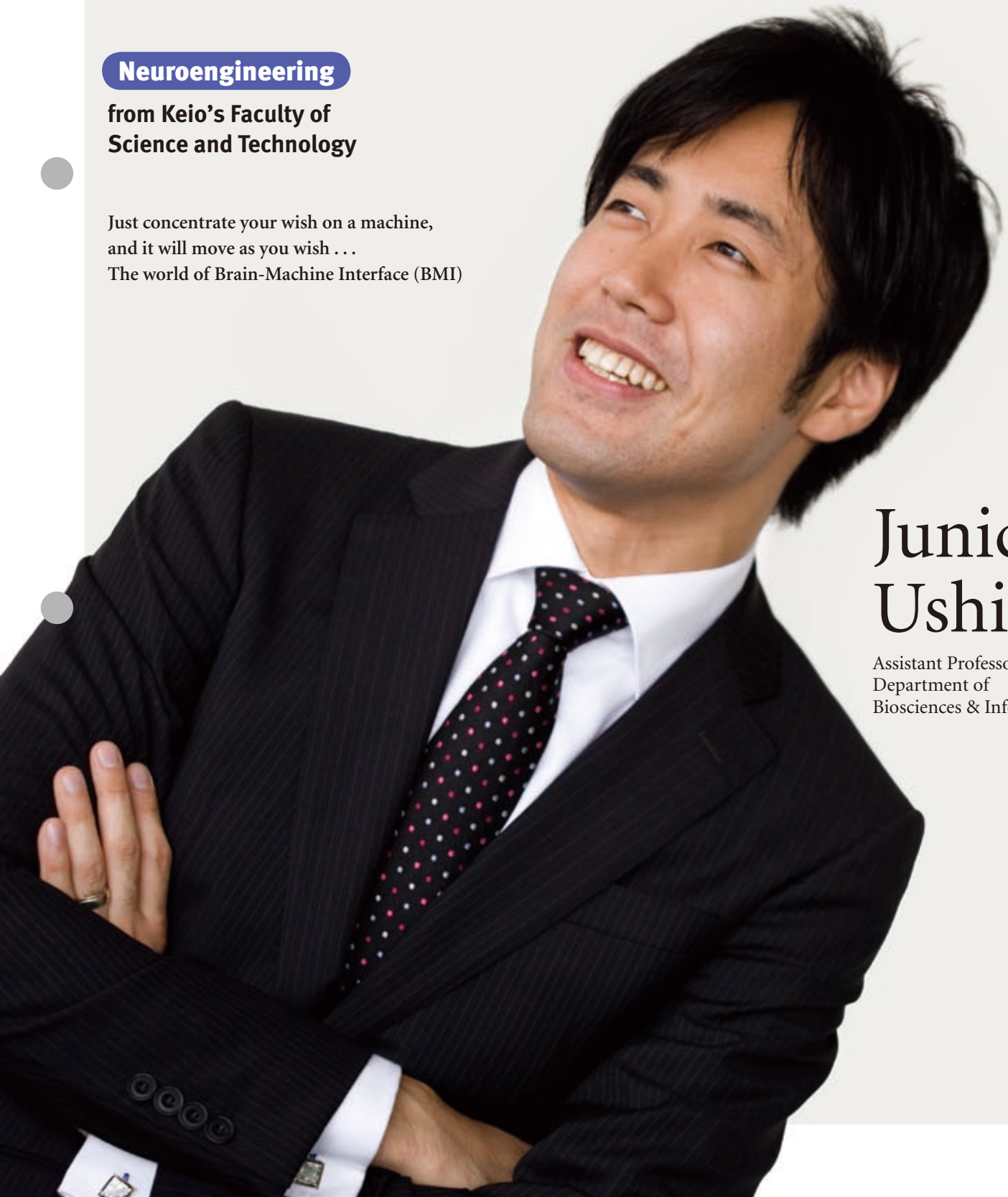
Bulletin of Keio University Faculty of Science and Technology

New Kyurizukai
新版 窮理図解

2009 DECEMBER
no. 01

Neuroengineering
from Keio's Faculty of Science and Technology

Just concentrate your wish on a machine,
and it will move as you wish . . .
The world of Brain-Machine Interface (BMI)



Junichi Ushiba

Assistant Professor,
Department of
Biosciences & Informatics

Introducing Researchers

Each issue of the New "Kyurizukai" introduces a promising young researcher. Featured in this issue is Assistant Professor Junichi Ushiba who spearheads BMI – the highly expected research field to be used as an application for rehabilitation.

BMI to Revolutionize Rehabilitation

Linking your "Will" to "Movement"

A man is plodding along a freezing snowy path. It's true walking on a snowy mountain path is tough, but his movement is unnaturally awkward. Moving straight forward for a while, then abruptly turning to the right or left, and even turning backward at times . . . His destination seems nearby. He keeps walking desperately, putting forth his last efforts. At last, he arrived at a small hut on the snow-covered mountain. A sigh of relief . . .

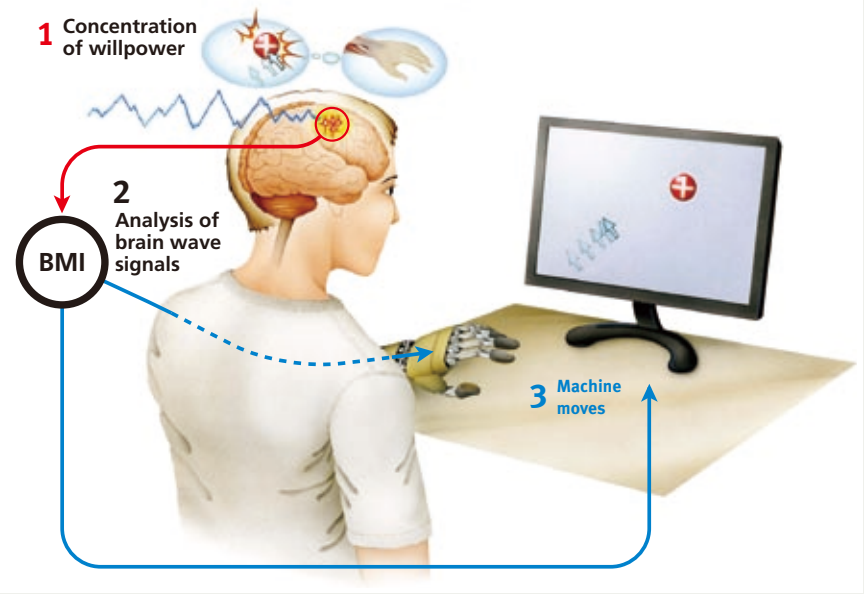
Several young men suddenly ran out of the hut. Surrounding the man, they unanimously said, "Congratulations!" "Thank you," the man responded vigorously

BMI enables your willpower to move an object

The young men who ran up to the man were undergraduate and graduate students of the Tomita-Ushiba Laboratory, Department of Biosciences and Informatics, Faculty of Science and Technology, Keio University and the person who struggled along to the hut was Mr. K., a former systems engineer aged 41. Mr. K. is suffering from myodystrophy. For the past 30 years, he has been unable to move his arms and legs. The man who had made his way through the snow was K's avatar in his Second Life in the virtual world. The students' avatars surrounded K's avatar.

While the students manipulate the PC keyboards to move their own avatars, Mr. K. himself moves his avatar only by concentrating his "willpower." This magical ability to "move an object with willpower" is the BMI (Brain-Machine Interface). The BMI is a new concept system that embodies the fusion of knowledge from neuro and medical sciences and the latest in information engineering. Assistant Professor Junichi Ushiba is spearheading this R&D project – an up-and-coming researcher aged 31 and 184cm tall.

Mr. K. has several electrodes attached to his head. As he pictures images in his brain (activating his brain), such as "going straight, or turning to the right," the corresponding brain wave patterns are sent out as signals. By transferring these signals into the computer, it is possible to move an avatar in the virtual world.



BMI directly moves a wheelchair, electrical appliance, artificial arm, avatar and the like by reading the brain's motion instructions from brain waves and analyzing them using a computer. Much is expected of the BMI as a technology that may enhance the quality of life for patients suffering from damage to the spinal cord or limb dismemberment.

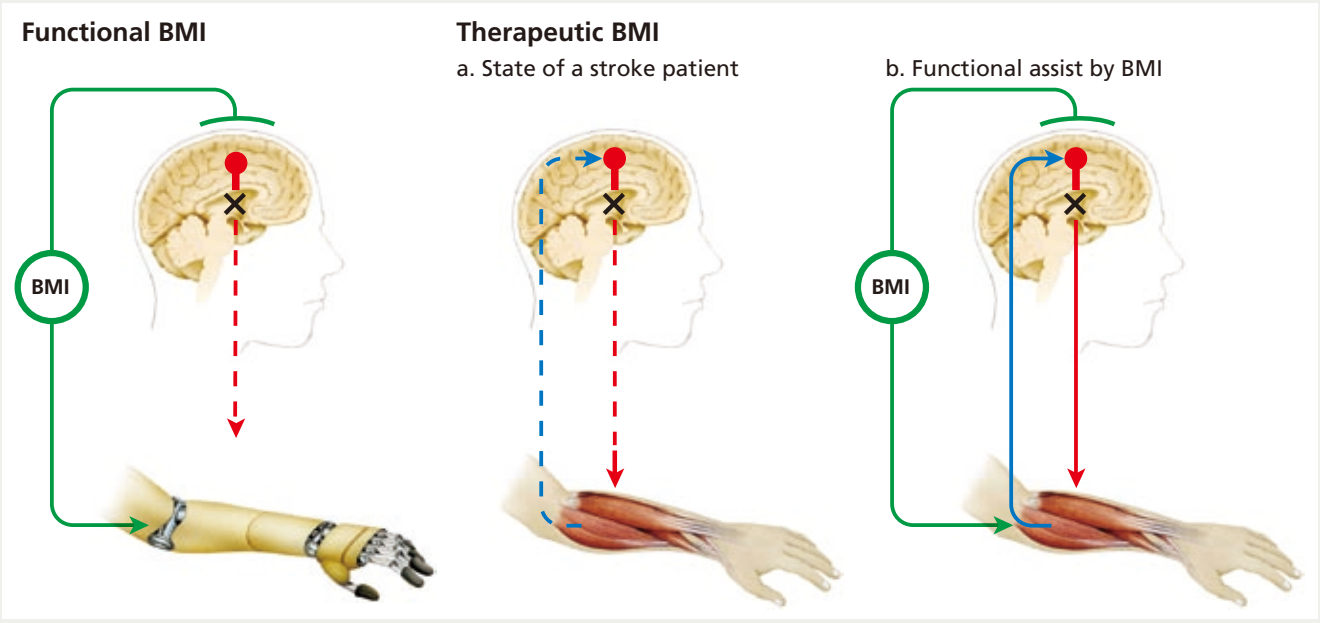
The use of BMI makes it possible even to move a piece of equipment or a system in the real world by concentrating one's willpower.

But when it comes to those who are physically disabled and have never moved their body for a long time, producing brain activity to create an imaged motion is difficult, resulting in failure to generate appropriate brain waves geared to the intended motion. Therefore, "rehabilitation" becomes necessary to activate the brain. Mr. K. took up the challenge of the "Second Life" again and again and finally succeeded in sending his avatar to the destination. This is why the fellow young researchers of the Tomita-Ushiba Laboratory ran up to congratulate him.

Bridging studies on the brain and the computer

Dr. Ushiba, the leader of the BMI project, first became absorbed in the computer as an elementary school student and was captivated by wonders of the brain during his junior high school days. (Please see pages 4~5 for an interview with Dr. Ushiba!) He has been engaged in studies on information engineering and electrical engineering with the Faculty of Science and Technology at the Yagami Campus in Yokohama City ever since he joined Professor Tomita's laboratory to complete his graduation research paper as an undergraduate. Then he took up and pursued studies in neurophysiology at the School of Medicine in Shinanomachi, Shinjuku, Tokyo and with the Tsukigase Rehabilitation Center in Izu City, Shizuoka. He says, "Both studies in the brain and computer have been the natural course of events for me. So I have long felt that my academic position should be in how I can fuse these two fields into one."

And it was in 2006 that Dr. Ushiba began to address research into the BMI, the system that directly links the brain to the computer. To begin with, he examined what brain waves would be generated from the somatic sensory-motor area of the cerebrum (the area presiding over senses and motion) when an able-bodied person does exercises or imagines doing exercises. The somatic sensory-motor area has specific places responsible for controlling the motion or sensation of arms, legs, shoulders or the torso, respectively. Dr. Ushiba mentioned, "Similar brain waves are generated from the same place of the motor area either when you are actually moving your legs



In the case of patients suffering from damage to the spinal cord, etc., their nerve conduction route that transmits brain's motion instructions (will) to the pertinent muscle (movement) is severed. Here BMI serves as a bypass, linking the will to movement.

With stroke patients, brain's motion instructions cannot be properly transmitted to the muscle, disabling the movement. This also makes it impossible for feedback of sensation to be generated (a). However, feedback can be generated if BMI is used since it enables the arm to move in response to motion instructions. It is presumed that the maintenance of the route from the brain to the muscle and vice versa stimulates rehabilitation (b).

or when just imaging so."

Thus he also developed a method to accumulate data on interrelation between the types of motions and brain wave patterns and process such data in real time. His next challenge was the development of a system designed to move an avatar with brain waves as introduced at the beginning of this article. Successfully developed within only six months, the purpose of the system was to use the BMI as an effective communication tool for those patients who cannot move their bodies due to damage to the spinal cord or ALS (amyotrophic lateral sclerosis). "For nearly ten years, I've conducted neurophysiological experiments jointly with doctors at the School of Medicine to identify differences in kinesthesia between able-bodied persons and disabled persons. These efforts seem to be the key to the smooth progress of our development."

Making BMI a tool for rehabilitation

In Dr. Ushiba's brain, perspectives, knowledge, methodology and techniques in a wide range of fields such as neuroscience, brain science, informatics and information engineering, among others, are accumulated and exist as an interdisciplinary wealth. In addition, on-the-scene feelings and experiences acquired at the medical care forefront are also an asset. He has opened up new BMI horizons by flexibly combining and deepening them. A fine example is the new concept calling for BMI to serve as a "rehabilitation tool for physical functions of arms."

Conventionally, BMIs in the medical care field have been developed from the perspective of "substituting physical functions of arms, legs, etc. for the physically disabled." But the foremost cause of physical disability is stroke. Many patients with stroke suffer paralysis on either the right or left side of their body and so do not require function compensation. Unlike cases of damage to the spinal cord and ALS, there are good possibilities that they can recover their impaired functions to a certain extent through proper rehabilitation. Dr. Ushiba says, "That's the key point. Yes, one day it dawned on me that BMI could be very instrumental in rehabilitation."

Seeking linkage between brain activity and movement

He was quick to structure the required BMI system and embarked on joint experiments with the School of Medicine. In this BMI rehabilitation system, the patient's paralyzed hand is fixed on a box that houses an electric motor. As the patient exercises his willpower to stretch his fingers, his brain wave signals are transmitted to the control signal of the motor via BMI, and then the motor moves to stretch the fingers. However, the motor cannot be switched ON unless the brain wave pattern coincides with that for the stretching of fingers, i.e. unless proper brain activity is generated.

For patients suffering from paralysis for years, this approach often does not work well at first because they can hardly picture the image of their paralyzed hand. If they force themselves to concentrate their willpower, unnecessary force is placed on the other hand that is not paralyzed, which works to alter the brain wave pattern. Dr. Ushiba adds, "But as they continue practicing by trial and error, they become able to do it properly while relaxing. Training is the key." Once the brain has been rehabilitated, positive changes become visible on the muscle side, too. The paralyzed hand muscle, with which no electric potential was formerly found, begins to show electric potential of muscle activity when the patient properly concentrates his/her willpower to stretch the fingers during the BMI-based rehabilitation.

As a result of such training, some patients began to feel some improvement, though slightly, in their finger movement while others became willing to use their paralyzed hand. The trend of BMI use for rehabilitation is increasing in the world. And it was Dr. Ushiba and his group who first proved that BMI is effective for rehabilitation.

As for research objectives for the future, he mentions as follows: (1) to shed light on the mechanism of BMI rehabilitation with which recovery is promoted; (2) to create an even more efficient BMI rehabilitation system based on the knowledge obtained in (1) above; and (3) to make the system less expensive to make it easily available to patients. To achieve these objectives, no one can predict what will pop up out of his brain that is packed with creative ideas like the cartoon character *Doraemon*'s magical pocket. (Reporter & text writer:Shinko Yuri)

Developing rehabilitation into a science, making BMI available to patients

Dr. Ushiba is devoted to research into application of Brain-Machine Interface (BMI) to rehabilitation. As an elementary school boy, he happened to find computing as a field that aroused his passion and was absorbed in it. Next, what caught his interest during junior high school days were wonders of the brain. Ever since, both fields of intellectual interest have become the interfacing guide for Dr. Ushiba's career as a researcher and are now beginning to take a concrete shape in his research into BMI with the objective that it will be made available for many patients one day.

As an up-and-coming researcher, you must be leading a busy and fulfilling life. To begin with, may I ask in what kind of family atmosphere were you brought up in?

I grew up in a family in which my father taught French literature at a university and my mother taught French conversation and did translation. It's a totally liberal arts-oriented family. As I saw my father spending much of his time in his study, I came to feel that being a university professor might be an enviable profession. This yearning seems to be the beginning that motivated me into life as a researcher. (laughter) Against such a family background, I had always been told, 'You do whatever you like. But once you get started, do it to the very end with a sense of responsibility.'

What was the motive that got you interested in computers?

When I was an elementary school fifth grader, my school offered an extracurricular computer class. Several PC units were made available to applicants who were taught programming during after-school hours. At the invitation of a friend, I attended a session. This was the very first time for me to play with a computer.

During summer vacation, a Keio University professor opened a computer class on the Faculty of Science and Technology campus, which I also attended. I was amazed at several graduate students each writing a computer program there, which greatly impressed and motivated me. Since that time, I have been totally fascinated by the computer world.

In those days, artificial intelligence (AI) was in fashion. One day, a postgraduate student visited our elementary school, bringing with him his program for an automated conversation system. It was something like a "Riddle" game. If you gave it hints one by one, the system finally responded with a correct answer. fact that humans can create artificial intelligence was totally new to me. I was taken aback.

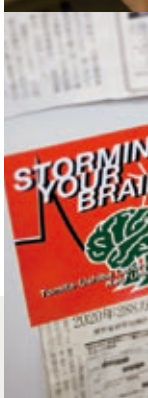
When I was a junior high school student, Dr. Katsuhiko Mikoshiba (now with RIKEN), one of our alumni, visited our school and gave a lecture about the brain – another first experience for me. He talked about brain enthusiastically and the content of this speech was also very attractive. Later on, I applied to attend a lecture featuring Dr. Gen Matsumoto (then with the Electrotechnical Laboratory), a celebrated brain scientist. Indeed, I was under the strong stimulus of these two scientists. For me, their impressions are still strong and vivid.

That is an age when various stimuli can come from various directions. Was it possible for you to carry through your interests?

Although I entered a high school with a reputation for computer education, I joined the brass music club where I played trumpet, and even formed a

Junichi Ushiba

He has been engaged in research on the motor control mechanism concerning human autokinesia and reflex. For the past several years, he focused on the development of Brain-Machine Interface (BMI) applying scientific knowledge accumulated so far. In 2003, he became a visiting researcher at the Center for Sensory-Motor Interaction of Alborg University, Denmark. In 2004, he obtained a doctorate (engineering) and became a Research Associate at Keio University. From 2007 to date, he serves as an Assistant Professor at Keio University Faculty of Science and Technology.



band of our own. The reason is that the computer world in those days saw the debut of Windows with a complex and hard-to-operate system, which spoiled my interest to some extent.

Meanwhile, I continued to cherish a strong interest in the brain. Pedantically I liked visiting libraries and bookshops to hunt up difficult-looking books. I sharply reacted to terms such as "artificial intelligence" and "artificial life." I received strong impetus when I knew that a postgraduate student at the university campus adjacent to our high school was translating a recently published book on artificial life, saying to myself "Wow, such an amazing student is so close to me!" Artificial intelligence and artificial life can create functions intrinsically peculiar to the brain or life whereas the computer can do only what it is instructed to. Why and how on earth is it possible? These questions intrigued me very much.

As the university entrance exam season approached, I hesitated as to whether I should choose the medical course or science and technology course. Finally I made up my mind to choose the latter At that time Keio's Faculty of Science and Technology just added a new department known as the Department of Applied Physics and Physico-Informatics, which I chose and entered. This is because the department had a close relationship with the School of Medicine and there were professors specializing in neurology and the muscular system.

Though admitted to this department, was only in the junior year that I became really motivated to study hard. Instead of learning the basics merely as the basics, I came to understand that the basics are necessary because there are such-and-such fields of application, or "exits" you might say. This is how I became self-motivated for learning. I'm of a type who begins to learn the basics required only after I can identify how a particular field of study can be useful for society.

I joined Professor Yutaka Tomita's laboratory mainly because Professor Tomita was engaged in research into rehabilitation and maintained a good contact with the School of Medicine. Immediately after joining the laboratory, I was lucky enough to be introduced to a Medical School professor and launch a joint research project.

You are a happy person since you could directly develop your interests and talent that had budded in your elementary school days, which became your calling. Don't you agree?

I've had familiarity with campus life partly because I was raised in a scholastic family and partly because I visited university campuses from time to time since my elementary school days.

Through such experiences, I found that universities are a wonderful world where everyone is doing creative work and both the young and the experienced are getting along with each other in friendly and liberal manners. This impression remained unchanged even after I became a university student myself. I was so attracted by the university that I found it as a place of my calling. Actually I didn't stop even for a moment to look around for opportunities of employment with prosperous businesses.

A little over five years have passed since you began to teach at the university. What is your impression of actually having worked there?

It's delightful to see my students doing good jobs in the business world. I feel extremely rewarded as a teacher especially when some of my former students tell me something like, "Your advice at that time was so precious and encouraging."

On the other hand, I always feel a certain kind of difficulty because I'm always dealing with students – "humans." There were occasions where my sincerity couldn't be understood by students, which was so depressing I lost confidence. I know it's not good if I'm too obtrusive when giving students advice or instruction, but there are students who want to be advised more specifically and attentively. Really puzzling, isn't it?

Please tell me something about your projects in progress in terms of industry-academia collaboration.

My goal in the foreseeable future is to develop the BMI into a tool actually available for patients. So I'm teaming up with interested businesses to create algorithms for biosignal analysis and develop machines.

In what direction do you intend to develop your BMI research project? What are your short, medium and long-term objectives?

For the short term, my objective is to present, in a few years, evidence of the BMI for rehabilitation I'm currently working on. Rehabilitation is a new concept of BMI application. I'd like to theorize the concept as a field of science and disseminate it from Keio to the world. While I expect certain progress in academic verification to be made within a few years, I think it will take more time before it can be applied to actual medical care.

For the medium term, I'd like to introduce brain science as the base of our project, while I also want our project to shoulder a part of endeavors to establish rehabilitation science. As you may know, current rehabilitation still depends much on experiential knowledge. However, this field is making progress toward becoming a systematized science, which I would like to be a part of and make a contribution.

"I'll establish a new remedy by bringing to light the mechanism of dysfunction due to neuromuscular diseases."

My eventual goal is to return the fruit of our research efforts to education. Because our field makes it necessary to learn multiple fields of study in well-balanced fusion and to associate with people from diverse fields, I'd like to nurture talents who can do such things on their own. I think I must study harder. At the same time I'd like to see my students not only grow as individuals with "interface abilities" but also become capable enough to extend these abilities to connect to those of their neighbors.

◎ **Just a word from . . .** ◎

● His secretary: Dr. Ushiba's weak point is getting things around him in order. Is it because his brain is too nimble for reality to catch up with, I wonder? When it comes to tasks, he gives me instructions gently and attentively. This reminds me of his smile-provoking image as a good Papa at home.

(Reporter & text writer: Etsuko Furukori)

For the full text of this interview, please refer to:

http://www.st.keio.ac.jp/kyurizukai

ON hours, OFF hours

A day of Junichi Ushiba

October 6, 2009

4:30 ～
Rising from bed, rubbing the sleep out of his eyes.It's still pitch-dark outside. Checks incoming e-mails. Prepares slides in his room to be used in classes.

6:00 ～
With the slide preparation almost over, he looks through the theses contributed by students.

7:00 ～
Wakes family members and eats breakfast.

9:00 ～
Takes his eldest son to kindergarten.
On the way, they happen to find a large magnolia leaf and play using it as a fan.

10:00 ～ 10:30
Arrives at the campus, and checks incoming e-mails.

10:30 ～ 11:00
Have a discussion with students. Confirms the progress of research work, and discusses about the next experiment to be conducted and experiment materials and equipment to be prepared.

11:00 ～ 11:30
Hangs around in the lab, casually speaking to students. ("What are you going to do with your research work?" and general topics like "Hey, Mac just came out with a new software package, didn't it?")

11:30 ～ 12:30
Goes to the cafeteria for lunch together with the lab members. Recently putting on weight because of eating too much ice cream at night, he eats the smallest plate of rice and a slice of broiled salmon, costing only 294 yen! He made it a rule to have the smallest plate of rice. He once attempted to omit rice, but gave up the idea accepting advice from a middle-aged cafeteria lady who said, "You should take even a small bit of rice which is good for your health."

12:30 ～
Moves to the School of Medicine together with the students.

13:30 ～
Arrives at the lab for joint research with the Department of Rehabilitation of the School of Medicine. Receives a visit from a technical official from the Ministry of Education, Culture, Sports, Science and Technology. Introduces to the official the research work in question and makes a demonstration together with some School of Medicine faculty members. Being tense, his spine is kept straight the whole time.

16:00 ～ 18:00
Does an interview for insertion in the "New Kyurizukai" to be published soon. Photographing and an interview session. Because he appeared for the interview straight from the previous job, he is very clear-headed and quick-tongued – apparently showing Adrenalin secretion.

18:00 ～ 18:30
Moves to Roppongi with some students. Running out of time, he dashes to the place using a taxi like a "great sensei." Makes an excuse saying, "I usually take a train, not a taxi."

18:30 ～ 19:30
Pays a visit to a certain company and has a meeting on the progress of a joint research project. After checking a prototype, both parties exchange a smile of satisfaction with the favorable progress of the project.

19:30 ～ 20:30
Says good-bye to the students. Goes home. The moment of release from the day's tension, at last.

20:30 ～ 21:30
Supper. Roars with laughter while enjoying a comic variety show TV program.

21:30 ～ 22:30
Prepares a bed, takes a bath, then changes his clothes. Gets into bed and falls asleep in only five seconds.

Checking his fashion

Suit
He wears a suit like this when visiting companies or attending academic society gatherings, and when meeting people from businesses or foundations who are financially supporting his research projects.

Knit sweater + jeans
This combination is his regular clothing. Casual clothing like jeans is especially useful when getting on his knees to handle experimental equipment and materials.

Parka + T shirt + jeans
He likes this combination on Saturdays when he meets only lab members, no visitors from the outside. Originally for off days, he favors this style also when he feels like working in a relaxed frame of mind.

Usshy's favorite!

Usshy's "ushi" (cow) goods collection

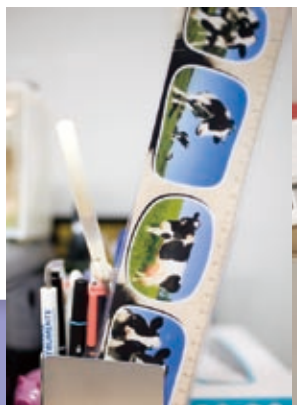
Ruler with photos of cows on it: Made in France. If I remember correctly, I bought it at a shop I happened to drop in while taking a stroll with my family. My mother was also a collector of cow-related goods. As a country famous for dairy farming, goods designed with cow motif can be found here and there in France.

Colorful (red, blue, etc.) "cow" clips: These clips I bought myself, but don't remember where.

Large porcelain cow object: This cow-shaped object is a present from my former secretary. The cow's skin surface features a pattern made of many numerals. Her comment: "This pattern just fits you as a man of science and technology." My desk is so messy that I often forget the whereabouts of my wristwatch, ring and so on and am always looking for them. Unable to stand it, she advised, "Why not hang them up on the cow's horns and neck?" Surely, I've never lost sight of such items ever since.

"Cow" bottle opener: This item is a present from a student who attended an international academic convention overseas. Made in Spain.

Stuffed white "cow": If I remember correctly, this is also a present from a student. Made in Germany.



私の本棚

My favorite books

PRINCIPLES OF NEURAL SCIENCES -In English

As a postgraduate student, I spent a half year in Denmark to study at the Sensation-Motor Integration Center of Alborg University (the university itself is science and technology-oriented). This book was used as a textbook there. It was a standard textbook in the neural science field. I could learn how neural sciences are taught in class at a science and technology-oriented university. Since I was aiming to become a university instructor in the science and technology field, this experience impressed me. At my lab, I use several chapters extracted from this book for senior students to study first.

Advanced Medical Care Series Rehabilitation Medical Science -In Japanese

This book is a summary of a variety of medical research works being pursued in the field of contemporary rehabilitation medical science. Most up-to-date trends in research can be obtained. I recommend this book to students newly joining our lab. I used to read it when pondering over ideas for a new research project.

MATLAB 5 FOR ENGINEERS -In English

As an undergraduate, I participated in a summer course in the United States. I found this book at a bookshop near Harvard University. Many academic books in superb binding fully occupied the shop space from one corner to the other, which was an impressive sight. At Japanese bookshops, the number of academic books is usually very small and books themselves lack attractiveness in appearance. But this particular book revolutionized my consciousness toward the academic world. Fashion-conscious young people were selecting apparently difficult books. I felt that such sense could be tolerated in the academic world. Since I knew that my lab would use "Matlab," I bought one for my own study. I cherish this book as it vividly reminds me of my visit to that bookshop.

Brain-Machine Interface -In Japanese

This book, in Japanese, concerns the research project I'm engaged in of late. Though a bit too specialized, I read it to get an overview as to what research bodies are engaging in what activities.

Artificial Life -Translated in Japanese

As a high school student, after school, I often dropped in a bookshop on the campus of the adjacent university, looking at shelves with books on computer and brain. I was very excited to discover academic fields beyond the reach of high school classes. This urged me to learn the field based on the fusion of computer and brain (life) as soon as possible. One day I happened to find this book on the shelf. In those days, the field of artificial life was in fashion. Looking at the author introduction, I was surprised to find that the translator was a graduate student of that very university. If one enters a university, one might even be able to translate books on leading-edge technology fields . . . The encounter with this book fueled my yearning for universities. As this book concerned the exact field of my interest (interdisciplinary fusion), I read it eagerly and even played with a trial program on my computer that was included in the book.

Ghost in the Brain -Translated in Japanese

As an undergraduate, I read this book, which impressed me with wonders of the brain. This is a story about a researcher who creates a remedy for a patient with no limbs who complains that he is annoyed by an illusion that his lost fingers are attached to his face. I was impressed with the author's ability as a scientist as he pursued a process of connecting clinical occurrences with an innovative achievement via a scientific approach. Like machines, our brain also exchanges information by electric signals and cells forming a network with each other. In spite of this physical structure, this phenomena continue to develop and transform themselves on their own (even in the case of an adult's brain). The brain is totally different from machines. For machines, "disconnection" simply means "failure." A fascinating book!

Wonders ofHuman Body: Its Amazing Mechanism (DVD) -Translated in Japanese

Measuring and inferring organs inside the human body, such as the brain and muscles . . . Researches in this field are all numerals in the level of academic papers. As such, research results can be hardly conveyed or understood by researchers in other fields as well as the general public. So I'm thinking of creating a CG animation following this DVD as an example. From time to time, even while I was studying abroad, I have seen excellent audiovisual publications produced by National Geographic. Indeed I was impressed with their wonderful approach of delivering highly academic contents in an easy-to-understand way and outreaching general viewers in society.

What is "Kyurizukai"?

"Kyurizukai" in possession of the Keio University Fukuzawa Institute

The title of this PR bulletin is "New Kyurizukai." This title owes to the book entitled "Kinmo Kyurizukai" published by Yukichi Fukuzawa in 1868. The book is claimed to be the first book on science in Japan. "Kinmo" means "Teaching the young and beginners in an easy-to-understand way" while "Kyuri" signifies "physics in a broad sense" – identical with what we call science today. If translated into a contemporary title, it may be something like "Illustrated easy introduction to science."

The book takes up phenomena such as heat, air, water, gravitational pull, solar eclipse and lunar eclipse, giving explanations for their principles with illustrations.

Though the book mentions books on physics from America and England as original sources, specific examples made to be easily understood by Japanese readers back in those days were all worked out by Fukuzawa himself.

When young in the closing days of the Tokugawa Shogunate, Fukuzawa studied the latest in science at the "Teki-juku" school of western learning in Osaka which was opened by the medical doctor Koan Ogata. He keenly felt the importance of "logical thinking" that underlies the advanced western civilization.

The Japanese public in those days understood astronomy and weather phenomena based on the superstitious "Onyo-Gogyo" theory imported from ancient China.

It is safe to say that Fukuzawa taught the Japanese how to "think logically" through this scientific reading.

While Fukuzawa is well known as a philosopher, enlightenment advocator and an educator, this book attests to the fact that he was also a superb science journalist with the ability to "interpret difficult things and put it in writing that could be easily understood."

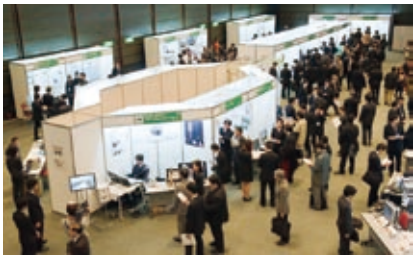
In our 21st-century society, science and technology are becoming increasingly diverse and difficult. Keio University Faculty of Science and Technology intends to disseminate information on its research works, getting back to the origin as advocated in "Kyurizukai."

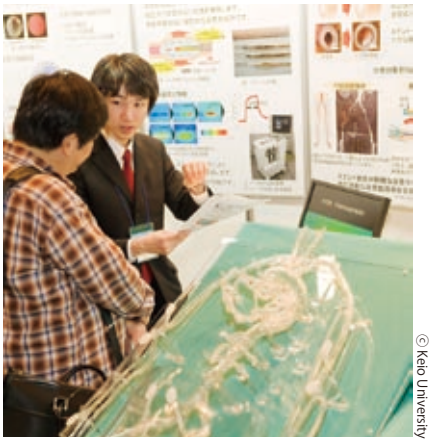
Science and Technology **Information**

KEIO TECHNO-MALL 2009

The 10th KEIO TECHNO-MALL held under the theme "Shaping the Future through Science"
http://www.kll.keio.ac.jp/ktm/
December 11 (Fri.), 2009 (10:00 ~ 17:00); Tokyo International Forum (Halls B7 & B5)
Admission free, no prior registration required

KEIO TECHNO-MALL is an annual science and technology exhibition held by the Keio Leading-edge Laboratory of Science and Technology (KLL). It introduces a diversity of research results and new technologies developed by Keio University with some 70 booths for demonstrations and exhibits. As the tenth year milestone, this year's event concurrently featured: a talk session by guests invited from the industrial circles and the administration who talked about the future of industry-academia collaboration; 14 seminars on technologies based on such collaboration; and two round-table sessions.





©Keio University

Science and Technology Information from Keio

Movies released on YouTube http://www.youtube.com/user/keiouniversity

Keio has begun YouTube distribution of its science and technology information! Each movie (3 to 5 minutes in duration) focuses on one of the many research projects being undertaken by laboratories of the Faculty of Science and Technology. Also recommended is a video (45 minutes) on a lecture "Fantastic science and technology from Keio" by Prof. Kohei Ito of the Department of Applied Physics and Physico-Informatics, targeting high school students. Video contents will be added in succession.

Editor's postscript

The launch of this new PR bulletin was first proposed in the spring of 2009. The idea behind issuing the bulletin was how we would be able to disseminate the Faculty of Science and Technology's research results and efforts in enjoyable and attractive ways. The first issue of the Japanese version was completed and delivered to everyone in December 2009 when streets were brightly decorated for the Holidays and the New Year just around the corner. We would like this bulletin to highlight our front-line research scientists who are most absorbed in their works, by having them talk about the fun of their pursuits. Also, by introducing some of their private side, we would like to portray their human touches so that people can feel closer to them.

Assistant Professor Ushiba, featured in the inaugural issue, is such a resourceful person that he came up with one idea after another during our meeting – too quick for us to note them down. He is so energetic and visits the School of Medicine or companies almost every day, making it difficult for us to interview him! But we are confident the inaugural issue successfully conveyed the energetic atmosphere of this up-and-coming scientist. The next issue (Japanese version) is scheduled for publication at the end of January 2010. It will feature a female researcher specializing in administration engineering. We are sure you will enjoy it.

新版 窮理図解

New Kyurizukai
No. 01 December 2009

Editing: Public Relations Committee, Faculty of Science and Technology
Photographer: Keiichiro Muraguchi
Illustrator: Tomoyuki Narashima (Tane+1)
Designer: Hiroaki Yasojima (GRID)
Cooperation for editing: SciTech Communications, Inc.
Publisher: Tojiro Aoyama
Published by: Faculty of Science and Technology, Keio University
3-14-1, Hiyoshi, Kohoku-ku, Yokohama,
Kanagawa 223-8522
Web version: http://www.st.keio.ac.jp/kyurizukai