

FORGING  
THE BONDS OF  
MEDICINE



# PROFILE **M.** 2011

**NAGOYA UNIVERSITY**  
Graduate School of Medicine, and  
School of Medicine

Dialogue

# Our common mission is shaping the future of medicine

SOBUE, Gen

Dean of the Graduate School of Medicine and School of Medicine

OKADA, Yasunobu

Director-General of the National Institute for Physiological Sciences

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( Available booklets )

FORGING  
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MEDICINE



DATABOOK



This booklet presents the vision, activities, and people associated with the Graduate School of Medicine and School of Medicine. The *DATABOOK* presents detailed data on our organization. The articles contained in this booklet will point you to the relevant page numbers in the *DATABOOK* for easy reference.

# FORGING THE BONDS OF MEDICINE



The world of medicine is undergoing some radical changes.  
Still, there is one thing that will never change:  
the commitment to people's happiness  
and well being that all of us in the medical field share.  
Every researcher at the Graduate School of Medicine  
and School of Medicine at Nagoya University is  
resolute in their common mission to contribute to human happiness  
—and further, seeks to communicate that passion to the upcoming generation of doctors and scientists.  
We are in endless pursuit of cutting-edge medical knowledge  
as we aim to link global progress to the lives of people in our local communities.  
We do this to create a brighter future for our individual patients as well as for our entire human family.

## Bringing ideas together to forge the bonds of medicine

# PROFILE M. 2011

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## Postscript

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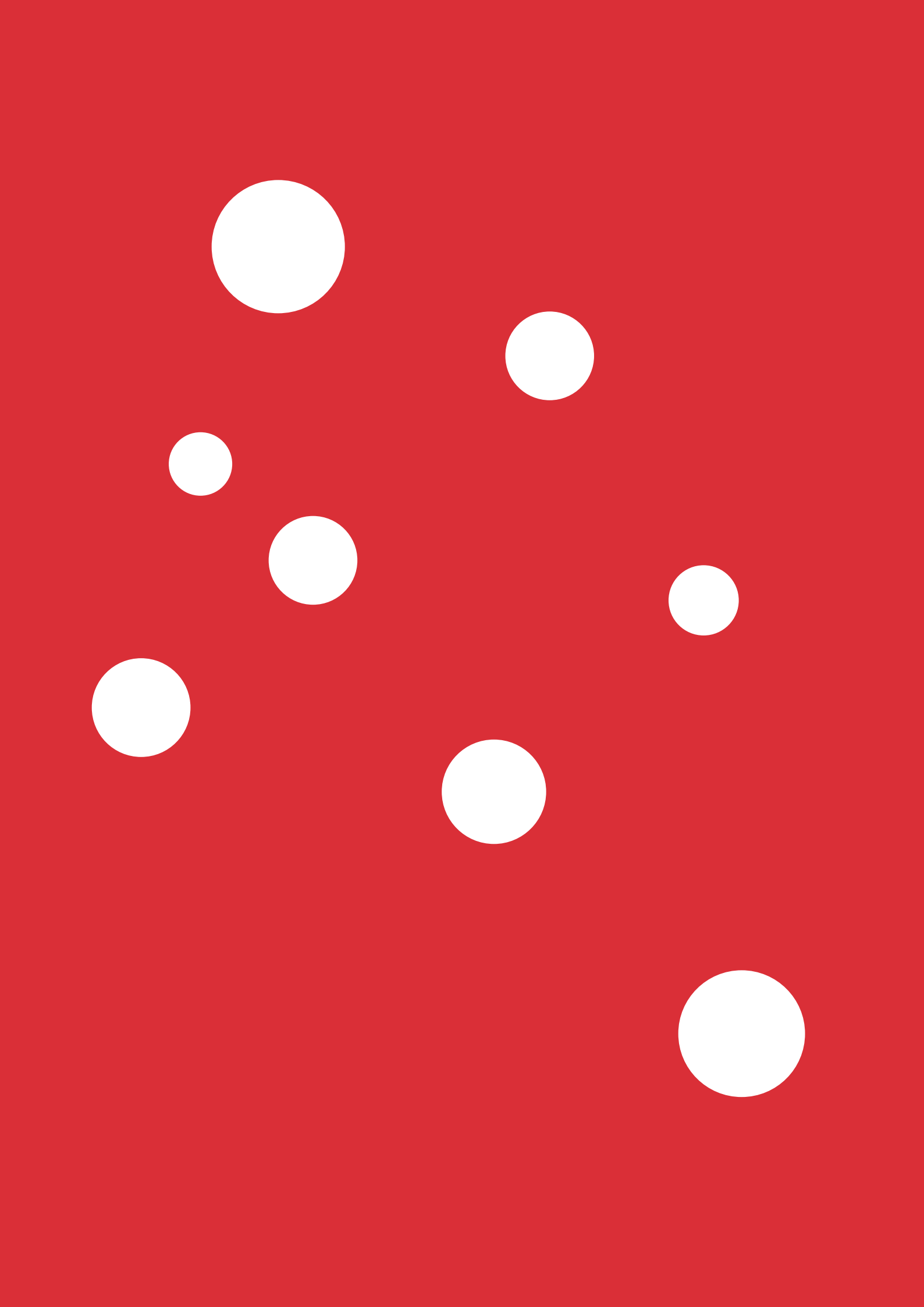


### Our hearts are in “M”

This 2011 edition profile of the Nagoya University Graduate School of Medicine and School of Medicine has been thoroughly redesigned in terms of both editorial policy and content in order to better communicate our thoughts and perspectives. The medical and graduate schools have always made an effort to publish information, but we felt that it was important that we reach a wide general audience as a means of returning the results of our educational and research activities to the public while clearly defining our approach to these efforts. We therefore decided to publish two booklets, this one to communicate our vision and initiatives, and a supplementary *DATABOOK* focusing on facts and data. We also changed the name of the publication to *PROFILE M*. The M stands for a variety of things, including “medicine,” “mission,” and “midland”—another term for the Chubu region where we are located. We hope that these booklets give you a greater understanding of our program and where our passions lie.

OHNO, Kinji Vice-Dean, Nagoya University Graduate School of Medicine





# Dialogue

SOBUE, Gen

Dean of the Graduate School of Medicine and  
School of Medicine

OKADA, Yasunobu

Director-General of the National Institute for  
Physiological Sciences

National Institutes of Natural Sciences,  
National Institute for Physiological Sciences

An Inter-University Research Institute that provides opportunities for collaborative use and research among Japan's researchers and scientists. It is the only research facility in Japan dedicated to research and educational activities on fundamental human physiology. They set the highest standards for global research, and are the top-ranked neurophysiology facility in Japan. They also offer a doctoral program through the Department of Physiological Sciences in the School of Life Science at the Graduate University for Advanced Studies. The Institute was established in 1977 and the facilities are located in Okazaki city, Aichi prefecture.



Our common mission  
is shaping the future  
of medicine

At the Nagoya University Graduate School of Medicine, and School of Medicine, we challenge ourselves to achieve on two vastly different fronts: supporting community healthcare in Japan and rewriting the history of medical science on a global scale. The key to our continued success in meeting these ambitious goals is our increasingly spirited efforts to push through the bounds of conventional practices. Dean Gen Sobue met with Yasunobu Okada, head of the National Institute for Physiological Sciences, to engage in a dialogue about the future of medicine. Their conversation offers a glimpse into the way that new bonds may drive the future of global medicine.

## Linking research processes with the goal of alleviating human ailments

**Sobue:** Japan's internal issues are mounting in the face of increasingly fierce global competition, and the medical community shares the country's overall sense of being trapped amidst the challenges. The way to shatter this oppressive atmosphere is to stand together with those of varying perspectives and set our sights on common goals. It is my view that this will allow us to break through. For example, though their research activities often proceed in different directions, the National Institute for Physiological Sciences and Nagoya University share medical science as their common foundation. I feel that there is tremendous opportunity here for fresh collaborative efforts. What are your thoughts?

**Okada:** In collaboration with universities, the National Institute for Physiological Sciences studies the functions and mechanisms that operate in the human body and brain. We are also a research institution that nurtures researchers working in the field of physiological science. Our number one mission is to promote world-class research, and we are currently working within a six-tiered structure: molecular, cellular, neural circuitry, the brain, the whole person, and interpersonal relationships. One pillar of our research activities in recent years has been setting up the development of animal models and an analysis of pathophysiological functions. Understanding pathological states is critical to our study of the way the human body functions, and that is where I am convinced that collaboration with Nagoya University is essential.

**Sobue:** Our Graduate School of Science is conducting research aimed at clarifying the molecular targets of cancer and neurological disorders and linking these to fundamental medical treatment. Their work is part of the Global COE (Center of Excellence) Program initiative by the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), and is entitled *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders*(\*1). This field of study has an unbroken

history spanning half a century, and is considered a part of the history of Nagoya University itself. In the field of regenerative medicine, we are promoting cellular therapy in several areas of specialization, including cardiovascular medicine, oncology, neurosurgery, obstetrics/gynecology, and orthopedics. Moving forward with practical regenerative treatments closely tied to clinical practice is one of our core endeavors.

**Okada:** Certainly the fact that you have a university hospital and can conduct clinical research on a variety of diseases is a major plus that we at the institute do not have. Though we are currently looking to move forward with our research on psychiatric disorders using studies that integrate human subjects and animal models, pinpointing the genes that cause human pathology requires information on the unique characteristics of those disorders. The fact that Nagoya University has collected this data has underscored for us just how imperative it is that we work with one another.

**Sobue:** We not only have access to our university hospital, but also operate in tandem with one of the largest networks of affiliated hospitals in the country. This has allowed us to exercise our ability to solve problems based on clinical epidemiology. We value both laboratory and field research, and because our foundations have been built on pathological and follow-up studies on a large number of patients, there are likely many areas of overlap that can provide opportunities for joint research with your institution.

**Okada:** The ability to conduct joint research that pinpoints unique patient characteristics, helps us understand causal factors, and analyzes animal models will no doubt lead to the development of innovative pharmaceuticals and medical treatments. Pathophysiological studies have now begun to play a part in our research at the National Institute for Physiological Sciences, and it is clear to me that we need to start building an organization that will serve a center for collaborative activities with Nagoya University.

**Sobue:** The aspect of your activities that has captured our attention is the animal models you just mentioned. Being able to amass analytical results using animal models with modified genes and



## SOBUE, Gen

Born in 1950, Gen Sobue completed his PhD at the Nagoya University Graduate School of Medicine and is also a licensed medical doctor. In 1995, Sobue began working as a professor at the Nagoya University School of Medicine. He was promoted to Dean of the Graduate School of Medicine in 2009, and currently leads the global COE center for *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders*. Sobue is currently working to explain pathogenesis and therapy development for neurodegenerative disorders, particularly new treatments for the adult-onset motor neuron diseases amyotrophic lateral sclerosis (ALS) and spinal and bulbar muscular atrophy (SBMA), which have advanced to the stage of physician-led clinical trials.



moving them closer to human ailments is critical if we are to understand the factors that cause illness. At the National Institute, you have worked to create sophisticated models using primates and other species, and have the facilities to conduct highly precise forms of analysis. Building a partnership that takes advantage of our individual strengths could produce some outstanding research.

**Okada:** In the field of genetically modified animal models, we are noted for having the technology to create knockout rats, creating primate animal models, and for breeding and supplying Japanese snow monkeys for brain research. We have gone through mice, rats, and a host of other steps, and have finally gotten as close as we can to human beings—so the time has definitely come to start working with Nagoya University. As an inter-university research institute, we are already in possession of the latest large-scale research equipment, and you are welcome to use our new experimental technologies—so I hope you will allow us to work with you on some collaborative research projects.

**Sobue:** We are really a long way from being able to return our

the researchers that will drive global medical science as well as sophisticated medical professionals who will support community healthcare. We have been working to make our undergraduate and graduate student body more international, setting up exchange agreements with Harvard University, the University of Pennsylvania, and twelve other universities as well as further strengthening the exchange programs we have with other universities in Asia.

**Okada:** At our School of Life Science at the Graduate University for Advanced Studies, we are working to develop world-class researchers, and I hope that you will allow us to heavily collaborate with you in terms of graduate education as well. We have also set up a sabbatical system that allows researchers to take off longer periods of time to participate in exchange programs both at home and abroad to further their own joint research. We have some positions currently available, and I invite the young researchers at Nagoya University to take advantage of them as well.

**Sobue:** In terms of training young researchers, we have been working with the Aichi Cancer Center, the National Center for

Our institutions have a great deal in common,  
and we also have significant differences that are very important.  
I am confident that new worlds will open up to us  
if we can collaborate while respecting those differences.—Sobue

research results to society in the form of drugs and treatment procedures that will directly benefit society. Since people are naturally the final step in this process, we will begin to see the light at the end of the tunnel in our development of molecular target therapy as well once we are able to verify our studies on human subjects through clinical research and trials. I imagine that the same is true for your research on the social nature of the brain. As you pointed out, this is an area where the National Institute for Physiological Sciences and Nagoya University can begin to truly come together. I believe that our collaborative efforts will topple the walls that stand in our way on the long road ahead, allowing us to use our complementary strengths to overcome them one after another.

### Creating an educational exchange program that takes advantage our strengths

**Sobue:** I'd also like to discuss collaboration in terms of developing talent. One of our missions at Nagoya University is training

Geriatrics and Gerontology, the Aichi Prefectural Colony, and other research institutions. We've set up collaborative graduate schools that allow students to earn compatible degrees, and we exchange personnel with one another. I hope that our shared mission in human and pathology research will give the National Institute reason to further collaborate with us in terms of talent development as well.

**Okada:** Allowing graduate students at both of our institutions to interact will surely allow them to take advantage of our individual strengths. Our students could perform research work related to patients at Nagoya University as part of their studies, while Nagoya University students would have access to our large-scale research equipment. Once these students become physicians or professional researchers, their experiences will allow them to make use of the National Institute for Physiological Sciences again—meaning that we could continue to enjoy the benefits of the program for ten, twenty—even thirty years into the future. I also think it is vitally important that tomorrow's practicing physicians are exposed to facilities where groundbreaking

basic research is taking place, so I hope you will be willing to work with us to make this happen as well.

**Sobue:** Our first venture into this collaboration in education and research was the first joint symposium held between the Graduate School of Medicine and the National Institute for Physiological Sciences in August 2010. I think the event had tremendous impact, because our research laboratories had lacked a solid point of contact and remained unaware of the how the other functioned as a whole—even though they are so close together and had previously collaborated on an individual basis. This was true of the professors, but I think the graduate students were surprised as well. I think it was highly significant for them to learn about the kind of research that the National Institute is doing and the progress we have made—and to discover that we are proceeding along a similar path.

**Okada:** Certainly the first step in collaboration is bringing individual people together. We had more than ten of our graduate students attend the Global Retreat for the Global COE Program too, and they continue to keep up a lively exchange with

that to the public, my hope is that the young people will flock to Aichi and that this will drive the region's growth. It is for this reason that I want both of our institutions to set up distinctive new projects that will eventually lead to things like the Leading Graduate School Concept(\*2).

**Sobue:** The decreasing number of people supporting basic medicine has become a real crisis. We have teamed up with other public universities to offer proposals to the government, and we have begun taking action to train medical scientists. In the future, we need to expand these initiatives to a nationwide scale. We also need to set up shared doctoral programs in research and education—programs like the Leading Graduate School program. We clearly need to look at ways to deepen exchange among students and professionals, including in terms of their career paths.

**Okada:** This is true of everything, but the most important thing is passion. The next most important things are people and the environment. However, these elements by themselves are not enough to make things happen. Starting anything new requires a system. Nagoya University and the National Institute of Physi-

Now is the perfect time to move forward.  
We must collaborate with Nagoya University in order to  
support innovative developments in medical care. –Okada

the other participants.

**Sobue:** The graduate students love these overnight retreats, since they provide a valuable opportunity for young researchers in the community to get together and talk about their research and future goals. We also have professional researchers attend and share why they became researchers and why they began working on their chosen projects. Today there are fewer and fewer people with the desire to pursue basic medical research as a form of pure scientific inquiry. It is my hope that our collaborative efforts with the National Institute of Physiological Sciences will inspire some of these young people in terms of their research goals.

**Okada:** In fact, the number of students from the School of Medicine that go on to become researchers—whether in physiology or anatomy—is decreasing, and I believe this is a serious problem that will affect the future of our country. Though the Japanese government does stress the importance of those that support basic medicine, we need to go beyond simply promoting the idea and present young people with role models that they can follow. If we produce outstanding talent and good research and communicate

ological Sciences must now work to create a system that will enable us to collaborate in a practical way.

**Sobue:** You're exactly right. Our institutions have always had the passion, but the time has now come to translate that passion into concrete form. Our institutions have a great deal in common, and we also have significant differences that are very important. I am confident that new worlds will open up to us if we can collaborate while respecting those differences. I sincerely thank you for the valuable proposals that you offered here today.

#### \*1 Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders

A project by the Ministry of Education that aims to provide targeted support for the establishment of internationally superior education and research centers as well as promote the formation of globally competitive universities in Japan. The *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders* project at the Graduate School of Medicine was selected for the program during the 2008 academic year.

#### \*2 Leading Graduate School Concept

An initiative by the Ministry of Education to construct leading graduate schools that bring together Japan's strongest academic disciplines. The aim of the project is to develop doctorate-level graduates within an international framework who will then take a leading role in driving global progress—particularly in growing fields.



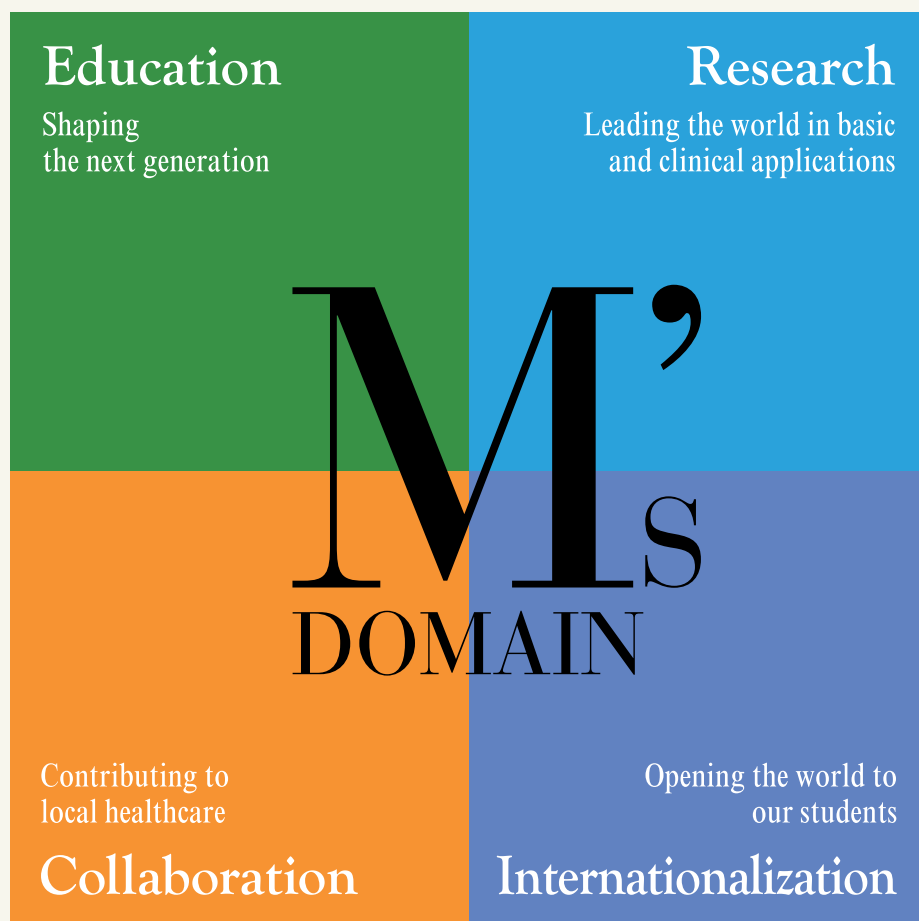


## OKADA, Yasunobu

Born in 1943, Yasunobu Okada graduated from the Faculty of Medicine at Kyoto University and is also a licensed medical doctor. He was an assistant professor at the Kyoto University Faculty of Medicine as well as professor at both the National Institute for Physiological Sciences and the Graduate University for Advanced Studies. He was dean of the School of Life Science, Graduate University for Advanced Studies, and then vice director of the National Institute for Physiological Sciences. In 2007 he was appointed director-general of the National Institute for Physiological Sciences and executive director (vice president) of the National Institutes of Natural Sciences. He specializes in molecular and cellular physiology. He has been president of the Physiological Society of Japan since 2006, and is the world's top researcher in the field of electrophysiology, particularly ion channels and transporters. He was listed as an ISI Highly Cited Researcher in 2010 (based on author citations in research published between 1981 and 2008).



## Domain



### Four interconnected areas come together to create the future of the Graduate School of Medicine and School of Medicine

The Nagoya University Graduate School of Medicine and School of Medicine is rolling out a variety of activities with the dual aim of leading the science and practice of medicine in Japan while constructing educational facilities, research facilities, and medical institutions open to the world at large. We are performing these activities in four strategic domains: education, research, collaboration, and internationalization. In addition to carrying out initiatives specific to each domain, we are also generating creative results by organically linking them with one another. We will continue to focus our attention on pressing issues within each domain as we work to clarify the vision that our medical and graduate schools hold for the future.



Medical Science Research Buildings 1 & 2

From the entrance of the Graduate School of Medicine, the path leads to the entrance of the Medical Science Research Buildings 1 & 2.



View of the campus from the south



Tree-lined path from the front entrance

The path from the front entrance is lined with trees, creating a green corridor that leads to the entrance of the Medical Science Research Buildings 1 & 2.



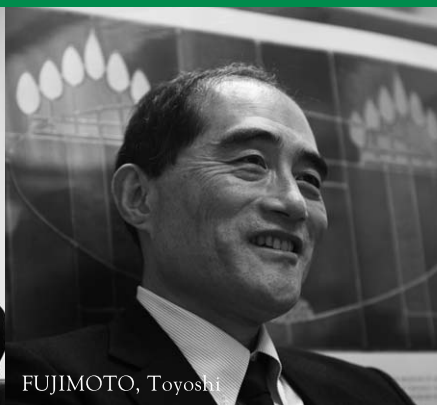
# Education

It goes without saying that it is people who will create the future of medical science and healthcare, and medical education lies at the heart of this endeavor. At the Nagoya Graduate School of Medicine and School of Medicine, our goal is to foster medical scientists and practitioners who combine a research-oriented mindset with a profound compassion for patients. To this end, we have worked to offer our students a rich and comprehensive medical school and graduate school education. Medical school students are encouraged to get involved in research and clinical trials early in their coursework and maintain their ties with education after they graduate. Our graduate school gives students an education that will prepare them to drive new research on a global scale. We are also working to provide extensive career options for our medical researchers and practitioners both locally and globally. Reforms in our learning environment and educational programs, coupled with an academic culture known for supporting free thinking and open discussion, have fueled even more opportunities for growth among the leaders of tomorrow.

Putting the future leaders of medicine  
on the cutting edge of global progress  
and the front lines of local communities



UEMURA, Kazumasa



FUJIMOTO, Toyoshi



FURUKAWA, Koichi

## Our purpose is to train scientists capable of conducting world-class research and medical practitioners who can make a contribution to society

At the Nagoya University Graduate School of Medicine and School of Medicine, we are working to train medical scientists who can conduct world-class research that will contribute to the promotion of human health as well as medical practitioners who can respond to society's healthcare needs. Both endeavors demand the same fundamental qualities: a scientific mind and compassionate heart directed at improving the lives of patients. It is critical that our students be creative, ethical, and cooperative as well as possess a thorough awareness of the social mission of medicine and have empathy towards human beings and society as a whole. Our medical school puts students in contact with the world of researchers and clinicians from an early stage, with an educational curriculum that supports their future career options. The education we provide transitions seamlessly through graduation, and fosters clinicians through a junior residency training system that was established early on. This system is known nationwide as the "Nagoya University Way". We produce great numbers of outstanding medical practitioners, and we are building a solid foundation to support community-based medical care in the Tokai region. At the same time, our graduate school is at the forefront of efforts to develop medical researchers, offering four areas of specialization [ ❶ ] that make no distinction between basic and clinical research. We have built an integrated system that aims to bring basic research to fruition in clinical settings and use clinical problems as topics for basic research, and we are training our basic and clinical researchers using this system.

## Getting on the right track with early exposure to research and clinical training

We take a separate approach to educating researchers and clinicians in the School of Medicine. In terms of training researchers, one of the unique strategies we have for fostering a research-oriented mindset from an early stage is holding a **Basic Medicine Seminar** for third-year medical students. Students are divided into small groups and allowed to participate in a course of their choosing for a semester, where they get to experience cutting-edge basic/social research. This gives the participants a chance to see what the life of a researcher is like. All public medical schools in Japan have similar trial programs, but the Nagoya University program is exceptional in that students get to spend an entire semester in a course so extensive that some are even cited as co-authors on published research during the seminar.

Future clinicians begin a preliminary education program in their fourth year, which will prepare them for the clinical training that will put them into contact with actual patients. As **Dr. Kazumasa Uemura** tells his students, "You will be permitted to perform medical interventions only because you are a physician. You must begin acquiring the skills and ethics that society requires prior to graduation." For a physician,

Supplement ❶  
[DATABOOK] P9-12  
Doctor of Medical Science

### Basic Medicine Seminar

Medical school students spend the entire second semester of their third year participating in a basic or social medicine course, where they experience research activities on the front lines under an advisor. Once the seminar is over, they are required to give either an oral or poster presentation on their experiences.



### UEMURA, Kazumasa

Born in 1957, Kazumasa Uemura graduated from the Yamaguchi University School of Medicine and is a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2005. He specializes in medical education and general medicine. He is currently conducting research on professional ethics in medical education and for physicians. He serves as director of the medical school's Center for Medical Education.

training to develop things like clinical skills and bedside manner are essential. We have students role-play with their fellow students and interact with simulated patients to mimic these situations for practice. Our **Skills and IT Laboratory** [ ② ] is one of the premiere educational simulation facilities in the country, and we use it to help students acquire the skills they need. During Clinical Clerkship II in their sixth year, students select two subjects and engage in practical training in those areas for seven weeks each. The system is designed to get students to deepen their personal interest in certain clinical fields. During the program, those students who wish to go abroad are eligible to be selected to study at one of our affiliated overseas institutions, thus providing them with an opportunity to experience foreign medical settings and broaden their perspectives. According to **Dr. Toyoshi Fujimoto**, “We honor students’ independence in both the research and clinical aspects of their education, and one of the strengths of our program is the amount of time we allow for self-directed learning.” In this way, we further student’s learning not only through our fully appointed educational system, but also through a broad-minded an open academic culture that fosters students’ independence and creativity.



Central venous (CV) catheter workshop   Acute care training (large room format)   Diagnostic imaging laboratory

## Enhancing our graduate courses through the use of English has created a learning environment open to the entire world

With our graduate education, we are working to create a more international learning environment. As part of our *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders* [ ③ ] Global COE program, we have established four courses at the core of our educational program for the future world leaders in research: neuroscience, cancer science, translational science, and basic science. We invite lecturers from Japan and abroad to give courses that put students in contact with cutting-edge global research in each area, allowing them to systematically build their knowledge. We also have a medical English course that teaches students to write medical research and give presentations in English while also developing their ability to hold English discussions. In order to accommodate foreign students, we also began adding English to our course syllabi for enrollees in the 2009 academic year. In addition, we’ve published an online English version of the guidebook for our Basic Training course where faculty members train students in the procedures and techniques associated with their area of expertise. Many of our graduate courses already include lectures and practical training conducted in English, and we have truly opened our educational program to the world

### FUJIMOTO, Toyoshi

Born in 1954, Toyoshi Fujimoto graduated from the Kyoto University Faculty of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University School of Medicine in 1999 after serving as a visiting researcher at the University of California, San Diego. He specializes in cellular biology and general anatomy. He is currently researching the structure and function of biological membranes.

### Skills and IT Laboratory

This facility recreates actual medical settings in order to develop students’ clinical abilities. It features training rooms where students can perform resuscitations, carry out medical examinations, and practice other vital skills. The facility uses information technology to put students in an environment that recreates clinical conditions.

### Supplement ②

[ DATABOOK ] P38

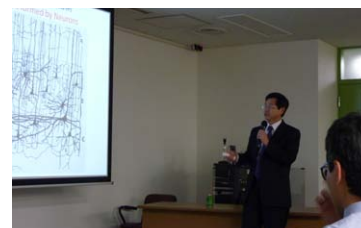
Use survey of Skills & IT Laboratory

### Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders

A project by the Ministry of Education that aims to provide targeted support for the establishment of internationally superior education and research centers as well as promote the formation of globally competitive universities in Japan. The *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders* project at the Graduate School of Medicine was selected for the program during the 2008 academic year.

### Supplement ③

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Lecture by Kazuhiro Ikenaka  
Overview of glial cell functions and disorders



by creating an environment where foreign students can enroll and attain their degrees entirely in English.

## A new program that trains the clinicians who will support community healthcare and the researchers who will drive medical science

In an effort to make a variety of career options available to those wishing to enter the medical field, one of our recent activities has been reforming the way students both enter and exit our program. In the 2009 academic year, we began a new admissions program to foster clinicians who work for Aichi residents using scholarships provided by the prefecture. The goal of the program is to educate those who will be serving in community-based healthcare in Aichi. Though the Nagoya University School of Medicine has historically endeavored to train clinicians for the community, we have recently been working to enhance our ties with Aichi prefecture and further contribute to community-based healthcare in the area—for example, by increasing the number of admission slots reserved for those who will work in the prefecture. As part of these efforts, the Graduate School of Medicine was also able to open the **Department of Education for Community-Oriented Medicine** in 2009 with funds from Aichi prefecture and other sources. The department's mission is to train health professionals who are oriented towards the needs of the community, and thus provides students with an education that fosters a sense of purpose in terms of serving the needs of the community and society prior to graduation.

At the same time, finding a way to train medical scientists in the Japanese medical community is also a pressing issue. As **Dr. Koichi Furukawa** notes, “We need to rethink students’ first years in graduate school and build a system that exposes them to research as early as possible.” In order to address this issue, the Nagoya University School of Medicine set up two programs for researchers four years ago: (1) a Special Researcher Course (MD/PhD Course) that allows fourth-year medical school students early admission and (2) a Dean’s Direct Graduate Course [4] that is designed for doctors in the first two years after their medical school graduation. We also launched a recommendation-based admissions program in 2008, targeting those actively seeking to become successful basic or clinical researchers in the future. The new approach forges superior students with a passion for research—for example, by exposing them to research laboratories from their first year and asking them to read research papers in English. We are also doing everything we can to support their lives as researchers by applying to the Ministry of Education’s Medical Scientist Development program to secure a certain number of medical researchers who can be granted scholarships. We have a project team dedicated to training more medical scientists, and are currently looking at additional new strategies for doing so. Through these efforts, we are breaking new ground that will allow us to turn out great numbers of clinicians who can support the local community as well as researchers who can take medical science to the next level.

### Department of Education for Community-Oriented Medicine

A department designed to support Japan in the twenty-first century by training health professionals who are oriented towards the needs of the community as well as researching, developing, and providing information on a new system for community-oriented medicine. It is the first endowed chair to be linked to the government administration.



Three core missions underlying departmental activities

### FURUKAWA, Koichi

Born in 1949, Koichi Furukawa graduated from the Nagoya University School of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University School of Medicine in 1997 after working as a researcher at the New York Sloan-Kettering Cancer Center. He specializes in glycobiology. He is currently working to explain the factors causing cancer and neurological disorders and develop new treatments for these diseases.

#### Supplement ④

[DATABOOK] P13

Dean's Direct Graduate Course

Special Researcher Course (MD/PhD Course)

# Research

In the research domain, our goal at the Nagoya University Graduate School of Medicine and School of Medicine is to promote world-class academic research. In order to achieve this goal, we dedicate ourselves to securing outstanding researchers who have made their mark both in Japan and abroad while providing a comprehensive research program that spans everything from basic research to translational and clinical research in an environment that is well supplied with state-of-the-art research equipment. At the same time, we have worked to create a program that supports cross-disciplinary integrative research in an international research environment in order to keep us competitive on the front lines of global research activities. We create an open research climate by breaking down the barriers that divide basic and clinical research, various laboratories, and divergent fields. We believe that our efforts to organically concentrate the talents of individual researchers are what generate new research outcomes and allow us to return them to the medical community in the form of tangible benefits.

Linking medical insights with  
medical practice as we probe into  
the heart of basic and clinical medicine



TAKAHASHI, Masahide



KAIBUCHI, Kozo



KADOMATSU, Kenji



OHNO, Kinji



## Using large-scale projects and endowed courses to secure the people who will take research forward

In the biological sciences, the first thing you need to advance in cutting-edge global research is the originality to identify the seeds of the next breakthrough. However, once you discover those unique seeds, it can then take decades before the seeds sprout in clinical research and bear fruit in an actual medical setting. Research does not yield benefits for society overnight, and creating an environment that fosters ongoing world-class research is essential, as is providing a long-term foundation that supports passionate researchers as they hand down their insights to the next generation. It is for this reason that the Nagoya University Graduate School of Medicine and School of Medicine works hard to build the basic infrastructure to support research by securing the funding needed to hire and train outstanding talent, thoroughly enhancing the research environment, and carrying out important measures and policies. Our aim is to comprehensively improve our capacity for top-notch research.

One of the initiatives that allows us to secure outside funding is our endowed chair system [1] and other benefits that come from being involved with large-scale national projects and with corporations. Most of this money is used to obtain researchers. Despite the trend towards having fewer university researchers as government budgets shrink in the wake of incorporation, each of our research laboratories have been actively applying for projects and launching endowed programs with the aim of strengthening the human foundation needed to support research. Our efforts have borne fruit, and in addition to being selected for [key projects](#), we currently have eleven corporate-endowed programs that center on clinical research. As a result, we have been able to hire new faculty and conduct specialized research targeting specific fields and disorders—research which has generated reliable outcomes. In some cases, individual research laboratories have faculty members linked to the private sector working on every project, and daily collaboration with the corporate world has provided our outstanding young researchers with the opportunity to make their mark as associate professors, post-doc fellows, or research assistants. Solid financial backing is one reason that we are able to provide our scientists with an environment where they can dedicate themselves exclusively to their research activities. This can lead to truly meaningful work, as [Dr. Masahide Takahashi](#) has noted: “most researchers also conduct medical examinations at hospitals, limiting the amount of time they can spend on their research. Our endowed programs and other initiatives have allowed us to increase the number of faculty members, and this supports advancements in research.” In the 2010 academic year, we were able to hire nearly 90 researchers as a result of outside funding. Adding the nearly 160 full-time faculty members in the School of Medicine and Graduate School of Medicine reveals the tremendous scope of our operations. Enhancing our human power has been a driving force in taking both our basic and clinical research activities into the next era.

Supplement ①  
[DATABOOK] P15-17  
Endowed chair

### Key projects

- ◎ Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders (Global COE Program)
- ◎ COE for Education and Research of Micro-Nano Mechatronics (Global COE Program)
- ◎ Cancer Professional Training Plan
- ◎ Career Support Program for Young Doctors in the Tokai Region
- ◎ Establishing a Vision of Regional Partnership for Drug Discovery Research
- ◎ Project for Realization of Regenerative Medicine
- ◎ 2010 Local Emergency Fund to Prevent Suicide
- ◎ Project for the Realization of Individualized Drug Therapy
- ◎ Core Research of Evolutional Science and Technology (CREST) in two fields
- ◎ Special-appointment research projects in six fields
- ◎ Special Coordination Funds for Promoting Science and Technology

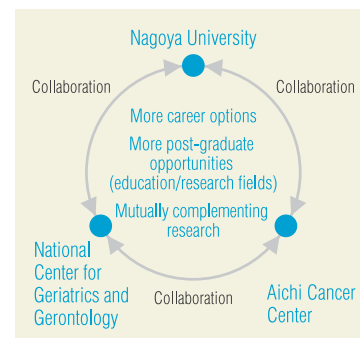
### TAKAHASHI, Masahide

Born in 1954, Masahide Takahashi graduated with a PhD from the Nagoya University Graduate School of Medicine and is also a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 1996. He specializes in the molecular biology of cancer. He discovered the cancer-related gene RET and the girdin protein, and is currently conducting comprehensive research on the infiltration and metastasization of cancer as well as the structure of the nervous system.

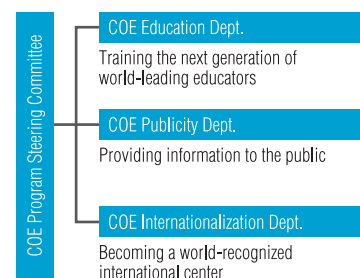
## Fostering new integrative research and a positive research climate through Global COE activities

The activities associated with the *Integrated Functional Molecular Medicine for Neuronal and Neoplastic Disorders* Global COE program [ 2 ] lie at the heart of our efforts to promote cutting-edge global research and train the next generation of researchers. We are searching for the functional molecules common to neurological disorders and malignant tumors with the aim of successfully treating them through molecular target therapy. As a result, we are looking to build one of the world's leading educational and research centers. About twenty of our university research facilities are participating in the program, and our efforts to conduct integrative research among scientists from different fields has fostered creativity and made us unique throughout Japan. As a critical part of our efforts to train researchers, we have established four courses. The fields of molecular biology and medical science have made rapid progress in recent years, and scientists must be able to efficiently absorb vast amounts of information and put it to work in their own research. This program supports that effort by allowing students to take a series of courses within a curriculum that gives them simultaneous access to cutting-edge knowledge and background information in each discipline. Nationally and internationally acclaimed professors teach many of these courses in English. Though this is an innovative approach among Japan's graduate schools, several of our research laboratories quickly adopted it prior to being selected for the project as a way to bolster their educational outcomes. The expertise that they gained as a result of their efforts has also been incorporated into the systematic courses. The program also affords students ample opportunities to hone their research presentation skills. There are monthly reports as well as presentations and interactions with their peers from around the world at the yearly [Global Retreat](#), an event that brings in young researchers from other countries for a shared overnight trip. The Institutional Program for Young Researcher Overseas Visits is a government-subsidized project linked to the COE program that presents research findings overseas and supports experimental research. Our research laboratories also send young scientists abroad to participate in these efforts.

The environment at Nagoya University puts students on the front lines of global research even when they are in Japan, while also allowing them to accumulate international experience. What they develop are far-reaching knowledge and broad perspectives, an international mindset, and stronger communication skills—forging them into the kinds of researchers who can succeed in a wide array of disciplines. The research climate has also been evolving since the program began, and thanks to the retreats, progress reports, and similar initiatives, graduate students now move freely among the different research laboratories—generating more opportunities for joint research. Noting this development, [Dr. Kozo Kaibuchi](#) observed, “The traditional method of conducting all research within the walls of a single laboratory just doesn't work in today's fiercely competitive global environment. If we are to work together as a single human society, it is imperative that we promote interdisciplinary joint research both



Collaboration with local research centers involved in the Global COE program



Global COE governing structure

Supplement 2  
[FORGING THE BONDS OF MEDICINE] P12

### Global Retreat

Local research centers and young scientists from around the world gather for a shared overnight stay. The retreat provides opportunities for participants to exchange ideas through research presentations and discussions and is planned and run entirely by young people, including the calls for topics, presentation format, special talks, and social events.



Second Annual Nagoya Global Retreat

within the university and outside of it.” The walls between the laboratories are now beginning to come down. We are working to create a new culture where young scientists share techniques and inspire one other to conduct even better research.

## Supporting joint research and research advances with open access to state-of-the-art equipment

The [Center for Research of Laboratory Animals and Medical Research Engineering \(Division for Medical Research Engineering for instrument sharing\)](#) gives students at Nagoya University a tremendous advantage as they seek to promote their research to a global audience. The center is a shared-use facility that collects and controls all of the university’s state-of-the-art analysis and measuring equipment, and it is open not only to medical school students, but to all students at the university. We are also in the process of setting up a system that would allow corporations and others outside of the university access to the equipment as well. This open approach is unique to Nagoya University, and it is also one of our strategies for remaining competitive as a research institution. In today’s world, conducting world-class research in any field absolutely requires the latest technology. These valuable devices were acquired through substantial investment—and rather than put them in an individual classroom, we made the decision to put them in a central location. This move was based largely on the desire to allow all of our researchers—and the entire student body—the opportunity to use them effectively. [Dr. Kenji Kadomatsu](#) commented on the importance of these instruments: “There are worlds that can only be accessed through the use of highly advanced technology. When we are finally able to catch sight of them, questions arise that pave the way for the next scientific breakthrough.” We are also in an era where the use of precise instruments allows us to explain the pathology that characterizes the intractable diseases so that we can then control and treat them. Sharing equipment encourages researchers to exchange information with one another, which in turn furthers their individual research and eventually results in advances in medical science. We hope that our students will make even more use of the center as a way to take world-class research to the next level.

Another fresh approach has been stationing young faculty members at the center to serve as advisors on the analysis equipment—in addition to the usual technical staff. The purpose of this strategy is to create an environment that makes it easier for students to freely use the state-of-the-art equipment for their own research as they receive guidance from the advisors. As the students become specialists comfortable with these sophisticated instruments, their career choices will open up as well. Eventually, they will be in a position to lead the next generation of young scientists, where their advanced knowledge and skills will be preserved as they are passed down and further refined. Viewed in this way, the Division for Medical Research Engineering is a kind of human resource center that fosters professional development as well.

### KAIBUCHI, Kozo

Born in 1955, Kozo Kaibuchi graduated with a PhD from the Kobe University Graduate School of Medicine and is also a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2000. He specializes in neuroscience, cellular biology, molecular biology, and pharmacology. He is currently working to better explain schizophrenia and the structure of polarized cells.

### Center for Research of Laboratory Animals and Medical Research Engineering (Division for Medical Research Engineering)

The Division for Medical Research Engineering consists of four laboratories: the ultramicro morphology lab, the molecular structure analysis lab, the cellular function analysis lab, and the genetic information analysis lab. Each fitted with a variety of instruments. Users can receive research support services on how to operate the equipment. In the 2009 academic year, the center added a state-of-the-art confocal microscope, mass spectrometry instrument, and flow cytometer.



Flow cytometer



Mass spectrometry instrument

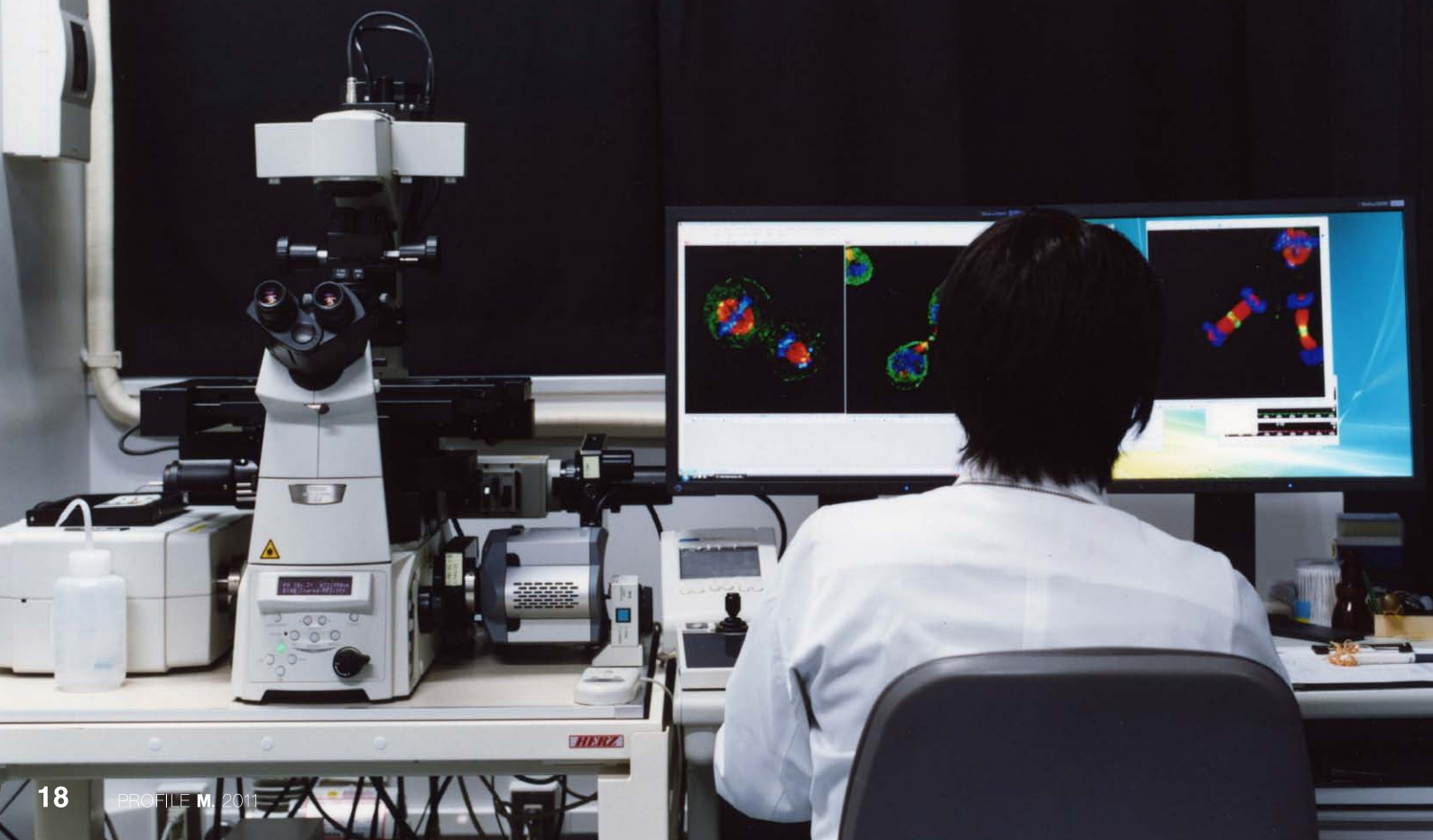
### KADOMATSU, Kenji

Born in 1957, Kenji Kadomatsu graduated with a PhD from the Kyushu University Graduate School of Medicine and is also a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2004. He specializes in biochemistry, glycobiology, and neurobiology. He is currently working to explain the action mechanism for midkine as a molecular target in cancer treatments and develop new treatment strategies.





Confocal microscope at the Center for Research of Laboratory Animals and Medical Research Engineering  
(Division for Medical Research Engineering)



## Leading research in Japan as a translational research center

The science we do at the Graduate School of Medicine spans everything from basic research to application—and one of our primary focal points is taking research outcomes directly from “bench-top to bedside.” This approach is based on the knowledge that medical science is a practical science, and our conviction that its purpose is to resolve the problems that arise in clinical settings. As [Dr. Kinji Ohno](#) reminds us, even today there are more than a few intractable diseases for which we have not found effective treatment methods: “If even one person is suffering from a disease, doctors and universities have a responsibility to figure out how to treat it.” The seed planted during the research phase is tied to the need in clinical settings to cure diseases—in other words, medical scientists are looking for ways to apply their basic research and put it to practical use. In order to better make those connections, we are enhancing our translational research activities—activities that build bridges between basic science and clinical endeavors. Nagoya University has been conducting translational research for many years, specializing in gene therapy, cell therapy, and regenerative medicine. In 1999, we became known for being the first institution in Japan to treat brain cancer using gene therapy. Building on our history and past successes, we opened the [Center for Advanced Medicine and Clinical Research](#) as part of Nagoya University Hospital in June 2010 to serve as a hub for translational research activities. The advanced medical research procedures conducted at the center are rooted in ethical and scientific principles, and structured so that scientific outcomes can be swiftly introduced to society. In this way, the center seamlessly integrates the process that extends from initial seed development to established treatment procedure. The center is also designed to sustain progress achieved through long-term focus on the development of advanced medical treatments. Of particular interest is our [Biomaterials Coordination Unit](#) in the Advanced Medicine Support Department, which is known for being the premiere facility of its kind in Japan. We hope to take advantage of our unique position and become a leader in translational research in Japan. The center has already been selected for several promising projects, and we are developing research support with the aim of eventually arriving at cutting-edge, sophisticated medical treatments. Our goal is to find practical uses for the scientific outcomes generated at the center so that they eventually become standard medical procedures.

World-class basic research is what paves the way for groundbreaking advances in medical science, while clinical research looks to discover ways of treating a variety of diseases and conditions. Translational research is the bridge that links these two important endeavors. By supporting individual research projects while working to further strengthen our organization and strategically link different areas of research, Nagoya University is taking the next giant leap into the future of medical science.

### OHNO, Kinji

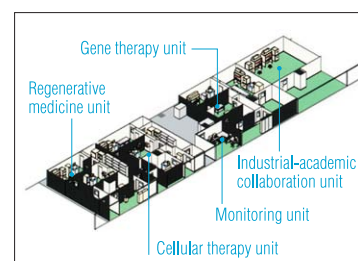
Born in 1958, Kinji Ohno graduated with a PhD from the Nagoya University Graduate School of Medicine and is also a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2004. He specializes in applied genomics and neuropathology. He is currently working to explain the molecular pathogenic mechanism that drives RNA levels in neuromuscular disorders and researching ways to control it.

### Center for Advanced Medicine and Clinical Research

The center features collaboration between two departments: the Department of Advanced Clinical Support, which handles the furthering of clinical research as well as development support for new drugs, medical devices, and the Department of Clinical Research Support, which promotes clinical trials and conducts data monitoring activities. The center thus provides integrated support for the entire advanced medical treatment development process, from translational research to clinical trials.

### Biomaterials Coordination Unit

The Biomaterials Coordination Unit is made up of four sub-units that have a Class 10,000 (ISO Class 7) cleanliness rating: regenerative medicine, cellular therapy, gene therapy, and academic-industrial collaboration. Operations on the unit are controlled by the ISO 9001:2008 and ISO 13485:2003 regulations issued by the International Organization for Standardization.





# Collaboration

## Mining the possibilities of fresh collaborative efforts in order to drive innovations in medical science and healthcare

Efforts undertaken by the Nagoya University Graduate School of Medicine and School of Medicine to further science in a way that integrates its chosen domains and fields of study go beyond the confines of its undergraduate and graduate programs. We have a long history of collaborative projects with nearby research centers in the areas of both education and scientific inquiry—and we are now looking to bring additional partners into our established network. We are also actively developing joint research projects with industry and governments as well as with other university departments. We are making our intellectual property public and throwing ourselves into furthering collaboration with private companies. At the same time, we are cooperating with other universities in the areas of medicine and pharmacology as we work to train the people who will support new cancer treatments. This is not the way that medical schools have typically been portrayed in the past. We are taking innovative steps in medical science and healthcare by exploring every avenue for potential collaborative opportunities—and in doing so, showing the world how the new model of medical education and medical science should operate.



TAKAHASHI, Takashi



MIYATA, Takaki



ANDOH, Yuichi



NAOE, Tomoki

## Deepening collaboration with nearby research centers to generate synergy in our educational and scientific endeavors

In an effort to free themselves from the status quo and discover fresh opportunities, every academic field is working to create open relationships and forge organic linkages. The medical community is no exception, where collaborative efforts are going beyond the confines of individual fields and specialties. At the Nagoya University Graduate School of Medicine and School of Medicine, we are taking advantage of the many outstanding affiliated hospitals and research centers scattered throughout this region as we actively work to develop collaborative activities in both education and science.

One such activity has been setting up an affiliated graduate school [ ❶ ] with the Aichi Cancer Center Research Institute. We have been working with this celebrated institution—one of the premiere cancer research facilities in Japan—to promote collaboration in education and science. We bring in epidemiology, cellular engineering, and cellular oncology researchers from the cancer center as visiting professors or in other capacities, and are creating a system that allows our graduate students to complete their doctoral courses and earn a PhD under the guidance of these scientists. The relationship is one that has inspired and benefitted both sides, as **Dr. Takashi Takahashi** reflects: “There has been brisk interaction between those from the institute and the university, and positive collaboration has taken many forms—including joint research projects and the development of scientific talent.”

It has been more than ten years of forging increasingly strong ties with the Aichi Cancer Center, and at last we have taken the first major step in our collaborative efforts by linking up with the National Institute for Physiological Sciences [ ❷ ]. In an effort to deepen our research exchanges with this world-class institution known for its work in physiology and neurology, we held our **first joint symposium** in August of 2010. **Dr. Takaki Miyata** commented, “They are interested in our university hospital for medical science, and the fact that we are conducting clinical research and treatments on actual patients. We are interested in knowing how far they have come with their cutting-edge basic research at the institute. So this symposium was a long-awaited step forward for both of us.” Though this is just the beginning of their shared endeavors, both organizations have drawn a great deal of attention for the scientific advances brought by their collaboration, which also looks promising in terms of professional development. The Tokai region has quite a collection of prominent research centers, and the university is looking to further expand its collaborative activities in the future as well.

Supplement ❶

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Affiliated graduate schools

### TAKAHASHI, Takashi

Born in 1954, Takashi Takahashi graduated from the Nagoya University School of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University Graduate School of Medicine in 2004 after serving as chief of the Molecular Oncology Division at the Aichi Cancer Center. He specializes in oncology. He is currently working on multidirectional research on the molecular pathogenesis of hard-to-treat cancers, particularly lung cancer.

Supplement ❷

[FORGING THE BONDS OF MEDICINE] P 2-7

Dialogue with Dr. Yasunobu Okada of the National Institute for Physiological Sciences

### MIYATA, Takaki

Born in 1963, Takaki Miyata completed his PhD at Kochi Medical School and is a licensed medical doctor. He became a professor at the Nagoya University Graduate School of Medicine in 2004 after working as a researcher at RIKEN. He specializes in neural development. He is currently working to define the role of genes in the brain and research the brain development process.

### Graduate School of Medicine— National Institute for Physiological Sciences First joint symposium

The first joint symposium was held on August 21, 2010 at the National Institutes of Natural Sciences' Okazaki Conference Center. Participants were introduced to each other's research projects and given a tour of the National Institute of Physiological Sciences an effort to spark joint research and allow graduate students to experience scientific activity on the front lines.



Opening address by Dr. Sobue

Symposium lectures

Poster session venue



## Using joint programs with other universities to train cancer experts that can work beyond the healthcare field

Nagoya University is notable for its university hospital, which is the primary medical health center in the region. The ties between the Graduate School of Medicine and the hospital are also a core feature of our program. One of the initiatives that showcases this collaboration is our **Training Plan for Multi-organ Cancer Specialists (Tokai Gann Professional Plan)**, which was selected for the Cancer Professional Training Plan. Participants undergo practical training in treatment settings, and include clinical oncologists, registered nurses, pharmacists, and radiologists. With this program, we aim to provide multidisciplinary medical teams capable of delivering some of the finest cancer treatment in the world. Nagoya University is one of eight universities in the region participating in the Tokai Gann Professional Plan. The group covers a wide area and includes regional medical associations as well as government institutions. One of the key features of the plan is its multi-organ approach to cancer diagnosis, which goes beyond traditional organ-specific examinations to develop experts capable of performing chemotherapy or radiation therapy with the knowledge that all of the body's organs are interconnected in some way. Each university hospital has set up a Cancer Board that brings together various hospital departments and professional disciplines for conferences as well as joint seminars with other universities. One of the signs of collaborative progress is the intensive course—a separate program from the graduate course—which trains medical experts as well as assistant medical personnel. The course is designed to raise the level of expertise among the physicians and medical assistants that already work in clinical settings, and there are some physicians practicing outside of the school that come to Nagoya University to learn about medical treatments. In the past, the rigid barriers between different hospitals made this sort of interaction difficult, but collaboration under the Tokai Gann Professional Plan has opened the door and contributed greatly to the quality of healthcare in the region. Another unique feature of the educational opportunities that Nagoya University offers through the plan is their focus on actual practice. In other words, participants receive training that fits with their actual professional tasks and are able to resolve questions while performing treatment in a real outpatient setting. **Dr. Yuichi Andoh** said of the program, “Learning chemotherapy and radiation therapy is impossible without practical on-site training. This program has value in that it incorporates hospital needs into students’ education.” It is because Nagoya University already has a multi-organ chemotherapy department in place where physicians and medical assistants specializing in different organs can work together during regular examinations that we are able to offer this kind of education, and our curriculum has received high marks as a result.

### Cancer Professional Training Plan Training Plan for Multi-organ Cancer Specialists

A support project by MEXT launched in 2007. The plans led primarily by Nagoya University aim to train the clinical oncologists and other medical staff specializing in cancer to take charge of multi-organ cancer treatments. Our goal is developing world-class medical oncology teams.



#### ANDOH, Yuichi

Born in 1965, Yuichi Andoh graduated from the Nagoya University School of Medicine and is a licensed medical doctor. He began working at the Nagoya University Hospital in 2006, and currently serves as an associate professor and head of the chemotherapy department. He specializes in pharmaceutical cancer therapies. He is involved in medical, educational, and research activities in the chemotherapy department as he carries out multi-organ anti-cancer drug treatments.

## Looking to offer next-generation medical care with collaboration that extends across schools, industries, and governments

In addition to working with research institutes and hospitals, collaboration with industry and governments as well as with those from different fields and professions will be a critical aspect of how universities are run in the future. Just as cooperation from pharmaceutical manufacturers and approval from regulatory agencies is essential in the field of drug development, turning the seeds and ideas generated at a university into concrete results requires cooperation from a variety of academic disciplines and collaboration with both companies and government institutions. To highlight its role as research center that promotes integrative research through academic-industrial-government cooperation and medical engineering, Nagoya University established the **Innovative Research Center for Preventative Medical Engineering** in April of 2010. The center houses researchers from the Graduate School of Medicine as well as the Graduate School of Engineering, and has corporate participants from a variety of industries—like NGK Insulators and ITOCHU Corporation. All are working together to develop projects that will establish a model for preventative medical engineering under the research concept of “putting talented physicians and major hospitals in the palm of your hand.” By setting up a system of seamless care that addresses the full range of conditions from health to illness, and by making it possible to collect a vast amount of biological information on individuals at any time and any place (including medical data from within major hospitals and health information at home), the center hopes to provide optimum prevention and early-stage medical treatment customized to suit each individual patient.

The **Intellectual Property Fair for Medicine and Biological Systems** is another initiative designed to promote industrial-academic collaboration. Though the Graduate School of Medicine has secured a great number of patents, there is room for improvement in terms of taking action to translate these patents into practical and commercial results. For this reason, the university set up an event to introduce its intellectual property to businesses, identify the needs of both parties, and create opportunities for business or joint research. Other medical and pharmaceutical schools from the Tokai region are also invited to participate, and the fair has drawn attention as a framework for interuniversity cooperation. The Intellectual Property Office at Nagoya University currently supports university members in securing patents. If intellectual property created through collaborative effort is patented, this again draws corporate interest in a positive cycle that is likely to be a source of strength for the university in the future. **Dr. Tomoki Naoe** says of this aspect of collaboration, “The idea isn’t simply to work together for the sake of collaborating, but to put together something unique that could instigate a breakthrough.” The goal is to bring together people from different fields with different ways of thinking in order to spark new ideas through interaction. Challenging ourselves to reach out those in different fields both inside and outside the university is what will allow us to usher in the next generation of cutting-edge medical care.

### Innovative Research Center for Preventative Medical Engineering

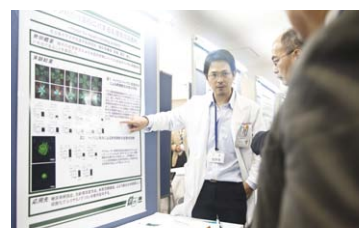
This center was designed around developing preventative and early-stage medical treatment through analytical and diagnostic medical engineering—an effort that was carried out as part of the Building Centers for Creative Innovations in Cutting-edge Integrative Disciplines project funded by 2006 promotion and coordination funds. The facility promotes integrative research that brings together academic, industrial, and government players as well as the fields of medicine and engineering.



Fourth research conference at the Innovative Research Center for Preventative Medical Engineering

### Third Intellectual Property Fair for Medicine and Biological Systems

This event was held on December 17, 2010. Seven medical and pharmaceutical universities participated along with Nagoya University, displaying newly created patents as well as tangible achievements that could be transferred to technology. The first fair was held in 2008, and there have been many instances where companies have gone as far as entering contracts with the universities.



### NAOE, Tomoki

Born in 1951, Tomoki Naoe graduated from the Nagoya University School of Medicine and is a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2001. He specializes in hematology. He is currently working to develop new molecular diagnostics and molecular target therapies to fight leukemia and lymphoma as well as promoting multi-center cancer research.

# Internationalization

Medical research and practice look to contribute to the well being of people all over the world. In order to develop professionals who can achieve that aim, the Nagoya University Graduate School of Medicine and School of Medicine has been working to become more international in its focus—putting several distinctive research and educational programs into action that are open to the world at large. One of these is our exchange program with other world-class universities, where our unique support measures allow a great number of students to achieve tremendous growth. Our Young Leaders' Program (YLP), which brings in leadership candidates from developing countries, has also earned a reputation for global contribution, and has played a key role in getting our name out to a worldwide audience. The international networks we have built by sending Japanese students abroad and bringing foreign students to Japan are beginning to make their mark on global society as important educational and research organizations.

Making our mark on society by  
developing the people who will bring  
our world closer together



## Sending students overseas to top universities through an extensive support program

Faced with the ongoing global recession, the Nagoya University Graduate School of Medicine and School of Medicine has taken swift action to develop a strategy for internationalization with the aim of building a world-class organization for training medical researchers and practitioners. The strategy is noted for its wealth of highly distinctive features, and is characterized by a two-way flow of participants—Japanese students going abroad and foreign students coming into Japan. Nagoya University's foreign exchange program boasts a long history of academic exchange agreements with select schools [ ① ]. Our partners are typically ranked among the top 50 universities in the world, and include American giants Harvard University and the University of Pennsylvania as well as Europe's prestigious Medical University of Vienna and the University of Warwick. In addition to bringing in students from each of these schools, we also send between ten and twenty of our sixth-year medical students to our partner institutions each year for a three-month stay, giving them the opportunity to gain hands-on clinical training at overseas hospitals. The system provides a host of benefits for Japanese students, whose university credits can be easily transferred and whose tuition fees are often waived. Additionally, having built long-term alliances with these schools means that many of our students receive preferential treatment during their stay. Students who plan to go abroad are given preparatory English training before they leave, which includes holding discussions about patient ailments after having observed simulated cases. One of the truly unique features of our program is that most of this training is carried out by graduates of the program who currently have active careers overseas. By having older members of the "Frontier Group" with overseas experience run the classes in line with the current reality of life abroad, students are able to adapt to more quickly when they get there and make the most of their valuable time overseas. [Dr. Hideki Kasuya](#) points out that Nagoya University's exchange program is so strong that it is one of the reasons some students apply to our School of Medicine: "Linking current students with alumni creates one educational cycle, and the links among faculty members in different countries also provide opportunities for foreign study and international exchange. These rich human resources are a great strength that set Nagoya University apart from other schools."

## Bringing in outstanding talent from developing countries to foster the next generation of national leaders

A second acclaimed Nagoya University program that makes an international contribution through talent development is the [Program in Medical Science, Healthcare Administration Course, which is part of the Young Leaders' Program \(YLP\)](#) [ ② ]. The YLP is an initiative led by the Japanese Ministry of Education that invites talented people from Eastern Europe and from other parts of Asia and gives them the skills to

Supplement ①  
[DATABOOK] P 36  
Number of students sent out/accepted under  
international exchange agreements



### KASUYA, Hideki

Born in 1961, Hideki Kasuya completed his PhD at the Nagoya University Graduate School of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University Graduate School of Medicine in 2009 after serving as a surgery research fellow at Harvard University. He specializes in digestive surgery. He became a professor at the Baylor College of Medicine ICMT in 2010.

Supplement ②  
[DATABOOK] P 19  
Program in Medical Science,  
Healthcare Administration Course  
〈Young Leaders' Program (YLP)〉



formulate policy—an ability they will need as future national leaders. The program was also designed to teach participants more about Japan with the aim of forging bonds of friendship between Japan and other countries. Of the four universities participating in the YLP program, the Nagoya University School of Medicine and Graduate School of Medicine was put in charge of the field of healthcare administration. Potential candidates are interviewed in their home countries, and each year eight to sixteen mid-career government officials in charge of medical affairs (one per country) are invited to participate. All courses are conducted in English, and students are given interactive instruction in the medical knowledge they will need to serve as government officials in the fields of healthcare administration and public health. Participants are also instructed to write a master's thesis suitable for journal publication, ensuring that their master's degree carries weight among an international audience. In order to make the program even more attractive, a signature Graduate School of Medicine follow-up program is also in place. Under the program, faculty members representing the school visit participating countries and interact directly with high government officials as a way of demonstrating their enthusiastic support for the success and promotion of program graduates. Many Nagoya University YLP graduates now hold key positions in their home governments. As [Dr. Junichi Sakamoto](#) has pointed out, the foreign students have a deep trust in the program, which is a major factor driving its success: “I think it is extremely reassuring for them to know that we will continue to keep in contact even after they graduate, and that the program will continue to support them.”

## Making our presence known on a world stage in order to showcase Japanese leadership

We are taking proactive steps to increase the number of countries participating in the program—both for sending Japanese students abroad and bringing in students from overseas. In terms of our strategy in Asia for our exchange programs, we are furthering our collaboration with major universities in China (including Peking University and Shanghai Jiao Tong University) by sending over and bringing in medical school students for clinical training as well as putting effort into training young researchers by inviting master's program graduates to enroll in our doctoral programs. We are also planning on holding program orientation sessions at participating overseas schools in order to bring in a wider variety of outstanding students. In the Young Leaders' Program we have accepted our first student from Poland and are making arrangements to bring in our first student from Afghanistan—which became a new participating country as of the current academic year. In addition to learning healthcare administration, we hope to work through the new participant to learn more about medical care in Afghanistan and offer Japanese assistance where possible. All of our international strategies are designed to boost the presence of Nagoya University across the globe as a premiere research university and educational institution. At the same time, we believe that our efforts will serve to showcase Japanese leadership on a world stage.

### Program in Medical Science, Healthcare Administration Course Young Leaders' Program (YLP)

This program is designed to help develop government healthcare administration agencies in Eastern Europe and in other parts of Asia. There are currently fourteen participating countries, including Uzbekistan and Cambodia. Participants take study trips to Japanese medical facilities and cultural assets, while also holding internship positions at medical facilities within Aichi prefecture.

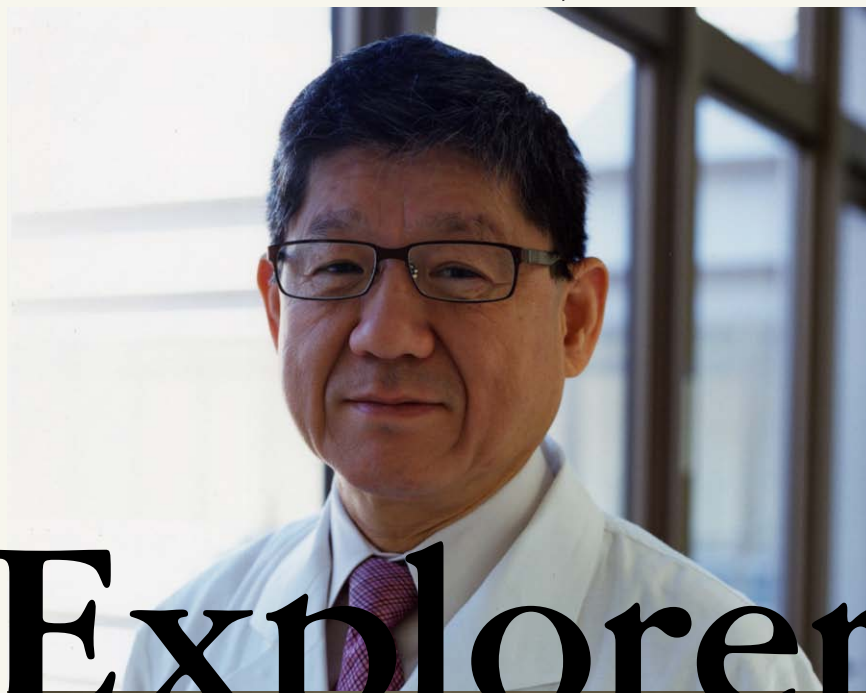


### SAKAMOTO, Junichi

Born in 1950, Junichi Sakamoto completed his PhD at the Nagoya University Graduate School of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University School of Medicine in 2006 after working as a research fellow at the New York Sloan-Kettering Cancer Center and teaching at the Kyoto University Graduate School of Medicine. He specializes in surgical oncology for gastrointestinal cancers as well as in healthcare administration.

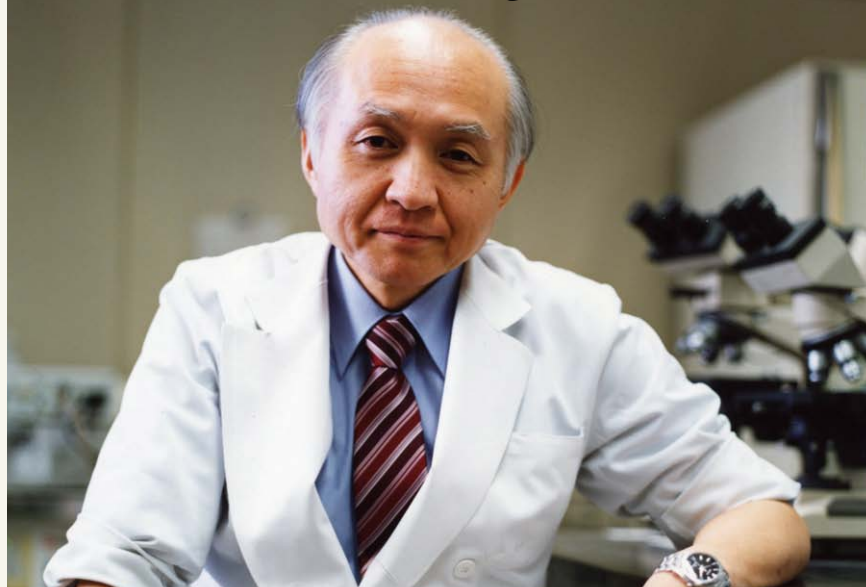
## Interviews

ISHIGURO, Naoki (Professor)



# Explorer

Seeking new horizons



GOTOH, Momokazu (Professor)

Even today, our medical institutions are beset with a host of seemingly incurable diseases for which effective treatments have yet to be developed.

These illnesses are life threatening and rob patients of their ability to lead comfortable lives. Our mission at Nagoya University is to break through our current limitations and free people from their suffering.

Two of our clinical researchers are true explorers who are using clinical research to seek new horizons in medical care.

Explorer — Seeking new horizons ❶

# Applying new distraction osteogenesis (bone lengthening techniques) to clinical treatment through the combined use of cell treatment with cultured cells

ISHIGURO, Naoki (Professor)

Born in 1954, Naoki Ishiguro graduated from the Nagoya University School of Medicine and is a licensed medical doctor. He has been a professor at the Nagoya University Graduate School of Medicine since 2001 and is the vice director of Nagoya University Hospital. He specializes in orthopedic surgery. He is currently researching cellular therapy for bone and joint disorders, and has begun carrying out highly sophisticated medical procedures—distraction osteogenesis (a leg bone lengthening technique) and cartilage regeneration therapy—in clinical settings.

## Serving patients of short stature

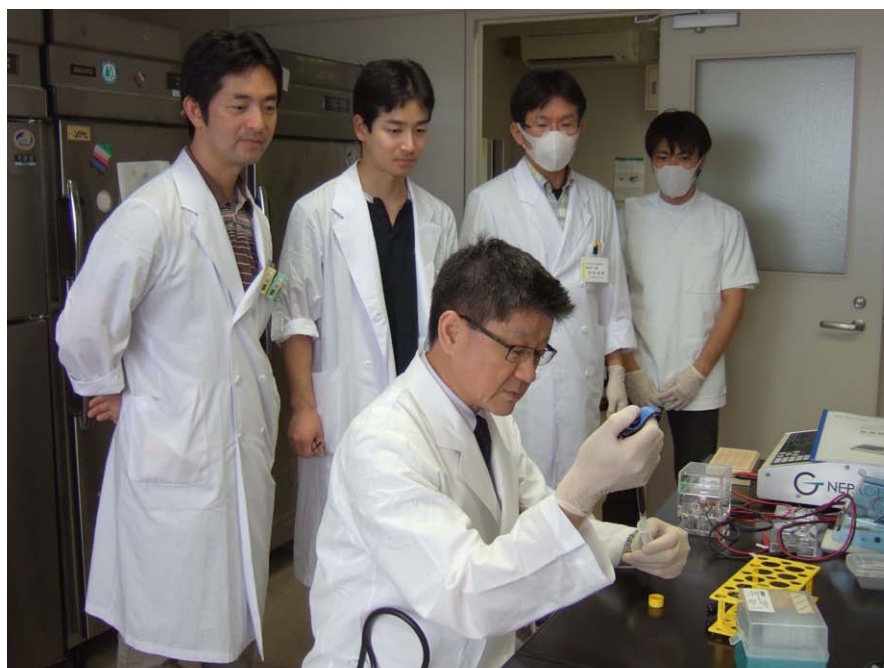
Patients who do not grow tall during adulthood due to a bone disorder are said to be afflicted with dwarfism. Their lack of height forces them to suffer a host of inconveniences in their lives, including the inability to drive a car or use vending machines. In the field of orthopedics, doctors have

been using a bone lengthening technique that requires breaking the bones and using an external fixator device to lengthen the legs over a long period of time. However, this traditional procedure requires extensive treatment time and presents a handicap to learning for patients of school age (under 20 years old). However, Dr. Naoki Ishiguro and his team at the Nagoya University Graduate School of Medicine have worked to shorten this treatment period by developing a new bone lengthening technique called distraction osteogenesis through the combined use of cell treatment with cultured cells. After proving the technique's effectiveness in animal studies, the team has moved on to clinical research, and has now begun performing the procedure as a form of cutting-edge medical treatment.

## Using cultured cells to lengthen bones

One of the most remarkable features of the new medical procedure is the harvesting of bone marrow cells from the patient, which are then cultured and differentiated into osteoblast cells. They are then combined with platelet-rich plasma taken from the patient's serum and multiplied before transplanting them to the area of the patient's body where bone growth needs to be stimulated. The procedure adds cellular therapy to existing bone lengthening techniques in order to speed up bone formation and growth, reducing treatment periods by about two-thirds. This improves the patient's quality of life and allows them to return to normal society earlier, greatly reducing the negative impact of their illness.

The general course of treatment first involves breaking the bone and separating it by a centimeter or two. The cultured cells





are then injected into the site, and the bone is gradually stretched out as we closely monitor its formation. The treatment is carried out on both the femur and lower leg bones, allowing us to extend each portion by an average of eight or nine centimeters. Dr. Ishiguro notes, “Our patients are between 120 and 135 centimeters tall, so the addition of nearly 20 centimeters of height greatly reduces the obstacles they face in daily living. We have transplanted the cells into several patients, and we are already seeing some extremely positive results.”

This medical technique can also be applied to patients whose legs are uneven due to a traumatic automobile accident or congenital disorder, and such medical trials are already underway. Dr. Ishiguro and his team are also working to further their extraordinary clinical research outcomes; for example, by conducting cartilage regeneration therapy using the technology for transplanting the cultured bone marrow cells.

### The true heart of an orthopedic surgeon

Dr. Ishiguro’s work to develop medical procedures for short stature patients stems from his desire to help alleviate the physical and psychological suffering that comes from living with a disability. It is this caring attitude that gives him the true heart of an orthopedic surgeon. Dr. Ishiguro points out that hundreds of Japanese people are afflicted with pathological short stature. “Once it is clear that a person is beyond the growth period and will not get taller even with the administration of growth hormones, it is time for the orthopedic surgeons to step in,” he says. “If we don’t continue our research, the patients that suffer from short stature will end up neglected forever.” Because the disorder is so rare,

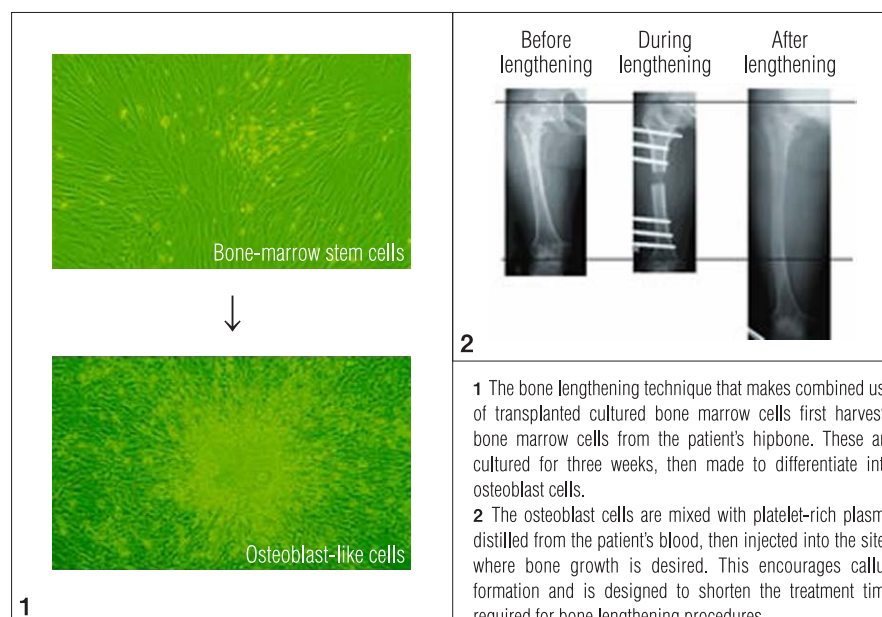
research will never be profitable—causing few people to focus on it and few medical institutions to offer treatment. However, Nagoya University Hospital has become the hub of these treatments in the Chubu region, and the new procedures are being ardently carried out for the sake of the patients that come from within Aichi prefecture and beyond.

### Working to further shorten treatment periods

Dr. Ishiguro is working on new research in the hope of further reducing the time it takes to treat short stature. He says, “The techniques we are doing now are the very best out there in terms of the burden on patients, treatment outcomes, and the requirements for cellular cultivation. However, there is still room for further improvement.” One of the new directions he is working on is preventing diminished activity among cultured cells, which use proteins known as cytokines and growth factors, by developing a technique for cultivating huge numbers of them. Reduced activity among cultured cells over time has

been a major issue facing the procedure, but the team anticipates that the newly developed technology will be able to address this issue in some way. They are also looking at a way to make the treatment more efficient with a procedure that would extract the required elements from within the patient’s body and concentrate them, then introduce them to the areas where they are needed at just the right time.

Dr. Ishiguro is also developing technology to further advance cellular differentiation by introducing genes. However, this kind of gene therapy faces some problems in terms of ethics and safety, so it will be several years before it can be applied to humans. Short stature is not a life-threatening illness, but “for precisely that reason,” Dr. Ishiguro notes, “we are able to find less invasive treatment procedures. That is the road we are taking.” Clinical research has worked to address the pressing needs of actual patients by going to medical settings and listening carefully to their feedback. The day when the results of this research can be returned to the wider public is just around the corner.



1 The bone lengthening technique that makes combined use of transplanted cultured bone marrow cells first harvests bone marrow cells from the patient’s hipbone. These are cultured for three weeks, then made to differentiate into osteoblast cells.

2 The osteoblast cells are mixed with platelet-rich plasma distilled from the patient’s blood, then injected into the sites where bone growth is desired. This encourages callus formation and is designed to shorten the treatment time required for bone lengthening procedures.

Explorer — Seeking new horizons ②

# Using non-cultured, autologous adipose-derived stem cells to take regenerative medicine to urinary incontinence

GOTOH, Momokazu (Professor)

Born in 1955, Momokazu Gotoh completed his PhD at the Nagoya University Graduate School of Medicine and is a licensed medical doctor. He became a professor at the Nagoya University Graduate School of Medicine in 2006 after serving as director of the urology department at Hekinan Municipal Hospital. He specializes in urology. In addition to seeing patients at Nagoya University Hospital, he is currently conducting urodynamic research on lower urinary tract obstructions.

## New treatments for urinary incontinence

Stress urinary incontinence is the term for urine leakage caused by sneezing or violent coughing. Anywhere from twenty to forty percent of women are affected by the condition, so there are a significant number of potential patients with this disorder. The condition is caused by a weakening of the sphincter muscles that close off the urethra, which may be a result of aging, pregnancy or childbirth, or other gynecological problems. If the condition becomes serious, doctors now perform a surgical procedure to

correct it. Because of anatomical differences, few men suffer from this condition compared to women, but there have been many cases where surgery to treat prostate cancer has damaged the sphincter muscle and lead to permanent urinary incontinence in men as well. As of now, there is no effective surgical procedure to treat these male patients, who must wear an absorptive pad or adult diaper for the rest of their lives. This condition causes considerable everyday hardship for those who suffer from it, so Dr. Gotoh and his team at the Graduate School of Medicine have been searching for a form of treatment that is less invasive for women and more effective for men as well. They eventually discovered a method of regenerative therapy for the urinary sphincter that uses non-cultured, autologous adipose-derived stem cells, which has made it to the clinical research phase.

## Confirming the efficacy of adipose stem cells

The adipose-derived stem cells used in the new form of treatment have drawn attention as a cell source for regenerative therapy, and can be used to regenerate the kidneys and improve renal function. They have even been used in Europe and the US for myocardial regeneration and breast reconstruction. These adipose-derived stem cells can differentiate into a variety of cell types such as bone, nerve, vein, and muscle cells, and a large amount of stem cells are contained in the adipose tissue. Furthermore, adipose tissue is abundant in human body. In other words, the cells have an advantage in that large amounts of fatty tissue can be safely harvested from the body, ensuring that there are a sufficient number of cells available for treatment. In order to verify whether adipose stem cells can be effec-



tively used to regenerate the urinary sphincter, Dr. Gotoh and his team are using a low-serum culture method to cultivate the adipose stem cells and conducting experiments where they inject it into the urethras of rats. They have applied for an international patent for their culture method. Their experiments have resulted in a thickening of the sphincter and increased urinary resistance, making urinary leakage less likely. The team found that the cells changed into smooth muscles without a specially induced culture, generating large amounts of the cytokine needed for cellular proliferation.

### Safe, minimally invasive procedures

Another distinctive feature of the new treatment is its use of non-cultured, self-derived cells. Researchers in Japan face many hurdles when using stem cells, and cultured cells must be tested for safety and carcinogenic properties for long periods before they can be used. The result is that these treatments rarely make it to clinical applications. Faced with these challenges, Dr. Gotoh and his team focused on their ability to harvest adipose stem cells without culturing fatty tissue, using a device previously used in mammoplasties and other applications. The researchers hoped to use the device to harvest subcutaneous fat with liposuction, then isolate the adipose stem cells and endoscopically inject them into the urinary sphincter—setting up a treatment procedure that would regenerate the sphincter and improve its functioning. Dr. Gotoh expects that the duration of the procedure should be between two and three hours, including the time it takes for the device to isolate the cells. He explains, “Non-cultured cells are safer, and because they are taken from the person’s own

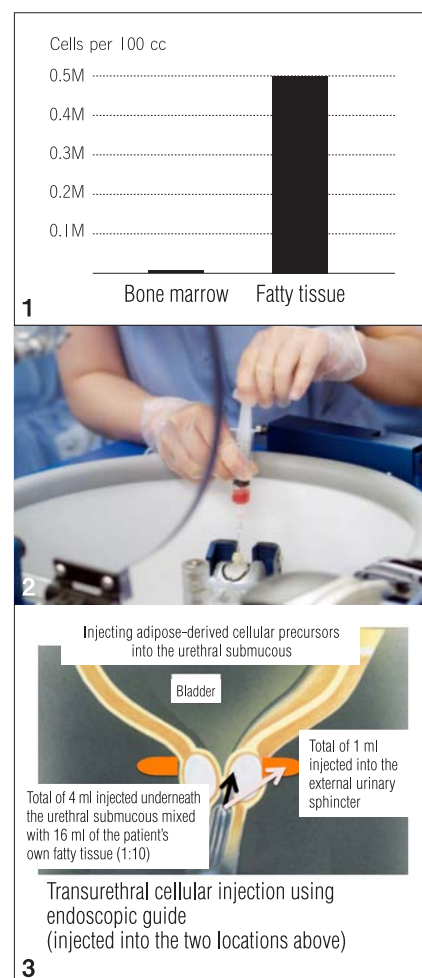
tissue, will not be rejected by the immune system. On top of that, the procedure is incredibly quick.” If his team can apply the new treatment to clinical settings, there is no doubt that it will substantially reduce the burden on patients.

### On the cutting edge of combined basic and clinical research

This development of a new medical treatment is the latest chapter in Nagoya University’s long medical and research history. Nagoya University Hospital has been treating female incontinence with surgical procedures and collagen injection therapy for over thirty years, and Dr. Gotoh has made clinical research on lower urinary tract obstructions his life’s work. This groundbreaking treatment concept was also a result of integrating Dr. Tokunori Yamamoto’s basic research on kidney regeneration using low-serum cultured adipose stem cells. Dr. Gotoh explains, “The idea of using adipose stem cells to treat urinary incontinence was not being discussed anywhere in the world. Nobody had even thought of using the device for myocardial regeneration and breast reconstruction for that purpose.” Regenerative therapies are the result of joint efforts between basic and clinical researchers. It is this partnership that will certainly change the lives of the thousands of patients now suffering from urinary incontinence.

Dr. Gotoh described his feelings about the new procedure, saying, “historically, people have not paid much attention to quality-of-life diseases like urinary incontinence, but improving our quality of life will become extremely critical as we mature as a society.” People want medical treatments that do not simply prolong life, but allow them to live out their allotted years

to the fullest. With the graying of Japanese society well underway, treating urinary disorders is likely to become even more important. Nagoya University will continue to take up the challenges on the front lines as we work to combat these ailments.



**1** Stem cells are used to regenerate the urinary sphincter and treat stress urinary incontinence, but as the graph indicates, the number of cells that can be harvested from bone marrow is extremely limited. They are therefore derived from fatty tissue, which is extremely rich in stem cells.

**2** Subcutaneous fatty tissue is harvested from the abdomen or buttocks using liposuction and then put into a separation device. The rich cellular fluid containing the adipose tissue-derived stem cells is then distilled. Because no culturing process is required, the procedure can be carried out quickly and safely.

**3** The distilled cellular fluid is injected into the urinary sphincter and submucous using an endoscope inserted into the urethra. The purpose of the treatment is for the transplanted cells to regenerate the sphincter and restore functioning, thus alleviating urinary incontinence.



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