle down and tackle their research. Prof. KITSUREGAWA also instituted a policy in which a Research Director is assigned to all young researchers as a mentor to support them in their area of research.

There are also regular interviews with the NII Director to get advice. NII offers an environment that enables young researchers to stay close to what they are really interested in and to feel a sense of mission.

— What are the features of NII’s approach to recruiting and training young people?

AIZAWA: From the time NII was established in 2000, its organizational structure has been designed to be very flat. Unlike the “chair system” of universities, all new members become independent researchers, even if they are just assistant professors. It’s reported that most young doctoral students aspire to become a principal investigator (PI) who presides over a lab. At NII, everyone is a PI from the moment they arrive. As a PI, you have the autonomy to conduct the research you want in the way that you want. One of the charms of NII is that it offers an environment where this is possible.

ECHIZEN: When I first came to NII, I had no idea how to secure a research grant. Fortunately, NII has its own internal application system for supporting strategic research on specific themes. If Prof. KITSUREGAWA found a proposal interesting, the funding would be obtained somehow. Researchers can explain their proposals directly to the director. I too was able to obtain external funding through this kind of internal mechanism. This tradition at NII is healthy. And by actively making available opportunities for exchange and interaction, Prof. KITSUREGAWA has made this system even more effective.

— According to “20 Years of NII...,” one in three faculty members are

A free environment that enables researchers to pursue their studies autonomously



young researchers (under 42) and one in five are women.

AIZAWA: This is an exceptionally high level for the computing and IT field. Since we do not have a chair system, every year we hire several people through an open application process. And since our recruitment is not restricted by gender, nationality, or even research field, we've been able to hire more women.

However, the government has now set numerical targets for the hiring of female researchers to push the percentage of women even higher. Competition for diversity hires between universities and research institutes is therefore likely to intensify.

ECHIZEN: Generally speaking, more and more people with graduate degrees in AI or data science, both men and women, are choosing not to go on to work in academia. Many are starting their own tech ventures. This trend applies not just to NII but also universities. Relatively speaking, the situation at NII is not so bad. We are still getting a lot of applications from top-class people.

— What about attracting people from overseas?

AIZAWA: To promote international exchange, we are concluding MOUs with overseas research institutions. We're also receiving many overseas applicants for open faculty positions. We also provide information about



job openings to the partners we have signed MOUs with.

ECHIZEN: The number of MOU partners is steadily growing. We also offer numerous international internships; over 100 graduate students from abroad have already participated. The program had to be suspended due to the COVID-19 pandemic, but it has now resumed. It seems that in many cases, people applying for faculty positions once had a positive or enjoyable research experience at NII.

NII also has an International Advisory Board that gives young researchers the opportunity to present their work in front of world-renowned researchers. This gives young researchers the opportunity to communicate directly with people such as KANADE, Takeo (professor at Carnegie Mellon University) and Jeffrey David Ullman (a professor emeritus at Stanford University and Turing Award winner). This possibility too is the fruit of Prof. KITSUREGAWA's efforts to form a worldwide network of people to support NII.

AIZAWA: The main work of many NII faculty members is to lead projects aimed at delivering services relating to networks and contents. Although there is a shortage of human resources across the board in IT, the number of people who can carry out this kind of role is especially limited, so these people are very precious. What should we do about the career paths of these people? There are many things that can only be done in cooperation with other organizations through exchanges of expert personnel, so we are seriously reviewing this issue. Over several years, we have also created multiple evaluation scales for different positions.

ECHIZEN: Professor KITSUREGAWA firmly believes that evaluation should not be based solely on the number of published papers or citations. If a researcher is enthusiastic about what they want to do, we should take into account that enthusiasm in evaluating



them and their career path. This also helps to make NII more appealing.

Applying research findings to give back to society

— It seems that AI, big data, and other new information technologies are having both positive and negative effects on society.

ECHIZEN: A program we developed for automatically detecting fake facial images using AI was adopted by a company and put to real-world use. NII is not just about research; delivering real-world value is also important. Although NII is smaller than many university faculties, it manages to conduct a very diverse range of research.

AIZAWA: For many years, I've worked on research that involves analyzing academic papers. One research topic that has grown substantially in recent years is the use of AI for the support of researchers and digital transformation of research. For example, software capable of correctly answering all sorts of questions has become amazingly smart, but generated answers still include unsubstantiated and erroneous contents in many cases. However, verification technology for figuring out how to correct these kinds of AI inference errors remains immature.

— The question of "what is reliable data or information?" is a very essential theme, isn't it? Thank you very much for your time today.

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YAMAJI, Kazutsuna



The Road to Building an Academic Research Platform

— Services and possibilities offered by four service centers —

As part of its effort to build a comprehensive academic information platform in Japan, the National Institute of Informatics (NII) has established four service centers over the past decade, under the leadership of its director, KITSUREGAWA, Masaru. These centers support the foundations of research from a variety of angles, including open science, cybersecurity, and cloud computing. What was the concept behind this infrastructure? And how will the platform evolve in the coming years?

The two wheels of NII's vehicle are "research" and "service." NII's core "service" is the SINET data and telecommunications network, a vital part of Japan's academic information infrastructure. In collaboration with universities, research institutes, and other research communities,

NII contributes to academic research and educational activities by building, upgrading, and operating this ultra-high-speed, high-reliability, and multifunctional network. In the past 10 years, in addition to upgrading the Research and Development Center for Academic Net-

works under the leadership of Prof. KITSUREGAWA, NII has also set up three new research centers in rapid succession: the Center for Cloud Research and Development (April 2015), the Center for Strategic Cyber Resilience Research and Development (formerly the Center for Cy-



SINET offers a highly confidential and high-speed data network (URUSHIDANI)

bersecurity Research and Development) (April 2016), and the Research Center for Open Science and Data Platform (April 2017). These four centers, which collectively make up a comprehensive academic research platform, are now fully up and running.

In the time all this was done, SINET was upgraded from SINET4 to SINET5, and then to SINET6 in April 2022. With SINET5, NII built a 100 Gbps network connecting the whole of Japan mesh-style, to meet the growing demand for distribution of research and education data. SINET6 boosted network bandwidth across the country from 100 to 400 Gbps and increased the number of network nodes, thereby creating the

most advanced network of its kind in the world. SINET6 also supports 5G and other mobile networks and more extensive international connections. The number of universities and research institutes subscribed to SINET grew from 802 in 2013 to 1,000 by October 2022. The subscription rate is 100% for national universities and Inter-University Research Institutes, and 92% for public universities. The overall subscription rate for all national, public, and private universities is approximately 76%.

In addition to enhanced functionality, performance, and scale, SINET has also evolved through its integration with the NII Research Data Cloud (NII RDC), an innovative research data

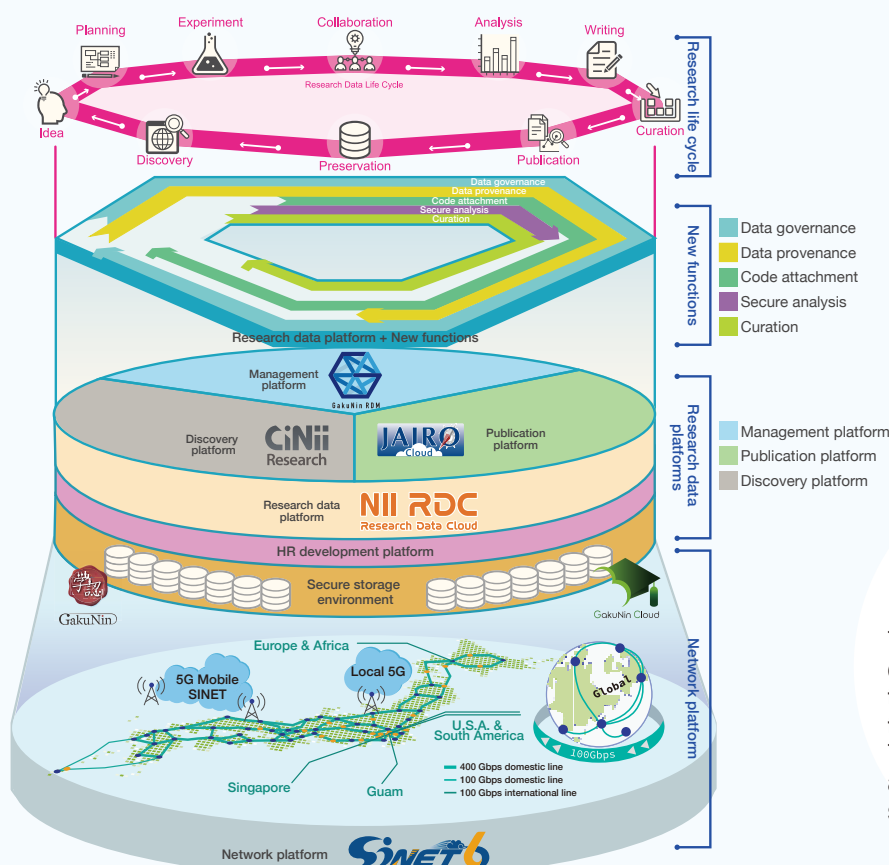
platform for managing, storing, and distributing research data. This integration commenced with the launch of SINET6.

Here, we interview the directors of the four NII service centers mentioned above that were conceived to realize the “Academic Research Platform” under the leadership of Prof. KITSUREGAWA. We discuss the roles of each center, the changes and difficulties they have encountered, and their prospects for the future, building on their past 10 years.

Service centers serving Japan’s academic information platform

— To begin, I want to ask each of the directors of the four service centers set up and operated by NII as part of its comprehensive academic information platform to offer an outline of their missions and some background to their center’s establishment.

URUSHIDANI: I am the director of



Schematic diagram of NII's Academic Research Platform

This is a general overview of NII's Academic Research Platform, integrating the SINET6 network infrastructure and the NII RDC research data platform. The various infrastructure elements and functions are organically linked to support academic research in Japan.

the Research and Development Center for Academic Networks, which in very simple terms is dedicated to R&D on the development of SINET (the academic data network established and operated by NII). SINET is currently used by over 1,000 subscriber universities and research institutes and a total of over 3 million people.

As an exclusively academic network, the requirements of SINET are quite different from those of a typical commercial network. Since SINET links up large-scale experimental facilities and supercomputers, it needs to handle extremely high volumes of data. Since much of the data on SINET are highly confidential, a feature of the service is its high-speed, secure VPN connections.

As part of the effort to develop and deploy a service like SINET, our center works on the design of the service and development of its functions. Our center was established more than 16 years ago, actually, before the launch of SINET3. In the last 10 years, NII has opened other service centers in quick succession. What about our relationship with these other centers? Well, while we are responsible for network infrastructure, the other three centers do in-depth exploratory R&D on specific aspects of network utilization. For this reason, we are the center that works most closely with other centers.

AIDA: The purpose of our Center for Cloud Research and Development is to develop advanced cloud-based research and education infrastructure.

It all started in 2014, when the Science Council of Japan issued a proposal about SINET, insisting that cloud computing would become in-

dispensable for Japan's future. At that time, the use of cloud computing had barely begun in a few pockets of industry; most people still had no idea what "cloud computing" was. Our center was established to promote adoption of cloud computing and to support universities and other organizations in implementing it. Our mission was not so much to build cloud infrastructure, but rather to focus on how to make use of it for research and how to create a user-friendly cloud computing environment for universities.

More specifically, we do such things as develop basic software for using the cloud, conduct various kinds of verification testing, and create checklists of points to keep in mind when universities or other institutions use the cloud.

TAKAKURA: For us, it all started when universities and institutes were asked what they wanted when SINET was being expanded. There were many requests about cloud computing and security. That was the impetus for setting up the Center for Strategic Cyber Resilience Research and Development (formerly the Center for Cybersecurity Research and Development). Another factor was that a cyberattack on the Japan Pension Service and an accidental data leak at a university occurred around that time, driving up interest in security. I was at Nagoya University when Prof. KITSUREGAWA invited me to get involved.

Our mission is not just to prepare

for cyberattacks or to deal with damage after the event. Given that SINET, which is operated by NII, is such a vital piece of infrastructure, our key function is to ensure that even if a cyberattack occurs, we can keep SINET running, and by extension keep universities running.

It was partly for this reason that the center was renamed to include the word "resilience" when it was reorganized in 2022. This signaled a shift to dealing not just with cybersecurity but more broadly with maintaining strategic resilience. The name has now become a real mouthful, so within NII some people refer to it as the "long name center," or as "Takakura's place," as Prof. KITSUREGAWA calls it (laughs).

YAMAJI: The Research Center for Open Science and Data Platform was established in 2017. For a few years the idea of promoting open science on a policy basis had been discussed in Japan, with claims that some kind of infrastructure was needed for this purpose. Ultimately, NII was chosen to take charge of this infrastructure. In a nutshell, our mission is to develop a data platform for promoting open science.

Specifically, we have a "data management platform" for managing the data associated with various research projects, and a "data publication platform" for compiling or summarizing research findings. There is also a "data discovery platform" for comprehensively



Our mission is to create an environment that makes it easy for universities to use cloud computing (AIDA)

searching and finding data. These three platforms combine to form a single comprehensive data platform in accordance with the lifecycle of research data, for facilitating distribution of research data.

An aggressive approach to supporting the development of SINET

— What are some of the major changes that have taken place over the past 10 years or since your center was established? And what are some of the difficulties you have encountered in your activities?

URUSHIDANI: Although SINET had been upgraded to SINET3 and SINET4 before Prof. KITSUREGAWA took over as NII Director, the SINET project was in difficulty because its operating expenses were gradually being reduced. The big change that happened after Prof. KITSUREGAWA arrived was that the approach to SINET became more aggressive.

Before the upgrade to SINET5 in April 2016, we shifted our focus. Instead of just submitting a budget request to the ministry (MEXT) as in the past, we worked to obtain a consensus within the academic community. Specifically, to give more impetus to the development and improvement of SINET, NII managed to get the promotion of SINET included in the Master Plan of the Science Council of Japan and MEXT's annual Road Map. This was a significant shift. To help achieve these changes, Prof. KITSUREGAWA worked energetically at giving presentations and persuading various stakeholders. Naturally, this kind of infrastructure development cannot be sustained by securing a decent budget just

once. For one thing, money is needed constantly for operation, and the service will also quickly become outdated unless its functions are upgraded.

For those of us working on SINET R&D and operation, it's easy to get discouraged when we don't receive the financial support we want. But Prof. KITSUREGAWA would only step up his efforts when there was an occurred. Mind you, it was very tough. Every year when the time to submit budget estimates drew near, I was filled with trepidation. Professor KITSUREGAWA would ask me, "What are you going to do next? Give me a 'key'," so we can persuade the others" (laughs). That's what it felt like these past 10 years.

YAMAJI: We already had repositories of research findings and search services for promoting open science. However, setting out to build the "data management platform" mentioned earlier—that is, new services for handling academic information and research resources in the process of research—was a very big challenge for NII.

Due to the nature of this infrastructure, such services can never be stopped, because they are used for research processes 24 hours a day, 365 days a year. In addition, while the previous kinds of repositories were intermediated by librarians, for example, this management platform is provided directly to the researcher. This means that there is a great deal of individual variation in how people want to use it. When we started working on the

project, many people told us that doing such a thing was impossible, or that we should stop. I am proud to say that it's because we dared to tackle challenges like this one that NII's current services have improved so remarkably.

AIDA: In pursuing the activities of the Center for Cloud Research and Development, we need to work closely not only with academia but also with industry, particularly cloud service providers. In this sense, we need to pay attention to the balance between universities and businesses, as well as between businesses. We've been very careful about these things.

One notable difficulty is that we were groping in the dark in the beginning. Although we were told that "the cloud is here, so everyone needs to adapt, and this change will make things better," we didn't really know what universities wanted from us. The hardest thing was that to set up these services, we had to study continually and get help from a variety of people.

TAKAKURA: We faced several difficulties, including funding. Even if the government provides a massive budget, if that money is shared between 100 universities, each university will only receive 1/100th of that budget. It's simply not possible to reduce the quality to 1/100th in this case. It was tough to come up with ideas that would maintain the highest possible quality within a limited budget.

Then there is question of human resources. Initially, the center was a



Ideas for maximizing quality within a budget are important (TAKAKURA)

kind of “one-man shop.” There was nobody but me, the center director. Immediately after we launched, we did some recruiting, fortunately receiving applications from some excellent people who came to work at the center. Nevertheless, we suffer a chronic shortage of staff.

Naturally, we want people to know about cybersecurity. However, we don't them to just do research on analyzing cyberattacks or attack tools. What's more important is studying how to respond in the event of an actual attack to ensure resilience (continual education and research). In other words, I would like to see more people doing cybersecurity to support their principal research interest, rather than doing cybersecurity as their principal research interest.

Another thing that makes things tough is that since I wrote up the concept of the center when I was the lone center director, I'm the only person who fully understands the framework. The concept contains some quite pioneering ideas, so when I'm asked questions like “Is this how you protect it?” I struggle to explain things from scratch.

10 years of continuous evolution and what lies ahead

— After reviewing the past 10 years, how do you see your center's prospects for the coming years?

URUSHIDANI: With network infrastructure, we've been on the offensive continually for the past 10 years, and I think we will go on like this in the coming years. In our current and foreseeable work on SINET6 and SINET7, our major points of focus will be ultra-high speed and wireless connectivity.

YAMAJI: The open science plat-



A turning point in the spread of open science from universities to society at large (YAMAJI)

form we developed began operating in 2021, but with the support of the ministry (MEXT), we are adding functions. However, our highest priority is to expand the deployment of this platform (NII RDC) to universities all over Japan.

As for the data management platform that we started from scratch, although we have received user applications from 60 institutions, the platform is still being used only internally, and on a small scale. However, along with the institution of university data policies, we will roll out the platform to the entire university, to create an environment that is eventually used by all researchers as a matter of course. That is our goal.

At the same time, while our focus has obviously been on deploying our services to institutions of higher education, considering the growth of open science, we want to make our services partially available for use by industry and the general public, which would be unprecedented. This is likely to be a major turning point for NII's services, I think.

TAKAKURA: In the field of cybersecurity, I think we can continue with the current framework for another five years or so, but I feel that the framework itself will probably change in around 10 years.

With the rise of mobile devices and the growth of online education, even the way SINET is used will change. It follows that cybersecurity will also need to be implemented differently. I think we will need to

look for new approaches to cyber protection.

AIDA: As director of the Center for Cloud Research and Development and general manager of the Cyber Science Infrastructure Development Department, I think the biggest difference compared to 10 years ago is how people involved in commercial services are seen.

Ten years ago, people working on information infrastructure, not just at NII, were not always regarded highly. For one thing, this kind of work does not always allow researchers to write a paper. Infrastructure is taken for granted to be working. That was the viewpoint, at least. However, this situation has changed dramatically over the past 10 years under the leadership of Prof. KITSUREGAWA. In developing services, he has listened to a wide variety of opinions, and the importance of commercial services within NII is now recognized much more strongly than before.

However, much remains to be done. When I think about the next 10 years, I feel that we need to increase this awareness even further. I don't say this just because we are working in this area, either. The point is that if we fail in this, Japan will face the real danger of running out of people capable of taking charge of its information infrastructure. Even today, there is an ongoing exodus of talented IT specialists from Japan to other countries. It is therefore a vital and urgent task to improve the situation further.

Hello from Edinburgh

In September 2022, after flying into Edinburgh Airport in the UK, I was surprised to find that the city was overflowing with garbage. This was surprising, given that Edinburgh is renowned for its beauty and the whole city enjoys World Heritage status.

The purpose of my trip was to pursue an international joint research project between the UK and Japan. The project, focused on British and Japanese sign languages, explores how the online meetings that exploded throughout the world in the wake of the COVID-19 pandemic have linguistically changed the world of sign language users. Since restrictions to limit COVID-19 infections were still in place, we considered doing everything online. However, since sign language is a face-to-face language, we decided to travel to the UK in person. We felt that it would have been too difficult to carry out the entire project in the two-dimensional world of online meetings.

After overcoming numerous challenges, such as obtaining a visa and organizing a suitable residence, the long-awaited day arrived.*1 As soon as I arrived in the UK, I was met with a number of difficulties, however. It took me a month to open a bank account and a further month to receive my bank card by post. And when I tried to catch a train, services were often cancelled. My host university, my daughter's junior high school, and my son's nursery school were quickly closed too. What on earth was happening...? A strike. Not just postal services, public transport, and educational institutions—even nurses and ambulance crews were systematically striking for higher pay. It finally clicked that the trash-filled streets of Edinburgh that I saw on arrival were due to a strike by garbage collectors.

It was clear that the chaos caused by worldwide inflation and the pandemic were strongly impacting the country. Prices were rising rapidly. Although the prices of foodstuffs and other essentials of daily life had not risen substantially, the people who knew the country before COVID-19 were feeling the pain. Gas and electricity prices had also risen, to the point that the government now had to pay a portion of each household's energy bills.

Despite this situation, the people I passed on the street were not gloomy-faced. My impression is that the British people are very stoic. Even when they suffer inconveniences because

someone decided to strike, they tend to be accepting. "It's their right to strike," they say. I even sense that many are supportive of the strikers. Even when a strike leads to cancelled trains and it takes them more than twice as long to get to work or school, people seem to tolerate the hardship. Strikes also offer an opportunity for people who are adversely affected to realize that businesses and services should not be taken for granted, because they depend on the precious labor of real, flesh-and-blood human beings.

How does all this compare with Japan, then? Strikes that affect essential businesses and services in Japan are very rare. Because of this, Japanese people have had extremely little experience of suffering due to strikes. If one day all our postal mail suddenly stopped arriving, or if all public transport were suspended, we would finally realize that many things we take for granted are not as certain as we think.

In the very first days of the new year (2023), when various strikes were happening day after day, Britain's first ever Asian Prime Minister, Rishi Sunak, announced in his New Year's address to the nation that mathematics would be made compulsory up to age 18. Sunak considered the fact that only half of students aged 16 to 19 learn mathematics as problematic, so he decided to continue exposing students to mathematics until the age of 18. My daughter, who is now in her first year of junior high school after coming to the UK, has been rated as being highly capable in her math classes. She was surprised by this appreciation because she had struggled with her arithmetic in Japan until just before we left for the UK. We often hear that Asians are good at mathematics. With its patience and understanding of others, it will be interesting to see what kind of country the UK will become under the leadership of its first Asian PM.

*1 Details are summarized here (in Japanese).

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NII NEWS TOPICS

Period

November 11 (Fri.), 2022 to
January 31 (Thu.), 2023More details about news
items are available online.
(in Japanese)
www.nii.ac.jp/news/2022

NEWS RELEASE 2022

- 2023 Jan. 23** NII and NTT launch trial of secure computation system for universities: Offering “the world’s first secure computation AI software capable of training and inferencing with key algorithms in four major categories of AI”
- Jan. 13** SYNTHETIQ VISION program for automatically detecting fake AT-generated facial images is deployed for detecting deepfake images of celebrities: First practical application of automated facial video authenticity detection in Japan
- Jan. 10** AI for estimating biological age from fundus images is publicly released: A foundation for establishing a new biomarker of ocular diseases
- 2022 Dec. 23** NII analyzes changes in public topicality and interest in COVID-19 vaccines: Reading massive quantities of Twitter data (over 100 million Tweets)
- Nov. 24** NII starts offering travel data submitted by users of a Japanese travel website (Chikyu no Arukikata) free of charge for academic research

AWARD 2022

- 2023 Jan. 10** A paper by former NII Project Researcher ZHANG, Xiaoqing; Associate Prof. KANEKO, Megumi; Project Researcher LE, Van An; and Prof. JI, Yusheng (all three of Information Systems Architecture Science Research Division) is runner-up in the **BEST PAPER AWARD at IEEE CCNC 2023** (2nd out of 271 papers)
- 2022 Dec. 20** Former NII Project Researcher CLANUWAT, Tarin is selected as a “**Nice Step Researcher**” by the National Institute of Science and Technology Policy (NISTEP) of the Ministry of Education, Culture, Sports, Science and Technology (MEXT)
- Dec. 8** A paper by Prof. KOIBUCHI, Michihiro and his team (Information Systems Architecture Science Research Division) wins **BEST PAPER AWARD** at the 23rd International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT’22)
- Nov. 25** The IIIF Curation Platform developed by Prof. KITAMOTO, Asanobu and his team (Digital Content and Media Sciences Research Division) wins the **Best Infrastructure Award at the 4th Japan Society for Digital Archive Awards**
- Nov. 25** “miwo: App for AI Kuzushiji Recognition” developed by Prof. KITAMOTO, Asanobu and his team (Digital Content and Media Sciences Research Division) wins the **Best Infrastructure Award at the 4th Japan Society for Digital Archive Awards**
- Nov. 21** Assistant Prof. AOKI, Shunsuke (Information Systems Architecture Science Research Division) is included in the “**Innovators Under 35 Japan 2022**” by *MIT Technology Review*
- Nov. 12** Project Researcher SUETSUGU, Koki (Principles of Informatics Research Division) wins the **Excellent Presentation Award at the 48th IPSJ Game Informatics Research Group**



NII Commemorative Retirement Lectures FY2022

Dates and times:

Wednesday March 22, 2023

1:15 pm: YONEDA (Vice Director-General)

3:00 pm: OYAMA (Assistant Director-General)

Friday, March 24, 2023

1:15 pm: ABE (Professor)

3:00 pm: KITSUREGAWA (Director-General)

Format: Online

For details about how to
participate, visit this URL:
[https://www.nii.ac.jp/
event/2023/0322.html](https://www.nii.ac.jp/event/2023/0322.html)


10th NII SHONAN Conference Commemorative Lecture

“Digital twins that extend the experience
of humans and robots”

Date and times: Saturday March 25, 2023

“Digital Twins Experience Corner”:

1:30-2:40 pm (Venue only)

Lecture: 2:40-4:10 pm (Venue +
Online)Speaker: INAMURA, Tetsuya
(Associate Professor, Principles of
Informatics Research Division)

Format: Venue + Online

Venue: Hayama Campus,
Graduate University for Advanced
Studies (SOKENDAI)For details about how to
participate, visit this URL:
[https://www.nii.ac.jp/
event/2023/0325.html](https://www.nii.ac.jp/event/2023/0325.html)


[E s s a y]

Aiming for a New Form of University

There is no doubt that dramatic advances in information and communication technology over the past half century have greatly eased the constraints of time and space on human activities. Technological advances have caused great changes to the structure of society. Universities are now also approaching a major turning point.

Many of Japan's universities were founded in the late 20th century based on Western universities, with national and private universities dating from the late Meiji and Taisho periods as typical models. Currently, there are a total of 800 universities and other institutions in Japan engaged in education and research. These are typically made up of an executive department and administrative organization that lead the management of the university, a campus where students and faculty study and work, classrooms, libraries, and other buildings, as well as various educational and research facilities. Additionally, there are various organizations and services that support the activities of students and faculty.

However, when the basic structures of most of these institutions were constructed, the existence of today's information and communication technology was scarcely unimaginable. This technology has therefore been adopted bit by bit to achieve gradual improvements. However, due to the changing structure of society, universities are now required to transform themselves radically; because information and communication technologies now



play a very central role in their operations and functions.

I think it's fair to say that in the decade covered in this special issue of this magazine, during which KITSUREGAWA, Masaru served as NII Director and expanded the functions of the institute, this transformation was taking place gradually—first latently and then, suddenly, very visibly and obviously with the outbreak of COVID-19. The COVID-19 pandemic that swept the world in the spring of 2020, initially an unknown threat, forced many universities to close their campuses and continue their education and research activities by utilizing information and communication technology to conduct lectures and conferences online.

Confronted by this crisis, many universities managed to quickly restore their educational and research functions by

temporarily suspending the functions and adopting alternative means of delivering them, such as online lectures. This success was achieved thanks to the new IT infrastructure prepared by these universities and NII. A system supporting a wide range of educational and research activities was prepared so that it could be firmly secured by various platforms and authentication systems, supported by the various information platforms deployed by each university and the information platforms on the cloud, and connected by the SINET service developed by NII. This has proved to be a powerful tool.

This also led to extensive discussions about the ideal form of a new university. Does the administrative organization of a university need to be in a centralized location? Can the facilities, equipment, or services needed for operation be shared between multiple universities? Can we create a platform for sharing organizations and services that supports education and research between universities? Is a large library or campus even necessary? In many of these discussions, the need for institutional reform was expressed, including laws that define criteria for establishing universities, as well as the development of human resources to support new university organizations and fundamental reform of organizational structures. The time has come for serious debate, not only among experts involved in IT infrastructure but more broadly among everyone involved in education, science, and technology.

Professor Emeritus, Kyushu University
Vice Director-General, NII
Chief Cyber Science Infrastructure Director, NII
Project Professor, NII

YASUURA, Hiroto