

Science and Technology in Society (STS) *forum*

“Lights and Shadows of Science and Technology”

Third Annual Meeting

September 10-12, 2006, Kyoto
Kyoto International Conference Hall

SUMMARY OF PROCEEDINGS



Science and Technology in Society (STS) *forum* (NPO)

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All of the names, job titles, and functions stated herein reflect those current as of the date of the forum; personal titles have been omitted.

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September 10, 2006, Sunday

13:30–14:30 Opening Plenary Session

Session Chair: Omi, Koji, *Chairman and Founder, STS forum; Member, House of Representatives, JP*

Speakers:

- Abe, Shinzo, *Chief Cabinet Secretary, Cabinet Office, Government of Japan, JP*
- Aho, Esko, *President, Finnish National Fund for Research and Development (SITRA), FI*
- Helal, Hany M., *Minister of Higher Education and Scientific Research, EG*
- Marburger, III, John H., *Science Advisor to the President and Director, Office of Science and Technology Policy, US*
- McKinnell, Jr., Henry A., *Chairman, Business Roundtable and Chairman of the Board, Pfizer Inc, US*
- Mitarai, Fujio, *Chairman, Nippon Keidanren (Japan Business Federation) and Chairman and Chief Executive Officer, Canon Inc., JP*

Koji Omi opened the Third Annual Meeting of the STS *forum* 2006 by pointing out that progress in science and technology has made us feel as if humankind could control the globe at will. However, people should live in harmony with nature and with the laws of the universe, since they are part of it. Science and technology should be used to its fullest to reap the advantages, while overcoming its negative aspects. Because the means for doing so exist, the challenge will be to apply them. Synergies among participants had increased during the last two forums and the concept had become more established. Furthermore, the participants of the STS *forum* are standing at the beginning of a new movement, which will produce creative solutions for sustainable development.

Shinzo Abe focused on the following three factors: knowledge, wealth, and power. Science has made astonishing advances in the knowledge of humankind, the world, and the universe. People have learned how to pursue wealth with creative economic and business systems and how to deploy power within controlled political systems, so that power can be directed to the protection of freedom and human rights. Justified pride may be taken in what has been learned and accomplished, since this gives further motivation for

improvement. However, it is necessary to be aware of the danger of giving in to egoistical temptations either on the knowledge, wealth or power side alone and to establish real cooperation among these three factors.



John H. Marburger

John Marburger focused on the social environment of the "scientific enterprise". The cultural independence of science has proven to be valuable for intercultural communication, even if two countries' political or economic relations have been obstructed by difficulties or misunderstandings. Partnerships have grown into a vast global enterprise of discovery supported by a common language and pictures, working collectively and fast, to respond to the growing challenges of our times. Among these challenges are the side effects of the exploitation of science in technology. World history has become one of a gradual convergence and globalization of cultures. With this, new sets of problems associated with the increased impact of side effects on a global scale have arisen calling for the need of sustainable development.

Hany Helal portrayed the wisdoms of science and technology from the perspective of a developing country, stating that they are the driving forces for the economy and sustainable development. Developing countries need the developed world's knowledge since he believes this is the only way they can achieve development and transform their economies. There is need to focus strongly on innovation. This must include the whole cycle from papers to patents and prototypes finally leading to the development of new products. Egypt established policies fostering innovation, the most important one being the strengthening of education. Suitable funding must be provided by both the state and private companies. "Invest in innovation, innovation, innovation."



Hany M. Helal

Henry McKinnell, Jr. believes that the acceleration of knowledge in the field of medical sciences bears extremely helpful and promising discoveries. It is important to start now to think about how to manage these advancements and their effects on peoples and their societies, since they can bring the potential for new and sometimes frightening technologies. Crises and infectious diseases, especially HIV/AIDS demonstrate how scientific advances have greatly outstripped the advances in the political will and ability to care for the poor. The irony is that both the developed and the developing world are facing the potential threat of new infectious diseases carried by the modern ways of transportation that have become routine in the world.



Fujio Mitarai

Fujio Mitarai stated that Japan is an aging society with a declining birthrate, poor in natural resources and energy. He is ready to make an active contribution to again turn Japan into a country of hope built on science, technology and creativity and he is confident that Japan can overcome the problems previously mentioned through the pursuit of innovation in various areas. Change can be brought about by means of new combinations of

knowledge. No country can resolve the big problems alone, so it is essential for nations to work together. Science and technology should not simply be a tool for profit, but should be used to make the world a better place.

Esko Aho tackled the question of how to transform the EU from a resource-based into a knowledge-based society. Not only money, but radical changes in the traditional social model are also needed, namely in the following: Firstly, creation of properly functioning markets for innovative custom services. Secondly, mobility: human and financial resources should be transferred in line with their strategic goals. Thirdly, entrepreneurship for innovation is necessary. Finland benefited a lot by implementing these points .The next step will be the transformation from a R&D-driven society to an innovation-driven society. Again, radical reforms in organizations, working methods and attitudes are needed, which is why innovation requires favorable environments. Innovation is not a miracle, but the outcome of hard work.



Esko Aho

14:30–15:45 Plenary Session: “Sustainability and the Economy”

How can we pursue the double goal of achieving global sustainability while ensuring fast economic growth and prosperity to wider areas and more countries? How can science and technology progress contribute to achieving this dual objective in a tangible way? What good news to this effect can we expect for the foreseeable future?

Session Chair: Komiya, Hiroshi, *President, University of Tokyo, JP*

Speakers:

- **Al-Shatti**, Ismael K., *State Minister for Cabinet Affairs and Deputy Prime Minister, KW*
- **Cho**, Fujio, *Chairman, Toyota Motor Corporation and Vice Chairman, Nippon Keidanren (Japan Business Federation), JP*
- **Moratti**, Letizia, *Mayor, City of Milano, IT*
- **Rahman**, Atta-ur, *Federal Minister/Chairman of the Higher Education Commission and Advisor to the Prime Minister on Science and Technology, PK*
- **Rowland**, F. Sherwood, *Donald Bren Research Professor of Chemistry and Earth System Science, School of Physical Sciences, University of California, Irvine, US*

Hiroshi Komiya, together with his research group IRSSS from University of Tokyo identified three kinds of systems: global, social and human, and the linkages among them to be crucial to the coexistence of human beings and the environment. Global sustainability crises arise from a break down in one part of this fragile network. The ultimate objective is the development of visions and policies for repairing and rebuilding this network. The rapid increase in knowledge has caused subdivision and compartmentalization of academic pursuits. In order to produce solutions to achieve the goal of sustainable development, knowledge must be structured, with outputs linked and combined.



Hiroshi Komiya



F. Sherwood Rowland

Sherwood Rowland started by stating that the first necessity for sustainability is that the population remains finite. Future estimates predict a peak in the middle of this century, followed by a decline. A key question is how this 30 to 40% increase in population could be handled until then, given the limited resources combined with an increase in per capita energy consumption. Global warming and climate change are continuing trends and

nuclear power is the only source of energy which is free from greenhouse concerns. The goal of sustainability requires expansion of the contributions from all of the renewable sources and success in new energy areas as well. It is heavily dependent on progress in many fields of science and technology.

Ismael Al-Shatti affirms that sustainability of economic growth is related to the availability of low cost and clean energy. Presently, energy means oil to most people. There is such a heavy dependence on oil that its security becomes an international problem and fears and concerns of oil depletion are rising, the depletion being expected to occur within this century. Therefore, there is a need to turn to other energy sources such as affordable photovoltaic cells, producing fuel by artificial bacteria, hydrogen biofuel gasoline or working towards the clean destruction of radioactive waste.



Ismael K. Al-Shatti

Letizia Moratti highlighted some of the issues that cities are facing. A city perspective is different from a national perspective because it allows more direct, less bureaucratic and thus more efficient ways of action and interaction. It is important to work on both levels to find out which is the most appropriate one. A question to consider is how cities can contribute. What is needed most for research and innovation is human



Letizia Moratti

capital. To build and attract it, there is need for a good cultural environment, strong developments in ICT, R&D, new communication technologies, modern services and infrastructures, and alleviating inequalities.

Atta-ur-Rahman offered interesting insights into revolutionary reforms that Pakistan undertook in order to foster science and technology and therefore, to work towards a sustainable development. At the core of these reforms lies the building of a responsible, educated society.

Attracting the brightest by rewarding them with financial incentives as well as interesting research opportunities in centers of excellence, and thus reversing the Brain Drain is one important pillar of the strategy. Another one is the so-called "research productivity allowance" where scientists are paid according to their productivity and not for example according to seniority. The third pillar constitutes sending students abroad on governmental scholarships. Since its implementation in two-thirds of the universities in the country, there was a 30% increase in papers and more talented individuals going into science.

Fujio Cho shared his thoughts from the perspective of the automobile industry. The automobile has brought unprecedented mobility for people and goods. It has made life more convenient and more enjoyable, and has also supported economic growth and its vitality. However, the negative side effects such as air pollution, emission of greenhouse gases, depletion of energy resources and safety must be challenged with effective responses that require preventive solutions. Promising, for example, is hybrid technology, which will be the core technology for many years to come, he believes. For solutions to be real and lasting, they must be broader. Solutions, which address transport systems as well as individual vehicle and intelligent transport systems, are associated with interactive communication systems, for the purpose of raising efficiency and safety.



Atta-ur-Rahman



Fujio Cho

16:30 –18:30 First Series of Concurrent Sessions

A1: Environment and Economic Growth – Post Kyoto Protocol

While international measures to control greenhouse emissions have been adopted under the Kyoto Protocol, the protocol is not fully effective partly because some major countries have not yet signed and partly because some of those that have signed seem unlikely to meet their targets. In order to prepare the ground for a new international agreement that can be acceptable to all, the STS forum provides a framework for discussions leading to a new consensus.

Session Chair: Oxburgh of Liverpool, Ronald, Member, the House of Lords, UK

Speakers:

- **Poncellet**, Jean-Pol, *Special Advisor to the Chairman of the Executive Board, Areva Group, BE*
- **Reilly**, William K., *Board Member, DuPont (E.I. du Pont de Nemours & Company), US*
- **Tanaka**, Nobuo, *Director, Science, Technology and Industry Department, Organization for Economic Co-operation and Development (OECD), JP*
- **Zhou**, Dadi, *Director General, Energy Research Institute, National Development and Reform Commission, CN*



Solving the world's energy problems lies not in regulating the individual's energy use, but in changing the way energy is obtained and supplied. The Kyoto Protocol was one step in the right direction, but not enough. A "2000 Watt Society" would be desirable, with the developed world cutting down (possibly through technological advances), while allowing a controlled increase for the developing world. Studies have shown for Europe that this could be achieved by 2050. It was agreed that there is a lack of leadership and collaboration on all levels to instigate significant action and change must be completed with consideration for impacts to economic development. Bottom-up efforts must be initialized together with the best top-down international and national strategies. Only the economically most sustainable solutions will make it. However, the question remains open of how the long-term external cost will be internalized, and which capital market instruments are most useful for best leverage. The Dow Jones Sustainability Index may perhaps become an even stronger instrument than it already is now.

B1: Lights and Shadows related to the Applications of Individual Genomic Information

Too much or too little information? Whole genome versus SNPs, information and time – What do we want to know, when and what shall we use it for?

Today, progress in the development of genome sequencing allows us to sequence a patient's entire genome as a step in a medical investigation. This might be a new opportunity for tailor-made medicine, criminal investigations or when potential security leaks can cause severe troubles for the patient. The focus of future technologies on speed, accuracy or quantity, will have great implications for the individual, and what the information can be used for. This session will explore the impact of different technologies, for example whole-genome versus specific loci focus, in commercialization and research and what ethical aspects will arise from the use of an individual's genetic information. The balance will be between the right to remain uninformed and the benefits of tailor-made treatment, between the shadow of doubt and the harsh light of truth.

Session Chair: Liu, Edison T., *Executive Director, Genome Institute of Singapore (GIS), US*

Speakers:

- **Bartl**, Knut, *Head of Research and Development, Roche Applied Science, DE*
- **Hayashizaki**, Yoshihide, *Project Director and Chief Scientist, Genome Exploration Research Group, Genomic Sciences Center, RIKEN, JP*
- **Lombardi**, Steven, *Vice President, Helicos BioSciences Corporation, US*
- **March**, Ruth, *Senior Principal Scientist, R&D Genetics, AstraZeneca, UK*
- **Primorac**, Dragan, *Minister of Science, Education and Sport, HR*
- **Roses**, Allen D., *Senior Vice President, Pharmacogenetics, GlaxoSmithKline, US*

Developing a "1000 dollar genome", sequencing a human genome in 2 or 3 days for 1,000 dollars, is the next goal in genomic research. This easy access to individual genomic information will hopefully lead to the development of efficient diagnostic tools, the improvement of disease prevention, tailor-made therapies, reduction of costs of treatment and improvement of crime investigation and identification. At the same time, there is need to be cognizant that



Edison T. Liu

personal genetic information could be used to discriminate against individuals who are susceptible to a certain disease but do not have the disease yet (for example by insurance companies) and that it is difficult for the regulatory agencies to follow the very rapid technological evolutions. The solutions to these problems may lie in information technology with increased security and in legislative protections. A point of discussion was that if genetic information along with medical records could be stored in an IT vault to be carried around by the individual, instead of hospitals being in possession of medical information as is currently the case, the patient would have much greater control.

C1: Impact of New ICT Developments on Society

This session gathers many visionaries who will share with us their view on how ICT will impact society in the future. What are the new developments expected in the IT and Communications areas? What are the changes expected in terms of businesses, industries and services deriving from these new developments? What are the implications for society? What are the foreseeable problems and what solutions can be thought of?

Session Chair: Thajchayapong, Pairash, *Senior Advisor, National Science and Technology Development Agency (NSTDA), TH*

Speakers:

- Cerf, Vinton G., *Vice President and Chief Internet Evangelist, Google Inc., US*
- Dvivedi, Dhananjaya, *Advisor to the President for IT, Shinsei Bank, Ltd., IN*
- Hara, George, *Group Chairman and Chief Executive Officer, DEFTA Partners, JP*
- Liu, Leonard, *Chairman and Chief Executive Officer, Augmentum, Inc., US*
- Tiemann, Michael, *Vice President, Open Source Affairs, Red Hat Inc., and President, Open Source Initiatives (OSI), US*

The panel discussed the present status and possible future development of ICT, including the expansion of mobile Internet access, the handling of smaller components, the possible disappearance of the PC in favor of pervasive ubiquitous communication platforms, software creation by collaborative teams and open software virtually connecting the infinite number of people and devices. Related to these possible developments, it was suggested that it is the sharing of information that gives power and that new styles of social systems are becoming increasingly necessary. The issues include: Digital Divide (in particular the gap between the rich and the poor), the language barrier (English), the difficulty in distinguishing good participants from bad ones in e-commerce systems, information network ethics, and particularly the need for helping people in developing countries not to be left behind in reaping the benefits of the future Internet society. To solve these issues, there is a need for innovation and a need to deal with the social

implications. Educating people for the future Internet society will be indispensable.



D1: Science Literacy for All

Both in developed and developing countries, an enhanced science literacy at all levels of education and all components of society should largely benefit quality of life of humankind, including health consciousness, better prospects of economic growth, and in the long run, further advancement of science by attracting good talents into scientific areas.

Session Chair: Mohri, Mamoru, *Executive Director, Astronaut, National Museum of Emerging Science and Innovation, JP*

Speakers:

- Darling, Martha, *Consultant, National Academy of Sciences, US*
- Kao, Kim Hourn, *President and Founder, University of Cambodia, KH*
- Léna, Pierre J., *Member, Academy of Sciences of France, FR*
- Norrby, Erling C. J., *Professor of Virology, Center for History of Science, Royal Swedish Academy of Sciences (RSAS), SE*
- Vitarana, Tissa, *Minister of Science and Technology, LK*
- Zakri, A. H., *Director, United Nations University Institute of Advanced Studies (UNU-IAS), MY*

The main vectors for science literacy are the education system, the media and the Internet. The education system should emphasize science, strengthen reasoning, encourage the teaching of science history and let people see science as a human journey of discovery, therefore stimulating children's curiosity. Scientists should work with educators to promote this. The media gives little coverage to science and it tends to sensationalize the findings or slant the issues. Fellowships for science journalists can help, but scientists should communicate better and devote more time to the media. The internet today provides enormous quantities of often dubious information.

Scientists should create the means of providing it with accurate information and also devote some time to combating quackery, whose corrosive effects on decision makers and public attitudes cannot be underestimated. Science literacy will help create a better labor force and fight obscurantism and extremism.

E1: New Developments in Nanotechnology

Nanotechnology opens new frontiers in the bio area as well as many others. These new opportunities include new therapies, new business domains, but they can also bring fear and non-acceptance from society. What are the forefront developments in this new area?

Session Chair: West, Geoffrey B., President and Distinguished Professor, Santa Fe Institute, US

Speakers:

- Declerck, Gilbert, President and Chief Executive Officer, Interuniversity MicroElectronics Center (IMEC), BE
- Ryan, John, Director, Bionanotechnology Interdisciplinary Research Centre, University of Oxford, UK
- Tanaka, Kazunobu, Principal Fellow, Center for R&D Strategy, Japan Science and Technology Agency, JP
- Tanthapanichakoon, Wiwut, Director, National Nanotechnology Center (NANOTEC), TH
- Von Ehr II, James R., Founder, Chairman and Chief Executive Officer, Zyvex, US

Nanotechnology emerges rapidly as the world's private sectors and governments continue to invest heavily into it. At the nanoscale, unique material properties appear which open up vast opportunities in a broad set of areas. Much of the potential for new products is high risk – "pioneering and entrepreneurial" as one panelist described it. However, manufacturing reproducibility and adherence to nanostandards will pose significant challenges. Negative experiences of the past (GMO's in particular), have raised awareness of the need to address serious ethical, legal and social concerns. R&D programs for risk assessment and continuing surveillance are fortunately increasingly the norm. Strict regulations for the introduction of nanomaterials into the body for diagnostic or therapeutic purposes exist already and might serve to raise the overall regulatory standards – hence slowing the pace of implementation of new technologies. Additionally, there is a need for educational programs at all levels to promote nanotechnology and raise its societal acceptance.

F1: Engaging Policy Makers in Scientific and Technological Issues

What are the recent trends and thinking in science and technology policies around the world? How can policy makers and other stakeholders work together to boost the advancement of science, technology, and innovation? How would all this fit into national strategies to improve the economy and the quality of life?

Session Chair: Goldin, Daniel S., Chairman, President and Chief Executive Officer, The Intellisis Group, US

Speakers:

- Emmott, Stephen, Director, European Science Initiative, Microsoft Research, UK
- Harbour, Malcolm, Member, European Parliament for the West Midlands, UK
- Nobel, Michael, Chairman, Nobel Family Society, SE
- Richter, Burton, Director Emeritus, Stanford Linear Accelerator Center (SLAC), Stanford University, US
- Zich, Rodolfo, President, Fondazione Torino Wireless, IT

The Panel distinguished two domains of public policy. Policy for Science involves priorities, promotion or restriction and funding for science, science education, industry, and government. Science for Policy draws upon and invests in research and new technologies to solve or manage important societal problems.



Michael Nobel

Scientists should endeavor to understand the political process better, since politicians can help them translate their capabilities to the perceived needs of their constituents. The chance to influence a decision will be greater if a relationship had been established previously. Politicians need their support, but scientists should not forget that politicians have many truly compelling needs to address, not just theirs. Mechanisms for organized, unbiased technical advice to governments have been created in many countries (for example National Academies of Science) and governments should make regular use of their advice. For nations without such bodies, it was suggested that the STS forum may provide these insights to help direct policy decisions.

19:30–21:00 Official Dinner: "Lights and Shadows of Science and Technology"

Session Chair: Kurokawa, Kiyoshi, President, Science Council of Japan, JP

Speakers:

- Barbour, Haley, Governor of Mississippi, US
- Matsuda, Iwao, Minister of State for Science and Technology Policy, JP
- Rees, Martin, President, The Royal Society of UK, UK



Kiyoshi Kurokawa

Kiyoshi Kurokawa enunciated the fragileness of the world at present and the considerable changes it has undergone. The current understanding of the universe, energy, and other convenient technological advances were unimaginable to most people in the not so distant past. The increase of the world's human population having a longer life expectancy and facing an ever greater need for energy, poverty and

HIV/AIDS are some of the problems today. People living in a knowledge-based society are aware of them and that is why Kurokawa voiced the need for action. Action must be taken now in order to prevent future generations, 50 years from now, from saying that this current generation knew of all these problems, and yet did nothing.

Iwao Matsuda, conveyed the full commitment Japan has to pursuing future excellence in science and technology. He orated that even during the stagnant economic growth of the 90's and despite severe general government cuts in spending, the rate of government investment in science and technology has consistently increased. International cooperation in science and technology must be further strengthened and he has endeavored to enhance cooperation with Asian countries as well as many other countries.



Iwao Matsuda

Haley Barbour stated that it is not often that politicians have the opportunity to meet with leaders of science and technology. Taking part in the STS forum has made him further realize the importance of that, since science and technology not only plays a crucial role in the general world but is particularly a powerful driver of economies. And economic progress is driven by innovation and the technology that makes innovation possible. He stated that in the United



Haley Barbour

States, there is a tendency for governors to be close to economic development because of the direct connection they have to the economic situation due to the fact that they are judged by job creation or job loss, as well as the creation or expansion of industries.

Martin Rees stated that technologies drive economic advance and those that drive it fastest – information technology and biotech – are environmentally benign. They are socially benign as well, because they help the developing as well as the developed world. Existential risks are a new concern. There is a widening gulf between what science could make possible



Martin Rees

and what is ethical to do. The answer is not to stop science, but to better direct it. Currently, the balance of science is not optimal. There is research emphasis on cancer and cardiovascular disease, the ailments of the rich, rather than infectious disease, endemic in the tropics. Furthermore, the prognosis of energy and climate change is scary and no satisfactory fix is yet on the horizon.

September 11, 2006, Monday

08:30–09:30 Plenary Session: “Dialogue between Political Leaders and Scientists”

Political leaders typically tend to avoid difficult science and technology questions, to leave them to specialists. But unless they start thinking about science and technology as their own problems, there will not be any fruitful dialogue and collaborative effort between political leaders and the scientific community.

Session Chair: Yeo, Philip, *Chairman, A*STAR (Agency for Science, Technology & Research), SG*

Speakers:

- **Kumar**, Ashok, *Chair, Parliamentary Office of Science and Technology, Houses of Parliament, UK*
- **Varmus**, Harold E., *President and Chief Executive Officer, Memorial Sloan-Kettering Cancer Center in New York, US*
- **Rattanapian**, Pravich, *Minister of Science and Technology, TH*
- **Shiozaki**, Yasuhisa, *Senior Vice-Minister for Foreign Affairs, JP*
- **Schaal**, Barbara, *Vice President, National Academy of Sciences, US*



Philip Yeo

Philip Yeo agreed that there is a communication gap between political leaders and scientists. Scientists feel underappreciated by politicians and politicians may view scientists as impractical. Political leaders are concerned with seeking strategies to solve real-life problems as quickly as possible. The scientific knowledge they possess must be relevant and applicable to particular policy problems.

The resulting decisions made by many political leaders on scientific issues tend to solve problems in the short term and place emphasis on quick results. Scientists today, on the other hand, pursue their intellectual interests and tend to have a long-term perspective. This makes the outcome of their research, whether it is a cure for cancer or alternative energy resources, far in the horizon. Constructive dialogue between scientists and politicians is necessary.

Ashok Kumar disagreed that political leaders typically tend to avoid science and technology questions and to simply leave them to experts. He stated that S&T affects the lives of virtually every person in a politician's constituency. Therefore, political leaders can not avoid considering S&T matters. Since the role of S&T is so important, political leaders are

keen to encourage more investment in research and development and to encourage universities and companies to pursue their research. Particularly for basic scientific research, the majority of the funds come from the taxpayer's pockets. Therefore, S&T research must compete with all the other calls for public spending. Political leaders have to make difficult decisions on the balance of this spending. Spending on S&T can not be limitless. Kumar noted that there are very few political leaders with an S&T background. Therefore, politicians need quality information and analysis in order to make decisions.



Ashok Kumar



Harold E. Varmus

Harold Varmus acknowledged the crucial importance of productive dialogue among scientists and political leaders. He lamented the lack of productivity in the dialogue between scientists and the government, as well as the lack of interest top political leaders have in S&T. Varmus gave four recommendations for making a more effective case of the importance of science:

- 1) Identify effective arguments to refocus public interest and consequently the interest of politicians on the importance of S&T.
- 2) Make S&T a larger component of the international aid and development program.
- 3) Encourage international cooperation in science and technology whenever possible.
- 4) Decrease dependence on government and politicians by seeking more support for science from other sectors that are active and have a vested interest in the development of science and technology, including foundations, non-governmental organizations, private donors, and public advocacy groups concerned about disease and the environment.

Pravich Rattanapian

stated that policymakers must increasingly understand safety, ethical, and environmental issues, while cognizant of how new technologies benefit society. The linkage between policymakers and scientists has become more complex and central to national competitiveness, sustainable development, security, etc. A gulf in time frames, perspectives, goals, approaches, and especially budget exists between policymakers and the S&T community. In Thailand, efforts are being made to bridge this gulf, such as the National Science and Technology Development Agency Thailand working closely with APEC governments to pool the resources of experts in biomass and bio-energy. The road to sustainable development will be built on innovation. National development is increasingly closely linked to its performance in the science and technology arena. Therefore, alignment between policymakers and the scientific community is crucial.



Pravich Rattanapian



Yasuhisa Shiozaki

Yasuhisa Shiozaki stated that science and technology has created the “economies of speed.” S&T has unlimited possibilities, even potentially changing the picture of global conflicts since energy resources have been the major source of conflicts and wars. Global conflicts may be reduced if global policymakers allocate more for investments in infinite energy resources such as sunshine or water to be used instead of scarce and limited energy

resources such as oil and gas. Shiozaki also addressed the number of people suffering from diseases such as cancer. It may not be a mere dream to reduce the number of patients in pain, if policymakers agree to change resource allocation to have more focus on research and investment to fight difficult diseases. In this sense, it is important for political leadership to be used in the right way.

Barbara Schaal informed that the National Academy of Sciences, nearly 140 years old, was founded with the specific purpose of providing scientific advice to the government of the United States. However, the NAS is an independent non-governmental agency. Funds are provided on a contract by contract basis. The NAS's work is done by a committee of volunteers pro bono. Committees are evaluated for potential conflicts of interest.

Although the NAS is asked to provide advice to the government, this advice is not always followed. Science is just one aspect that goes into a decision. Social issues, budget, political considerations, and timing are all balanced by policymakers. There is a trend for the scientific committee itself, holding responsibility for its work. The advice of the scientific community must be both flexible and responsive.



Barbara Schaal

10:00 –12:00 Second Series of Concurrent Sessions

A2: Energy Paths

The various responses to increasing worldwide energy needs coupled with the growing preoccupation to curb greenhouse gases and other polluting elements are to be urgently

discussed. No single solution can be expected to hold immediate results, but this is exactly why they must be implemented as soon as possible, and from all fronts.

Session Chair: Campbell, Donald W., *Group President, CAE Incorporated, CA*

Speakers:

- Botha, Hannes, *Group General Manager, SASOL South Africa, ZA*
- Chung, KunMo, *President, The Korean Academy of Science and Technology (KAST), KR*
- De Carvalho, Eduardo P., *President, Sao Paulo Sugarcane Agroindustry Union (UNICA), BR*
- Dixon, Robert K., *Head, Energy Technology Policy Division, International Energy Agency (IEA), US*
- Meggs, Tony, *Group Vice President, Technology, BP p.l.c., UK*
- Naitoh, Masahisa, *Chairman and Chief Executive Officer, The Institute of Energy Economics, JP*
- Salje, Ekhard K. H., *President, Clare Hall, University of Cambridge, UK*

Energy security is one side of the coin. Pollution, which goes with energy conversion and consumption and global change in tow, is the other side. De-carbonization of energy supply is needed in the long term. But there is no quick fix for this problem, because for the time being, oil, gas and coal are the main options. Coal reserves are the largest and actually are found conveniently where most energy is needed in the future: China, India, Russia, and the USA. Since coal will be the main fossil energy source in this century, and coal exploitation is among the most polluting, much emphasis is needed in pollution prevention and carbon sequestration. Alternatives for the long run represent renewables like hydro, wind, solar and biofuels, and most importantly, nuclear power. A significant need for process optimization and technology development can be identified, but even more important is the need for public policies and a change in thinking.

B2: Enhancing Food Security by Science

How can safe food be efficiently provided to all people around the world? What are the contributions of science and technology towards this goal? How to address the inevitable controversy around GMOs?

Session Chair: El-Beltagy, Adel E. T., *Chair, Global Forum on Agricultural Research (GFAR), EG*

Speakers:

- Bhumiratana, Sakarindr, *President, National Science and Technology Development Agency (NSTDA), TH*
- Daar, Abdallah S., *Professor of Public Health Sciences and of Surgery, University of Toronto, CA*
- Horsch, Robert, *Vice President, International Development Partnerships, Monsanto Company, US*
- Legocki, Andrzej, *President, Polish Academy of Sciences, PL*

- **Lewanika**, Mwananyanda M., *Executive Director, National Institute for Scientific & Industrial Research, ZM*
- **Mundree**, Sagadevan G., *Chief Executive Officer and Member of the Board of Trustees, PlantBio Trust, ZA*
- **Patell**, Viloo M., *Vice-Chairperson, Founder and Chief Executive Officer, Avestha Gengraine Technologies Pvt. Limited (Avesthagen), IN*
- **Wandira-Kazibwe**, Speciosa, *Former Vice President of the Republic of Uganda, UG*



Speciosa Wandira-Kazibwe

Can sufficient food of proper quality be produced in a sustainable manner, without damaging the planet's biodiversity? Although the gap in food production might be able to be bridged, the need to work hard on sustainability and diversity of natural resources will remain, possibly while making use of recent developments in biotechnology and nanotechnology. There was agreement amongst the participants on the strong need to develop safety codes and regulations to maintain biosafety and prevent threats to biodiversity and that the public must be made aware about the benefits and risks of modified organisms. The encouragement of self-sufficiency and sustainability of food for African countries is of special importance in this context. New biotechnology plants could contribute greatly but it will be necessary to achieve a hybridization between modern plant biotechnology and traditional agronomy. This will require capacity building in a structured partnership between African countries (to avoid the duplication of experiments and to make the results obtained available to all) as well as between the North and the South.

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C2: Benefits and Risks of Open Networks

How to ensure enhanced protection of networks and their content against ill-meaning intrusions? How to ensure privacy while more and more private information on individuals travels around the world through the networks?

Session Chair: Anderson, Ross, *Professor of Security Engineering, Computer Laboratory, University of Cambridge, UK*

Speakers:

- **Coleman III**, William T., *Founder, Chairman and Chief Executive Officer, Cassatt Corporation, US*
- **Ito**, Joichi, *President and Chief Executive Officer, Neoteny Co., Ltd., JP*
- **Kitano**, Hiroaki, *Director, Sony Computer Science Laboratories, Inc., JP*
- **Koanantakool**, Thaweesak, *Director, National Electronics and Computer Technology Center (NECTEC), TH*

- **Liu**, Peng, *Chairman, Penrod International, Inc., CN*
- **Popescu-Zeletin**, Radu, *Director, Fraunhofer Institute for Open Communication Systems, FOKUS, RO*
- **Pritlove**, Tim, *Member, Chaos Computer Club e.V., DE*

Open networks, namely in terms of the Internet, are very useful for person-to-person communication and access to shared knowledge. They seem to empower people's free minds and activities and help promote innovation. As a means to prevent the malfunctioning of the cyber economy or cyber terrorism, security is important. However,

"open" and "secured" are opposite technical concepts and to overcome this apparent conflict, there is a need for new approaches. It may be possible for people to learn from biological networks such as neural systems and immune systems, which use systems related to chaos and complexity that go beyond conventional reductionistic decomposable systems. However, as the situation remains now, there is no better cure than "reasonable freedom and reasonable security". Issues discussed include whether there should be implementation of intelligent mechanisms into the core of the network architecture, to what extent regulations of the government are allowed and independence of networks from applications and management systems. Points yet to be solved included issues of digital divide, language barrier, education particularly for people in developing countries, legal issues such as copyright, and other IPR issues.



Hiroaki Kitano

D2: The Role of Universities in the 21st Century

What are the new challenges faced by universities around the world in the new century? What are their roles in research? Education? As opinion leading institutions? What are the new management requirements for universities to be viable?

Session Chair: Shirai, Katsuhiro, *President, Waseda University, JP*

Speakers:

- **Chang**, Chun-Yen, *President, National Chiao Tung University, Chinese Taipei*
- **Kiranandana**, Suchada, *President, Chulalongkorn University, TH*
- **Miller**, William F., *Herbert Hoover Professor, Public and Private Management, Stanford University Graduate School of Business, US*

- **Otiemo Malo**, Joseph, *President, Kenya National Academy of Sciences (KNAS), KE*
- **Parker**, Richard J., *Director, Research and Technology, Rolls-Royce plc., UK*
- **Peccei**, Roberto D., *Vice Chancellor, Research Department, University of California, Los Angeles, US*
- **Sironi**, Gianpiero, *Vice-Rector, Research Department, University of Milan, IT*
- **Durongkaveroj**, Pichet, *Director, Graduate School of Management & Innovation, King Mongkut's University of Technology, Thonburi (KMUTT), TH*
- **Keidel**, Hannemor, *Vice President, International Affairs, Technical University of Munich (TUM), DE*

Universities tend to have structures largely inherited from the 19th century with insufficient horizontal cross-cutting and research insufficiently related to the needs of society.

American universities that are top-ranked have learned to work with industry while providing creative environments for researchers. They are nourished by a highly competitive system, competing for students, teachers and funds. In Europe, pending reforms include the adoption of the BA, Masters, and PhD structures across all universities. This will maintain diversity within a common reference structure. East Asia shows enormously successful models, including a focus on excellence and broad-based participation in tertiary education. In many developing countries, political demography and societal pressures for degrees have created huge mediocre institutions with inadequate budgets and poor facilities. Institutional pluralism and good governance should be promoted, the autonomy of the university enhanced, its links to the industry reinforced and its commitment to excellence strengthened to turn out leaders, thinkers, and innovators, not just well-trained workers. Furthermore, brain drain must be turned into brain gain.



Roberto D. Peccei

Session Chair: **Straus**, Joseph, *Director, Max Planck Institute for Intellectual Property, Competition and Tax Law, DE*

Speakers:

- **Adly**, Noha, *Director, Information and Communication Technology (ICT), International School of Information Science (ISIS), Library of Alexandria, EG*
- **Arai**, Hisamitsu, *Secretary General, Intellectual Property Strategy Headquarters, The Cabinet Secretariat, JP*
- **Bienenstock**, Arthur L., *Vice Provost and Dean of Research and Graduate Policy, Stanford University, US*
- **Fayyad**, Usama, *Chief Data Officer and Senior Vice President, Strategic Data Solutions Department, Yahoo! Incorporated, US*
- **Haour**, Georges, *Professor of Technology and Innovation Management, IMD, CH*
- **Johnson**, Ray O., *Vice President and Chief Technology Officer, Lockheed Martin Corporation, US*
- **Ledoux**, Marc J., *Chairman of the Director at of Industrial Policy, National Center for Scientific Research (CNRS), FR*
- **Lee**, Yoon-Woo, *Vice Chairman and Chief Executive Officer, Samsung Electronics Co., Limited, KR*

Intellectual property was identified as an indispensable and useful incentive for investment in R&D and innovation. However, due to globalization and an increase in the rate of discovery, the current IP system is under constant upward pressure on patent filings, long delay times in examining patent applications, a duplication of effort in seeking protection and the appropriate length of protection. Harmonization of the currently territorially limited IP systems ultimately resulting in a global patent is necessary. Steps along that path should include: multilateral agreements on examinations (easing the growing backlog of applications and providing protection worldwide), universal adoption of a research exemption (enabling the use of patented inventions for further development and improvement), the education of the personnel responsible and introducing a new system of trading and access to IPR. Developing countries need greater access to IP to foster innovation and economic growth to provide drugs and healthcare protection for their population ravaged by infectious diseases, at affordable costs. Towards this aim, an equivalent of the IMF was suggested, to assist developing nations in obtaining access to IP.



Georges Haour

E2: Intellectual Property Rights that Work for All

What is the appropriate intellectual property rights (IPR) framework that will be beneficial for all humankind while promoting science and technology? Active use of patent information in R&D and the creation of a global patent system are of great importance in this regard. Also, the ways to eliminate the negative effects of IPR protection are to be considered. These issues should be addressed from a broad perspective without being constrained by conventional thinking.

F2: Utilizing All of our Talents: Women in Science

How do we ensure that all aspiring talents see equal opportunities in the world of science and innovation? How can diversity of actors benefit the scientific world?

Session Chair: Inoguchi, Kuniko, *Minister of State for Gender Equality and Social Affairs, JP*

Speakers:

- **Enssani**, Elahe, *Professor and former Chair of Civil Engineering, San Francisco State University, US*
- **Komarek**, Kurt L., *Chairman, Austrian Academy of Sciences, AT*
- **Nair**, Sudha, *Program Director, JRD Ecotechnology Center, M.S. Swaminathan Research Foundation, IN*
- **Rubinstein**, Joanna, *Chief of Staff to Prof. Jeffrey D. Sachs, Director, Strategic Programs, Earth Institute, Columbia University, US*
- **Samarasekera**, Indira, *President, University of Alberta, CA*
- **Samayoá**, María del Carmen, *President, National Academy of Science of Guatemala, GT*
- **Shuler**, Sally G., *Executive Director, National Science Resources Center (NSRC), US*

Involving women in both developed and developing countries, together with men, will provide more diversity, bring a source of novelty required to transform the paradigms of science, give rise to new discoveries and allow new types of questions to be addressed.

Three critical areas require focus:



Sudha Nair

- 1) *Promotion* – outstanding women must be identified, mentored, and included in traditionally male networks so they can rise to leadership roles in business, government and academia. This will help promote policies that will enable women to more effectively participate and create a climate that captures the strengths of women scientists.
- 2) *Participation* – participation of women should be facilitated in their critical mid-career years such as flexible and affordable child care. Flexible career paths are also desirable.
- 3) *Preparation* – throughout schooling, much more needs to be done to promote recruitment of girls and boys to scientific careers. More brainpower is universally necessary in order to meet the needs of the rapidly-emerging knowledge-based global economy.

12:00–13:45 Working Lunch: “Cooperation between Academia and Business”

Session Chair: Krieger, Eduardo M., *President, Brazilian Academy of Sciences, BR*

Speakers:

- **Castell**, William M., *Chairman, The Wellcome Trust, UK*
- **Russell**, Alan J., *Director, McGowan Institute for Regenerative Medicine, University of Pittsburgh, US*
- **Sasaki**, Hajime, *Chairman of the Board, NEC Corporation, JP*



Eduardo M. Krieger

Eduardo Krieger started the session by pointing out that the success of a communication and knowledge-based society depends largely on the skills of well trained human resources. The development of new products and processes starts by the appropriation of new knowledge that usually exists in universities, but translation of knowledge from university to industry depends mostly on the qualified people working in industry. It is required that universities facilitate this transference by providing opportunities for life-time learning such as short-term courses in new fields like biotechnology, nanotechnology, computer science or new materials. Industry and university relationships will always hold some risks and conflicts due to the difference of missions and objectives, but dialogue between the two is essential for innovation.

William Castell emphasized that new methods of worldwide cooperation are necessary and he suggested a system of territorial allocation of the “world’s problems”, which should be tackled and then shared worldwide, taking the developed and developing countries both into account. He gave recommendations on which countries should partner together to work on various issues. Regarding solar energy, he recommended having a project in possibly Sudan, Portugal, and Egypt because of their interest in the sun and their current status



William M. Castell

on solar energy development. These are countries where global companies could partner, too. Forged drugs are killing many in the emerging world and they are starting to hit the developed market as well. He suggested that Nigeria, Belgium, China, and Thailand could attend to this as well and share their recommendations to the rest of the world.



Alan J. Russell

Alan Russell stated the necessity for university-industry partnerships in the medical field. People, as well as patients as researchers, a joint goal and natural synergies resulting from different approaches, as well as money are the driving forces that make this already existing collaboration a necessity. The new challenge is the shift from industry-academic sponsorship to real partnership, where they work together with a joint vision

and open regular communication. The biggest challenges that could destabilize this relationship are conflicts of interest, ownership of IP, access to IP and sometimes also government policies. Political forces often drive collaborations, without realizing that sometimes those partnerships can cause changes that can shake the foundation of academia and introduce temptations that compromise the sanctity of the scientific process.

Hajime Sasaki observed a decrease in students from the science and engineering departments who are able to think logically about complex problems. Reasons in Japan can be found in the decreasing number of people engaging in such studies because of the harsh university entrance exam and unattractive future working environments, but also in deteriorating

academic skills among university students. The borders between fields are disappearing. Therefore, he expressed the need for universities to take a more interdisciplinary approach. On the other hand, industry needs to put more effort into fostering talented individuals, for example by designing and implementing university-based training programs or by participating in joint research and development activities at collaborative laboratories, which combine the knowledge and wisdom of both industry and academia.



Hajime Sasaki

14:00 –16:00 Third Series of Concurrent Sessions

A3: Protecting the Environment vs. Economic Development: Including Water for a Growing Population

This session will discuss critical ecosystems to be protected, preserved or restored globally; issues to be covered include: biodiversity, deforestation, desertification, recycling, waste disposal and remediation of contaminated sites. There will be a special focus on safe water, as ensuring clean water for the world's growing population will become a significant priority for humankind in this century. How can new technologies contribute to the solution of this problem? What policies are needed to implement such technologies successfully? Where will financing come from?

Session Chair: Colwell, Rita R., *Distinguished University Professor, University of Maryland and Johns Hopkins University, US*

Speakers:

- **Gagosian**, Robert B., *President and Director, Woods Hole Oceanographic Institution (WHOI), US*
- **Huang**, Haifeng, *Professor, Institute of Recycling Economy, Beijing University of Technology, CN*
- **McNeely**, Jeffrey A., *Chief Scientist, IUCN – The World Conservation Union, US*
- **Myers**, Norman, *Honorary Visiting Fellow, Green College, University of Oxford, UK*
- **Szöllösi-Nagy**, András, *Deputy Assistant Director-General, Natural Sciences Sector, UNESCO, HU*
- **Wallace**, Terry C., *Principal Associate Director for Science, Technology and Engineering, Los Alamos National Laboratory, US*
- **Yamanaka**, Akiko, *Vice-Minister for Foreign Affairs, JP*

There are vast oceans of water and enough solar energy to power society thousands of times over. The problem arises from the desire to find the quickest, easiest and cheapest way to cover society's needs in water and energy. Water is fundamental not only for drinking, but also in ecosystem services and food production to maintain the health of people and a livable environment. Yet 1.2 billion people lack adequate water supply and about double the number is without satisfying sanitation. Food exports and imports can help offset water-poor regions, and it is important to recognize ways in which water can be provided adequately without having a net impact on the supply in the future. In many cases, aquifers are over-pumped and/or contaminated. More effective utilization can help, but there are still extreme cases of water shortages in places such as the Middle East and North Africa. Effective treatment of wastewater is also essential. This must be incorporated into strategies to improve water infrastructure to prevent the spread of water-born diseases.



B3: Development of New Medicines, New Vaccines and New Therapies

What is the news about medicines, vaccines and therapies in our fight against diseases, both infectious and other?

Session Chair: Corr, Peter B., *Senior Vice President for Science and Technology, Pfizer Inc, US*

Speakers:

- Akimoto, Hiroshi, *Managing Director, Member of the Board, Takeda Pharmaceutical Company Limited, JP*
- Chandra, Ramesh, *Founder Director, Dr. B.R. Ambedkar Centre For Biomedical Research (ACBR), University of Delhi, IN*
- Chen, Zhu, *Vice President, Chinese Academy of Sciences (CAS), CN*
- Dompé, Sergio, *President, Farmindustria, IT*
- Ganguly, Nirmal K., *Director-General, Indian Council of Medical Research, New Delhi, IN*
- Minger, Stephen L., *Director, Stem Cell Biology Laboratory, Wolfson Centre for Age-Related Diseases, King's College London, UK*
- Moon, Chulso, *Assistant Professor of Otolaryngology, Head and Neck Surgery and Oncology Department, Johns Hopkins, KR*

To enhance successful innovation, the biomedical “ecosystem” – academia, the biomedical industry, NGOs and research organizations – need to start working together collaboratively on pre-competitive areas. It is equally important to continue the paradigm shift from “sickcare” to true healthcare, with a focus on disease prevention, wellness and early detection through better diagnostics. Due to the present limitations of cancer management, there is a need for new approaches in developing novel cancer diagnostics, therapeutics and guidelines. This can best be achieved by industry,



Sergio Dompé

particularly biotech companies. Furthermore, significantly more governmental investment in biomedical research and greater uniformity in the regulatory and R&D process are necessary, in order to deal with diseases and develop new vaccines. The increasing disparity between rich and poor in the distribution of health resources, better policy making and international collaboration were highlighted. The discussion also called for a consortium of companies to provide differential pricing all over the world, based on ability to pay. For developing countries to really benefit though, nothing can replace efforts from inside these countries, including the convergence of modern medicine with traditional medicine, which treats patients holistically and draws on nature to find new compounds.

C3: Open Access to Information

Open access to the scientific literature through the Internet and public digital libraries is a desirable goal: it can enhance scientific progress, broaden the impact of scientific information and reduce the overall costs of publication and distribution. However, there are also significant costs to be met in producing scientific journals, many publishers are wary of the loss of subscription revenues and scientists are often reluctant to institute changes in the publishing methods on which their careers are so dependent.

Session Chair: Varmus, Harold E., *President and Chief Executive Officer, Memorial Sloan-Kettering Cancer Center in New York, US*

Speakers:

- Blume, Martin, *Editor-in-Chief, American Physical Society (APS), US*
- Chi, Youngsuk, *Vice Chairman, Elsevier B.V., US*
- Omi, Asako, *Professor, Research Institute of Science and Technology, Tokai University, JP*
- Tavakol Kosari, Seyed Mohamad, *Secretary General, Iranian National Commission for UNESCO, IR*
- Walport, Mark, *Director, The Wellcome Trust, UK*

Given the increasing number of published documents, open access to them was one of the central themes of the session, with particular emphasis placed on new methods for publishing, distributing and storing scientific reports. There are several factors that should be considered including the degree of openness. Should it be open to subscribers only, or also to the general public after some months or to anybody from the beginning? Another factor is sustainability of publishing models. It is important for users to be able to have access to articles in the same manner at any time. Publishing open-access e-journals and constructing the digital archives worldwide is proceeding fairly well in research fields such as physics, chemistry, medical and biological sciences. Whether or not information should be free of charge in the Internet society was a key topic of discussion, particularly the new information produced by the magnificent effort of talented scientists at significant cost for research. A final issue

was how people in developing countries, who often lack education, hardware and software, could access this “open” information.

D3: Science and Technology for/in Developing Countries

How can capacity building in science and technology contribute long-term solutions to stability and prosperity in developing countries? What has experience taught us about types of programs and best practices that are most effective in building S&T capacity in developing countries?

Session Chair: Atkinson, George H., *Science and Technology Advisor to the Secretary of State, U.S. Department of State, US*

Speakers:

- Brito, Lidia, *Assistant Professor, Department of Forestry, Eduardo Mondlane University, MZ*
- Hassan, Mohamed Hag Ali, *Executive Director, The Academy of Sciences for the Developing World (TWAS), SD*
- Myint, U. Than, *President, Myanmar Engineering Society, MM*
- Saeed, Abdelrahman, *Minister of Science and Technology, SD*
- Shuttleworth, Mark, *Founder, Ubuntu Foundation, ZA*
- Sibisi, Sibusiso, *President and Chief Executive Officer, Council for Scientific and Industrial Research (CSIR), ZA*
- Velarde, Rene del Monte, *Congressman, Committee on Science and Technology, Congress of the Republic of the Philippines, House of Representatives, PH*

There is a growing gap amongst developing countries, with some 80 countries lagging behind. This problem will require South-South cooperation, including fellowships, as well as more North-South cooperation in capacity building, with focus on:

- National S&T, education and industry policies;
- Human resources, focusing on better teaching of science;
- Promotion of centers of excellence and virtual networks;
- Collaboration between the private and public sectors; and
- Better funding mechanisms that fund research, not just salaries.

Development will require linking knowledge to action. It needs both scientists and managers. They will help develop markets and use new opportunities such as enhanced bandwidth, to promote innovation and rapid movement from lab to market. Inspiration exists in places like Korea, which

went from the 3rd poorest country in the late 50s to the 11th largest economy now. It was done through real and sustained commitment to promoting S&T, a highly prioritized investment program, and a focus on building a developmental infrastructure for the whole country.

E3: Establishing International Collaboration in Science and Technology

How can we improve international collaboration schemes on “big science” subjects that one single country cannot deal with alone, such as ITER, space, and pandemics of infectious diseases?

Session Chair: Cleave, Mary L., *Associate Administrator for the Science Mission Directorate, National Aeronautics and Space Administration (NASA), US*

Speakers:

- Córdova, France A., *Chancellor, University of California, Riverside, US*
- Hentschel, Christopher, *President and Chief Executive Officer, Medicines for Malaria Venture (MMV), UK*
- Ikeda, Kaname, *Director General Nominee of the ITER Organization, ITER International Team, JP*
- Kennel, Charles F., *Director, Scripps Institution of Oceanography, University of California, San Diego; Former Associate Administrator at Mission to Planet Earth, NASA, US*
- Kosaka, Kenji, *Minister of Education, Culture, Sports, Science and Technology (MEXT), JP*
- Krieger, Robert J., *Chief Technology Officer, The Boeing Company; President, Boeing Phantom Works, US*
- Yaari, Menahem E., *President, Israel Academy of Sciences and Humanities, IL*

Changes in the nature of science and new trends in networking performed a large scale transformation in international S&T cooperation. Theme driven cooperation, such as the International Polar Year, and goal driven cooperation, such as the International Thermonuclear Experimental Reactor (ITER), are useful models. Establishing a focused goal and spending the effort early in the process is important. In the area of life science, seeking global common goods such as new drugs or vaccines for diseases that lack a market driven impetus, offers another model.



Sibusiso Sibisi



Mary L. Cleave

Furthermore, geopolitical reasons can be at the root of new forms of collaboration and serve in overcoming barriers in strife-torn areas. The Israel–Palestinian Science Organization is one example. Multisectoral S&T cooperation often involves industry and higher education, generating value for participating partners. The involvement of higher education requires greater student involvement, providing funding from grants to stimulate such activity and removing barriers of a regulatory or policy nature, such as stringent visa requirements. Other key issues included: ensuring access for developing countries, examining various models of cooperation, and for funding before outset.

F3: Media and Science and Technology

The media play a crucial role in educating and informing people on the development of science and technology. They also play a leading role in shaping public opinion on public acceptance of science, and forming values. What do they have to say about science and technology?

Session Chair: **Waldvogel**, Francis A., *Director of the Executive Board, World Knowledge Dialogue Foundation, CH*

Speakers:

- **Gannes**, Stuart H., *Director of Digital Vision Program, Center for the Study of Language and Information, Stanford University, US*
- **Goh**, Eng Lim, *Senior Vice President and Chief Technology Officer, Silicon Graphics Incorporated, US*
- **Kozhokin**, Mikhail M., *Deputy Chief Executive Officer, Vneshtorgbank 24, RU*
- **Mallet**, Victor, *Columnist and Asia Editor, Financial Times Group, UK*
- **Pooley**, Eric, *Managing Editor, Fortune Magazine, US*
- **Rubinstein**, Ellis, *President and Chief Executive Officer, New York Academy of Sciences, US*



Eng Lim Goh

barriers to be overcome for science news to reach large populations in the developing world or the backlash against science in some sectors of the public. People, having a short attention span and many competing worries, do not respond to abstractions about scientific theories but to

stories that are relevant to their lives. Therefore, even if not every scientist, but at least some should become willing and able to communicate with the media – and not be surprised when journalists insist on finding someone with a contrary view, in the name of “balance”.

16:30–17:30 Plenary Session: “Emerging Infectious Diseases Requiring Global Solutions”

In view of the serious threat caused by new pandemics such as SARS and the avian flu, the STS forum has introduced this major plenary session in order to establish a basis for worldwide cooperation to fight against this new global health challenge.

Session Chair: **McKinnell, Jr.**, Henry A., *Chairman of Business Roundtable and Chairman of the Board, Pfizer Inc, US*

Speakers:

- **Atlas**, Ronald M., *Dean, The Graduate School, University of Louisville, US*
- **Lvov**, Dmitry K., *Director, The D.I. Ivanovsky Institute of Virology, Russian Academy of Medical Sciences, RU*
- **Meyers**, L. Richard, *Lead Operations Officer, Human Development Sector Unit East Asia and Pacific Region, The World Bank, US*
- **Omi**, Shigeru, *Regional Director, Regional Office for Western Pacific, World Health Organization (WHO), JP*

Henry McKinnell, Jr.

explained that tremendous strides are being made against chronic non-infectious diseases, such as cancer and heart disease.

However, there is a new threat from infectious disease, not merely SARS or Avian flu, but HIV, HCV (which McKinnell believes will have an even bigger impact than HIV) or drug-resistant tuberculosis, which will affect both developing and developed countries. There have been roughly 3 pandemics every 100 years and another pandemic is now overdue. To prepare, the unique capabilities of the research-based pharmaceutical industry should be encouraged. In the private sector, where companies such as Pfizer develop, discover, and produce 95% of all medicines, the public sector can help make the most of biomedical efforts by advancing basic science and supporting intellectual property rights.



Henry A. McKinnell

Richard Meyers stated that the World Bank has become increasingly concerned about emerging infectious diseases with their impact on human capital, the subsequent influence on economic development, the overall economic and financial implications and their consequences on the world's poor. Meyers suggested that transparent public information policy is perhaps the most potent weapon, because people

must know what steps they could take to help avoid infection. These diseases may have dramatic impact or may not, but the world should be prepared in case they do. And since they are not likely to go away, it is important to strike a balance between short and long-term interventions and make a substantial investment into national and international efforts in capacity building in the areas of surveillance, diagnostics and animal health services.



L.R. Meyers

for example in Vietnam. The three main factors for success are public awareness, compensation mechanisms for farmers who must cull their infected chickens and – most importantly – good animal surveillance. Should it come to the worst, a human pandemic, the window of opportunity is very small: within about two weeks, detection, response, and proper measures of containment are vital. In reality, only half of the human cases reach the WHO within this period.

Ronald Atlas related that infectious diseases are the leading cause of death worldwide. Reasons are the inability to deliver clean water resources and the lack of education to limit the spread of sexually transmitted pathogens, but also the fact that microbes are continuing to evolve at very high rates and in unpredictable ways. The failure of any nation to detect the emergence of

a new and deadly pathogen and to sound an alarm loudly so that the public health system can respond, places the entire world at risk. Therefore, global surveillance networks must be increased and new diagnostic technologies and approaches that could be used easily anywhere in the world are vital. Over half of the emerging diseases are zoonotic, so it is crucial to have effective cooperation between human and animal health agencies.



Ronald M. Atlas



Dmitry K. Lvov

Dmitry Lvov stated that the problem of emerging infections has a high priority because they are unpredictable and able to provoke extraordinary epidemic situations, an example being the case of bioterrorism. However, he warned that the most dangerous terrorist is nature, mentioning the extensive outbreak of West Nile Fever and the huge threat coming from Avian Flu. The viruses causing those infections are normally transmitted by

mosquitoes or ticks and spread to other regions by migrating birds. The study of the evolution of such viruses is the primary object of investigation, with the goal of understanding where, how and why viruses evolve in order to predict future evolutions and get vaccines.

Shigeru Omi informed about the current situation of the Avian Flu. In Asia, the virus is already entrenched and it may not be possible to eradicate it, but in some countries the efforts made by governments and the community were successful in bringing the transmission under control,



Shigeru Omi

September 12, 2006, Tuesday

8:00–9:45 Plenary Session: Summaries from Concurrent Sessions

Rapporteurs reported the results of discussions from the concurrent sessions.

Session Chair: Lee, Yuan Tseh, President, Academia Sinica, Chinese Taipei

Speakers:

Track A **Zehnder**, Alexander J.B., President of the Board, ETH – Swiss Federal Institute of Technology, CH

Track B **Desmarescaux**, Philippe, Chairman, Scientific Foundation of Lyon, FR

Track C **Anzai**, Yuichiro, President, Keio University, JP

Track D **Serageldin**, Ismail, Director, Library of Alexandria, EG

Track E **Carty**, Arthur J., *National Science Advisor to the Government of Canada, CA*

Track F **Omenn**, Gilbert S., *Chairman of the Board, American Association for the Advancement of Science (AAAS), US*

Samarasekera, Indira V., *President and Vice-Chancellor, University of Alberta, CA*



Alexander J.B. Zehnder

Alexander Zehnder stated that supply of energy and water can only be sustainable with decreasing global consumption. The developed world should cut down on its energy consumption (mostly through technological advances), while it allows a controlled increase for the developing world. On the other side stands the problem of pollution. Carbon, the main fossil energy source at the moment, is among the most polluting. That is why

renewables and nuclear energy should receive strong consideration. As for water, suitable strategies to improve water infrastructure and treatment of wastewater must be found especially for the Middle East, North Africa, China and India, where water shortages are/will be most severe.

Philippe Desmarestaux summarized the sessions dedicated to Life Science. A “1000 dollar genome within 2 to 3 days” is the next target in genomic research. It would allow the development of new medicines, efficient diagnostic tools and tailor-made therapies, and therefore reduce health costs. However, care must be taken in regard to ethical issues, genetic discrimination and issues of privacy such as the ownership of genomic information. New partnerships between different actors in life science and the integration of technology (e.g. IT) have proven to be very fruitful and a convergence of modern and traditional medicine is promising. Food security is especially an issue in countries such as Africa. It is a goal to reach self-sufficiency and sustainability for each country by using a mixture of modern plant biotechnology and traditional agronomy.



Philippe Desmarestaux

Yuichiro Anzai stated that the sessions on ICT were concerned with the explosion of the number of people, devices, pieces of software and information, and the rapid increase of the possible speed of communication.

Particularly, networks and databases in the future, and already in the present, are characterized by open networks and open-access databases made available mainly through the Internet. Discussions were held about “the future Internet Society” and issues such as digital-divide, the gap between rich and poor, the language barrier (English) and security. The appropriate degree of openness, the need for sustainability of publishing models and search engines for the increasing number of scientific reports were discussed in the session dedicated to “open access to information”.



Yuichiro Anzai

Ismail Serageldin called for a world where knowledge is a fundamental right and the sharing of knowledge a fundamental duty. Science literacy should be enhanced through the educational system (by teaching how to reason and encouraging curiosity), the media and the Internet. American universities are highly competitive because they work with industry and

provide creative environments for researchers. Europe and Asia are following, but Africa needs to make deeper reforms. In general, there should be more horizontal cross-cutting. There is a growing gap among developing countries with a resulting need for South-South cooperation (e.g. fellowships) as well as North-South cooperation in capacity building through national policies, human resources, cooperation between private and public sectors, or funding.



Ismael Serageldin

Arthur Carty reported that the world invests heavily into nanotechnology and more private companies engage in it. Driving forces are promising and will have major implications for healthcare. It is time to start to establish standards and regulatory regimes. IPR should be seen as an indispensable incentive for R&D and innovation. Globalization leads to a need for harmonization of the territorially limited IP systems with the ultimate goal of a world system. Additionally, this should include a body similar to the IMF, assisting developing nations in getting access to IPR. Examples of international collaboration in S&T are the “International polar year” or “CERN”. They can help in overcoming cultural barriers and they should try to include developing nations and students while focusing on a goal with clarity in program design.



Arthur J. Carty



Gilbert S. Omenn

become willing and able to interact with the media and to deal with critics. More brainpower is necessary for the rapidly emerging knowledge-based economy. Involving women brings more diversity and novelty, added **Indira Samarasekera**. It is important to promote outstanding women throughout their careers, especially in their critical mid-careers (e.g. offering childcare).

10:15–11:15 Plenary Session: “Science and Society”

Session Chair: **Yoshikawa**, Hiroyuki, *President, National Institute of Advanced Industrial Science and Technology (AIST), JP*

Speakers:

- **Furukawa**, Kazuo, *President and Director, Hitachi, Ltd., JP*
- **Jarjis**, Jamaluddin bin Dato' Mohd, *Minister of Science, Technology and Innovation, MY*
- **Mangena**, Mosibudi, *Minister of Science and Technology, ZA*
- **Richter**, Burton, *Director Emeritus, Stanford Linear Accelerator Center (SLAC), Stanford University, US*
- **Seweryński**, Michał, *Minister of Science and Higher Education, PL*

Hiroyuki Yoshikawa

expressed concerns about whether or not a common language exists among scientists, policy makers and business leaders. However, he thinks that is has been in the process of development through past forums and interest and awareness are being raised. Everyone aims at getting good results, but those results are local. It is the integration of those local results that



Hiroyuki Yoshikawa

sometimes creates shadows. So it is not easy to understand the mechanisms which create benefits or threats. He thinks that the relationship between science and society is a very wide subject and he must confess that modern sciences are weak at it, since their strength lies in making well structured disciplinary knowledge. He therefore regards continued dialogues important for the future.



Mosibudi Mangena

Mosibudi Mangena illuminated efforts of the south to become a stronger player. He mentioned the Second G77 Minister's of Science and Technology Meeting. The ministers committed themselves to ensure higher levels of science, innovation and technology through a variety of mechanisms, namely through greater national investments, with emphasis on human capital development and infrastructure as well as a

broadening and deepening of international cooperation. Furthermore, the minister's meeting endorsed the declaration of the third world network of scientific organizations to transform itself into the consortium of science, technology and innovation of the south in accordance with the South Summit. This is a great step forward for Africa and the developing world.

Michał Seweryński expressed Poland's commitment to continue to invest in education and to improve cooperation between academia and industry in order to enhance innovativeness. New threats pose dilemmas in society, for example the ever rising costs of research, ethical issues or exportation of substandard technology to less developed countries.

The global science community, but also the government and the industry should accept greater responsibility for its research and new technologies. Ethics should progress at a faster pace. Science is characterized by a rejection of dogma, openness to new ideas, and an emphasis on logical arguments, cooperating internationally. Could this concept not be extrapolated to a broader range of political issues?



Michał Seweryński



Jamaluddin bin Dato' Mohd Jarjis

based economy with a young population. Another point is that it is very hard for them to compete globally in R&D, given the fact that there is much more money in the west for that.

Burton Richter talked about energy supply for the rapidly developing countries. He thinks that energy is closely connected to global warming and therefore sees a need for the scientific community to provide policy makers with "cleaner" technical options that will allow energy use to increase. Two points are of interest: efficiency and nuclear. The latter is good for both solving the issue of

energy security as well as avoiding climate change. Developing nations have to start to contribute in solving this issue. It should best be done through economic incentives



Burton Richter

such as taxes or licenses. He identified one of the problems of the Kyoto protocol to be the presence of too many players. A smaller group containing the nations with the highest expected energy consumption rates would be more appropriate.

Kazuo Furukawa explains with the example of brain science what the industry can do with newly developed technologies. At Hitachi, a non-invasive method was invented for measuring brain activity. Its applications were twofold: one made further scientific

research possible and led to a new discipline. The first result is the discovery that babies are able to distinguish the native language they have heard in the womb. On the other hand stands the practical application where this technology is transformed into a product in response to the needs of society. So this method can be used to gather biometrical data in order to meet new security standards.



Kazuo Furukawa

11:15–12:00 Closing Plenary Session: "Paving the Way for the Future"

Session Chair: Wallberg-Henriksson, Harriet, President, Karolinska Institutet, SE

Speakers:

- Okamura, Tadashi, Chairman of the Board, Toshiba Corporation and Vice Chairman, Nippon Keidanren (Japan Business Federation), JP
- Omi, Koji, Member, House of Representatives, JP
- Platé, Nikolay, Vice President, Russian Academy of Sciences, RU
- Zerhouni, Elias A., Director, National Institutes of Health (NIH), US



Harriet Wallberg-Henriksson

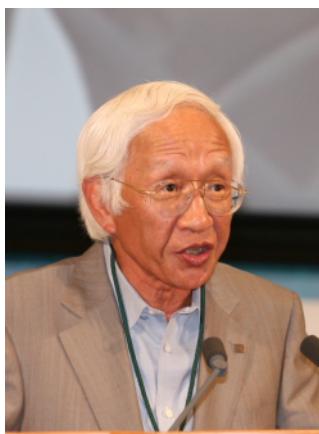
Harriet Wallberg-Henriksson thinks that 3 points are essential to secure a better future. The first is to invest in the brightest of the younger generation. Secondly, all resources should be used. It is vital for young women to be supported and encouraged to participate at all levels, otherwise 50% of the talents would not be utilized.

The third key to success is communication. Scientists should be clear on the point of what, why and for what benefit they are doing things and be able to pass this on to politicians in order for them to understand and help in the implementation of measures.



Nikolay Platé

provision of political and financial support for prevention and medicine. He called for an international collaboration, with the developed world helping developing countries. Additionally, he mentioned a growing anxiety due to the fact that human psychology lags behind the fast development of science and technology.



Tadashi Okamura

young age. Changes should be made in universities given the growing need not only for specialists, but also for generalists. It would be advisable for leaders to look ahead 10 years from now and ask themselves if they have done enough to train their successors to deal with the issues that have been discussed.

Elias Zerhouni sees the need to understand the forces of the present in order to become able to influence the future. The key phenomenon is what he calls a “divergent bi-globalization” leading to “connected globalization” producing the benefits, but also to a “globalization of disconnecting” creating the problems. A part of the world is increasingly disconnected. Has knowledge per capita also increased, given the rapid population growth?



Elias A. Zerhouni

Which globalization will predominate when population grows further? There is a need for discovery to be accelerated in order to understand the complexity of biology and behavior. Furthermore, understanding gene-environmental interaction will determine success and will ensure that policies that will be required for sustainable environments will be promoted.



Koji Omi

Koji Omi related the key points that had arisen during the course of the forum. It is of utmost importance for humankind to attain sustainable development by striking a harmonious balance between economic activity and protection of the environment. It is necessary for rapid progress to be made in energy efficiency. The increased provision of funds for basic research, the maintenance of incentives for academic and private research, and the establishment of common international rules or standards that would make research collaboration in all countries possible, are salient. It is urgent to develop vaccines and medical therapies to combat infectious diseases such as AIDS, Avian flu, malaria, and tuberculosis. In the realm of ICT, enabling access to scientific information is crucial. In the area of intellectual property rights, the idea of building a global, integrated system was raised.

12:00–13:00 Farewell Buffet Lunch



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Because international efforts to address these problems are needed now more than ever, the forum gathers every autumn top opinion leaders of various backgrounds including scientists, researchers, policymakers, business and media from all over the world

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