

The 6th AIST Advisory Board Meeting



AIST's mission is to contribute to social development by raising the standard of Japan's industrial technology, with "the realization of a sustainable society" as its ultimate goal.

In pursuing this, AIST holds advisory board meetings, assembling a group of leading experts in a variety of disciplines, both from Japan and abroad, who provide independent advice from an outsider's perspective to AIST regarding the organization's research activities and general operation.

On February 7, 2011, at its Tsukuba headquarters, AIST held its 6th advisory board meeting, which was the first meeting of the Third Medium-term planning period. This meeting featured a board with a new look, and was the first advisory board meeting since newly appointed president Tamotsu Nomakuchi came into office.

The foci of the Third Medium-term plan are "solutions for 21st century issues" and "reinforcing the function of an open innovation hub", leading to attaining a sustainable society, in recognition that connecting fundamental research to product development is more important than ever.

Thus, the main theme of the conference was the expectations placed on public research organizations in relation to shaping a sustainable society and the role played by the organizations in this effort. Reflecting a broad range of perspectives, the board members discussed the question of how a public research organization like AIST should contribute to resolving challenges facing the nation in the 21st century. In addition, the members took tours of the research facilities, exchanging opinions with the researchers "on site". The following report offers an outline of the meeting findings and notable comments and advice from board members.

Table 1 List of AIST Advisory Board Members

Junichi Hamada	President, The University of Tokyo
Nobuhiro Yamada	President, University of Tsukuba
Hiroyoshi Kimura	President, Kimura Chuzosho Co., Ltd.
Sadayuki Sakakibara*	Chairman & CEO, Toray Industries, Inc.
Waichi Sekiguchi	Editorial writer, Business News Department, Nikkei Inc.
Toichi Takenaka	Chairman of the Board, Astellas Pharma Inc.
Hajime Bada	President & CEO, JFE Holdings, Inc.
Sawako Hanyu	President, Ochanomizu University
Ei Yamada**	President & CEO, AnGes MG, Inc.
Alain Fuchs**	President, National Center for Scientific Research (CNRS), France
Makoto Hirayama	Professor, College of Nanoscale Science and Engineering, State University of New York, USA
Thaweesak Koanantakool	President, National Science and Technology Development Agency (NSTDA), Thailand
Jürgen Mlynek	President, Helmholtz Association of German Research Centres, Germany

(* : Absent ** : Visited for discussion before the meeting)

Table 2 Schedule

Monday, February 7, 2011	
9:30	Opening of the meeting
9:40	Introduction of AIST Advisory Board Members
9:55	Welcoming address
10:20	"The role of AIST as a public research organization in resolving 21st century issues"
12:00	Lunch
13:00	Laboratory Tours: Meeting with AIST researchers
15:00	"Initiatives for realizing an open innovation hub"
17:15	Closing remarks
17:30	Adjournment

Outline of AIST Advisory Board Meeting

The new members invited to participate in discussions at this advisory board meeting were all distinguished individuals from Japan and abroad with a wealth of knowledge in technology and a broad range of other social and economic fields. The 13-member board consisted of 9 members from Japanese companies and universities and 4 members from an overseas university and public research institutes (Table 1).

To open the meeting, AIST president

Tamotsu Nomakuchi presented a brief outline of the organization and explained AIST's mission in the Third Medium-term planning period.

There were two discussion sessions involving all board members, one in the morning and one in the afternoon (Table 2). The theme of the morning session was "The role of AIST as a public research organization in resolving 21st century issues". Being mostly outsiders and viewing AIST objectively, the board discussed the kind of role that AIST is expected to play in society from a broad perspective.

In the afternoon session, the theme was

"Initiatives for realizing an open innovation hub". The board focused on the internal structure of AIST and the nature of its projects, discussing issues and policies aimed at achieving hub functions to promote open innovation. Before the afternoon session, the board members divided into two groups for lab tours of five research sites. Through direct exchanges of opinions with researchers, the board members were able to get a real sense of the initiatives AIST is pursuing to generate innovation. This experience was a valuable resource for the ensuing discussion.

Comments & Advice from Board Members

Junichi Hamada (Chair) (President, The University of Tokyo)

In a word, the role of public research organizations is to establish networks. The key to achieving open innovation is a network of diverse research bodies. After building broad networks as opposed to closed environments, it is important to generate fruitful results.

While universities focus on education, they are limited in their openness. The private sector, on the other hand, has a high degree of freedom in terms of their openness, but tends to have difficulty with continuity and stability. The role of public research organizations lies in overcoming

these limitations to tackle the challenges of open innovation. I expect to see a strong commitment to creating open networks that feature a diversity of people and organizations.



Nobuhiro Yamada (Vice-Chair) (President, University of Tsukuba)

Addressing 21st century issues is a major challenge for universities, and at every opportunity we brainstorm to question universities' vision, mission, and values. When doing this, it is absolutely necessary to demonstrate solutions to problems. To ensure this it is essential to set up a system capable of generating outcomes as rapidly as possible, harnessing the power of the whole organization. As an organization gets larger the gap between generations widens. While the older generation grew up in the high economic growth era, the younger generation has grown up in a period of economic maturity, making it difficult to establish a vision of 21st century challenges they both share. I would like to see efforts to set up management and governance measures that can fill this gap and lead to solutions.

Accordingly, on the question of what direction AIST should move in, it is important to consider how AIST can establish an environment that

promotes competitiveness. The answers we find must be reflected in evaluation and practices. We tend to talk about how young people today are inward looking and lack vitality, but we need environments in which young people can work comfortably and an organizational structure that transcends generation gaps where young people can express themselves freely. I believe that this can result in creative work that delivers added value. I would like to work with AIST to help bridge the generation gap in this way.

I hope to see AIST progress actively in open innovation. It would be a waste not to fully utilize the human resources and facilities of AIST. I would like to see AIST lower various hurdles as much as possible, and deepen their exchanges with a variety of other institutes. Exchanges in which people really move in both directions are particularly important, and even in international exchanges this two-way movement is very effective in building mutual trust. When AIST, as

an institution, faces any hurdles, I hope we can act together to overcome them.

On the matter of human resources, we, on the side of universities, don't want to merely push students through universities. We wish to deliver solid education at the undergraduate, masters, and doctorate levels, always taking usefulness in industry and research institutions into consideration. In this sense, we welcome your suggestions on what you need us to teach in universities. At times, we get criticism from industry and the research world that we only teach a narrow range of skills, so let us discuss together the question of what kind of human resources Japan will need over the coming years. Such discussion will surely help in the development of open innovation hubs.



Hiro Yoshi Kimura (President, Kimura Chuzosho Co., Ltd.)

I think the main theme of this discussion, expectations placed on public research organizations in shaping a sustainable society and their role in this process, is very fitting. Humanity is facing serious problems and

there is no time to waste in finding solutions to them, so I would like to see AIST specialize in applied and development-oriented research, rather than fundamental research. If AIST as a whole could systematically make use of

"seeds" of new technology in society, it would be wonderful. On the other hand, AIST has only 1,200 researchers from companies compared to 2,100 from universities, which seems low to me. My impression is that the follow-through from

applied research to research that is actually useful is rather weak.

One of the difficulties of small and medium-size enterprises (SMEs) is that it is hard to establish a business by means of only one kind of engineering. Our company, for example, cannot rely on metallurgy alone. We need a wide array of technologies, spanning information technology, mechanical and electrical engineering, and chemistry. SMEs may be good in their area of expertise, but they face difficulties adopting other necessary related technologies, and in collaboration and problem solving. For this reason, I would like to see AIST branches

that are equipped to support SMEs in multifarious ways right across Japan.

Our business is casting, which serves as a core industrial service. Core industries like this generally have a long history, and the technology behind them is essentially fully mature. Yet there are still many fields of “tacit knowledge”, where the combination of IT with old-style technologies can open up new pathways and lead to innovative developments. SMEs, however, generally use computer systems with very limited capabilities. Thus, it would be good if AIST could offer a service lending out high-performance computer equipment.

Another point I’d like to make here is that the number of researchers working in universities on these old core industries is gradually declining. In another decade there may not be any university researchers left in the field of foundry engineering. Given this trend, I worry that the fundamental engineering technologies that humanity has developed may not be handed down to future generations in Japan. I hope that AIST can take up this task and work to reestablish these technologies through industry.



Waichi Sekiguchi (Senior Editorial Writer, Business News Department, Nikkei Inc.)

I would like to make three points regarding public research bodies. The first has to do with, standardization. With the diffusion of Internet use, directions of standardization are now typically discussed and decided amongst engineers, whereas in the past standards were generally established by de facto or de jure processes. Companies tend to draw inspiration from each other in rivalry in their product development work, and if they are left alone they will tend to produce very different things. In light of this, it’s very important for public research bodies to set directions for Japan as a whole, but they should be neutral in their involvement with companies.

My second point is about networks of researchers. Looking at citations of recently published research papers reveals that Japanese researchers seem to be drifting further apart from their colleagues around the world. In the past, there seemed to be pipelines through which technology from the U.S. and Europe was brought to Japan, where we played catch-up. But after a certain point, when our technology reached international state-of-the-art levels, there was a shift in focus to trying to solve new challenges within Japan. As a result, the pipelines were broken, and my feeling is that Japan has been left behind in rapidly absorbing new technology from around the world and applying it to product development. Given that companies are not

sending people overseas so much, one of the key duties of AIST is to strengthen these pipelines.

My third point is about horizontal collaboration. For example, recently, horizontal collaboration has become increasingly important between nanotechnology and IT, and between IT and robotics. The research body of the Agency of Industrial Science and Technology has been reorganized as AIST, but it needs to be made into a system that produces synergies.

Next, I want to talk about three points regarding the realization of an open innovation hub. One is about technology research associations. It is good that various companies are involved, but since funding is from the Japanese government, only Japanese companies tend to participate. I understand that to be necessary to some extent, but I think this approach should be revised, so that overseas companies are also invited to take part. I appreciate that it is difficult to call on direct competitors, but it is important to actively invite foreign client companies and overseas companies that can help to promote Japanese-developed technology more widely.

Secondly, I want to mention the promotion of venture investment. In Silicon Valley too, technology cultivated by public research institutes is developed externally through venture initiatives. I wonder whether we can set up a scheme that can actively support people who create and cultivate particular

technologies in launching ventures based on those technologies. Recently some overseas venture capital firms like Intellectual Ventures, for example, have been trying to buy Japanese technologies. I feel that it is necessary to establish good contacts with such companies, to help in our efforts to disseminate Japanese technologies more widely around the world.

As my third point, I suggest setting up a forum where researchers can freely keep in touch with each other. To illustrate, consider why the U.S. west coast became so successful in the IT industry, while the industry faded on the east coast. East coast companies applied vertically integrated business models, where they tried to handle everything from software, terminals, and parts, to services internally. As a result, they could not adapt effectively to technological changes. In the Silicon Valley model on the west coast, if someone was successful in one layer, successive products or services were built on top of that layer, thereby raising the standard of the industry as a whole. In this sense, as Japanese intelligence is gathered here, it would be great if AIST, through its leadership, build a framework for enabling engineers to communicate with and enlighten each other.



Toichi Takenaka (Chairman of the Board, Astellas Pharma Inc.)

Rather than pursuing various kinds of fundamental research like universities, as a public research organization, I think that AIST should focus on *Full Research* that would serve as a bridge between academia and industry. To play this role effectively, it is vital that AIST fosters people who have the ability to make

judgments about matters such as technological strategy. While there are many who can conduct research, developing strategies for research management is very difficult. The same is true in companies. If the strategy is weak, however much research is done, the results will be fruitless. For this reason, it is extremely

important to foster this kind of talent. Compared with other research bodies, AIST has many opportunities to provide this kind of experience. It needs to cultivate the ability to



identify promising “seed technologies” from university research findings, and to bring to life promising technologies that are dormant within the confines of universities. This is what I expect AIST’s role to be.

As for open innovation, projects that AIST conducts with companies can be broadly divided into two kinds: research associations and joint research with individual companies. In the case of research associations, research themes will generally be pre-competitive and focused on development of fundamentals. Many companies

join these kinds of associations simply to take part, or because sharing development costs between many participants makes participation inexpensive. In practice, such companies often hold projects back, so effective selection of participating companies is essential. Focusing narrowly on the theme is also very important. Desired research tends to steadily increase, but the budget is limited, so funds need to be collected from the private sector to pursue additional research tasks. In this case, by narrowing down the theme we can rightly say, “We narrowed the

research scope, with open innovation being a natural extension of the process.” If we claim that anything is possible no one will believe it, so I would like to see AIST grasp the need to narrow its research focus.

I would also like to say that the fact that there are not many female researchers at AIST tarnishes the image of the organization slightly. There are many women in the life sciences, but it would be good to see more women in other research fields too.

Hajime Bada (President & CEO, JFE Holdings, Inc.)

If we talk about finding solutions to 21st century issues, we have an extremely broad target to aim at, ultimately the whole of humanity. For this reason, we cannot make clear what our goal is, unless we hear a broad spectrum of opinions from “final users”. The flow of a project generally starts by establishing a core technology, then examining how to manufacture, market, and commercialize a product from that. Yet, what we really need is a system that works in the opposite direction, considering what is necessary at each step in reverse order. The problems of the 21st century are complex and multifaceted so it is important to aim at solving them efficiently, by some combination of government agencies together with various companies, and across geographical borders (foreign countries). In view of this requirement, I would like to see AIST function in a linking role, and as a provider of human resources. Companies look to AIST to provide them with

services that a single company or enterprise cannot handle, such as standardization and verification of safety performance. Ultimately, standardization efforts should be directed toward establishing international standards. The process of international standardization is pivotal, because it can determine competitiveness. I would like to see standards established rapidly, but with governments, national organizations, and the private sector being involved.

To realize open innovation, it is important to conduct joint research with companies, but only 4 billion yen of funds has been received from the corporate sector (companies), which is a small proportion of the total revenue of AIST. Thus, more effort is necessary here. Today we inspected three representative AIST facilities: a super clean room (a common platform); a leading-edge iPS technology lab, where work is evolving from applied research to development; and a carbon nanotube lab, where work is focusing on practical

implementation. I thought that if AIST used various resources, know-how, human networks, and systems, and demonstrated what can be made with all this, and if it proposed to develop ideas with a team of selected members, many individual companies would readily join the team. To help achieve this kind of environment, I would like to see more opportunities for people to visit AIST. There are few opportunities for the general public to see research facilities. If you open the gates a little wider, so that a broader range of people, from young children to company employees, can see what’s going on here, I think it will lead to insights that can help to make projects more successful. I know that AIST has an open house once a year, but I would like to suggest that opportunities to come here be expanded.



Sawako Hanyu (President, Ochanomizu University)

In considering the role of public research institutes, there are three basic considerations. First is the need to think at an international level at all times, and to keep an eye on international standards. Second is the need for horizontal links with similar organizations, such as universities and public and private research institutes. Finally we need to keep in mind what the people who stand to actually benefit from technologies are thinking and seeking. These three considerations are essential.

In AIST’s case, the second consideration, to link horizontally, is particularly important. AIST engages in goal-oriented fundamental research, so one of its key characteristics is that it pursues studies after first determining what kind of fundamental research is needed

to achieve a particular goal. Since universities do not necessarily set any specific goals when they conduct fundamental research, I would hope that AIST examines how it can make use of the various kinds of research done by universities when it sets itself a specific research goal, recognizing such research as “seeds”.

There is currently a debate among national universities regarding specialization of functions, particularly on questions such as whether to put more emphasis on education or on advanced research. Big universities may be able to give due importance to both, but for small and medium-size universities, this choice is a very difficult one. Although universities are essentially educational institutions, they

cannot specialize only in education. They need to keep in mind that education must eventually serve to promote research and contribute to society’s development. If we accept this, we cannot focus only on education. In this light, I feel that the open innovation hub is an opportunity for AIST and universities to share their roles. In other words, when a university implements specific research and training initiatives, it can do this keeping close communication with public research organizations such as AIST. I feel that it is in this sense that AIST can serve as a hub or interface.



Makoto Hirayama (Professor, State University of New York, USA)

The mission of AIST is to pursue “*Full Research*”, but it would be good to define, in simple and clear terms, what AIST’s role and mission are, specifically in relation to a methodology for how to link this “*Full Research*” with universities and industry. The College of Nanoscale Science and Engineering (CNSE) of the State University of New York (SUNY) at Albany, where I work, engages in industry-oriented research and industry cultivation. From a Japanese perspective it may seem surprising that universities are involved in industry this way. In fields that are important policy-wise, such as solar cells, CNSE collaborates with federal research bodies such as the Los Alamos National Laboratory to promote industry. We obtain funding for this from the state government and the Department of Energy. The vision and mission in this case are so simple that they can be stated in one or two lines. It would be good if AIST could clearly define “*Full Research*” with vision and mission statements propose very specific themes of research to industry and universities, and to launch joint research initiatives.

In order for AIST to attract a diversity of people, including foreigners, it needs some kind of “magnet” that will draw propose to it. In the case of CNSE, the magnet is the constant availability of a state-of-the-art technological environment, made possible by public funding, something that most companies cannot afford. Researchers who want to make use of the most advanced equipment have no choice but to go to CNSE. This is how the magnet works! For example, at the Albany campus there is a super clean room, which is more like that of chipmakers than the clean room here, and 1.5 times bigger. Almost all the major semiconductor manufacturers, like IBM and SEMATECH make use of it. CNSE’s policy regarding intellectual property (IP) is also clear, and the 300 mm lines can be used by anybody who pays the usage charges. The university makes no claim on IP derived from knowledge obtained using the line, except in cases of joint research projects. That is, only when university professors use the facilities as part of joint research projects with companies

or outside research bodies, do they make a joint application for IP protection with the collaborating researchers or the university.



A vital factor for proceeding with open innovation is the question of how can AIST globalize its activities. Without operating within international standards, AIST cannot expect to attract good students and researchers from around the world. America is a contract-oriented society, but that approach is unfamiliar to Japanese. It should be understood that while Japanese may be able to sense things like the intentions of others non-verbally, this is not the case with most foreigners. For this reason, it is important to adopt international standards for operations and management wherever possible, as is done with accounting standards. Adopting internationally acceptable ways of doing things is a form of globalization, and it is necessary in the promotion of open innovation.

Thaweesak Koanantakool (President, National Science and Technology Development Agency, Thailand)

I believe that AIST has expertise and strengths in those areas desired by industry. In this way, it is possible to step up the connection between basic researches with commercialization of the private sector. It thereby induces more collaborative innovation with industry towards the commercial end. Consequently, you can respond to the private sector in a way that they expect, at the same time solving the private sector’s crisis. The industry wants more innovation in order to get ahead of the competition while AIST wants more budgets out of collaboration with the private sector. I am impressed with your idea of *Full Research* as many new innovations come quickly from basic research and onto commercialization.

I hope that you extend to leverage the open innovation hub with ASEAN countries. Our research problems in the ASEAN area are quite different from here. For example, in the photovoltaic (PV) field - the solar cells in Thailand will be subject to very hot and very humid weather. In addition, we have heavy rain most of the time in the rainy season. Therefore, it would be a good opportunity to present a new challenge to researchers on how to research the life, durability, and degradation of solar cells in the hot and humid region. Also, in Thailand, an automobile sector is one of the top for exports, with the main investors being from Japan. These auto industries are also shifting towards hybrid and electric cars. We have observed a move towards power

semiconductors and a way to manage a smart grid in the city to fuel the battery-powered cars. This could be one new and extended area where researchers in the ASEAN countries could be participating in your open innovation.



In the near future, perhaps, AIST can show the other countries that AIST researchers have entrepreneurship with fearless risk taking activities. I am looking forward to seeing a good model of the *Type-2 Basic Research* that creates a culture of entrepreneurship with fearless risk taking.

Jürgen Mlynek (President, Helmholtz Association)

As an advisor, I would like to make comments on standing, balance, and potential. With respect to the standing of your organization, I realize that you are very successful in terms of publications. There is also some strategic relevance of the work that

you do. In this two-dimensional map, which is called Pasteur’s Quadrant, where you plot basic research against applied research, you are not in the field of pure basic research, nor in the field of completely applied research, you are in the field of use-inspired basic research. I think

one of the strengths of this institution is also a strong basis in basic research. So my advice would be even if you want to innovate and



even if you want to reach out to the private sector, your strength is also outstanding basic research and do not forget about this now and in the future.

With respect to balance, that is always the question, are we doing the right things and are we doing things right? But the real challenge is to ask the right questions. You always try to ask what your priorities are and what your posteriorities are. In view of your future budgets which will be essentially constant or even decreasing, the question of priorities is essential because in that context you can only

start something new if you quit certain fields that are running fine but maybe are not that important in the future.

With respect to potential, I was really impressed by the infrastructure of AIST, this clean room facility is just wonderful. So keeping research infrastructure up at the frontier is really essential. And the other aspect potential is people. Maybe you should also make an effort to have more females in your organization essentially at all levels. People, I think in the end, is what really counts and if you can become even more diverse and more

international, the better.

And finally, let me just stress one of the main transfer activities that institutions like yours and universities have are people, qualified people that you educate for the private sector. This is also part of your valuable output for society, it is not only patents and licenses, it is qualified people.

In summary, it is a wonderful institution. I think you are doing great and you should do everything to stay in that position.

Tamotsu Nomakuchi (President, AIST)

Thank you all very much for participating today in this very lively discussion. Despite the short time together, we learned a lot from your participation today. For example, you pointed out the limited presence of female researchers at AIST, the lack of mobility of our researchers, and offered thoughtful suggestions about how to address these issues. I am sincerely grateful to you all for your enthusiastic participation in today's meeting.

Discussion topics like the role of public

research organizations in resolving 21st century issues and initiatives for the realization of an open innovation hub can shed light on defining the ideal nature of research and development organizations in Japan. As a public research organization, we feel that when we review our past efforts and consider our future role in the context of a globalized world, even if such discussion is not entirely positive, we should try to enhance our core functions. Doing this gives us confidence. In

view of this, we set the topics of today's discussion desiring to address real issues head-on. All the board members contributed very valuable and useful opinions. I don't have enough time here to sort through all the feedback, but I will do this thoroughly in the days ahead, and work to translate the feedback into concrete action.



Research Lab Tours in Two Groups

Lab tours for advisory board members were arranged to allow members to get a real taste for AIST initiatives to promote innovation through direct discussions with researchers.

The members split up into two groups for the tours, which consisted of five labs: the Nanodevice Innovation Research Center (super clean room), the Spintronics Research Center (spintronics technology research), the Intelligent Systems Research Institute (new robot industry creation), the Research Center for Stem Cell Engineering (standardization of iPS cells and other stem cells for industrial applications), and the Nanotube Research Center (practical applications of single-wall carbon nanotubes). At each site researchers presented and explained their research findings.



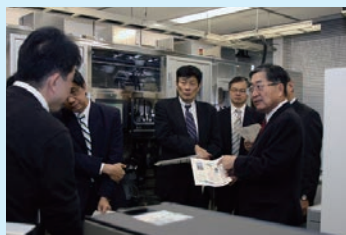
Super clean room



Spintronics technology research



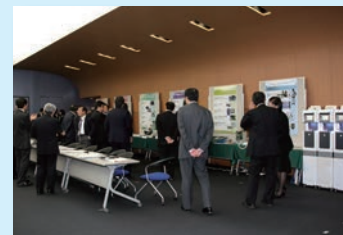
New robot industry creation



Standardization of iPS cells and other stem cells for industrial applications



Practical applications of single-wall carbon nanotubes



Presentations and explanations of research findings