

Title	Listening to what Assistant Professor Akiko Takeda says : leading MEMS studies with the spirit, "Conceive like an amateur and do the job professionally."
Sub Title	
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Publisher	Faculty of Science and Technology, Keio University
Publication year	2010
Jtitle	New Kyurizukai No.3 (2010. ) ,p.4- 5
JaLC DOI	
Abstract	
Notes	Interview
Genre	Article
URL	<a href="https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001003-00000003-0004">https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=KO50001003-00000003-0004</a>

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# Leading MEMS studies with the spirit, “Conceive like an amateur and do the job professionally.”

“I hate the word ‘setback,’” says Dr. Norihisa Miki. In Japanese, “setback” is written in two characters: “being disheartened” and “breakdown.” He maintains a belief that you’ll be okay if you are not broken mentally when you experience a setback. With his inquisitive character coupled with a challenger’s spirit and inborn brightness, Dr. Miki is pushing forward through his career as a research scientist. Under a motto of “Enjoy what you’re doing,” he strives to open up new horizons for MEMS, demonstrating his unrestricted power of conception and taking advantage of substantial achievements he has accumulated.

## As a small boy, was it your dream to become a research scientist?

No (laughter). I was born in the city of Tatsuno, Hyogo Prefecture. My family is a long-standing soy sauce maker - an environment having nothing to do with academic research. Fortunately my standing at school was so good that as an elementary school boy I also attended a college-oriented cram school famous for Spartan education. Then I advanced to a college-oriented school with consistent junior and senior high school education, and advanced to the University of Tokyo’s Faculty of Engineering. It was like a natural course of events (laughter). As I recall those young days, I think I could devote myself to studying because I had a number of friends with whom to compete and enjoy learning, rather than because I liked studying.

## You mean you didn’t have hard time studying?

Not then but now I’m having hard time

(laughter). I may be a type of person who can handle almost anything rather smartly but doesn’t have any particular field at which he is incomparably strong. As such, I chose my course without a definite intention or desire. During the first and second years at the university, I was interested in biology and elementary particle physics. But it was about the time for me to advance to an undergraduate course that a new field of study known as “virtual reality” came into the spotlight. Intrigued, I chose to advance to the Department of Mechano-Informatics. Later I became interested in robotics. When choosing a seminar as a senior, I was admitted to the laboratory of Professors Hirofumi Miura and Isao Shimoyama, the authorities of robotics.

In those days, the “ASIMO” robot was yet to be announced by Honda Motors, and research into biped walking robots and artificial intelligence was almost at a deadlock. Amid such circumstances, in an attempt to find a breakthrough, the laboratory just began studies on micro robotics. Assuming that if a human being is the model for a biped robot, then an insect should be the model for a micro robot, I began studying to create an insect-type robot based on MEMS.

What makes studies on small objects is that a force that can work on an object varies according to the size of the object. For example, if an object’s size becomes one-tenth its original size, its surface area becomes one-hundredth whereas its cubic volume becomes one-thousandth, meaning a drastically reduced force of gravity placed on the object. This is why a flea can jump to a height some 50 times

its own height. This in turn means that a robot appropriate for its intended size can be designed by taking such a factor into account. For example, we can even say that the major difference between the wing of aircraft and that of insects mainly comes from the difference in scale. By the way, the topic of my graduation thesis was on a robot controlled by an insect. In this system, the robot moves following the movement of the insect as it walks on a ball.

## You made effective use of your biological knowledge, didn’t you?

In this way I had fared as my personal interest went. But it was about that time that I began to think about my future more seriously. My options included succeeding my father in the family business and finding employment with a manufacturing company. As a Master Student, I had an opportunity to attend an overseas academic society meeting, accompanying my professors. I saw them shaking hands with foreign scientists and talking with them frankly. It was so “cool and impressive” that I made up my mind to advance to the doctor’s course (laughter). In fact, I found my life during the doctor’s course very fulfilling.

In those days, there were many opportunities for me to participate in exchange meetings involving different industries. Having talked with people from various industries and different occupations, I came to think that a life different from many others might be good although my way of life until then had been: “Don’t go against the flow.” This thought urged me to advance to the doctor’s course while most of my fellow students found employment in the business world. But I have no regret with my decision. Devoted to research from morning till dawn the next day when crows begin to caw (a little after 3:00 a.m.) - this had been my daily life at the lab back then.

At that time I was immersed in a project to create a tiny (less than 1cm in length) helicopter that can fly when a magnetic field is applied from the outside. When it comes to “flying,” letting wings rotate is much more efficient than letting them





flap as insects do. I'm sure it was the smallest helicopter in the world.

It was then that I frequently attended academic society meetings, both in Japan and abroad, which allowed me to deepen exchanges with other young research scientists. Even now I maintain contact with them for information exchange. They are my good colleagues.

**After completing the doctor's course, you found employment with the Massachusetts Institute of Technology (MIT), didn't you?**

Yes, I did. While I was imbued with the idea of going abroad to study after completing my doctor's course, an MIT professor in charge of the "MIT micro engine project," in which I was interested, just happened to visit our lab. I asked him if there was a vacancy for a researcher post there. I was told to send the required documents and called to come over for an interview. Then I was happily employed as a member of the project.

**You seem to have followed a smooth, favorable path so far.**

To begin with, I find myself a type who doesn't worry too much even when encountering a setback. I hate the idea that you have become stronger because you experienced a failure. Even if you suffer a setback, you shouldn't be broken - this is my philosophy of life.

I really enjoyed my life at MIT. In the micro engine project, I was making a small, silicon-based gas turbine the size of a button to be used in cellular phone power sources and micro rocket batteries. It was a big project and complete with the best possible equipment and environment.

Boston is home not only to MIT but also Harvard and Boston universities, among others. Many Japanese researchers from diverse fields study there. Once or twice a month exchange meetings were held, where I could meet and talk with many people. This helped greatly broaden my intellectual horizon.

Also worthy of note was the formation of an ice hockey team among Japanese researchers, taking place in the second year of my stay in Boston. Ice hockey was a sport totally new to me. I had never even experienced skating itself before. But it appeared so cool, which lured me to experience hands-on. What encouraged me was a typical reaction of Americans, who never fail to say "Good job!" only if I do my best no matter how poor the performance is. Motivated by this environment, I made up my mind to create a team with myself playing the central role if I were to meet the challenge. Like Japanese, we named

## Exerting unrestricted creativity to open up new horizons of MEMS...

### Norihisa Miki

Based on MEMS (Microelectromechanical Systems) technology, Dr. Miki is developing diverse research activities in fields ranging from ICT and medical care to environmental conservation. Born in 1974 in Tatsuno City, Hyogo Prefecture. Completed the Doctor's Course, School of Engineering, The University of Tokyo in 2001. From 2001 to 2004, he served as a postdoctoral fellow and research engineer at MIT's Department of Aeronautics and Astronautics. From 2004 on, he works for Keio University as Assistant Professor. As for pastime, he was keen on heavy metal rock music as a high school boy, mahjong and fishing as a college student, and golfing thereafter.



our team "Sushis." The team's basic rule was "No preliminary inspection." "Just join and try your hand at it if you are interested" - this was the team policy.

**After fully enjoying your life at MIT for three years, you returned to Japan and came to Keio University, right?**

"If I do something, I should do something exciting." With this determination in mind, I'm addressing research work exerting unrestricted creativity. Under the core theme of MEMS-based human interface, I'm currently handling a variety of research projects such as the sight line detector, tactile sensation display, and gestation/olfaction sensors. My motto, as my teacher Prof. Shimoyama taught me, is "Conceive like an amateur and do the job professionally." This means that you should do a job with professional skills to produce a perfect result while maintaining an amateur's inquisitive mindset when conceiving.

There are 20 students at my lab, all cheerfully enjoying research work. During our training camp every year, we stage various recreational events and games such as paint ball (two teams using toy guns to shoot paint balls at each other), rafting, softball and so on. Of course they are serious when engaging in research, which is the main purpose. I think a balance between learning and distraction is important.

Taking advantage of a weekly colloquium at my lab, we have common knowledge tests among the members. Students take turns coming up with questions on any topic - foreign capital city names, kanji ideographs, history,

movies - you name it. I think common knowledge is important because it helps to enhance the quality of our lives. It may surprise you, but knowledge we learned through topics for college entrance examination contains much common knowledge. Speaking of myself, the English language ability I had acquired through entrance exam English turned to be very useful later when making academic presentations and living overseas. Some say cramming is meaningless, but if you have acquired knowledge for education, it can be put to practical use.

In fact, I find my common knowledge highly useful when I communicate with foreign people. Topics like Japan's isolation during the Edo Period are well received by them. Common knowledge must be also useful for expanding the scope of your research work. In addition to the academic basis required of researchers, I would like to foster my students into becoming persons of broad vision.

◎ Just a word from . . . ◎

● A student: Dr. Miki is always cheerful, gentle and reliable. Learning many things from what Dr. Miki is doing, we are enjoying our campus life by maintaining a good balance between study and distraction.

(Reporter & text writer: Madoka Tainaka)

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

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

