

## IPMU Interview with Hiroshi Komiyama

Interviewer: Hitoshi Murayama

I am working for "All Japan" now

**Murayama:** On your last day as President, I had a chance to speak with you, and when I gave you the standard greeting at retirement "Otsukaresama deshita" [\*1], you replied jokingly

"No, I'm not tired." How is life for you now?

**Komiyama:** Everyone thinks I have a lot of leisure time since I retired from President. That assumption makes me busier.

**Murayama:** I see. You must receive a lot of requests, like this interview.

Hiroshi Komiyama served as President of the University of Tokyo (UT) from April 2005 through March 2009. From April 2009, he has been holding a position of Chairman of the Institute, Mitsubishi Research Institute, Inc. He graduated from the Chemical Engineering Department, UT, in 1967. He received a Doctorate in Chemical Engineering from UT in 1972. Since then he has been working at UT. He became Professor in 1988; was Dean of Faculty of Engineering from April 2000 through March 2002; Vice President in April 2003; and Managing Director & Executive Vice President in April 2004.

**Komiyama:** The number of invitations to speak has tripled since my days as President. But I only accept special requests: for instance from old friends or events with 3,000 or so college students attending.

**Murayama:** I see. So, you are basically here [Mitsubishi Research Institute, Inc., hereafter MRI] except for lectures?

**Komiyama:** I have a contract with MRI to work here two days a week. But they also handle calls from anyone who wants to contact me. Therefore, I keep my office here and, in a way, I'm working for "All Japan." For instance, in the editorial column "Economic Lesson" of the *Nikkei News Paper*, I proposed what we should do with environmental energy including specific fiscal measures.

**Murayama:** Was that for the government or for private companies?

Photovoltaics for home roofs by the initial national investment

**Komiyama:** As the first commitment period of the

\*1: If translated literally, this means "You must be tired."

Kyoto Protocol will expire in 2012, a new international framework will need to be negotiated. How can Japan reduce emissions of CO<sub>2</sub>? Japan is weathering a rough spell financially. So I presented a proposal to reduce emissions of CO<sub>2</sub> without posing a large financial burden. On the contrary, we will be able to grow our economy. I called them "self-sustaining government bonds." The premise is to issue government bonds and purchase photovoltaics, for instance. The government will make contributions towards putting photovoltaic solar panels on the roofs of homeowners who want to join this system. If the photovoltaics are nationally owned, the electricity revenues will be national income. Then, even at its current price, initial investments can be recouped in about 15 years.

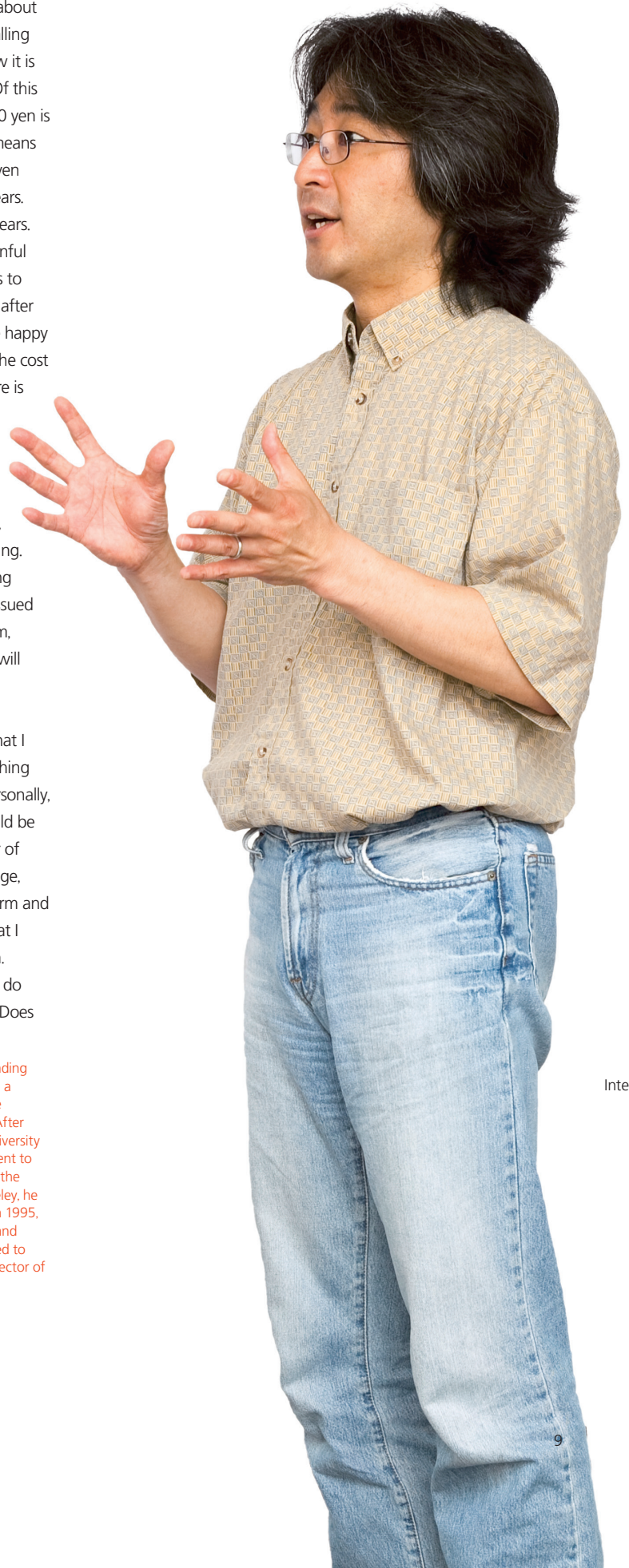
**Murayama:** Will the electricity expenses be what we usually pay to the power company?

**Komiyama:** In the beginning, they will be set a little higher than your regular electricity bill. Fifteen years later, the photovoltaic panels will become the property of the homeowner. So, no one loses money. And, there will be photovoltaic solar panels on the roofs of homes throughout Japan. I'll tell you why it is possible – because the government will grant loans towards the initial investment. The private photovoltaic panels on my roof was a 2 million yen investment. That was seven years ago. The

annual energy cost was about 300,000 yen before installing the photovoltaic, but now it is only about 50,000 yen. Of this difference, about 110,000 yen is from photovoltaic. This means I could get my 2 million yen investment back in 18 years. Now it is possible in 10 years. Still, 2 million yen is a painful amount for most families to pay now and get it back after 10 years. But they will be happy if the government pays the cost in advance. In Japan, there is about 1.5 quadrillion yen in personal assets. Because people are concerned about finances after retirement, they save without spending. But, if these self-sustaining government bonds are issued with a 1% extra premium, people will invest in it. It will simultaneously stimulate the economy and create new industries. This is what I proposed. It is not something that involves only me personally, but something that should be discussed with a number of people to share knowledge, consolidate ideas, and form and initiate policy. That is what I want to do from now on.

**Murayama:** How exactly do you make that happen? Does

*Hitoshi Murayama is the founding director of IPMU. He received a Doctorate in Physics from the University of Tokyo in 1991. After having worked at Tohoku University as a research associate, he went to the United States in 1993. At the University of California, Berkeley, he became assistant professor in 1995, associate professor in 1998, and professor in 2000. He returned to the University of Tokyo as director of IPMU in January 2008.*



the government consult you, or will you submit a proposal with the group members?

**Komiyama:** That's a good point and it's also my biggest concern. Do you know we had a council of advisers to the Prime Minister? About a month ago, the Prime Minister invited about 80 specialists from a wide range of fields and sought advice from them. I was invited as a specialist in the environmental energy-related field and conveyed my idea. But nothing happened, even though I received media coverage and my suggestions were reported. It made the front page of the *Nikkei News Paper*, too. I received enthusiastic responses like, "What you said was really great!" Still, Japan doesn't move. Why is this? When my retirement from the presidency was approaching, I thought to myself, "What should I do for Japan?"

**Murayama:** You mentioned you felt like you were Al Gore.

**Komiyama:** But you know, Al Gore lost the election so I don't want to be Al Gore.

**Murayama:** [Laughs]

**Komiyama:** Just kidding. I debated myself whether playing full out for one organization would give me enough incentive to keep going. No, I couldn't do it for long except from a global perspective for Japan and I want to make a difference with my life, which is shorter than yours. That is why I picked the think tank, MRI. Of course, I don't believe we can solve everything with MRI. If I want to work on

"global perspective Japan," networking is important. The University of Tokyo is a very important network hub, so MRI is by extension important, and I myself became a node involved in the process that will help Japan take the lead.

**Murayama:** You have been right in the middle of the University of Tokyo. Do you have a different impression of the university now by observing it from outside?

**Komiyama:** So far, I think the new administration is still looking for a concrete direction. I suppose the University of Tokyo has a responsibility to meet certain expectations yet maintain direct contact with society through a practical branch of learning.

**Murayama:** What is the practical branch of learning?

#### Learning originates from human needs

**Komiyama:** For instance, the current environmental problems, sustainability, and making an aging society in the 21st century more active are major issues affecting all mankind. Japan is a country with one of the largest aging populations and so there is learning for this issue. Learning originates from practice. Your subject can have a different framework but the most of learning originates out of needs, creates specific actions; those actions are systematized, and the framework of learning will be established. Very typical is Engineering.

**Murayama:** It has been said

that mathematics was born from the need to survey the boundaries of the land in the Nile Delta region after floods.

**Komiyama:** Then, all learning was born to meet human needs. I think there are three major issues for the mankind in the 21st century; an "explosion of knowledge," the finite and shrinking earth in comparison with human activities, and an aging society. I expect effort to address them will create new learning. When we talk about "structure of knowledge," it often reminds me of the Nobel Prizes awarded to Dr. Yukawa and Dr. Koshiba. Both are most prestigious Nobel laureates who created new fields in physics. Dr. Yukawa's work is easy to understand for me. In all, the reason why electrically positive protons stick together without coming apart is explained as due to playing catch or an interaction. I can understand that intuitively. But, when talking about neutrino, I would not understand it as intuitively as Dr. Yukawa's work. For instance, I would not understand its value unless someone explains to me the reason and impact of probable neutrino's mass in an easy-to-understand structural way. In the time of the explosion of knowledge, physics has many things that all people want to know from curiosity, such as what the root of the universe is. The media gives good explanations for them by using easy-to-understand expressions, but I don't think that is enough. I wish someone would explain it in a more a

structural manner – it may not be presented by means of papers only but also by utilizing other means, such as virtual-reality technology and the like. I hope someone can make the whole thing a little easier, as was done for explaining Dr. Yukawa's Nobel Prize work.

**Murayama:** I see. I think it is extremely interesting that the reason why the neutrino should attract everyone's attention is because it is the reason why we, human beings, exist in the universe – I think it is quite a strong argument. All matter has corresponding antimatter. Here is a problem specific to the neutrino: how can we distinguish between neutrinos and antineutrinos when they do not have electric charges? – It may well be that there is no distinction. Then, they could be interchanged. At the time the universe was born, a large quantity of matter and antimatter was created, but, unless a tiny bit of anti-matter was turned into matter, there will be nothing left in the Universe. Neutrinos and antineutrinos look the same, so they may have caused it. It may well have been that neutrinos played the crucial role of turning a billionth part of anti-matter into matter.

**Komiyama:** I see.

**Murayama:** I am often asked if research at IPMU is useful at all, and I answer "No, I don't think so." How does that sound to you?

#### Structuring of knowledge links value with knowledge

**Komiyama:** We need to take a

step forward to ask what the word “usefulness” means. I think it means values for human beings. There is a theory called “value theory” and it is said that there are four or six values in total. But the only value having genuine value is “knowledge value.” Also there is “public value,” “economic value,” and the like. Normally when we talk about the values, the economic value is highlighted, but it is only one of the values. In the past, knowledge value, economic value, and public value were rather simply tied together and were integrated. For example, once penicillin was discovered, no one died from infection anymore; Pfizer made a fortune and at the same time a knowledge value of antibiotics emerged. The same was true for semiconductors and lasers. However, because of the underlying explosion of knowledge, now these three values get separated from each other rapidly. This situation is the same for any field.

**Murayama:** What do you think is needed to integrate them?

**Komiyama:** For example, talking about the neutrino, what may be needed is to explain it like you have just done.

**Murayama:** Did you feel it was useful?

**Komiyama:** Yes, I did.

**Murayama:** I’m glad to hear that.

**Komiyama:** I remember I heard part of the story somewhere before – there existed a little bit more matter, or the other way around, and so it survived to form the present world. You’ve

explained beyond that – neutrinos might be responsible for it, because they have no electric charges, neither plus nor minus. It makes me feel as if I understand the story, quite apart from whether I really understand it at all.

**Both:** [Laughs]

**Komiyama:** That’s an example of integration of values. But, it is possible because physics is simple. Once the unified theory is established, physics comes to an end. This is peculiar to physics. Other disciplines diversify toward human beings. Let’s think about, say, energy.

IPCC (the Intergovernmental Panel on Climate Change) was awarded the Nobel Peace Prize. But, the only thing IPCC achieved was that it discovered that the Earth’s temperature was rising in the 20th century.

**Murayama:** And apparently it will continue to rise.

**Komiyama:** Correct. How did they do it? About 200 top-class scientists read 20,000 articles altogether in such a way that each article was read by several of them. The issue is so complicated that they barely managed to reach the conclusion only after this work.

However, global warming is a physical phenomenon controlled by only heat and material balances. For all that, the energy studies such as wind power, nuclear power, photovoltaics, geothermal power, and wave energy are about 10,000 times more complicated. But, unless ordinary people can understand by intuition what is truly

correct, it is impossible to understand the essentials. It would be overwhelming task to make things understandable by intuition. I think 2050 will be a time when half of researchers will be working on the structuring of knowledge, that is, to combine knowledge with value for human beings. Otherwise, there would be no relation between knowledge and human beings.

**Murayama:** Is that a university’s role?

**Komiyama:** Yes, that is exactly a university’s role. When *The University of Tokyo Newspaper* carried serial articles, “The University of Tokyo in 2050,” I wrote the first installment in the series. One of the topics I wrote was about diversity; a third of students will be those who are similar to the present students, another third will be those who are working in society, and the other third will be those of foreign nationality. The other topic was, as I just said, half of researchers will be those similar to the present researchers and another half will be researchers working on the structuring of knowledge.

**Murayama:** So far, researchers have focused on producing knowledge, but now they are requested to take another step forward to clarify its value. Is this what do you mean?

**Komiyama:** That’s right. Although physics, in particular your field, is an exception because it converges towards unified theory, all knowledge of other disciplines is heading towards 1ppb. This is something

that I say very often these days. They are heading more and more towards the tip of a needle. The probability of this needle point connecting to value for human beings is zero. Infinity and nothing are identical and infinite information means you have no information. I think this kind of situation will come sooner or later.

**Murayama:** What action are you taking to overcome it?

**Komiyama:** We have established the Center for Knowledge Structuring

**Murayama:** Has it been moving in a good direction?

**Komiyama:** Well, I don’t know. Engineering is a discipline that should be most sensitive about it. So the Faculty of Engineering has been seriously discussing this formidable situation for the past decade or so. As I have said earlier, three issues that we have in the 21st century are the finite and shrinking earth, aging society, and the explosion of knowledge. I strongly believe that universities should take responsibility for the explosion of knowledge.

#### Internationalization of university: why and how

**Murayama:** You have suggested that each one third of the university students will be those who are similar to the present students, those who work in the society, and those of foreign nationality. It is especially difficult to bring in foreigners, but why do universities have to internationalize and how can they achieve this?

**Komiyama:** Now we are living in the age of globalization. More people are coming and going, and information reaches everywhere in the world instantly through the Internet. In this situation, I think one of the important roles of universities is to work towards maintaining the diversity of human beings. This is because one aspect of the universities is to represent the local needs. To put it very simply, low carbonization is the common aim for humankind. This does not mean that we should make all the buildings in the world identical. It's ridiculous. Our buildings should go well with monsoonal climate of Japan, the climate of Tokyo. It is the University of Tokyo that can achieve low carbonization to the satisfaction of people living in the Tokyo area. Torino in Italy has a different climate and life style. People living in Torino can also achieve something suitable there. Yet there is something in common. For instance, we know that certain kinds of glass windows give better thermal insulation, so it's better to use them. Even when we deal with extremely physical issues such as global warming, we share something in common yet can still maintain diversity. This is the role that universities have to assume.

**Murayama:** Do you mean that people should dare to go out and come in for maintaining the diversity?

**Komiyama:** You are right. Also, experiencing something different makes young people

more motivated. The best thing is to have various experiences from childhood, but in reality, they have few experiences. But you can't blame the young for it. How can we put the young through diverse experiences? There will be no diversity in a group of 40 people each with similar experiences. What makes diversity is the presence of a person who has grown up in a different world and this is crucial. Students, faculties too, can enrich their experiences by interacting with a variety of people.

**Murayama:** I see. Then I should mention about bringing foreigners to universities in Japan. How should we do it?

**Komiyama:** There are a number of strategies. I have implemented some of them at the University of Tokyo when I was there. One was to create a curriculum you can finish using only English. It will start soon. In addition, there is *Recruitment & Scholarship*. The point is to adopt a system to Master's and Doctoral courses where candidates will be tested in local areas and recruited to Japan with guaranteed scholarships. Another important strategy is to establish Japanese language schools in India or somewhere in the Middle East. When I visited India and Middle East, I was asked to establish Japanese language schools. The elites in India can speak English since their childhood. So if we build Japanese language schools, lots of them will come to learn there. When those students come to Japan after learning

Japanese, they can take courses in Japanese. Considering Japan as a whole, I believe that this will work as a good tool for internationalization. It is actually tough to teach in English. Some faculty members may be able to maintain the quality of teaching even when they teach in English, but students can't keep up.

**Murayama:** This will be the last question. Now that IPMU has been established - and I believe it was your product - what do you think of it so far?

**Komiyama:** It has been working effectively far beyond my expectations. To my mind, internationalization is the front-runner in getting answers to many different problems in Japan. Take mobility of people between universities. It is not easy at all to activate personnel exchanges between the University of Tokyo and Kyoto University. It is easier to do it with foreign universities. It will come back to us in the end and have influence on increasing mobility in Japan. In this way, I believe, that internationalization will be the most effective specific measure to address all problems we face. In this sense, what IPMU has been doing is good for everything. Thanks to IPMU, the percentage of foreigners has increased dramatically. This enabled us to build the International Guest House and begin vitalizing Kashiwa Campus. And IPMU catches attention. It has made people to think "We didn't know we could do this," or "We didn't know we were allowed to do this." As a result of

corporatization, the university has discretionary power. If you are certain that you are free, you are free and if you think you are not free you are not. What is important is that strong organizations state they are free and demonstrate that they are free to do what they want to do. This can only be done by strong organizations. IPMU is doing a good job on this as well.

**Murayama:** IPMU is at the moment regarded as special zone inside the University of Tokyo and has been allowed to challenge a variety of things. Meanwhile it has become a so-called Dejima [\*2] with barriers around it. What could be done to take them down?

**Komiyama:** It is fine to begin with a Dejima.

**Murayama:** Do you think so?

**Komiyama:** When I was Dean of the Faculty of Engineering, I built with the help of donations the VLSI Design and Education Center located in Asano Campus, away from the main territory of the Faculty of Engineering, and called it Dejima, a place you could do anything. It did not go very well at first, but now it has become an extremely good cycle. So, there is no use in feeling rushed.

**Murayama:** I understand. I will enjoy myself inside Dejima for the time being.

**Both:** [Laughs]

**Murayama:** Thank you very much for your time.

\*2 : During the 16th century, Japan's shogunate adopted the national seclusion policy. Dejima in Nagasaki was constructed as an artificial, isolated island for severely restricted trading with only Dutch and Chinese merchants.