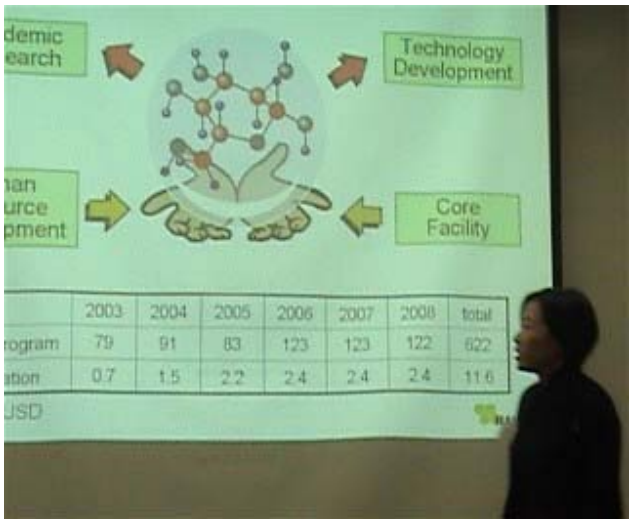
The 1st International Collaboration in U.S. on K-12 nano science courses

A long-held dream of a team of engineering professors and teachers from Taiwan to visit the United States and share their vision for K-12 nano science education was a very informative experience for the participants from both countries. Similarities between the program development regarding teacher training and the complexities involved in expanding current education to include new material were discovered as the team gave their presentations.

Their program is titled: **Nanotechnology Human Resources Development (NHRD)** organized to address the importance of having skilled and dedicated workers for their technological advancement in the emerging integrated fields of science that will address nanotechnology in the near future.



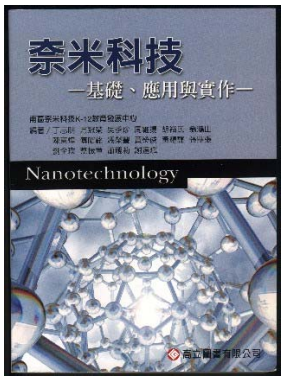
Left: Dr. Pei-Ling Liu (Program Leader) gives presentation

Launched in 2002, the program was developed to undertake the task of education and teacher professional development in cooperation with the Ministry of Education. From the beginning the program has included K-12 education along with the needs of higher education at the university level. In comparison the United States National Nanotechnology Initiative (NNI) which launched in 2000, has still not addressed primary grades education funding, except as outreach component programs by centers funded for research. The first NNI Nano Center for Teaching and Learning funded to address modules for middle school was announced in 2005, while Taiwan considers K-12 education to be a primary part of the project from the inception stages of their programs.

The Taiwan K-12 Nanotechnology program is located at the Institute of Applied Mechanics, National Taiwan University with a focus on providing teachers information about nanotechnology and to develop materials to inspire students to learn about this advanced technology. Established in August of 2002, a pilot program was initiated with "seed teachers" and was so successful that the Ministry of Education established the full K-12 program in January, 2004, expanding the program to include 5 regional centers around the county which can customize their activities for teacher training and instructional materials development.

In just two years of operation, engineering faculty from 17 universities and 193 teachers

from 169 schools participated in programs at the regional centers. Even though the teachers knew very little about the science or technology when they entered the program, they were able to develop 224 lesson plans, write one set of textbooks, a comic book, and create one animated film.



A large textbook with instructions for experiments from the many lectures they attended is scheduled for printing in December 2005. A copy of the textbook (451 pgs.) printed in Chinese was on display and the diagrams and photos included with the text clearly showed the quality of the teachers understanding.

Along with the training sessions, they established five regional Atomic Force Microscope (AFM) Labs for the teachers and students along with a touring van outfitted with scientific instruments for school visits. The program also included lectures and workshops, on-line courses, websites and newsletters.

The teacher workshops were the primary method where experts, professors and experienced "seed" teachers gave talks and led hands-on activities. Topics included carbon nanocapsules, carbon nanotube models, and making nano solar cells. Laboratory tours were arranged with visits to the National Science Council Northern Region Micro-Electro-Mechanical Systems (MEMS) Research Center and the Industrial Technology Research Institute (ITRI).

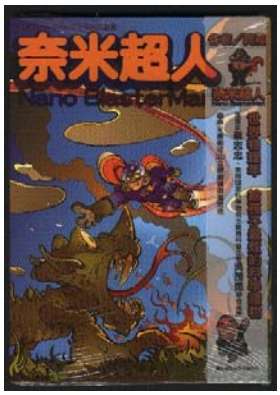
Development of Lesson Plans and Instructional Materials was the next phase of the project. Most of the teachers preferred to work with colleagues in the same schools and the new teaching materials were discussed during regular meetings to make sure they were suitable for the various grade levels of students. Materials were then evaluated in terms of the national curriculum at elementary and junior high schools, tested in trial classrooms, re-evaluated to be sure they were successful, and then presented at the second annual conference.

To assemble the instructional materials, the lessons, pictures, and text created by the teachers were collected and published as a three-part book titled: **Nanotechnology Symphony: Physics, Chemistry and Biology**. As introductory material about nanotechnology, the book contains concepts such as nano-size, nano-material, nano-catalyst, photonic crystal, and various applications, along with 6 experiments designed to give students hands-on experiences in a regular high-school laboratory. The experiments also included various topics such as synthesis of aqueous ferrofluid, and diffraction of laser beams with ferrofluid.

The animated films and comic books projects took a special effort of design and development

with a first testing in flash animation created by teachers in elementary schools, and then reworked with professional help provided by the main program office.

The animated film titled: **A Fantastic Journey for Nana and Nono** was released in July 2004 introducing the basic theory of nanotechnology and applications for daily life from a child's perspective. The 15-minute film was developed in Chinese language with English subtitles and in August 2004, Thailand signed an international contract to use this animated film in their schools.



The Comic book titled: **Nano BlasterMan** was created for middle school students and depicted the adventures of a superhero named Nano BlasterMan who could use the power of nanotechnology to fight evil. The comic book was suggested by teachers, drawn by a professional illustrator, but confirmed by the engineering faculty for technical details.

A high school lesson was also developed from the best-selling science fiction book **PREY** by Michael Crichton, where the teachers took advantage of the story line to show the real science of bionanotechnology and to discuss the social implications. During discussions at UW, Wendy Crone asked the presenter about that course of action. As she stated, "In the United States, science fiction books are ignored basically due to the bad science within the storyline, therefore, would never be included in instructional materials." However, the results from the lesson in Taiwan were expressed as helpful to the students, who would read the book anyway and wonder if it could really happen. By addressing the story in class, it gave the teachers an opportunity to teach discernment between real science and science fiction and created a more informed society.

In order to give teachers and students experience with advanced nanotechnology equipment, the regional centers set up AFM labs at the participating universities. Starting in September 2004, the equipment was purchased and the AFM manuals were developed for the K-12 teachers and students.

To reach schools in remote areas, the main program office worked with the National Taiwan Science Education Center in Taipei to build a demonstration van in 2004. Domestic products such as cloth, tiles and tennis racket nets, which used nano materials were displayed along with the animated films, AFM microscopes and hands-on activities such as light penetration and reflections of buckyballs. The van was staffed by volunteer teachers who would then visit the schools.

The Higher Education Nanotechnology Program was also in development at the same time as the K-12 was being established. Five regional centers were also established to coordinate resources and develop the interdisciplinary Nano curriculum, along with a web platform that was set up for researchers and academics to share curriculums and teaching materials.

In just two years, engineering faculty at thirteen colleges and universities worked together to develop a number of nano programs including courses in fields such as Mechanics, Electricity, Optics, Materials, Chemical engineering, Environmental Engineering, Manufacture, Measurement, Biomedical Engineering, MEMS, Physics, and Chemistry. The all inclusive programs introduced nanotechnology techniques while providing teaching materials and establishing research environments that aimed at conducting cross-department education and study of the theories and techniques. They also developed human resources from these courses for the emerging nanotechnology industries.

Cooperation is the key to their success by inclusion of all levels of students into their NHRD program at the very beginning of the initiative. The final segment of the program was the operation training for equipment. In cooperation with the Core Facilities Program of the National Science and Technology Program for Nanoscience and Nanotechnology, the Higher Education Regional Programs carried out experiments and Nanotechnology related training and operation courses for both pre-service and in-service training for engineers. Through this program, engineering students are able to have hands-on experiences in operating important equipment in the field of Nanotechnology and to increase their comprehension of practical applications in the various fields.

The NHRD program also hosts local and international conferences for people from various industrial and academic fields to interchange information and discuss research collaborations. The conferences encourage creativity and development of future industries. As experts at sharing ideas, the Taiwan conferences help the academic fields provide their research achievements for industry applications and exchange experiences in developing Nanotechnology human resources. Through this industrial-academic cooperative education, human resources are developed to meet the needs of industry to advance the development of Nanotechnology in

Taiwan.

Their National Competition on Innovative Nanotechnology and Nanoscience has a goal of developing research and professional skills and positive attitudes in college students about the field. Students are required to design, experiment and revise their projects with creativity, independent thinking and resourcefulness. The first contest was held in 2003 and winners had the opportunity to demonstrate their projects at the National Museum of Natural Science.

The final program of importance is the Internationalization for knowledge sharing and dissemination of Nanotechnology. In 2005, NHRD took its first step to train international human resources with short-term graduates exchange programs between internationally well-known institute laboratories and international research and development centers.

Regular International cooperation in academic research and human training will be built in the near future with long-term exchange programs. NHRD will also seek to establish faculty exchanging visits to internationalize teaching and research. It is hoped that through the collaboration and exchange between academics and industry, and between local and international communities that their understanding and development of nanotechnology will flourish.

This first visit to the United States to collaborate on ideas for K-12 education will be a barometer of the acceptance between both countries of future exchange programs and projects to internationalize education and promote life-long learning experiences for faculty and students. Everyone involved in hosting this group at both universities enjoyed the information that was shared concerning their project for K-12 students and appreciated their enthusiasm after such a long journey for such a short visit.

Presentations on the projects described above were given at ASU and MRSEC-UW by the following Professors from the Program office and 5 Centers of the NHRD in the program:

Professors :

- **Dr. Pei-Ling Liu (Program Leader)**

Director, Institute of Applied Mechanics, National Taiwan University

- **Dr. Horn-Jiunn Sheen – Presentation for North Region**

Professor, Institute of Applied Mechanics, National Taiwan University

- **Dr. Jing-Tang Yang – Presentation for Mid-North Region**

Professor, National Tsing Hua University

- **Dr. Fuh-Sheng Shieu - Presentation for Mid-South Region**

Professor, National Chung Hsing University Department of Materials Engineering

- **Dr. Chao-Ming Fu – Presentation for South Region**

Professor & Head of Department, Applied Physics Department, National University of Kaoshiung

- **Dr. Yu-Shiu Lo – Presentation for East Region**

Assistant Professor of National Dong Hwa University Chemistry Department

Seed Teachers from the programs joined the group on the journey:

- Mr. Yen-Hung Pan - Teacher of Taipei First Girl High School
- Mr. Chin-Hui Chung - Course Experiment & Research Administrator of Lu Chu Senior High School

Photo: Prof. B. Ramakrishna (3rd from left) with group)

Arizona State University (ASU) was the first visit on the schedule and the excitement created around the visit was visible as Stephen M. Goodnick - Head of Nano Initiatives at ASU and Interim Deputy Dean of the Ira A. Fulton School of Engineering personally greeted everyone on a Saturday morning, normally a day off for all the participants.

The "Welcome" talk was presented by Dr. Peter Crouch, Dean of Fulton School of Engineering and Vice Provost for Global Engagement was on the **History of Microscopy**, followed by Professor B. Ramakrishna, School of Life Sciences, Project Director of INVSEE (Interactive NanoVisualization for Science and Engineering Education) and Director of the GK-12 project at ASU, who voluntarily spent many hours planning the agenda and became our personal guide and host during the two-day visit.

As Professor B. Ramakrishna *(photo-left)* described the evolution of nanotechnology education at ASU, their leadership in electron microscopy became apparent with the establishment of the John Cowley Center for High resolution electron microscopy in 1970, making them among the first to 'see' atoms and 'bonds'.

Nobel Laureate H. Rohrer, co-inventor of the STM was a visiting professor at ASU since 1993 and served as the Chair of the Advisory Board on the INVSEE project. Concerning nanoscience and technology he stated, *"In education for the nanoscale, students need to learn to work at the nanometer scale. This opens completely new dimensions on how we will approach and solve many problems in the future as we enter the nanometer age."*

Through this project they soon discovered that the information delivery rates between reading/hearing were at 100 bits/second versus seeing the visual information which had increased the rates to 200 million bits/second. This discovery contributes to the success of the INVSEE program as they found that students who only receive information by hearing/lectures FORGET details, if they process information that has visual elements, they REMEMBER the details, and if they interactively do the experiment in the online nano-lab, they will UNDERSTAND the details.

Based on the desire to convey the excitement of nanoscience and reinforce these key concepts in a visual manner the next step was taken between 1994 and 1996, as ASU developed the first multidisciplinary undergraduate SPM laboratory, with the first REU in the country focused on SPM in 1995-97. Between 1995 and 1998, ASU worked with the Maricopa community colleges to attract girls in grades 6-14 with the **Women Images in Science and Technology** program to attract and retain the students in science and engineering careers.

Continuing their outreach to the young students in the community they sent out the **Patterns in Nature Van,** containing a mobile microscopy laboratory with an Optical Microscope, Scanning Electron Microscope and Scanning Probe Microscope across the state in 1995, to introduce microscopy to tribal schools in remote areas along with local elementary schools. The program was so successful with the students and teachers that they developed the **Science is Fun** program in 1997, as outreach for elementary and middle schools with the Center for Solid State Science and the University College. Both programs are still operating currently, but a larger van, motor home or bus is needed to continue traveling to the primary grade schools, as mechanical problems and age have put it out of service.

From 1997-2002 they developed the first Web based SPM for education through the INVSEE program to integrate research with education and outreach. In discussions with the group it was clear that hopes for continuous expansion of the web-based program would someday allow students in grades 6-12 to learn about the nanoscale with the STM and AFM microscopes. Between 2002-2004 the **ARRIVE** project to adapt and adopt INVSEE's

resources with collaborating partners at UW Madison, Cornell University, Maricopa Community College and Western Arizona College started the process of expansion and sharing. It is our hope also that the 1st International Collaboration on K-12 nano science education will result in future discussions to share and expand the INVSEE resources to the students in Taiwan.

In conclusion of this presentation, we were left with this thought for our future… *"new tools alone do not create educational change. The power is not in the tool but in the community that can be brought together and the collective vision that they share for redefining classroom learning".* --- M. Riel

Many presentations were given on the extensive research that is ongoing at ASU, featuring Neal Woodbury, Director of the Center for BioOptical Nanotechnology, who also introduced the new Biodesign Institute under construction and led by George Poste, a world-renowned scientist and policy maker, followed by a short description of the newly funded NSF Center for Nanotechnology in Society headed by David H. Guston.

Jenny Si introduced her work on ASU's China Initiatives and Special Projects, followed by Qiang Hu's presentation on Environmental Nanotechnology research and education.

Marilyn Carlson, Director of CRESMET, Center for Research on Education in Science, Mathematics, Engineering and Technology gave a presentation on their innovative theory, close observation and scientific testing as the route to enhancing teaching and learning in America's classrooms. As an interdisciplinary research center to promote excellence in K-20 STEM education they pursue working alliances among educators, scientists, mathematicians and engineers in all levels of education along with industry, state and national education organizations. They are currently developing course material for teachers in fractal geometry, which match the goals of The NanoTechnology Group Inc. for measurements in nature and wavy surfaces at the nano scale of science.

Andrew Chizmeshya, Director of the Visualization Facility hosted a tour on our second day of the tour, explaining the simulation, modeling and instrumentation resources for K-12 education. Providing visual simulations for young students visiting his facility and leading them through a playful connection exercise creates a dance of chemistry, whereby they form a pattern of elements from the joining of hands. His soft manner and exploration of the wonder of science comes through to the youngest of students at age 5. Making science fun and interesting is the key to teaching and Prof. Chizmeshya challenges their curiosity through movement and the engagement of their agile young minds that have the desire and capacity to absorb new ideas and concepts by 'doing' the activity. During discussions after his presentation Judith Light Feather

of TNTG Inc., asked if he could develop a film in the future of the children participating in the described exercise. The film could be offered as a 'virtual experience' video module for teachers in K-3 as a classroom activity to introduce the elements at the atomic scale of science through movement and engagement of all the senses.

Michael McKelvy, Director of the Materials Science Lab gave a presentation on the **"Science is Fun"** demonstrations that he takes into K-12 classrooms throughout the year, which are fast-paced interactive science demonstrations. At the schools the interns introduce themselves as ASU students and invite the students to consider the opportunities waiting for them at the university. Each presentation lasts about 45 minutes and is adjusted according to the grade level and science background of the audience.

Afterwards, Kenneth Mossman and B. Ramakrishna showed a presentation of the **"Patterns in Nature Van"** project that travels to local area schools as it was not available for a tour. Both of these outreach programs stimulate a curiosity for learning science by participating in the activities.

Vincent Pizziconi, *(photo-left)* Kenneth Mossman and B. Ramakrishna presented the Interactive NanoVisualization for Science and Engineering Education (INVSEE) project with a tour of their lab. Live demonstrations of the scanning abilities of the microscope housed in a separate room were viewed online in the adjoining lab room, which allowed the participants to have the interactive experience of a student located anywhere in the world. The online lab experience brings the STM and AFM microscopes into the classrooms as the most important tools for imaging and manipulating matter at the nanoscale. They provide the 'eyes' and 'fingers' required for measurement and manipulation in classrooms where the actual microscopes would be 'far too expensive' for younger students to use.

The activities concluded with round-table discussions on collaborative activities and potential future partnerships between the two countries. One of the projects suggested was to work on translations from Chinese to English of the many resources that they had produced from their program for K-12.

The team then traveled to Madison, Wisconsin for two days with Professor Wendy Crone, Director of the MRSEC Center and Olivia Castellini, Post-doc of the Interdisciplinary Education Group and the Program Coordinator of the Internships in Public Science Education (IPSE) program at UW-Madison MRSEC.

An Overview of the education programs presented by Professor Wendy Crone *(photo-left)* started the sessions. Since Professor Crone is the Director of the Interdisciplinary Education Group (IEG) for the UW-Madison Materials Research Science and Engineering Center (MRSEC), they developed a theme titled: **Exploring the Nanoworld**. Their strategy has been to develop high-quality educational materials on nanoscale science and engineering topics for broad dissemination in the form of kits, labs and activities; to produce in-depth high-visual content, instructional resources on the web; disseminate innovative instructional materials at conferences and workshops. The Center's dedication to outreach and science literacy is extended through its many partnerships with other individuals and organizations.

The high-quality materials and products produced at the MRSEC undergo a series of assessment to measure their impact on participants. These involve the front end assessment, formative assessment during development and ongoing summative assessments using both internal and external evaluators. The tested materials have a high impact towards development of global science literacy and an educated citizenry due to their web-based dissemination.

They also provide a five-week (RET) research experiences for teachers program for middle and high school grades. The summer (REU) research experiences for undergraduates program is held for 10 weeks in partnership with the COE Diversity Affairs Office. From 1994-2004: 289 participants, 64% have been underrepresented minorities, 44% were women. Their Graduate Student Development program offers research abroad opportunities in the international program, mentoring of undergraduate researchers, professional development workshops, science communication and integration of research and teaching.

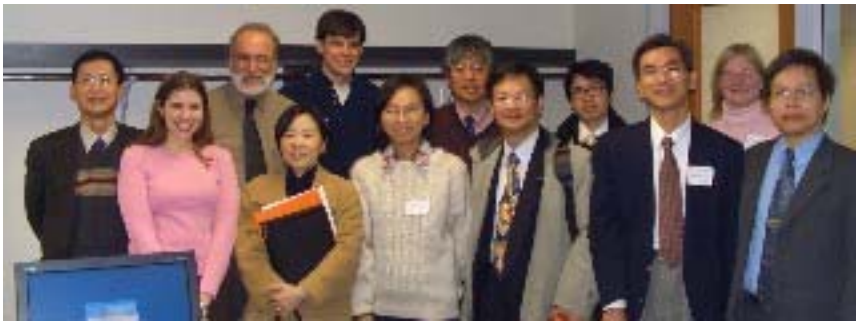
The Internships in Public Science Education (IPSE) collaborates with Milwaukee's **Discovery World** Museum, provides professional development for interns from a wide range

of disciplines, educates the public and students about nanotechnology, while providing a deeper understanding of scientific practices and connections among scientists, engineers and society. They are also working in exhibit development for museums under the program.

The MRSEC has interacted with nearly 30,000 kids, adults and teachers since 2000 and they aren't done yet. Keep your eye on their websites for more kits, instructional materials and modules for the classrooms.

The next presentation on **"Teaching the Size Scale"** was presented by Greta Zenner, Assistant Director MRSEC Education Group. "Size matters in understanding nano" so the more visual examples you can give an audience that are familiar from their real life perspective, the easier it will be for them to grasp the concepts of working at the atomic level. Limit the major concepts to 2-3 in your presentations to the public to avoid audience overload.

Tabletop demos were presented by Dr. Ken Gentry, with the Tabletop Kits demonstration for the group by Olivia Castellini. *(photo-left)* They are designed for Outreach hands-on experiments and adaptable to different age audiences. The kits included ferrofluid, probe microscopy, LED's, liquid crystal, carbon nanotubes and amorphous metal experiments. The Taiwan group was informed that the kits are available online at the Institute of Chemistry Education (ICE) website along with a solar cell kit which they would see at the next presentation. They were gifted two sets of the kits to take back to Taiwan and TNTG Inc. was gifted a set for developing education seminars as outreach and teacher workshops. The following morning, they were able to order enough extra sets of the experiments to take home for each of the 5 centers in Taiwan.



Janice Hall (2nd from left) and Prof. John Moore, (3rd from left) with group.

The Chemistry Outreach Activities and the new project funded through (NSEC/ICE) Institute for Chemistry Education for K-12 science were presented by Professor

John Moore. The ICE website has modules for classroom experiments for junior high and high school chemistry which can be utilized by students and teachers alike. Each demonstration has a movie and description of the experiment along with suggestions for materials. The MRSEC continuously adds new modules to the site as teacher resources for nano science. The ICE website also handles all the products developed by the MRSEC and these pages were shown to the group from Taiwan so they could disseminate the information back in their homeland. Extra order sheets were provided as the kits were defined and demonstrated.

Dr. Andrew Greenberg, developed a Societal Implications of Technology course for grades 9-12 that can be taught in 1-2 class periods either during science or social science. The course introduced an activity based on the students familiarity and use of wireless technology. When they were comfortable with the impact identified in society by a technology that they all were using, the teacher could then give a brief presentation introducing nanotechnology as defined by the government and some of its potential impacts. The course was funded by NSF and is also a product of ICE which can be purchased online.

Janice Hall, Project Director, presented her plans under the recently funded NSEC to develop teaching materials for K-12 teachers online and invited the Taiwan group to evaluate the program and make suggestions during the development stages from their country. She provided a link and password to everyone and took us to the website for a demonstration of the tools and areas of assessment that she is using for online course development.

This course will offer high school teachers and other educators the opportunity to learn about nanoscience and nanotechnology, and to discover how they can be used to illustrate both old and new scientific concepts. Ultimately, Nanoscience for Teachers seeks to provide educators with materials and information to teach nanoscience within their current curricula. By the end of the course, teachers will have a working nanoscience module for use in their classrooms.

Course Description:

The course will be online, with interactions enabled through the course website, email, online scheduled chats, and forums. In addition to this interactive community, the course will have a variety of topics to be completed by specific dates. Educators are asked to put together a nanoscience module based on their understanding of the subject and their current curricula, using the materials provided in each topic. A typical topic will consist of the following material:

- *Learning Objectives*—Describes what to get out of the topic from both teachers' and students' perspectives. Provides details on how the topic satisfies education standards.
- *Article(s) and/or Reading in Text Book*
- *Video*— Teachers can watch interviews with nanoscientists, or see a lab performed online, and use these videos in their classrooms.
- *Lesson(s)*—Designed to strengthen knowledge of the topic, based on the collection of materials provided.
- *Suggested Student Activities*—Hands on exercises that are tailored for classrooms
- *Quiz*—Designed to test knowledge of the topic
- *Forum and Chats*—Provides a place for educators to share their experiences as they build nanoscience into their current curricula
- *Assignment*—Each assignment will build upon the teacher's nanoscience module

Contribute Materials and Expertise: They welcome new materials or expertise that you could contribute as the course is being developed. Points of view from both science teachers and experts in the field are needed. Please contact Janice Hall at **janicehall@wisc.edu**, or John Moore at **jwmoore@chem.wisc.edu** for further information.

Diane Nutbrown (SPICE) offered an exercise called a Project Planning Logic Model featuring the standard Inputs, Activities, Outputs, and Outcomes for evaluation of the presentations during their visit that could be utilized by the Taiwan group to set priorities and new goals for their projects, and discover and decide which follow-up areas of interest would be important for implementation from their visit. The interactions were continued at a dinner that evening hosted by the MRSEC and enjoyed by all guests.

Professor Wendy Crone started the second day with a presentation on Assessment of the Nanotechnology Education Efforts of the MRSEC. The original funding for the center was initiated in 1996 and will continue until 2011. Many of the smaller programs discussed in the Overview were funded in various years in between. Assessments are continuous in all programs. The different cultures and pedagogical philosophies of universities, science centers and the many partners provide a rich environment for sharing expertise when joined in partnerships. All aspects of the work were covered in the assessment presentation and tools were shared with the group that could be used in their programs.

Exploring the Nanoworld Exhibits was presented by Olivia Castellini and IPSE interns. This work started in 2004 when the interns worked with Discovery World and were involved in all aspects of development from concept and design to construction. This was good preparation which was funded by a grant from the Baldwin Wisconsin Idea Endowment and was installed in December 2004 as a permanent exhibition as UW-Madison.

The MRSEC is now part of a new grant funded by NSF under the Nano Informal Science Education (NISE) which was recently awarded to a large group of museums to develop nanoscience exhibits. Working with the Discovery Center in Milwaukee, the MRSEC will design Nano exhibits for the Minnesota Museum as part of the group. We were introduced to the team of undergraduates who worked on the displays and viewed the current exhibits. This is a new area of education material development for the MRSEC and everyone was very excited about the upcoming project.

The Madison PEOPLE Program was presented by Ms. Jacqueline Dewalt, who has been the driving force of the program designed to reach underrepresented students at risk of dropping-out at an early age from the Madison Metropolitan School District. The program can only address and accept students who have just completed the sixth grade and requires a year-round commitment from the student and the parents. The program begins in the summer when the accepted students have finished sixth grade and continues until they finish high school. Upon graduation from high school, each PEOPLE graduate admitted to UW-Madison, who also completed the Bridge-to-College program, will be eligible for a tuition grant up to five years. with the conclusion of the program sharing the games that were developed at the MRSEC. The program has been very successful and Ms. Dewalt has encouraged expansion to larger areas and more of the UW campuses. Her dynamic presentation was appreciated by all the participants. Her passion for the students and the program stimulated a feeling of admiration from the audience.

The program finished with an experiential exercise by the Taiwan group of playing a Nano Game that was in development by the MRSEC. Since I had to catch a plane before their departure, I did not participate in the exercise. Farewells were difficult as we all expressed

our gratitude and willingness to nurture the relationships generated from their unique visit.

Taiwan Project website:

Visit: http://www.nano.edu.tw/main.aspx .

About Arizona State University:

Professor B.L. Ramakrishna, Project Director, "Interactive NanoVisualization for Science and Engineering Education" project http://invsee.asu.edu and Director, Grades K-12 project at ASU http://gk12.asu.edu

About UW-Madison Wisconsin MRSEC:

A good way to get started exploring the nanoworld is to go to the …
UW-Madison Wisconsin MRSEC website at:
http://mrsec.wisc.edu/edetc/description/students.html
http://www.mrsec.wisc.edu/edetc/index.html
http://mrsec.wisc.edu/edetc/cineplex/index.html

About The NanoTechnology Group Inc.

The NanoTechnology Group Inc. is a 501 (c) 3 nonprofit organization incorporated in Texas with an international group of members and welcomes collaboration in the United States and all countries to support education projects that lead to student and public awareness through formal and informal education globally. www.TNTG.org

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