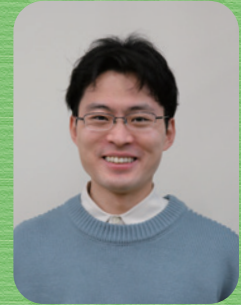
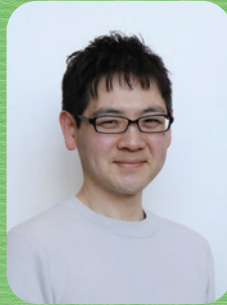


**FEATURE**

## People who Collaborate on Research within NICT

Round-table Discussion by Comprehensive Workers

### Young Comprehensive Workers Collaborating on Research





FEATURE

## People who Collaborate on Research within NICT

### Round-table Discussion by Comprehensive Workers

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Staff members that collaborate on NICT's research mentioned in this NICT News issue. In addition to them, many other staff members also collaborate on NICT's research.

FEATURE

People who Collaborate on Research within NICT



Round-table Discussion by Comprehensive Workers

## Young Comprehensive Workers Collaborating on Research



TANIOKA Daisuke

Senior Manager,  
Public Relations Department



TOKUDA Aya

Assistant Chief, Press Office,  
Public Relations Department



KUWAHARA Manae

Assistant Chief, Planning Office,  
Wireless Networks Research Center,  
Network Research Institute



AKAZAWA Naoki

General Planning Office,  
Radio Research

NICT continues to be at the forefront of the field of information and communication technology (ICT), but research is not conducted by researchers alone. Generalists always run side by side with researchers. What kind of work do they do every day to collaborate on research? This time, I interviewed three young comprehensive workers.

**TANIOKA** First of all, please introduce yourself and tell me about your career and current work.

**TOKUDA** It has been five years since I joined NICT, and the first department I was assigned to was the Personnel Affairs Group. There, I mainly worked as a recruiter for career-track positions. Since the recruitment system was not very detailed before I was assigned, I discussed with the people concerned how many staff in career-track positions would be required and what kind of personnel would be desirable, and improved the recruitment system for career-track positions.

Currently, I belong to the Press Office of the Public Relations Department and am in-

involved in two types of work. The first is preparation of press releases and handling media inquiries and requests to interview researchers.

The other is information dissemination work, and I was in charge of production of a comprehensive pamphlet for the 5th Medium-to Long-Term Plan and a promotional video for NICT called "A Future with N." Now, I'm in the process of producing a video that introduces the results of research called "N Channel," which is the sequel to that.

**KUWAHARA** It has been four years since I joined the institute. At first, I was assigned to the Strategic Planning Office of the Strategic Planning Department, where I was in charge of liaising with the Ministry of Internal Affairs

and Communications, which has jurisdiction over NICT, and establishment of the domestic internship system, etc., as well as preparation of business reports and formulation of medium- and long-term plans and annual plans. The Strategic Planning Department is the so-called "hub" of the institute, and while working in cooperation with departments and research institutes, the Ministry of Internal Affairs and Communications, and other corporations, I was able to get a bird's-eye view of the institute's overall activities and the direction of research and development.

Since August 2021, I have been a member of the Wireless Networks Research Center in Yokosuka. My main duties include maintaining facilities at the Yokosuka Base, managing



Round-table Discussion by Comprehensive Workers

## Young Comprehensive Workers Collaborating on Research

intellectual property for each research institute and center, and responding to inquiries from outside.

**AKAZAWA** I just joined the institute one year ago, and now I belong to the Management Operations Group of the General Planning Office of the Radio Research Institute, and am in charge of various tasks as a generalist. One of my current main tasks is management of intellectual property (patents), including operation of patent review meetings held in the institute, and calculation of costs related to patent maintenance; so I am able to be closely involved in actual research and inventions.

In addition, I am in charge of secretariat work for events and study groups within the institute. Last year, I was involved in management of a symposium with a capacity of 150 people. Also, I have gained valuable experience by interacting with external researchers and university professors.

**TANIOKA** I understand that work related to intellectual property is also carried out by comprehensive workers.

**KUWAHARA** I think that how generalists are involved differs depending on the policy of each research institute, but at the Network Research Institute, there are persons in charge of intellectual property at each center, and they work together with research engineers and administrative specialists.

**AKAZAWA** At the Radio Research Institute, there are persons in charge of intellectual property in the General Planning Office. While I am being taught by an experienced boss, both the boss and I work on this together.

How to engage with researchers

**TANIOKA** Many researchers are enrolled in NICT and conduct research on a daily basis. Please tell me about your engagement with researchers during your work.

**KUWAHARA** In terms of intellectual property, in work related to the application and maintenance of patents, I communicate with researchers on a daily basis, for example, for checking procedures, costs, and contents.

In addition, inquiries from outside, such as technical consultations and requests for collaboration, frequently come in, and when such inquiries are received, I coordinate between the client and the researcher in charge.

**TOKUDA** Since I came to the Public Relations Department, I have come to be involved with researchers more and more. During the production of "A Future with N," which I mentioned earlier, researchers, the production company, and the Public Relations Department worked together as one team to create one piece of work. At that time, I tried to make the production run smoothly as an intermediary. As a result, the work went well. I think that my experience in creating videos by collaborating with people from different fields to make content that is easy to understand and appealing to the public will continue to be useful in the future.

**AKAZAWA** I have many opportunities to interact with researchers even in the General Planning Office where I work. For example, during operation of an event, the secretariat receives various requests. In the process of handling each of them, I sometimes receive words of gratitude from researchers.

**TANIOKA** You work with researchers in various situations.

In that context, I think the perspective that is unique to a generalist is also important, but do you have any experiences in this respect?

**KUWAHARA** I am currently participating in a research project within the Innovation Design Initiative, and one of the researchers I work with told me that he can push forward with research by focusing on a theme, but he is

not good at thinking about how to promote it to society. I think that generalists can think about presentation to society from the point of view of ordinary people, and this will lead to further dissemination of our research.

**AKAZAWA** When I have to present our research to the general public, such as during events, I always try to rephrase difficult content in a way that is easy to understand even for someone like me with a background in humanities.

### Most memorable work experience

**TANIOKA** What was your most memorable work experience so far?

**TOKUDA** When I was working in the Personnel Affairs Group, my most successful work experience was recruiting for career-track positions. Until then, two or three people had been recruited each year, but I successfully recruited seven people in 2021 by introducing internships and increasing opportunities for students and our staff to talk to each other. What's more, there were no declinations. I will never forget the words, "well done," that my boss said to me after finishing this work.

**KUWAHARA** As one of my biggest successes, I was involved in the establishment of a domestic internship system in the Strategic Planning Office. Until then, NICT did not have a framework for accepting domestic students in the form of internships, so I started work to create a new system that was suitable for the environment of the institute. Through repeated interviews with each research institute and investigation of the situation regarding other corporations, I worked hard to design the system so that it would be easy for both field workers and students to use. It start-



Photo From left to right, TANIOKA, KUWAHARA, TOKUDA, and AKAZAWA. In the center is the official NICT character, "N," which was inspired by AI coming from the future of 203X.

ed operation in 2020, and I'm glad to hear that it is being put to good use.

**AKAZAWA** I have not been involved in many projects, but my work for the secretariat of the EMC-net symposium had a great impression on me. It gave me a little confidence that I was able to act for myself by thinking ahead before receiving instructions to assist researchers in their busy work. In addition, the fact that this big event successfully came to a finish gave me a sense of accomplishment, which left a strong impression on me.

**TANIOKA** From the perspective of an ordinary company, the duty of a comprehensive worker at a research institute may be somewhat unique. Is there anything that is rewarding or interesting about this?

**TOKUDA** ICT will become an increasingly important technology for society. NICT is the only public research institute in Japan that specializes in ICT, and the technologies being developed here will be widely used by Japanese people, who will be the end users. I would like to continue to convey how NICT's information and communication technology is useful to society.

**KUWAHARA** I believe that the duty of a generalist is to create an environment for re-

searchers engaged in cutting-edge research at NICT, and to communicate and connect their activities and results to society. I work every day with the belief that no matter what kind of work we do, it will ultimately lead to the development of research.

**AKAZAWA** There is no doubt that the demand for information and communication technology will increase more and more in the future, and it is very attractive to be able to work close to such cutting-edge research. Researchers are busy with their own research every day, so as a generalist, I will continue to make efforts to create an environment that makes it easy for researchers to concentrate on their research as much as possible.

**TANIOKA** Recently, opportunities for generalists have been expanding. For example, some have been assigned to overseas bases for the first time ever, while others have been studying abroad at overseas universities using our internal system for the first time in several years. I would like to strongly promote NICT's information and communication technology research through close collaboration between generalists and researchers who conduct cutting-edge research from an international perspective.

Thank you for your participation.





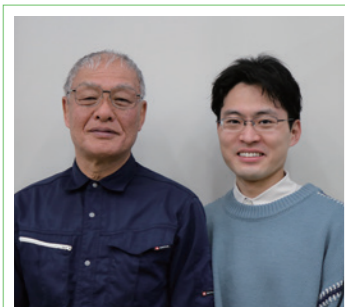
## Introduction to Activities of Manufacturing Group



**NAKAMURA Kenji**

Group Leader

Manufacturing Group, Radio Wave Management and Manufacturing Office, Operation Planning Department



**TSURUMI Masaaki**

Managing Expert

Manufacturing Group, Radio Wave Management and Manufacturing Office, Operation Planning Department

**KIDO Kouta**

Assistant Chief

Manufacturing Group, Radio Wave Management and Manufacturing Office, Operation Planning Department

N ICT has a department that specializes in "manufacturing" for in-house production of parts for experiments. This article introduces the significance and recent status of manufacturing operations that have continued uninterrupted for more than 80 years, including prototype development at the predecessor organizations of NICT.

### Why is it necessary to conduct in-house production?

The main targets for in-house production are "items that cannot be manufactured or are difficult to manufacture externally."

Most research institutes need "one-of-a-kind items" for use in experiments. Each one-of-a-kind item should not be a "prototype," but a "final product" to be incorporated into the equipment and used in actual experiments. Such a one-off order for a one-of-a-kind item is less profitable for its manufacturer and is not worth the cost, so the item may be expensive even if it is not technically difficult to manufacture. Moreover, there may be no guarantee that similar orders will be accepted in the future at all. From a manufacturer's point of view, it is only natural that they would be reluctant to accept an order for a one-of-a-kind item unless it is a "prototype" of a product that can be expected to be ordered in large quantities next time.

For this reason, research institutes studying experimental fields need to have a certain level of "manufacturing ability" on their own, except for items that are difficult to manufacture internally due to restrictions such as machine tools. In order to prevent leakage of intellectual property, it is necessary to possess and maintain basic machine tools and assign specialized technical personnel so that we can respond to any manufacturing request to the extent possible via in-house production.

### Outline of manufacturing operations

The Manufacturing Group is based in the Ionospheric Sounding / Prototype Development Building, which is located at the northern end of the Kodaira City side of the NICT Headquarters.

NAKAMURA Kenji, the Group Leader, has been working there for 40 years, with a focus on manufacturing. He is the manager in charge of work using an NC (numerical control) processing machine that automatically moves tools, etc. according to a program, and is also responsible for management and operation of the Group. KIDO Kouta, the Assistant Chief, undertakes precision processing with a wire electric discharge processing machine in addition to an NC processing machine, and engages in processing electronic substrates and resin modeling with a 3D printer (Figure 1). TSURUMI Masaaki, the Managing Expert, specializes in general-purpose machines (manual machine tools) such as lathes and milling machines. In addition, with many years of technical guidance experience at universities, technical colleges, and companies, he demonstrates his strengths as an instructor in machine work workshops held for researchers within NICT, etc. (Figure 2). KIBAYASHI Shinji, the Chief, is in charge of general affairs, such as procurement, and inventory management of materials and chemicals. In addition, TAKIZAWA Osamu, the Director of the Radio Wave Management and Manufacturing Office, also holds a seat in the Prototype Development Building to support the operation and general affairs of the Group.

In the Manufacturing Group, when we receive a manufacturing request from a researcher, etc., we first meet with the requester. If the researcher has a clear idea of what should be manufactured, we can start making it immediately after the meeting, but if there is only a vague image of what should be manufactured, we will proceed with design-

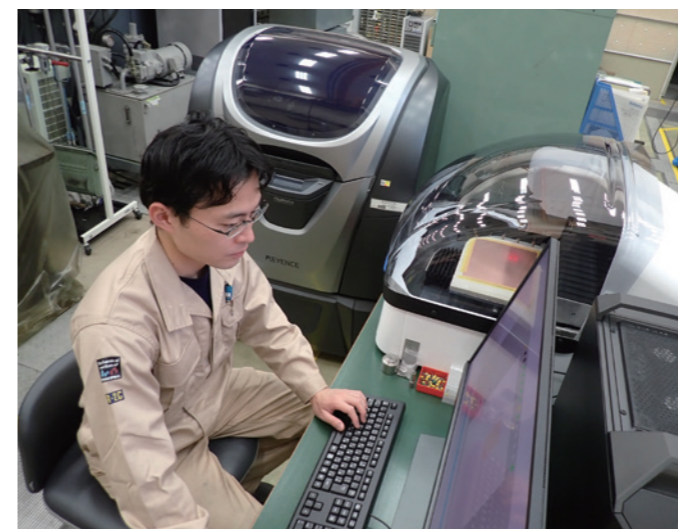


Figure 1 Assistant Chief KIDO operating a substrate processing machine (3D printer on the left)



Figure 2 A scene from the machine work workshop hosted by Managing Expert TSURUMI

ing the optimal shape while exchanging opinions with the requester about its intended use. This kind of interactive production process is often appreciated by the requester, and cannot be realized through an external order that requires the specifications and order price to be fixed in advance.

Materials handled in manufacturing include metals, resins, and wood. In addition, metal processing methods include cutting, grinding, casting, and forging. Casting, which involves pouring molten metal into molds, is cost-advantageous and suitable for mass production, but it requires molds or sand molds and cannot process very complex shapes. On the other hand, cutting enables precision machining and is suitable for one-of-a-kind items. Therefore, the Manufacturing Group mainly selects cutting of metals and resins.

### Actual manufacturing situation

NC machines are used for precision or complex cutting. For NC machines, it is necessary to master CAD (drawing data) and CAM, which programs the operation of relevant machine tools based on drawings. Today, CAD/CAM has become more complex, going from two-dimensional to three-dimensional (3D). In the case of an incorrect program entry on a computer, an error is simply issued or the computer is tentatively out of control. But a programming error in a machine tool, for example, an incorrect setting in the tool trajectory, will directly lead to a physical accident, such as hitting the machine and causing it to break. For this reason, NC processing machines that do not require nerve-racking programming work and can be interactively instructed to operate as needed are particularly suitable for the production of one-of-a-kind items (Figure 3).

Most of the time required for cutting is

spent on, for example, mounting and positioning objects to be cut (workpieces) and replacing tools (cutters), which require adjustment at the micron scale. Therefore, the actual cutting time itself is very short. For that reason, "machining centers" that automate tasks that occupy a lot of time have become indispensable machine tools in terms of both improving work efficiency and maintaining accuracy.

In addition, as a recent trend, the use of resin molding utilizing 3D printers has increased (Figure 4). 3D printers can only demonstrate accuracy equivalent to casting when compared to metal processing, but as with printing on paper, materials are three-dimensionally stacked and shaped based on data, so the work can be automated and molds are not required, which may reduce material waste and offer advantages in terms of cost. Recently, 3D printers for metal materials have appeared, but the Manufacturing Group has not introduced them at this time because they are too expensive and the relevant technology is not yet fully developed. If molding accuracy is improved and costs are reduced, an era will eventually come when metal 3D printers can be utilized in conjunction with metal cutting.

### The future of manufacturing operations

In the past, large-scale computers (mainframes) were provided by many universities and research institutes as a common resource for research, and were managed and operated by specialized departments. However, due to downsizing, many of them have been replaced by PCs and clouds and have finally disappeared. On the other hand, in manufacturing operations, it is difficult to downsize machine tools and reduce their cost, and it

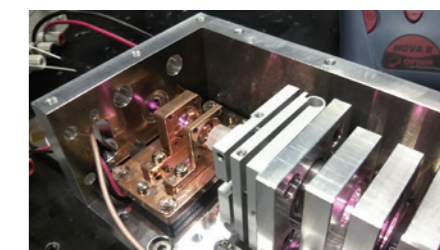


Figure 3 A prototype of a narrow-linewidth laser housing with a wavelength of 2 μm manufactured by an NC processing machine

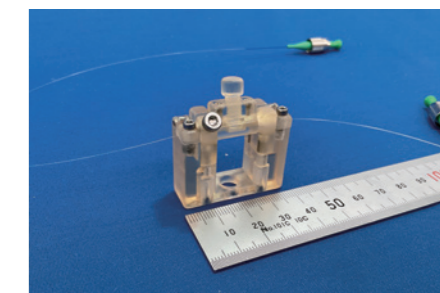


Figure 4 A compact optical polarization controller manufactured by a 3D printer

is also difficult to prepare alternative means in each laboratory, etc. The advent of 3D printers can be said to signal the arrival of an era in which manufacturing can be easily carried out in each laboratory, etc. on its own. However, as for metal cutting, a high level of expertise regarding machines and operations is required, and it is still difficult to eliminate management and operation by specialized departments.

Once the inheritance of technology is discontinued, it is not easy to revive it; it is not something that can be bought with money. NICT believes that it is necessary to maintain and inherit manufacturing operations in the future to contribute to the creation of research results and the acceleration of research and development.



## The Clean Room Supporting Innovative Device Research and Development



**SUZUKI Yoshio**  
Technical Researcher, Network Research Institute, Advanced ICT Device Laboratory

He joined NICT in July 2004 after working at a corporate research institute. He has engaged in the smooth operation of experimental equipment and facilities in the advanced ICT device laboratory clean room.



**YOSHIZAWA Katsumi**  
Technical Researcher, Network Research Institute, Advanced ICT Device Laboratory

He joined NICT in April 2019. He has engaged in administrative tasks such as introducing processing equipment, improving the experimental environment, and educating users at the advanced ICT device lab.

The Advanced ICT Device Laboratory (Headquarters, Koganei: Advanced ICT Research Institute, Kobe) provides a stable experimental environment and equipment for research on photonics and electronics convergence technologies at NICT. Its services are provided not only to researchers within NICT, but also to a wide range of research institutes inside and outside NICT even for the purpose of external use by industry and academia. As an open research facility, it widely contributes to society through the creation of innovative research results. In this article, We would like to introduce clean rooms and yellow rooms in operation at the Photonic Device Laboratory (NICT Headquarters) and explain their roles and operation methods.

### Yellow rooms supporting device research

In the manufacturing process of high-performance micro- and nano-structural devices, an important elemental technology is transferring fine and precise nano/micrometer patterns to material substrates of the desired device structure. This is commonly referred to as the photolithographic process. First, a photosensitive thin film (photoresist) is applied to the top surface of the material substrate using a spin-coater and dried in a furnace. Then, a photomask printed with the desired fine pattern is fixed at the desired position on the substrate and exposed to ultraviolet light (approx. 400 nm wavelength) by lithography equipment, and after development and washing with pure water, the pattern is transferred to the substrate in the same way as photographic development (Figure 1). Since photoresist materials can absorb light with a wavelength of 500 nm or less and photodegrade, the workplace where such a process is performed requires special lighting free of ultraviolet rays, etc. The color of this lighting makes the room yellow, so it is widely called the "yellow room" (Figure 2).

A cleaner environment with a higher degree of cleanliness is required and maintained at this workplace. The presence of dust in the yellow room greatly affects the success of the experiment in transferring fine nano/micrometer patterns. Dust deposits on the photomask or between the photomask and the substrate during the exposure process can cause excessive or insufficient exposure patterns, creating patterns on the substrate that are different than those designed. Therefore, the Photonic Device Laboratory operates the yellow rooms in an environment where the volume of dust is reduced to about 1/100 compared to general clean rooms where experimental equipment is operated (Figure 3).

In the yellow rooms at the Advanced ICT Device Laboratory, in addition to such lithography equipment using ultraviolet light sources and photomasks, maskless laser lithography equipment that directly radiates ultraviolet laser light, and electron beam lithography equipment are also in operation, and these are widely used for prototyping and examination of various types of devices (Figure 4).

### Maintenance, management, and operation of clean rooms at the Advanced ICT Device Laboratory

Work related to the maintenance and management of the clean rooms includes:

1. Maintenance of a clean environment, including room temperature control;
2. Management of draft-chambers using lithography and chemical process;
3. Supply of cooling water to experimental equipment, monitoring of the purity of pure water, and maintenance of a stable supply system;
4. Adjustment including replenishment of chemicals such as organic solvents, photoresists, developers, acids and alkalis used for cleaning substrates, etc., general gases for experiments, and special gases;
5. Treatment and management of experi-



Figure 1 A scene with staff working in the yellow room (photoresist coating work)



Figure 2 Inside the yellow room at the Advanced ICT Device Laboratory (Lithography equipment capable of nano/micro-sized photolithography)



Figure 3 Inside the clean room at the Photonic Device Laboratory (Vacuum equipment that realizes fine device processing)

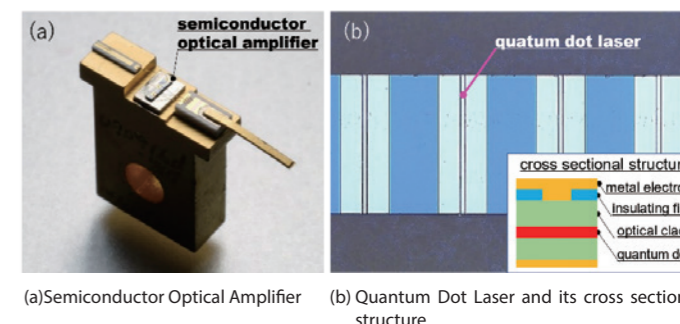


Figure 4 An example of device development utilizing the Advanced ICT Device Laboratory

- mental waste fluids;
- 6. Maintenance and management of experimental equipment to ensure its stable use; and
- 7. Inspection and monitoring of the performance of the experimental equipment through regular test operations.

All of these items are indispensable for operation of the clean rooms, so we measure and monitor the situation on a daily basis and respond accordingly.

We operate the clean rooms at the Advanced ICT Device Laboratory, including the yellow rooms, carefully with due consideration for safety measures since some of the chemicals and experimental gases handled there for device manufacturing, such as dry etching and insulating film deposition, are hazardous. We believe that preventing the spread of hazardous substances to outside the area and taking environmentally friendly measures are also important factors. For that reason, we implement appropriate treatment of solid and liquid waste. As a specific initiative, the Advanced ICT Device Laboratory (Koganei) has acquired ISO 14001 Environmental Management System (EMS) certification, and as EMS members,

all related staff work to operate the Laboratory with consideration for the environment, such as implementing resource conservation and power reduction. In addition to our own efforts, we hold seminars, etc. to inform and educate all laboratory users about the importance of environmental conservation in device development with the aim of having them cooperate in carrying out environmentally friendly operations.

As a feature of the Advanced ICT Device Laboratory, all of the operations of the Laboratory are managed by dedicated staff. They manage and operate the Laboratory while sharing responsibility for facilities such as air conditioning and utilities and for experimental equipment, and regularly determine policies for information sharing, defect countermeasures, etc. among all staff with the Director of the Laboratory. Our experienced technical staff, who have been engaged in research on photonics and electronics convergence technologies, etc. for many years at corporate research institutes and who are well versed in experimental work in clean rooms, conduct safe and secure operations while maintaining equipment and monitoring the work environment. In this way, we try to operate the Laboratory so that users

both inside and outside NICT will not be burdened with work other than research to the extent possible.

### Future prospects

For research on cutting-edge photonics and electronics convergence technologies, it is necessary to upgrade experimental equipment and facilities, which can be an effective means for not only research continuity but also for the creation of more advanced and innovative devices. This should also be a trump card for energy-saving measures such as reducing power consumption. At the Advanced ICT Device Laboratory, we update the device processing equipment to be more functional and efficient as appropriate. We also systematically renew our experimental facilities, aiming to realize stable operation and energy-saving measures. With the cooperation of all staff, we will continue to promote smooth operation that places the highest priority on user convenience to the extent possible, and will strive to create innovative device technologies originating from the Advanced ICT Device Laboratory. We would like to ask all of you who will use the Laboratory for your continued cooperation.



## A Meaning of the Outreach Activity in Science and Technology With my experience as an example



**HOSOKAWA Mizuhiko**  
Principal Researcher, NICT / Principal Researcher, NICT Knowledge Hub

After completing graduate school, he joined the Communications Research Laboratory (CRL, currently NICT) in 1990. He has been engaged mainly in research on precise space-time measurements. After serving as Vice-president of NICT, he is presently Principal Researcher, Ph.D. (Science).

I have worked at NICT for a long time, becoming old in the process. Thankfully, I sometimes receive requests for lectures. This time, I was asked to speak about outreach activities. According to Kojien (a trustworthy Japanese dictionary), “OUTREACH” is an activity carried out by experts towards society with the aim of promoting public interest and understanding of science and art.

Of course, research results are important at research institutions, and they can only be recognized by disseminating them to the research society, such as specialized academic societies. Moreover, in my opinion, though it might be just desirable for individual researchers to disseminate their results to the general public to obtain recognition, it should be indispensable for an organization to disseminate information to the general public. The wide recognition of the value of an organization as a research institution will lead to its *raison d’être*. The bottom line is that being a research institute that is loved, favored, and respected will lead to recognition of its existence, the gathering of human resources and funds, and the creation of a better institution that can reproduce good results in the future.

In addition to the organizational issue, responsibility for the research field should also be emphasized. The reason is that if a large number of people are not interested in the attractiveness of a particular research field and the state of its front line, there will be few human resources and funds for the field even before we start our efforts and it will become obsolete. During the recent rugby and soccer World Cups or WBC (World Baseball Classic), etc., I often heard players and officials saying that they wanted many people, especially the younger generation, to know the appeal of this sport on this occasion. I think it was because they earnestly felt that the future existence of the sport was at stake. Therefore, I should say that it is important for research institutions to promote the attractiveness or appeal of their research to a wide range of people.

However, with regard to sports competitions, the top athletes that play them are themselves attractive to spectators. On the other hand, in general, the results of research institutions cannot be widely understood by the general public if they are released as intended for professionals. I guess that this is the peculiarity of the outreach of science and technology. It seems to me that there is some value in having a veteran who has gained some experience in the field, even if he/she is a little far from the front lines, give easy-to-understand explanations to non-experts with an overview of the whole field. On the other hand, it would be cruel to ask front-line researchers, who continue to struggle to reach the summit time and again, to come down to the foot of the mountain and explain the correct route to the general public. However, I would like to tell you that even researchers who are currently taking on front-line challenges should, if the occasion is chosen carefully and properly, review and talk about their own challenges with the general public since such opportunities may offer the advantage of not only providing the

audience with a sense of reality that is unique to an active researcher, but also giving the researcher new realizations through reviewing and explaining the research from a broader perspective.

As I mentioned at the beginning, I sometimes receive requests to give lectures to the general public. I am very thankful for this, and I think a lot about what kind of speech I should give every time. Even though outreach is important, it is not good to speak in too formal a tone. With many requests, the field and direction are specified to some extent, but there is still a lot leeway for the speaker to maneuver. For example, how to get the audience to become interested in the research field, including what the introduction and core of the speech should be and how to incorporate NICT’s brilliant research results into it. In my case, when an interesting idea or story comes to me while I’m thinking, the result is often a good speech, but elaboration of such an interesting story requires me to make up for my lack of knowledge and do some additional study. However, as a result, if I can gain a lot of knowledge and convey what I find interesting to the audience, I believe that this is optimal for both myself and the audience.

I would like to give you an interesting example which took advantage of a slightly unusual environment. In 2021, the Tamarokuto Science Center\*1 in Nishitokyo City, with which NICT has a partnership agreement, invited me to give a lecture at its Planetarium around Time Day (June 10). It is the newest planetarium, said to be the best in the world (Figure 1). When I was asked, I wondered what the standards of space-time would be like. The vernal equinox, which has been the standard of the heavens since ancient times, or roughly the position of the sun in the heavens on the day of the vernal equinox, has actually moved from around Aries in ancient Greece to around Pisces now. In fact, the true unmoving standard of the heavens is currently being



Figure 2 The Kashima 34m antenna, which has been at the forefront of the world for many years in VLBI research and development and observations

measured by a technology called Very Long Baseline Interferometry (VLBI)\*2. In the development of this technology, NICT has made a lot of contributions (Figure 2). With this as the core, I wondered if I could tell a story about the efforts of people who have continued over time to measure the position of each celestial body and search for the unmoving standard of time and space in the universe. Although I used the calendar, which is a familiar item in everyday life, as the introduction for my speech, the twenty-four seasons of the lunar calendar remind us of literature. It was interesting for me to know the fact that they are actually determined by the position of the sun relative to the vernal equinox through a bibliographic survey. In addition, as a collaborative lecture, I could ask the staff at the Science Center to demonstrate how the vernal equinox has moved and how the positions of the stars and even the shapes of the constellations have changed over the course of tens of thousands of years. This was a lot of fun for me, and I heard that many people in the audience found it interesting as well.

For some time now, lectures have been subject to various restrictions due to the COVID-19 pandemic, but if I have some opportunities in the future, I would like to continue my activities to speak about the appeal of

science and technology and convey the results of NICT’s research in such a way that the enjoyment of the speaker can reach the audience.



Figure 1 A scene from the author’s lecture held at the Tamarokuto Science Center Planetarium in June 2021

### Glossary

- \*1 Tamarokuto Science Center:  
<https://www.tamarokuto.or.jp/english/>
- \*2 VLBI (Very Long Baseline Interferometry): A technology that performs similar to a giant radio telescope by equipping multiple radio telescopes with atomic clocks and synthesizing their observation data later based on time data.

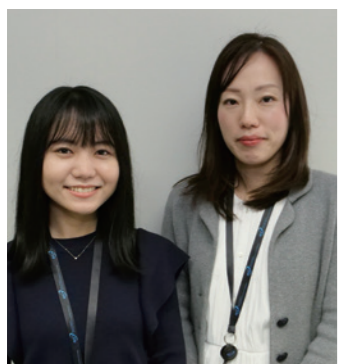


## The Role of the NICT Exhibition Room



**YOKOYAMA Katsumi**

He joined Toppan inc. in 1996, where he mainly engaged in public relations and sales promotion. Since 2022, he has been seconded to the NICT Public Relations Department.



**NARITA Emiko (right)**

Assistant Chief, Director of the Public Relations Planning Office  
She joined NICT in 2005

**YASUI Yuri (left)**

Director of the Public Relations Planning Office  
She joined NICT in 2021

The NICT Exhibition Room was opened about 20 years ago when the current building (main building at NICT HQ) was completed. Since then, it has exhibited NICT's latest research contents as well as the history and research materials of NICT open to the general public. During the three years from 2020, the Exhibition Room was closed or the number of visitors was limited to prevent the spread of COVID-19 infection, so the total number of visitors per year has continued to decrease. However, before the COVID-19 pandemic, we had more than 3,000 visitors every year, to whom we explained a wide range of NICT's research. Currently, we are preparing an environment that visitors can visit comfortably while also observing the social situation.

### Overview of the Exhibition Room

The NICT Exhibition Room is roughly divided into three areas, with the outline of each area as follows:

|  |   |
|--|---|
| Advanced Electromagnetic Technology Area | <ul style="list-style-type: none"> <li>● Pi-SAR2: Airborne Synthetic Aperture radar2</li> <li>● Space Weather Forecast (video)</li> </ul>   |
| Innovative Network Area                  | <ul style="list-style-type: none"> <li>● Optical communication technology (video)</li> <li>● 36 multi core fiber (static display)</li> </ul>  |
| Cyber Security Area                      | <ul style="list-style-type: none"> <li>● NICTER: Network Incident analysis Center for Tactical Emergency Response (Image on the terminal, realtime observation display)</li> <li>● DAEDALUS: Direct Alert Environment for Darknet and Livenet Unified Security (Image on the terminal, realtime observation display)</li> </ul> |
| Universal Communication Area             | <ul style="list-style-type: none"> <li>● VoiceTra: Multilingual Translation app (operation, experience)</li> <li>● KoeTra: Tool for Communication between the hearing-impaired and the non-impaired (operation, experience)</li> </ul>  |
| Frontier Science Area                    | <ul style="list-style-type: none"> <li>● Introduction of the Center for Information and Neural Networks (CiNet) (Video)</li> <li>● Quantum ICT (Video)</li> </ul>   |
| Open Innovation                          | <ul style="list-style-type: none"> <li>● Examples of Implementation of NICT Technology to real world</li> </ul>   |

### "Prologue Area"

- The "NICT Overview Corner" introduces NICT's more than 120-year history through chronological tables and historical exhibits.
- The "Space-Time Standard Corner" displays exhibits on the "Creation and Delivery of Japan Standard Time," which is one of NICT's main tasks.
- The "Special Exhibition Corner" displays a variety of topics from time to time and some of the research facilities that were active in various regions.

### "Main Exhibition Area"

The contents of NICT's research are introduced with a focus on the five research fields. Please see Table 1 for the main exhibits.

### "Multipurpose Area"

This includes a seminar space that can accommodate about 20 people, which is used to watch an introduction video on NICT at the beginning of the visit program or give a lecture on individual research contents, and



Atomic fountain-type primary frequency standard (first unit)



Full view of the Exhibition Room



TYK-type wireless telephone (replica)

an area where you can take a commemorative photo of the visit with the Japan Standard Time exhibit.

### About our visitor acceptance policy

Visitors are required to make a reservation before visiting the NICT Exhibition Room. Please refer to the chart on the right for details on how to apply and what to visit. Please send us a visit application form in advance and we will inform you of our decision on whether we can accept the visit or not after confirmation of a convenient day and time to visit, the possible duration of the visit, the desired contents of the visit, and other visitors' schedules.

When you visit us, our expert staff will provide you with explanations according to your request. Since NICT is the only public research institute in Japan that specializes in the field of information and communications, we have exhibits on various research contents as mentioned above. Although some expertise is required to understand them, we will explain how these research contents are useful in our daily lives, how they are utilized, and so on, in an easy-to-understand manner,

while introducing actual usage scenarios.

We have received comments from visitors as follows: "I was surprised by the breadth of the research"; "I thought the research content would be difficult, but it was a new discovery whose content is relevant to my own life"; and "I enjoyed this visit. Next time, I want to visit with my family."

The Public Relations Department's medium- to long-term business plan is to "proactively carry out public relations activities that will lead to enhancement of interest in and understanding of NICT's activities, in order to disseminate NICT's R&D results and promote activities aimed at social implementation." In our business plan, we believe that the Exhibition Room should be an important point of contact between the general public and NICT.

We will continue to do our best to provide a place for as many people as possible to visit and offer opportunities for visitors to understand more about NICT. We sincerely look forward to seeing you at the Exhibition Room with the belief that it will be a place of new discoveries for you.

### Open Hours (Pre-reservation Needed)

Monday to Friday, Every Week

**9:30~17:00**

\* Please note that we may not be able to accept reservations depending on the implementation status of in-house events, etc. and other circumstances.

### MAX Visitors at One Time

**20 people**

\* If more than 20 people will visit, please contact us in advance

### Support Languages

Japanese, English

### An Example of Content for the Visit

- Introduction of NICT (Video)
- Explanation of standard frequency oscillator and Japan Standard Time
- Explanation of VoiceTra
- Explanation of Pi-SAR2 (Airborne Synthetic Aperture)
- Explanation of NICTER, DAEDALUS, and improved NIRVANA (Network Security)
- Experience Corner (Aroma Shooter, Certification Card for Visitors)
- Free Watch

### How to Apply

Please fill out a visit application form and send it to us by e-mail at least two weeks before your desired visit date.

After receiving your application, we will inform you by e-mail of our decision to host your visit.

<https://www.nict.go.jp/publicity/tour/index.html> (in Japanese)



A sample of the exhibition room visit certificate (A photo of the visitors at the time of the visit will be printed.)



A sample of the exhibition room visit certificate (A photo of the visitors at the time of the visit will be printed.)



## A Newly Established Quantum Security Collaboration Facility within NICT Headquarters

Operation Design Office, Operation Planning Department HIRASAWA Yae

The Quantum Security Collaboration Facility (hereinafter referred to as the "Collaboration Facility") was completed on the north premises of NICT Headquarters at the end of March 2022 using the FY2019 supplementary budget (subsidy for facility maintenance costs), based on the Cabinet Office's "Integrated Innovation Strategy 2019" to develop an international research base at the National Institute of Information and Communications Technology, which will be a hub for industry-academia-government collaboration on quantum security technology, etc. (Photo 1).

The Collaboration Floor on the 3rd floor of the Collaboration Facility is an open research and implementation area for promoting collaboration and open innovation by industry, academia and government, with open spaces allowing large numbers of people to gather, as well as small meeting rooms that can accommodate smaller more intimate meetings. Construction of the Collaboration Facility is based on the concept of a diverse and free "airy" research environment and a natural environment that stimulates the five senses. The interior is designed to be bright and airy even during the day, taking advantage of natural daylight and ventilation (Photo 2).

The spatial design of the shared space aims to satisfy the various needs of visitors, such as those who want to think about things, relax for a while, have a meeting while drinking something, or share ideas with colleagues. In order to realize an ideal space, we considered the color and shape of equipment to be installed in the shared space while listening to the opinions of the staff, including expectations and requests regarding the Collaboration Facility, with the aim of having each visitor find their own favorite space.

Currently, the Collaboration Floor is being used for information sharing and discussion both inside and outside of NICT. For example, in the Event Area, NICT executives and researchers regularly discuss the long-term direction of NICT's research activities. This event is held in a face-to-face and online hybrid format, and it has now grown into a large event in which about 15 people, including presenters, participate on site, and up to 100 people participate online. We also hold regular events inviting outside experts. Lectures hosted by the Innovation Design Initiative (IDI), which functions as a think tank within NICT, are held for the purpose of collecting information on ICT-related research and development, policies, industrial trends, etc. in Japan and overseas. Currently, due to limitations on the number of people as a result of the COVID-19 pandemic, they are held in hybrid format, but about 20 people participate on-site each time. In addition to these events, small-group meetings are increasingly being held in hybrid format. For this reason, in order to satisfy the needs of users, we are currently expanding the lineup of audio-visual system conferencing equipment compatible with hybrid meetings, such as microphones and speakers.

In the future, as a cross-sectional initiative within NICT, it is expected that new mechanisms and value will be created by utilizing



Photo 1 Exterior of the Collaboration Facility newly established in 2022

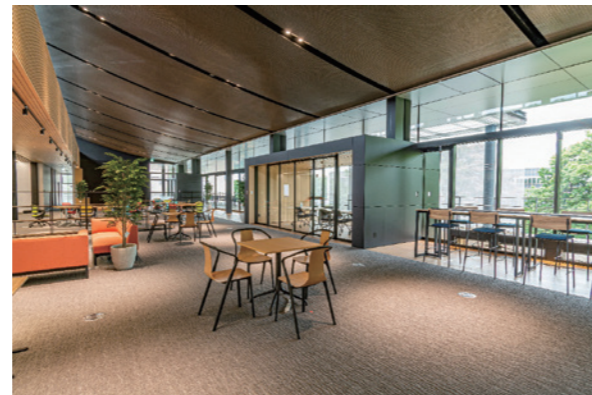


Photo 2 The Collaboration Floor on the 3rd floor is airy and bright, taking advantage of natural daylight and ventilation



Photo 3 Project Room on the Collaboration Floor

the Project Room on the Collaboration Floor, where members from each department gather and engage in activities while maintaining continuous communication (Photo 3). As for operation of the Collaboration Facility, we will work every day to foster cooperative relationships both inside and outside NICT through these activities, leading to further revitalization of research activities and the establishment of a collaborative environment.

## Importance of Expanding Circles of Sympathetic Connections Created with NICT



### EGUCHI Tomoyuki

Manager, Innovation Design Initiative

#### ● Biography

- 1978 Born in Gunma Prefecture
- 2002 Joined Communications Research Laboratory (currently NICT)
- 2013 Graduated Graduate School of Western Michigan University (Master of Public Administration)
- 2022 Current Position

#### ● Awards, etc.

- 2013 Concept Mapping MPA Scholar Award

#### Q&As

#### Q What is the best thing for you at NICT?

A The best thing I have experienced in NICT is that I obtained master's degree in Public Affairs at Western Michigan University in the United States under the international employee dispatch program of NICT. It was a challenging experience but it changed my outlook on life and broadened my horizons.

#### Q Message to the students who would like to join NICT

A I think my colleagues in NICT have always supported my job in various ways. I appreciate for their support. I am sure that you will find wonderful colleagues at NICT. Make your dreams come true at NICT!

#### Q How do you spend your holidays?

A I often go shopping and play with my family. Sometimes I enjoy catching insects with my daughter.



There are some NICT staff members hearing voice of surprise of people outside NICT they talked with because they did not know that NICT's research results were used in applications or public services around them. Although applications and public services that utilize NICT's research results are well known, in some cases, recognition of NICT as their source is low. In addition, there is a challenge that although NICT is widely recognized among experts in related research fields, it does not necessarily have a high level of recognition outside such fields.

If more people sympathize with NICT's activities and they gain recognition, great benefits can be expected in promoting open innovations which involve other industries and recruitment activities. The IDI Branding Design Project (hereinafter referred to as the "Project") plays a part in NICT's branding promotion activities for expanding and disseminating recognition of NICT.

In 2022, as the first step of NICT's branding promotion activities, the Project contrib-

uted to the creation of a brand statement that expresses NICT's brand image because the Project thought that it was necessary to create an item to easily share the common image of NICT among NICT's employees. Thanks to the cooperation of many staff members, the Project was able to define NICT's brand image as the NICT Brand Statement (Figure). Going forward, the Project would like to use

this brand statement as an item to increase opportunities for people both inside and outside NICT to feel NICT's brand image, so that not only NICT staff members but NICT stakeholders as well can sympathize with NICT. In particular, branding is a new area for NICT, so the Project would like to proceed with it through trial and error to figure out what kind of measures and tools are suitable for NICT.



Figure NICT Brand Statement





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