Executive summary

First Workshop on 'Human Resources Development in Nanotechnology' in Asia

Bangkok, July 5-7, 2003
School of Advanced Technologies, Asian Institute of Technology

*The Asia Pacific Nanotechnology Forum (**APNF**), the School of Advanced Technologies of the Asian Institute of Technology (**AIT**), and the National Metal & Materials Technology Center (**MTEC**) of the National Science & Technology Development Agency (**NSTDA**) invited renowned Nanotechnology experts from Asia, Europe, and North America to present their insights on various issues related to Human Resources Development in Nanotechnology. The Workshop took place in the NSTDA conference facility at the Thailand Science Park.*

Speakers:	
Prof. Pairash Thajchayapong, Director, NSTDA, Thailand	Prof. Heinrich Hofmann, EPFL, Switzerland
H.E. Vice Minister of Science & Technology, Kwang Robkob, Thailand	Prof. Jöns Hilborn, Uppsala University, Sweden
Dr. Jurgen Schulte, Executive Director, APNF, Australia	Prof. John Ralston, Director, Ian Wark Institute, Australia
Prof. H.N. Phien, Dean-SAT, AIT, Thailand	Dr. Alison Downward, MacDiarmid Inst. of Advanced Materials and Nanotechnology, NZ
Assoc. Prof. Joydeep Dutta, AIT, Thailand	Dr. Joe Shaptor, Flinders University, Australia
Assoc. Prof. Paritud Bhandhubanyong, Director, MTEC, Thailand	Dr. J. J. Gooding, Univ. of New South Wales, Australia
Prof. Wiwut Tanthapanichakoon, NSTDA, Thailand	Prof. M. Yahaya, Univ. Kebangsaan, Malaysia
Dr. Itti Rittaporn, Director, TMEC, Thailand	Prof. Phan Hong Khoi, NCST, Vietnam
Dr. J. Light Feather, The NanoTechnology Group, USA	Prof. Mats Boman, Uppsala Univ., Sweden
	Prof. Hiroo Niiyama, Tokyo Institute of Technology, Japan

Nanotechnology is expected to permeate many areas of science and technology outside of the traditionally strong fields of development and engineering. The changing scenario of technology and product development is leading to a challenge for the academic community to educate engineering and other biosciences students with the necessary knowledge, understanding, and skills to interact and provide leadership in the emerging world of Nanotechnology. The interdisciplinary nature of research and applications further warrants dedicated training of engineers and scientists to prepare them for the next round of industrial revolution. The current view is that a lack of skilled workers would diminish opportunities to fully utilize the possibilities promised by this technology In the Asia-Pacific region, as in other parts of the world, it is important that qualified human resources are developed within a short span of time to address the future requirements of workers in the field of Nanotechnology to maintain the competitiveness and enhance future economic growth of the region.

Invited speakers and some delegates posing with H.E. Vice Minister for Science & Technology, Thailand, Kwang Robkob at the inaugural function.

The first Workshop on Human Resources Development in Nanotechnology in Asia was held on July 5-7, 2003, at the Thailand Science Park in Bangkok, Thailand. This workshop was a first of its kind, worldwide, that was organized by the School of Advanced Technologies (SAT) of the Asian Institute of Technology (AIT) and the Asia Pacific Nanotechnology Forum (APNF) with major financial support from the National Science and Development Agency (NSTDA) and logistics and organizational support from the National Metal and Materials Technology Center (MTEC), Thailand. Expert delegates from Australia, Japan, Malaysia, New Zealand, Sweden, Switzerland, Thailand and Vietnam discussed pressing issues about human resources development in Nanotechnology ranging from challenges and possible avenues in secondary and tertiary education to requirements at industry and senior levels in business and government.

The Workshop was opened by the Vice Minister for Science and Technology of the Royal Government of Thailand, His Excellency Kwang Robkob, who expressed a keen interest in the issues surrounding Human Resources Development in Nanotechnology by personally attending the first half-day of the workshop. At the opening ceremony the President of NSTDA, Professor Pairash Thajchayapong, announced that the proposal for the establishment of a new National Nanotechnology Center under the umbrella of NSTDA has been approved by the Screening Committee of the Cabinet of Thailand and is expected to gain approval from the Cabinet within the next few weeks. He also mentioned the proposed appointment of Prof. Wiwut Tanthapanichakoon as Acting Director of the new Center. Dr. Paritud Bhandhubanyong, Director of MTEC, Dr Jurgen Schulte, the Executive Director of APNF and Prof. Huynh Ngoc Phien, Dean of the SAT of AIT, set the stage for the workshop discussion

Dr. J Schulte presenting economic and technology indicators for Human Resources Development in Nanotechnology at the opening presentation.

Prof. Pairash Thajchayapong, Director of NSTDA, announcing approval of the Nanotechnology Center by the Screening Committee of the Cabinet of Thailand.

by presenting economic and technology indicators for assessing human resources requirements in Nanotechnology while Dr Joydeep Dutta of the School of Advanced Technologies at AIT, introduced the basic concept of the workshop for the two days and what was expected from this conglomeration of eminent scientists, researchers and educators during the two working days of the workshop.

After almost one year of careful planning, Dr J. Dutta (AIT) and Dr J. Schulte (APNF) delivered a most productive workshop that addresses key issues such as education requirements in Nanotechnology in the various parts of Asia, educational models, the development and implementation of specific programs in Nanotechnology, design of educational programs for specific present and future needs in industry, and inter & intra-region programs. In addition, discussions regarding the necessity of cross cultural communication, not only between countries, but within the academic community to start the integration and unity of specific fields of study such as chemistry, physics, biology, and engineering. This workshop is expected to be a stimulus to forge future collaborations amongst the participants of the Asia-Pacific nations. Already, new seeds have been planted through discussions about collaboration projects ranging from the development of Nanotechnology education to specific human resources developments in this region.

The speakers presented their views on nanotechnology Human Resources development through their own experience in developing training for industries, outreach programs for school children, retraining of educators, undergraduate and graduate level courses and specific topics covered. Prof. Heinrich Hofmann from Switzerland mentioned that the cross-disciplinary nature of nanotechnology has made discussions amongst experts very difficult, which need to be addressed by training future nanotechnologists who can easily address the diversity of educational needs. Prof. Jons Hilborn stressed on the need for international collaborative teaching and research and the adoption of a cross-cultural approach to make full use of the talents abiding in the region. Speakers from Australia, Prof. Ralston described how colloids would play an important role in Nanotechnology while, Dr. Joe Shaptor and Dr. J. J. Gooding, introduced their cutting-edge experiences in teaching undergraduate nanotechnology courses and presented ways on improving upon this experience. Dr. Downard from New Zealand talked about an interesting 'outreach' program to get high-school students interested in nanotechnology. Prof. Yahaya and Prof. Thuy completed the session lectures by describing the plans for nanotechnology human resources development in Malaysia and Vietnam, respectively.

H.E. Vice Minister for Science & Technology, Thailand, Kwang Robkob delivering the inaugural speech.

Dr. J Dutta presenting world wide Nanotechnology Human Resources Developments and Higher Education Programs.

Dr. Paritud Bhandhubanyong, Director of MTEC, welcoming participants at the opening ceremony.

Prof. Wiwut Tanthapanichakoon of NSTDA, Acting Director of the proposed Nanotechnology Center, outlines the strategy of HRD in Nanotechnology for Thailand.

In the second day Prof. Mats Boman began the lecture session with a presentation of an effort by Uppsala University (Sweden) to build up a European Union project to teach masters level Nanotechnology program between Europe and Asia. Following this Professor Wiwut Tanthapanichakoon from NSTDA presented the 'Nanotech Requirements for Thailand'. He informed the audience about the proposed Nanotechnology Center in Thailand with an aim to produce 300 researchers in nanotechnology, and a budget of $25 million (US). Human Resources Development was identified as the key to the success of Nanotechnology development in Thailand. Finally, Dr. Dutta gave an overview of various nanotechnology programs being run across the globe and set up the stage for the discussion sessions that followed throughout the afternoon of the second day.

Dr. Itti Rittaporn of NSTDA, Director of TMEC chairing a session on the curriculum development projects worldwide.

A panel discussion was organized with the panel comprising all the invited speakers to discuss about the human resources needs in nanotechnology and measures and suggestions on how to achieve these requirements. In this discussion, many participants felt that though advanced experimental instruments and techniques were necessary for the training of nanotechnology experts, several simpler less expensive equipments and experiments could also be used to disseminate knowledge to the trainees. An issue concerning the limited number of current students interested in the new Nanotechnology courses was also addressed and it was agreed by the panelists that efforts should be made to reach the general level of the societies and to demonstrate the importance of nanotechnology based developments for our future. Therefore, a short-term solution to the present lack of student awareness concerning nanoscale science education was not available, with the exception of developing a higher volume of students from other countries. However, after considering the long-term effect of utilizing these remote nano labs in early education, it soon became apparent that early exposure to these exciting new fields would stimulate and expand the student interest in the coming decade. The Workshop attendees were very receptive to new ideas, which were proposed as parts of both long-term and short-term solution-based planning for our combined efforts at developing an enhanced global Nanotechnology workforce for the future.

H.E. Vice Minister for Science & Technology, Kwang Robkob, discussing with delegates during the break.

Dr. Schulte (left), H.E. Vice Minister for Science & Technology, Kwang Robkob (middle) and Prof. Huynh Ngoc Phien (right) exchange views.


Focus groups discussing about Interdisciplinary Programs, International Programs, Industrial Training, Faculty Enhancement, Graduate and Undergraduate education..

Another Focus discussion group.

Dr. Chanchana and Dr. Light Feather reporting the review of their groups discussions to the participants.

Prof. Hofmann summarizing the outcome of focus discussion to the participants, while Prof. Phien, Dean SAT-AIT (right) giving the vote of Thanks.

Atmosphere in the auditorium during the talks.

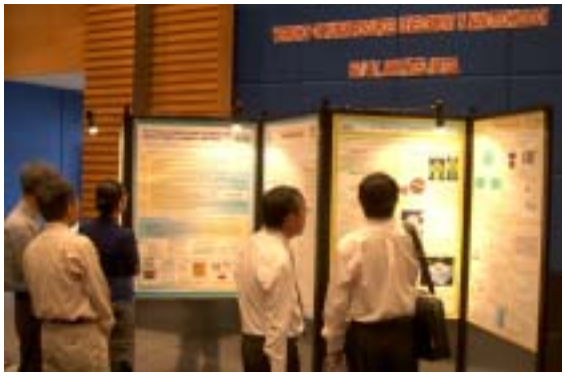
Panel discussion (from left to right): Dr. Downard, Prof. Ralston, Prof. Hofmann, Prof. Hilborn, Dr. Gooding, Prof. Boman, Prof. Niiyama, Dr. Shaptor, Prof. Wiwut and Prof. Thuy (Dr. Schulte in the foreground).

The afternoon of the second day was organized as a working session where three groups of participants were given specific targets to discuss. This was followed by a summary of the groups' results compiled and presented by Prof. Hofmann. The following were the recommendations made for the development of human resources in nanotechnology:

- Find out the needs of the industry in each country to establish plans for future nano products. Search for Supply and Demand side of prospective niche products.
- Translate English teaching materials into regional languages and / or build up the students' English proficiency to follow courses in nanotechnology.

- Develop informational workshops to introduce and address virtues of nanotechnology to industries.
- Re-train faculties in Universities to enable them to teach nanotechnology through short term and specialized courses.
- Identify overlaps amongst faculties, learn more about each other's subjects and develop inter- and intra-departmental collaborations in Universities.
- Utilize a lecture / research combination for nanotechnology training.
- Create a network for the exchange of students amongst Universities in Asia-Pacific as well as more developed nations in Asia, Europe and America, so that final year masters students can make use of the vast available infrastructure of the advanced countries to achieve hands-on learning experiences.
- Collaboration on textbook development preferably made available over the internet for easier dissemination of information irrespective of the buying power of students
- Expanded modules of current syllabus to add subjects specific to nano science information in Biology, Physics, Chemistry, and Mathematics
- Include subjects based on engineering disciplines necessary to develop the Human Resources in these areas.
- Schedule interactive lectures given via electronic media from various universities and interrelated disciplines.

The workshop banquet organized at AIT Conference Center.



Workshop participants getting acquainted to nanotechnology R&D in Thailand.

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