



FACULTY FOR THE FUTURE

2010 Conference Proceedings 2011 Program Outline



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Launched by the Schlumberger Foundation in 2004, Faculty for the Future has grown to become a vibrant community of 194 women from 54 countries.

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Faculty for the Future

The Schlumberger Foundation Faculty for the Future program awards fellowships to women from developing and emerging economies to pursue PhD or post-doctoral studies in the physical sciences and related disciplines at top universities abroad.

Launched in 2004, Faculty for the Future has grown to become a close-knit community of 194 pioneering women from 54 countries. Faculty for the Future applicants are selected for their leadership abilities and scientific talent. Grantees are awarded fellowships ranging from USD 25,000 to 50,000 per year.

Ultimately, these women return home to become leaders, to strengthen their university faculties, to contribute to the socio-economic development of their countries and to serve as powerful role models to attract more young women into the sciences.



About the Forum

As the flagship program of the Schlumberger Foundation, Faculty for the Future is building a community of women leaders in science and technology.

In addition to an online forum that provides a popular venue for daily interactions between members of the community, conferences are held on a regular basis to provide an opportunity to interact in a face-to-face setting. At these events Faculty for the Future Fellows share research and life experiences, advance topics about gender and other common issues, discuss science and socio-economic development and, not least, become friends offering each other moral support.

Two informal gatherings with about 10 Fellows in attendance are held every year, and a major biannual forum brings together approximately 30 Fellows for a three-day gathering. The 2010 Faculty for the Future Forum took place December 4–8 in Abu Dhabi, United Arab Emirates, with 25 attendees coming from or studying in the Middle East and Asia regions. This booklet provides an overview of those proceedings.

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Faculty for the Future is the key program of the Schlumberger Foundation and is now in its seventh year of existence. It is devoted to bringing about long-term, enduring social advancement through the empowerment of women by generating conditions that result in more women pursuing scientific disciplines. The success of the program is inextricably linked to the steady growth of a recently created international global community of women lead scientists, enhancing and strengthening its impact.



A group of 25 women from 11 countries attended the Faculty for the Future Forum, which took place in Abu Dhabi in December 2010. This was by far the largest and most ambitious meeting the Schlumberger Foundation has hosted since the launch of the program.

The participants at this gathering were immediately captivated by the sense of belonging to a community of scientific women with similar ambitions, challenges and missions, where they could freely share their experiences and air their concerns on the barriers and obstacles many of them face. These women quickly learned that they have plenty in common: they are all passionate about scientific research, they are all highly talented individuals possessing vast potential, and they are all determined to bring value to their countries. This very special pool of women is in itself an invaluable, constant resource for each to tap into at any given time.

In my opening remarks, while I reiterated the commitment of the Schlumberger Foundation to provide the required tools to the community, whether in the form of an online forum or a face-to-face meeting, the key to the success and growth of this community lies in the very hands of its members. We therefore incite and encourage each member to take ownership of this community.

We are now starting to measure the success of the Faculty for the Future program through the increasing number of high-quality applications we receive. The Schlumberger Foundation received more than 600 new applications for the 2011 fellowships. Ultimately, the overriding objective of this program is to see the Faculty for the Future community inspire other female scientists, building steadily on their empowerment and exploiting their leadership skills to become influential role models in countries where women are still under-represented in science. ■

Jean-Marc Perraud
Chairman,
Schlumberger Foundation

Overview of Proceedings

The 2010 Schlumberger Foundation Faculty for the Future Forum, held December 4–8 in Abu Dhabi, included 25 women scientists and engineers coming from or studying in the Middle East and Asia regions.

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Make your research tangible and concrete, and show how it is relevant

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As most of the participants had never met before, the three-day event enabled them to get to know one another and to better understand their role as Fellows.

“Congratulations to you all for attaining membership in what has quickly become a unique and important community of women scientists,” said Jean-Marc Perraud, chairman and president of the Schlumberger Foundation, opening the proceedings on day one. “You have been chosen not only for your scientific skills but for your qualities as leaders and your will to change the societies in which you live and work. This is what Faculty for the Future is all about.”

Forum participants were invited to present their research projects, methods and goals, using posters they had prepared for the purpose. The Fellows thus learned about each other’s work, forged new connections and discussed potential collaborations. For example, Indonesian scholar Wiratni explained how she is planning to help farmers in her native Indonesia by developing a better biogas digester, which is a device that converts cow manure into fuel gas for cooking stoves. Listening in was Nigerian Edu Inam, who completed a Faculty for the Future fellowship in 2008 and who is now teaching at the University of Uyo in Nigeria. Inam later said that Wiratni’s presentation got her thinking about the possibilities of using efficient biogas digesters in Africa.

Three 45-minute poster sessions were separated by two individual presentations. Filipino Jeanne Therese Hilario Andres, who received her first fellowship in 2008 and who is now working toward a PhD in chemical engineering at the University of Cambridge, described her research into carbon dioxide capture and storage methods and her success in coming up with a new technique for determining flow rates and carbon density in underground storage aquifers.



Sidrotun Naim, a doctoral candidate in environmental science and micropathology at the University of Arizona, delivered the second presentation. Naim is working to help shrimp farmers in her native Indonesia overcome the potentially devastating impact of viral and bacterial disease on shrimp stocks. She has found that stocking the shrimp ponds with tilapia can greatly reduce shrimp mortality.

The Forum focus next shifted to issues of communication. Attendees gathered together with David Dickson, an experienced science journalist and founding director of SciDev.Net, an online science and development forum. Dickson explored the intricacies of science communication, stressing the importance of being able to explain the relevance of a research topic to a lay audience.

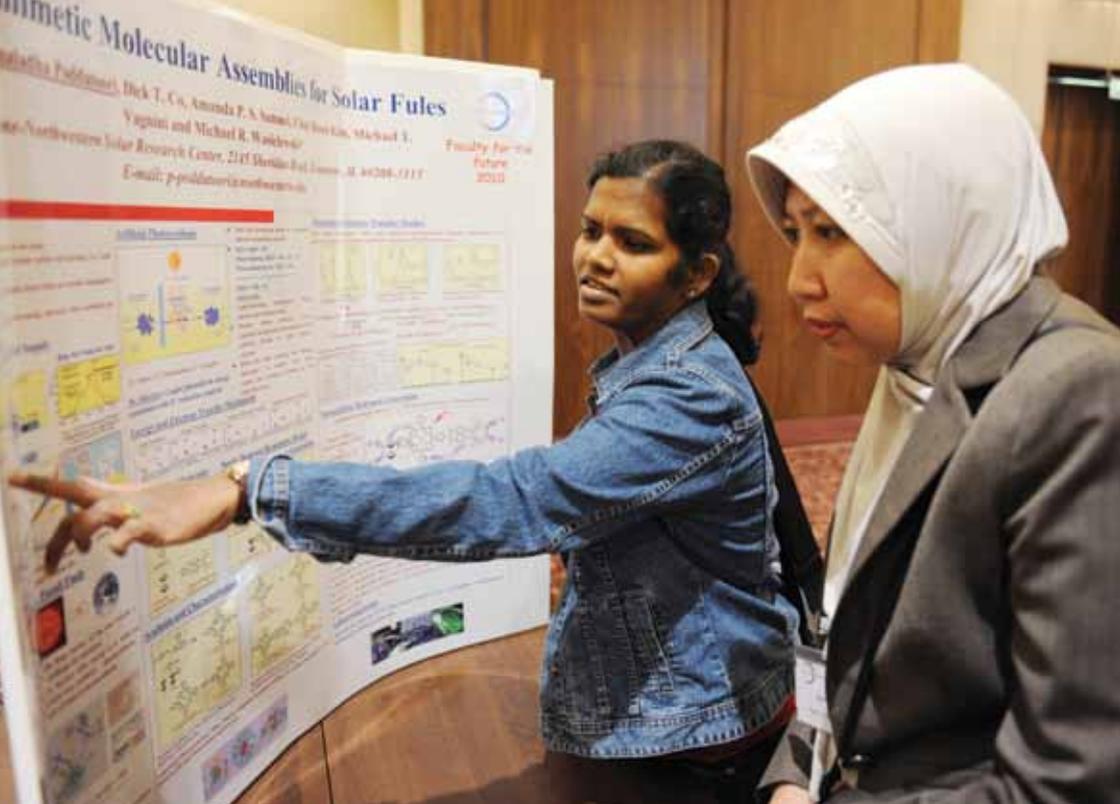
“Summarize the big picture,” Dickson advised. “Make your research tangible and concrete, and show how it is relevant.”

Dickson ended the afternoon with a plea for help. SciDev.Net, the online organization he founded more than a decade ago, is planning an upcoming series of articles on the topic of women in science. He asked the Fellows for advice on possible story ideas, and suggested that some of them may want to consider the possibility of contributing to the SciDev.Net series.

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It is important to communicate what you want and what you are expecting from your home university

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Dinner on day one was hosted by Schlumberger Chief Executive Officer Andrew Gould, who spoke to Fellows about the growing importance of the Faculty for the Future program.

“Schlumberger has a long history of gender and nationality diversity as well as the oil and gas industry’s strongest commitment to research,” Gould told the audience. “Faculty for the Future fits right in to this tradition, and we feel confident that, over the long term, the program will go a long way toward equalizing the gender balance in the sciences. The world needs more women in science, and we’re determined to help see that it gets them.”

DAY TWO

On day two the Fellows visited the Middle East and Asia Learning Centre (MLC), where they were given a tour of the facilities, which serve as a Schlumberger training hub in the region.

During the morning session a panel of five accomplished women chosen for their exemplary careers in science and academia served as external role models, providing insights and guidance from the perspective of personal experience. The panelists—Hannah Akuffo, Head of Team for Research

Policy and Method Development at the Swedish International Development Cooperation Agency (Sida); Najah Y. Ashry, Executive Director for Saudi Initiatives at King Abdullah University of Science and Technology; Nadia El-Awady, President of the World Federation of Science Journalists; Ruth Graham, consultant in engineering education; and Ellen Hazelkorn; Vice President of Research and Enterprise as well as Dean of the Graduate Research School at the Dublin Institute of Technology—each spoke thoughtfully about the challenges that come with being a woman in the world of science and engineering.

Common themes emerging from the discussions were balancing family life with work commitments and pursuing your passion. There was general agreement that there is no miracle solution to the challenges facing women in science, but most thought that listening to the panelists was inspiring.

Breakout working group sessions that afternoon focused on the three conference themes—mentoring & networking, managing the return home, and finding a proper work-life balance. Three groups consisting of about eight Fellows each met to discuss issues and challenges facing female high achievers in science, and to come up with possible solutions.



DAY THREE

On day three each working group began by preparing flip charts and key messages. The first group dealt with work-life issues and noted that balancing long hours in the lab, sometimes seven days a week, with family commitments and long-distance relationships requires making difficult decisions and employing good time management. In the end, they said, the most successful outcomes require sharing, compromise, effective communication between partners and supervisors, and developing personal strategies to combat stress.

The second group focused on the theme of managing the return home, but this quickly became complicated, as some Fellows are returning to guaranteed positions in their home countries and some are anticipating to search following their studies. Dividing into two subgroups made the task more manageable. Both subgroups underscored the importance of maintaining regular contact with potential institutions, and of ensuring

that individuals within home universities are kept apprised of their research and its significance. Collaboration is key, and it is important to not only communicate what you want, but also what you are expecting from your home university, because in many emerging economies access to adequate research facilities and even to basic academic journals can be difficult to obtain.

Presenting on mentoring and networking, the third working group began with two role-playing exercises. In the first exercise a hesitant mentee was rebuffed while approaching a busy mentor for advice, while the second role-playing exercise resulted in a more positive outcome for the mentee. In illustrating the delicate nature of the relationship between mentors and mentees, the group noted that it is based on trust, mutual respect and open communication. Networking is also essential, said the group, since by some estimates half the people get their positions through networking. Conferences are good places to network, as are research talks and becoming involved in appropriate academic organizations.

After the working group presentations, Schlumberger Foundation Vice-President Ranaa Riyamy summed up the proceedings by saying that in her work as an operations manager she saw many of the same issues described by the Fellows. She challenged the Fellows to tackle the root causes of problems, and to pick only two or three main issues to fix at any one time. While attending a host university it is easy to lose touch with the people back home, said Riyamy, so it is important to maintain close ties with your home university and to promote yourself as a scholar with worthwhile skills to contribute.

“The period of time you are abroad is the time to market yourself,” said Riyamy. “Don’t sit in a lab 24/7. Promote yourself and show you have what they need.”

The 25 Fellows in attendance, most of whom who had arrived as strangers, began departing as colleagues, collaborators and friends. It was clear that the meeting had contributed to fostering a vibrant international community of female scientists. ■

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The period of time you are abroad is the time to market yourself. Don’t sit in a lab 24/7.

Promote yourself and show you have what they need

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PROFILE: SHEEJA JAGADEVAN

Finding sustainable new ways to treat waste metalworking fluids



As a child growing up in India, Sheeja Jagadevan used to help her father, an engineer, fix broken household appliances such as fans, irons and toasters. Today she credits his do-it-yourself resourcefulness for inspiring her own career in engineering.

“He never used to call in a technician,” remembers Jagadevan. “He would always say, ‘why don’t we just open it up and see?’”

As a young student Jagadevan was motivated by the natural world—she joined nature organizations and helped out as a volunteer whenever the southeast coast area of India around Visakhapatnam, where she grew up, fell victim to annual flooding.

After graduating in 1996 with her BSc in life sciences from Andhra University in India, she earned her MSc in environmental science in 1998, also from Andhra University. She then spent two years at the Indian Institute of Technology in Bombay, where she earned her Master of Technology degree in environmental engineering.

During this time she began working on remediation of oil-contaminated water from offshore drilling along the Mumbai coast. Her research focused on bioremediation of the oil-contaminated sludge found at the bottom of sediment, and that led to her current interest in industrial wastewater issues.

In 2008 she enrolled as a PhD student in the Department of Engineering Science at the University of Oxford in the United Kingdom, where she began researching hybrid technologies for treatment of toxic metalworking fluid wastewater.

Lubricants widely used by industry, metalworking fluids are a very big market. Consisting of an emulsion of oil and water, something like 20 to 25 billion liters are produced every year—making disposal of these operationally exhausted fluids a very big issue. When government regulations began to shut down many of the former disposal options, such as landfill sites, a whole new field of research began to open up, and Jagadevan decided to become involved.

“The problem with metalworking fluids is that they contain 50 or 60 organic components, all of them proprietary—manufacturers don’t divulge those ingredients,” she says. Because the ingredients are trade secrets, it is difficult to treat the fluids when they enter the wastewater system.

Jagadevan’s research at Oxford is helping develop an affordable, effective hybrid method of treatment that when used by industry could work on a wide spectrum of wastewater. The toxicity associated with the metalworking fluid formulation is largely due to biocides added into the blend to prevent bacteriological action during its lifetime. Using a combination of advanced oxidation processes and bioremediation, the approach Jagadevan has taken combines complementary physico-chemical and biological technologies to optimize the processing of metalworking fluids wastewater treatment.

Most major cities in India face severe urban water management challenges related to drinking water supply, storm water and wastewater treatment. In light of climate change and finite natural resources, addressing these challenges in sustainable ways will require innovative solutions arising from interdisciplinary collaboration. Jagadevan believes that a clever manipulation of chemistry, microbiology and engineering could tackle this problem in a sustainable manner.

When she completes her doctorate, Jagadevan plans to teach at the Indian Institute of Technology. ■



SESSION I

Research Presentations

Poster Session I

Suman Anand
 Pelin Candarlioglu
 Vivien Djanali
 Farhana Jabeen
 Erees Queen Macabebe
 Sidrotun Naim
 Premaladha Poddutoori
 Korakot Sombatmankhong
 Banafsheh Zahraie

Poster Session II

Jeanne Therese Hilario Andres
 Ova Candra Dewi
 Jenny Ho
 Sheeja Jagadevan
 Radhika Madhavan
 Dade Nurjanah
 Betty Purwandari
 Wiratni Budhijanto

Poster Session III

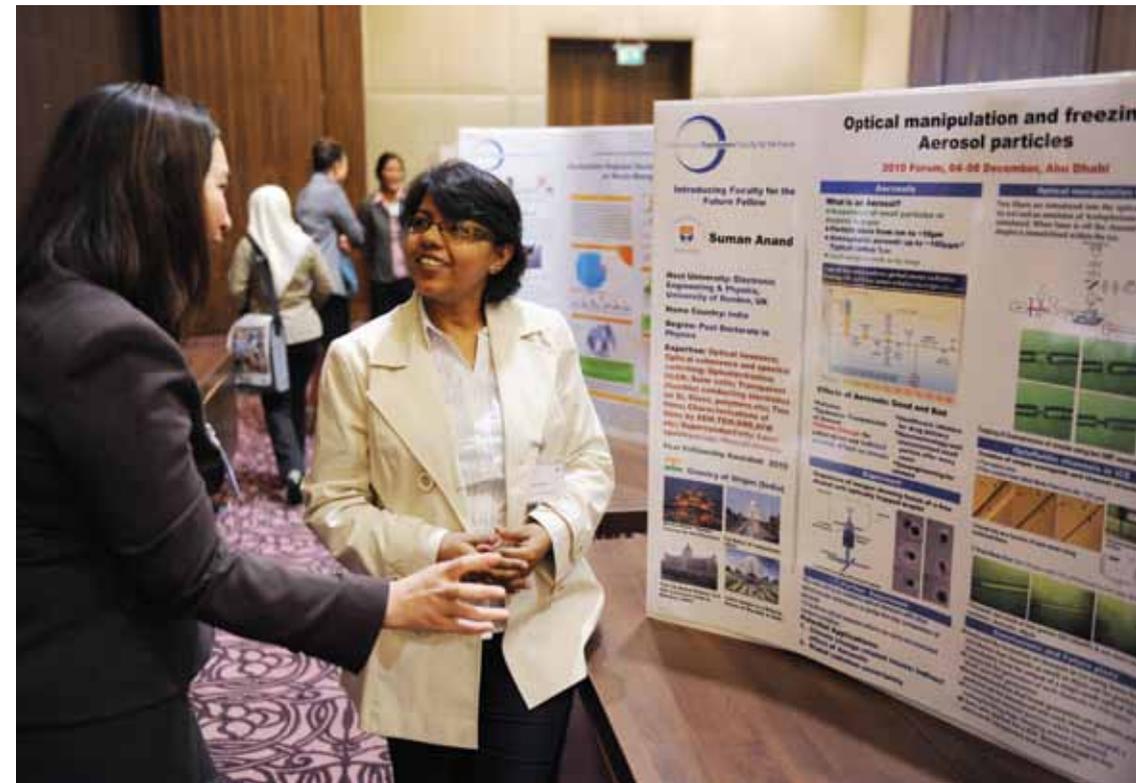
Rana Bilbeisi
 Ismudiati Puri Handayani
 Edu Inam
 Witri Wahyu Lestari
 Dewi Mairiza
 Nimalika Perera
 Sujata Ray
 Euis Tintin Yuningsih



Poster Sessions

During a series of poster sessions, the Fellows discussed their research projects, methods and goals, learned about each other's work, forged new connections and discussed potential collaborations.

The conference kickoff event consisted of three 45-minute poster sessions separated by two individual research presentations to the plenary group of 25 Fellows. All of the posters featured technical information about the Fellow's research in the form of an abstract with accompanying diagrams, in addition to brief personal descriptions, capsule country profiles and, for many, a discussion about gender issues back home. When set up in rows on two long tables in the large hall, the 25 posters served as a powerful visual statement about intellectual prowess. See Appendix C pages 62–87 for a compendium of all research abstracts presented at the 2010 Faculty for the Future Forum.





In the breaks between poster sessions, many Fellows commented on the value of these types of presentations in their academic careers. For the scientific community, poster presentations form a major part of campus life. Most of them stated that standing in front of a poster describing your research focuses critical thinking and helps develop essential communication skills.

Betty Purwandari, an Indonesian web scientist who is researching the impact of the mobile web on emerging economies for her PhD, said she appreciated the pacing of the Faculty for the Future sessions because it gave her time to explain her own research and to gather insights about the research of others.

"I studied chemistry years ago and today I learned more about polymers, which I found fascinating. It was good to get an update," she smiled.

For others, the poster session was challenging. "Normally at a conference I am talking to colleagues who understand what I am talking about, but

here I have to figure out how to explain my research in more general terms," explained Vivien Djanali, an Indonesian Fellow studying for a PhD in mechanical engineering. "It's harder to do this, but it's also good for networking."

Others had praise for the interactivity of the sessions. "Sometimes when I am talking about my research someone will come up with a really interesting question about how I am collecting the data, or how it is working, and it will give me a whole new perspective," said Farhana Jabeen, a PhD student in computer science from Pakistan whose work in distributed and adaptive systems is yielding insights into ad-hoc wireless sensor networks.

"It gave me an opportunity to explain about my work, about my country and about myself," agreed Pelin Candarlioglu, a bioengineering student from Turkey working toward a degree in materials science. "I've discovered that a few of my Fellows are working on similar topics, and we hope to find ways to collaborate in the future." ■

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The poster session gave me an opportunity to explain about my work, about my country and about myself
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RESEARCH PRESENTATIONS: SIDROTUN NAIM

Investigating ways to reduce shrimp disease in Indonesia



When Sidrotun Naim emailed the world's leading shrimp pathologist at the University of Arizona about her wish to study shrimp diseases, she wasn't expecting his response. He said he had been waiting for a student from Indonesia."

Indonesia is one of the biggest shrimp producers in the world. It is where Naim graduated from Bandung Institute of Technology (ITB), and where she worked as an environmental consultant for Freeport Indonesia in Papua, where her duties led to an interest in marine biology.

In 2005 she earned a Master of Marine Studies degree from the University of Queensland in Australia, and in 2006 she began working as a marine program consultant for World Wildlife Fund Indonesia in Aceh – the epicenter of the devastating 2004 tsunami. Aceh is one of Indonesia's biggest shrimp broodstock areas, but the shrimp industry there had been devastated by the tsunami.

After receiving a 2009 UNESCO-L'Oréal Indonesia Award for Women in Science, she began studying for her doctorate in environmental science and micropathology at the University of Arizona in the United States. In addition, she earned a Master of Science in Environmental Science degree in December 2010, and she hopes to complete a Master in Micropathology degree at the same time as her PhD in 2012.

Explaining this demanding schedule, she says, "To express my gratitude to those who have put their trust in me by supporting my education, I always try to accomplish more than they are expecting. It's my way of paying it forward."

Her research involves using a polyculture technique of stocking tilapia in reservoirs to stimulate the production of microalgae, which shrimp eat. She believes this practice may help reduce disease due to the presence of antibacterial and antifungal properties on the skin mucus of tilapia. Experimenting both in the lab and in the field, she has tried different combinations using green oysters and seaweed along with varying concentrations of bacteria to achieve better immunity among the shrimp. Her findings so far are that the presence of tilapia stimulates growth of microalgae and inhibits pathogenic bacteria, contributing



to lower shrimp mortality.

"Shrimps are sensitive to dirty water and crowded places. They are also prone to viral infection," she says. When an infection occurs, shrimp farmers must harvest in haste, resulting in smaller sizes and lower yields.

Coming from a long line of teachers, Naim feels lucky that her parents created a supportive environment for learning. The seventh in a family of 11 children, she once aspired to be a medical practitioner but became concerned about the heavy expense of medical school on her parents and decided to take biological sciences instead.

When it comes to finding a healthy work-life balance, Naim says her husband's flexibility is a major contributor to her academic success. She often brings her young son on field trips and says he already knows all about shrimp and tilapia. She is helping her son start what she hopes will be a lifelong voyage of discovery and self-discovery by encouraging him to read to her each night.

"Education is slow, but it is powerful," she says.

When she returns to Indonesia, Naim plans to teach at the Bandung Institute of Technology as the country's first shrimp pathologist. Eventually, she hopes, her aquaculture research may help increase productivity among shrimp farmers in coastal communities throughout her country. If she is successful, more than six million people working in fishing villages all along the coast stand to benefit. ■

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RESEARCH PRESENTATIONS: JEANNE THERESE HILARIO ANDRES

Researching better ways to store carbon dioxide in underground aquifers



“When it comes to climate change, it’s too late to be a pessimist.” That statement, attributed to French environmental advocate Yann Arthus-Bertrand sums up Jeanne Therese’s research philosophy.

Jeanne Therese is studying for her PhD in chemical engineering at the University of Cambridge in the United Kingdom. Working in carbon sequestration, she is looking at the effect of a simple chemical reaction on the onset of convective mixing in underground aquifers. Her mathematical model shows that the basic interaction between fluid flow and chemical reactions in a porous medium is fully governed by a new non-dimensional number. This new parameter is a measure of the relative strengths of the reactive, diffusive and convective processes taking place in the geo-storage of carbon dioxide. Her numerical simulations show that increasing values of this parameter increases the time for the onset of natural convection in subsurface reservoirs.

“We want to know when convection will occur, because convection increases mass transfer rates of carbon dioxide into the brine. Convection shortens the time needed for carbon dioxide to be completely dissolved—it spreads the carbon dioxide around and assures contact with the aquifer minerals, facilitating permanent storage,” she says.

Her research, which has been accepted for publication in the scientific journal *Physical Review E*, identifies conditions for which the breakdown of a buoyant boundary layer within a porous medium may be delayed or inhibited by even a simple chemical reaction, thus delaying the onset of natural convection in the underlying fluid. Her results show, that distinct regimes for carbon dioxide transport and storage can occur in saline aquifers, depending on the strength of reaction between carbon dioxide and the porous rock. In weakly reactive systems, the carbon dioxide transport will occur throughout the depth of the aquifer, while in strongly reactive cases, the carbon dioxide will stay near the top of the reservoir, leaving the deeper part essentially inactive.

“There is no magic bullet for reducing atmospheric carbon dioxide emissions”, she says. “We need a whole portfolio of solutions. Even if we stop all carbon emissions right now, the changes to our climate will continue to happen.” ■

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SESSION II

Science Communication Workshop

Avoid using technical terms without adequate explanation, speak at a level that will be understood, and use analogies to help laypeople understand complicated scientific concepts. That advice from veteran science journalist David Dickson underpinned an afternoon skills-building workshop on science communication.

“Watch to see if your explanation is being understood, and offer to explain anything that isn’t clear,” advised Dickson, founder and director of SciDevNet (www.scidev.net), a web site that helps individuals stay informed about news about science of interest to the developing world. “Ask for comments on what you’ve said so that you can check the level of their understanding.”

This “reality check” is especially important when dealing with journalists and government policymakers, said Dickson, who was a Washington correspondent and news editor for *Nature* magazine and has worked for *The Times Higher Education Supplement*, *Science* and *New Scientist* magazines. He said relatively few journalists and politicians have a serious grounding in science, although he pointed out that in some emerging economies, many politicians responsible for science-related issues do in fact have science backgrounds.



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People need to know the facts of the situation before they can have a properly informed debate about decisions

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Communication is a two-way process that requires a degree of interaction, said Dickson, pointing out that one of the big discussions currently under way in the science communication field is how to open up dialogue using social media and blogs. Feedback is an important part of this process, he said.

It is also important that a division of labor be respected when communicating about research. Scientists shouldn't necessarily be required to write news releases, but they should know what is involved and be open to being approached by science writers or by public affairs officials. "You have to be able to explain your research in terms that can be picked up by a professional communicator."

Fundamental research is generally harder to explain than applied research, he said, but it often helps to focus on the possible results that could come out of that research down the road. However, Dickson also agreed with Indian scholar Radhika Madhavan, who pointed out that it is important to avoid over-selling your research when promoting the work you are doing.



Getting your message across

1. Speak at a level that will be understood
2. Avoid using technical words, or explain them in non-technical terms
3. Use analogies
4. Use diagrams if appropriate
5. Watch to see if the explanation is being understood
6. Offer to explain anything that isn't clear
7. Ask for comments on what you've said

When approached to describe your research, Dickson advised the Fellows to be prepared to get their message across using 20 to 30 words that will be understandable to non-experts. Asking for volunteers from the audience to come up with pithy descriptions of their own research, Dickson illustrated how difficult this is in practice.

For example, when Turkish bioengineering Fellow Pelin Candarlioglu briefly described her research into bone tissue engineering and regenerative medicine, she used the term "biologically acceptable materials" which Dickson suggested might be more clearly stated as "materials that will not be rejected by the body."

"Start with the problem you are trying to solve, and ask yourself if it is really necessary to use technical words," he said, adding that it helps to know your audience and to present your message in a way that is appropriate to each audience.

During a practical exercise designed to develop communications skills, Dickson said that it is important to "find the story" and to summarize the key messages in a way that will be understood. "Summarize the big picture," he said.

Spend some time thinking about how to bridge any gaps in understanding without using technical language. Determine in advance what the main messages are, and prepare for the interview in advance by practicing different ways of getting those messages across, he advised. ■

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You have to be able to explain your research in terms that can be picked up by a professional communicator

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PROFILE: BANAFSHEH ZAHRAIE

Managing water infrastructure to ensure demand can be met now and in the future



Banafsheh Zahraie is living proof that Faculty for the Future graduates can make a big difference at the highest levels when they return to their home countries.

After being awarded a post-doctoral fellowship in 2007, Zahraie resumed teaching at the University of Tehran, where she is also pursuing her research into applications of evolutionary computing in water engineering. She was promoted to associate professor in 2008, and for the past year she has been working with the Iranian ministry of energy to develop a national water plan for the country.

She received her undergraduate, graduate and doctoral degrees in civil engineering from the School of Civil and Environmental Engineering at Amirkabir University of Technology. She began teaching in the School of Civil Engineering at the University of Tehran in 2002. As the only female faculty member in her school, she says her affiliation with the Faculty for the Future program “was an amazing experience” that helped her develop her career. Now she is looking for opportunities to encourage other females to come into science.

During the past 15 years she has been involved in more than 25 applied research projects related to water resources planning and management. “Because Iran is an arid country, our challenge is very real,” she points out. “We face serious shortages and even droughts. Climate change is affecting us in the worst way.”

“Part of the work I am focusing on is how to manage water infrastructure to be more efficient in terms of increasing the reliability of supplying water to different users, improving water quality, and ensuring that we have the capability to meet hydropower demands,” she explains.

In 2009 she took sabbatical leave as a visiting professor at the University of Illinois at Urbana-Champaign in the United States, where she developed a fast genetic algorithm model for shared-memory parallel computing with applications for reservoir operation management. Her research is now helping the Iranian Water Resources Management Company and other agencies develop a plan for ensuring that water will continue to be provided to all the different users in the country. ■

GALA DINNER

Faculty for the Future fits into longstanding gender diversity efforts

Dinner on day one was hosted by Schlumberger Chief Executive Officer Andrew Gould, who spoke to Fellows and senior Schlumberger Middle East managers about the growing importance of the Faculty for the Future program.

“Schlumberger has a long history of gender and nationality diversity as well as having the oil and gas industry’s strongest commitment to research and development,” Gould told the audience. “Faculty for the Future fits right in to this tradition.”

Gould noted that the company’s sustainability initiatives are focused around three main themes—health and safety, research, and education—with HIV/AIDS and malaria prevention occupying a central role in the health portfolio and driving safety taking a front seat in the company’s safety culture. Research underpins everything Schlumberger does, said Gould. He said that Faculty for the Future is a natural progression of the company’s gender diversity efforts that began more than 17 years ago.

We are known as a company that will give women engineers an equal chance,” said Gould. “We believe that it is important to invest in programs to encourage more women to go into engineering in different disciplines and in different countries around the world. It is a tribute to the hard work of Schlumberger Foundation board members and administrators that we have now given over 190 Faculty for the Future grants to women from more than 50 countries.” ■



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We believe that it is important to invest in programs to encourage more women to go into engineering in different disciplines and in different countries around the world

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Part of the work I am focusing on is how to manage water infrastructure to be more efficient in terms of increasing the reliability of supplying water to different users

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PROFILE: RADHIKA MADHAVAN

Mapping a functional wiring diagram of the brain to better understand how it works



Tackling one of the most intriguing scientific questions of this century. She wants to know what happens in our brains when we learn.

Having received a Faculty for the Future grant in 2006, Radhika is now attending Harvard University in the United States where she is pursuing her second post-doctoral fellowship. This time her focus is on how learning modifies neuronal connections in the brain.

“Neuroscience is such an exciting field—not much is known about the brain, and there are still so many questions to be answered,” she says.

Born the second of two daughters in New Delhi, India, she finished her undergraduate degree in electronics engineering from The Maharaja Sayajirao University of Baroda, securing two gold medals for academic excellence. She followed this up with a Master in Technology degree in biomedical engineering in the Indian Institute of Technology in Mumbai, where she worked on a project funded by the Government of India to design an artificial hand for below-elbow amputees.



“I spent the last three months at a hospital with my laptop and my robotic hand waiting for volunteers to come and try it out so we could develop a graph showing how well it did,” she grins. “That hand is still being used in India.”

Although her basic training was in electrical engineering, Radhika was interested in applying engineering principles to problems in biology, and this led to a shift in her research focus from electrical engineering to neuroscience.

“Brain cells interact using electrical activity, so there is this huge field of neurophysiology that opens up to electrical engineers,” she explains.

In 2007 she obtained her PhD in bioengineering at the Georgia Institute of Technology in the United States, then began her first post-doctoral fellowship at the National Center for Biological Sciences, Tata Institute of Fundamental Research, in Bangalore, India. In Bangalore, her research on learning and memory also drew on engineering rules, enabling her to bridge the gap between engineering and biology.

Her earlier work explored the relationship between structure and function in the brain by helping develop techniques to measure large-scale individual synaptic weights in hippocampal circuits using electrophysiology and optical imaging techniques. At Harvard she is looking at the network correlates of learning in humans performing long-term memory tasks, using electrophysiological recordings from implanted electrodes. The goal of her work is to map a functional wiring diagram of the brain. Specifically, she is looking at how learning modifies neuronal connections in the brain, and attempting to better understand the rules of information coding in brain networks. She hopes her work will help answer key questions about how the brain works, and it may enable us to devise new treatments for disorders in learning and memory.

“We do extra-cellular neurophysiological recordings in humans performing long-term memory tasks. These recorded signals can help us understand the processing of sensory information—how memories are encoded and stored in the human brain,” she says.

Madhavan plans to return to India and set up a research lab while maintaining collaborations with her colleagues in the United States. Ultimately, she wants to develop an exchange of knowledge, students and skills between the United States and India. ■

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Neuroscience is such an exciting field—not much is known about the brain, and there are still so many questions to be answered

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SESSION III

Role Model Panel Discussion

The highlight of day two was a panel discussion featuring women role models who shared their experiences as women, researchers and academics.



Hannah Akuffo is Head of Team for Research Policy and Method Development at the Swedish International Development Cooperation Agency (Sida) and adjunct professor of parasitology at Karolinska Institutet

She began by describing her own career path. Born the 11th child in a family that included eight girls in Ghana, Africa, she is now the mother of three girls of her own. After studying biochemistry she earned her PhD in immunology specializing in an animal model of leprosy, and in her studies after her post-doctoral years she began focusing on the mechanisms of resistance to infections caused by the parasite *Leishmania* sp. After her work in Ethiopia and brief research periods in Ghana, she moved to Sweden “for love.”

Akuffo says she realized early on that for her, work is both a passion and a hobby. The underlying thread in all that she does is related to research capacity strengthening in low-income countries, and she is especially gratified that her work at Sida allows her to be able to “create the conditions for people to do research.” She is convinced that all countries need to be able to do research, and this conviction is part of what motivated her to make, after a successful career as a researcher, the switch into administration.

“At Sida we try to see how we can assist in some way in creating an environment that enables research,” she says, pointing to a research cooperation agreement between Makerere University in Uganda and Swedish universities as just one of the ways in which she has been able to make a contribution. She is also proud of her involvement in research steering committees and the Strategic Technical Advisory Committee of a special program on tropical disease research and training.

Akuffo has also been involved in setting up an organization to support women scientists from Africa in Sweden called the Network of African-



European Women Scientists (NAWES). She says the women in this group come together for support and to make their voices heard, and she finds that being part of such a group strengthens her.

Summing up, Akuffo said that coming from a large family of girls contributed to her sense of empowerment and that it wasn't until she started going to university that she became aware of gender issues. Now, after “moving around a bit” in her careers in science and administration, she continues to seek clear purpose in her work to improve research capacity in low-income countries.

“Being in a university environment and in the lab doing things I find interesting combined with assisting Sida to alleviate poverty has worked out very well for me,” she says.



Najah Ashry is Executive Director for Saudi Initiatives at King Abdullah University for Science and Technology (KAUST) and former Dean of the Women's Section at King Abdulaziz University in Saudi Arabia.

Najah Ashry was born in Egypt to Saudi Arabian parents and educated in the United States and the United Kingdom, where she earned her doctorate in management information systems along with a postgraduate diploma in research methods before returning to Saudi Arabia to work in academia. "Education is the salvation for females in Saudi Arabia," she says.

After beginning her career as a lecturer in business administration at King Abdulaziz University (KAU) in Jeddah, Ashry was promoted to assistant professor. She then became deputy director of the Information Technology Centre at a time when Saudi Arabia was undergoing a concerted effort to increase the number of universities in that country.

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Sometimes you have to fight but sometimes to remove barriers you have to work within the system

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Ashry became chair of the accounting department at KAU and then vice-dean of admissions and registration, where she began working to eliminate restrictive conditions imposed on women students—including a controversial clause that required females to obtain permission from their fathers or guardians when making major course changes. After reviewing the admissions manual Ashry succeeded in having the clause removed, a feat that she still considers one of her greatest accomplishments. She was eventually named dean of the female section at KAU, which was considered the highest university posting possible for a female in Saudi Arabia at the time.



When Saudi Arabia opened the prestigious King Abdullah University of Science and Technology (KAUST), an international graduate-level research university, Ashry became senior assistant provost for student affairs, where she helped develop a strategic vision for the department. That led to her current position as executive director for Saudi Initiatives at KAUST, which she describes as helping to guide KAUST in its mission to support the Saudi Arabian development of scientific and economic growth. As examples of such initiatives, Ashry includes the structured effort to create a "brain gain" for Saudi Arabia by working to retain as many talented international graduates as possible, as well as initiatives to promote science and engineering disciplines among young Saudi females.

"Sometimes you have to fight," she says, summing up her distinguished career. "But sometimes to remove barriers you have to work within the system."



Nadia El-Awadi is president of the World Federation of Science Journalists and founding member and past president of the Arab Science Journalists Association.

She feels strongly about not being defined by what she does.

“Find out what your passions are, and actively pursue them,” says the mother, scuba diver, mountain climber and science journalist. “It’s important to learn how to accept failure and to be able to push through it.”

The daughter of an American mother and an Egyptian father, El-Awadi grew up in the United States before moving at the age of 17 to Cairo, where she earned a bachelor’s degree in medicine. She married and began having children while working on her master’s degree in pediatrics but gave up academic life in favor of happily raising her growing family, which soon numbered four children.

It wasn’t until her youngest son reached the age of two that she started wanting more out of life. Her inner voice was telling her to start focusing on other things. “I’ve learned over the years to listen to my inner voice. What it tells me to do, I do,” she says.



When some friends asked her to help them build a website, El-Awadi discovered a passion for the work of writing about science. After earning a master’s degree in journalism at the University of Cairo, she started working in the field while continuing to raise her children. At that time she didn’t even know the term “science journalism” existed, but an Internet search revealed that people in other parts of the world—but not her own—had similar interests. She formed the Arab Science Journalists Association (ASJA) in 2006 and began working with the World Federation of Science Journalists (WFSJ), where she became chair of its program committee and eventually president.



In the early days of the ASJA she helped develop a mentoring program whereby over a period of two years experienced international mentors exchanged ideas and experiences with mentees from Africa and the Arab world. She then left her position as science editor of IslamOnline to join the International Centre for Journalists, a United States-based organization that trains journalists in investigative reporting and the use of social media. She began teaching courses in journalism at a private university and more recently took on the task of organizing the seventh biannual World Conference of Science Journalists.

At the age of 35, after 10 years of juggling career and family commitments, El-Awadi began to focus on personal goals. After starting to work out as a way of reducing her stress levels, she discovered an interest in mountain climbing and in August 2009 she climbed Mount Kilimanjaro, the highest peak in Africa, which she describes as an amazing, life-changing experience. She subsequently attempted to summit Mont Blanc in France but failed due to inclement weather, an experience she counts among her most important in terms of personal development.

“You learn a lot about yourself on a mountain,” she says. “To make it to the top you can’t focus on the end result—the *only* thing you can focus on is putting one foot in front of the other.”

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Find out what your passions are, and actively pursue them

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Ruth Graham is a consultant in engineering education and former director of the EnVision project in the Faculty of Engineering at Imperial College London, United Kingdom. She works with industry, universities, professional bodies and charitable organizations to improve engineering teaching and learning worldwide.

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Engineering as a vehicle to foster world change is a message that really seems to resonate with young girls

After earning her doctorate and post-doctorate degrees in aircraft design and fatigue, Ruth Graham began to feel that the field of engineering education itself was in need of revamping. When the dean of engineering at Imperial College London asked her to design and lead a new program of engineering education reforms for the school, she jumped at the opportunity. With a sweeping mandate that went beyond curriculum redesign to include such things as promotions procedures for professors, she describes the role as challenging but says it was “an opportunity to really change education within a research-led university.”

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After successfully implementing a series of reforms at the college, she decided to set up on her own as a consultant. “I really wanted to make a bigger impact on engineering education around the world, and I felt that I could do a better job if I wasn’t operating from within an organization,” she explains. Pregnant and about to take maternity leave, she decided the

timing was right to take a risk. She began to do some consulting work to build up a track record even before her baby was born, and after the birth she was able to pick up where she had left off.

“Issues of women in science have been woven into my career ever since I was a student,” she says, citing a Women in Science initiative she developed at Imperial College as an undergraduate student called the Green Design Challenge. Intended as a means of attracting female students into engineering, the Green Design Challenge asked young women to design renewable energy devices and was so successful that it became a national competition in the United Kingdom. “The experience made me realize that perhaps I could change things,” she says.



At a time when less than two percent of engineering professors in the United Kingdom are female, Graham told the Fellows, “You’re swimming against the current.”

She has participated in a study which looked at different ways that boys and girls view engineering as a field of study. Girls, she says, identify most closely with the message that engineering is a vehicle for being able to change lives. “Engineering as a vehicle to foster world change is a message that really seems to resonate with young girls.”



Ellen Hazelkorn is Vice President of Research and Enterprise, Dean of the Graduate Research School and Head of the Higher Education Policy Research Unit at the Dublin Institute of Technology in Ireland. She also serves as a consultant on higher education issues to universities and university associations worldwide.

Describing a career path that has taken her to the very pinnacle of academic achievement, Ellen Hazelkorn likes to quote *The Road Not Taken*, a poem by Robert Frost:

*Two roads diverged in a wood, and I—
I took the one less traveled by,
And that has made all the difference.*

Growing up in the suburbs of Chicago after her grandparents immigrated from Russia and the Austria-Hungarian empire in the 1890s to the United States, she credits a strong middle-class upbringing and appreciation of education for establishing the foundation for her success. After finishing her degrees in politics and history at the University of Wisconsin in the United States and at the University of Canterbury in the United Kingdom, she moved to Dublin, Ireland, where she has lived for more than 35 years.

As a social scientist, she became interested in issues of policy, including the kinds of choices that governments make while under duress and how to affect change. “You always hear governments talking about making really tough choices,” she says. “It’s not the toughness of the choices that counts. It’s making sure they are the right choices.”

After starting her academic career as a lecturer in the Department of Communications at the Dublin Institute of Technology, Hazelkorn became director and dean of the new Faculty of Applied Arts in 1995 at a time when the work involved transforming what had previously been five disparate schools into an interdisciplinary faculty with recognizable strengths in the creative arts and media, humanities and social sciences. At about the same time, she began serving as a consultant to international organizations involved in higher education, including the Organization for Economic Cooperation and Development (OECD), World Bank, European Union and the International Association of Universities. As a policy adviser, she believes the big challenge is helping governments understand the tension between allocating funds to create world-class university systems that benefit the majority rather than world-class universities that benefit a few.

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I don’t think you can be in senior positions in research environments and not be involved in research itself—you have to lead with the front

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She also serves as dean of the Graduate Research School and leads her university’s Higher Education Policy Research Unit, where her work involves raising questions about such things as how best to assess university quality and performance, student choice and experience, and policy response to the global financial crisis. “I don’t think you can be in senior positions in research environments and not be involved in research itself—you have to lead from the front,” she says.

As the mother of two grown daughters, she believes that people live their lives in phases. In her own case, even though she has achieved senior roles in her career, she says she feels there is still lots of opportunity for advancement.

“Don’t think that you only have one shot at it, because you don’t,” she firmly advises. ■



PROFILE: SUMAN ANAND

Optically manipulating aerosol particles to better understand climate change



When Suman Anand was a child, she was fascinated by the stories of her father, a chemist in an explosives factory in Gomia, a small town in India. Sitting around the dinner table at night listening to him describing his experiments at work, she began formulating her own plans for a career in science.

During high school she qualified for the Indian National Mathematics Olympiad, but decided to pursue a different career path. "Math wasn't an option for me—I wanted to do experiments," she says. "I wanted to be a chemist, but my father suggested physics instead."

After receiving her BSc (Hons) degree in physics from Ranchi University in India she moved to Varanasi and graduated from Banaras Hindu University in 1992 with a MSc in physics. She married an engineer in 1997 and in 1999 she earned her PhD in physics, taking home a Best Researcher award for excellence in science.

Up to this time her focus had been on materials science with a specialization in dislocations in crystals. In 2001 Anand took up post-doctoral studies at the National Physical Laboratory in New Delhi, where she began working on problems in optical coherence and gained experience working with optical tweezers.

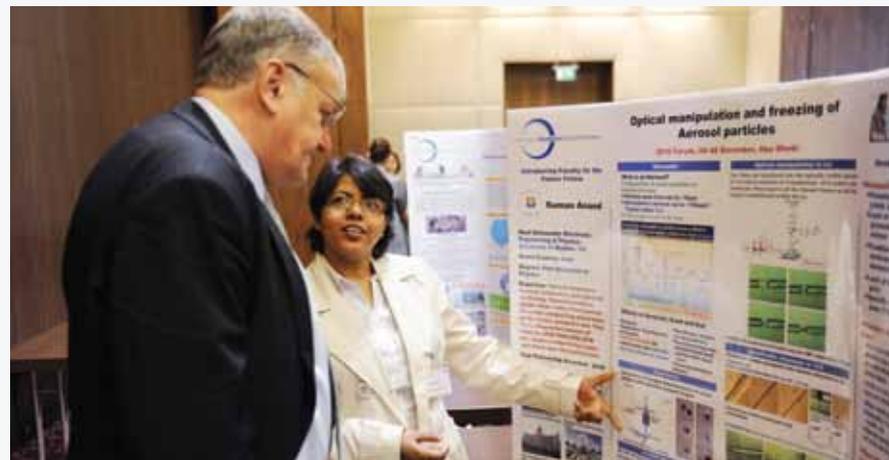
Optical tweezers use the optical force generated by a tightly focused laser beam to trap a particle at the beam's focal point. In 2004, after a career pause when her son was born, she received three-year funding from the Indian Department of Science and Technology for an independent project on optical phase singularity, and in 2009 she received a prestigious one-year Leverhulme Fellowship to study at the University of Dundee in the United Kingdom.

Balancing work and family life isn't easy, she says. Her days often begin at 6 am and extend to midnight, and sometimes she finds herself reading academic papers while cooking dinner. But she has a supportive husband who is willing to share the load, and the effort is worth it because in her research she is contributing to humanity.

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A growing body of researchers believe that aerosols have a direct impact on atmospheric cooling

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“You have to have passion for what you do.”

With the support of a Faculty for the Future fellowship, Anand is now a post-doctoral research Fellow in the Applied Optical Manipulation Group at the University of Dundee in the United Kingdom, where she is involved with experiments related to optical manipulation and freezing of aerosol particles. Her research aim is to develop new techniques to explore aerosol properties by making use of optical tweezers that can trap and manipulate aerosols in a controlled, non-destructive way.

Anand uses optical tweezers combined with laser probe techniques to probe the size and composition of aerosol particles. Her methods for sampling and analyzing atmospheric aerosol particles enable chemical reactions and physical transformations to be followed under controlled laboratory conditions. Ultimately, her work may help in resolving environmental issues such as climate change, global radiation uncertainty, and the effects of aerosols on cloud formations.

“A growing body of researchers believe that aerosols have an indirect impact on cooling of the atmosphere, but the mechanisms of this are not yet known,” she says. “My work may help in understanding climate change.”

When she completes her studies Anand intends to teach in the Amity Institute of Nanotechnology at Amity University, India. ■

SESSION IV

Working Groups

Group One
Work-Life
Balance

Jenny Ho

Suman Anand

Sidrotun Naim

Euis Tintin Yuningsih

Premaladha
Poddutoori

Nimalika Perera

Ova Candra Dewi

Wiratni Budhijanto

Group Two
Managing the
Return Home

Dade Nurjanah

Dewi Mairiza

Farhana Jabeen

Pelin Candarlioglu

Ismudiaty Puri
HandayaniErees Queen
Macabebe

Rana Bilbeisi

Witri Wahyu Lestari

Korakot

Sombatmankhong

Group Three
Mentoring &
NetworkingJeanne Therese
Hilario Andres

Edu Inam

Sujata Ray

Banafsheh Zahraie

Vivien Djanali

Sheeja Jagadevan

Betty Purwandari

Radhika Madhavan

Finding solutions to challenges
faced by women in science

Three working groups discussed ways to balance work and family life, how to manage the return back to home universities and strategies for mentoring and networking.

The final day began with presentations by three working groups who had met the previous afternoon to discuss challenges and come up with possible solutions on the themes of Work-Life Balance, Mentoring & Networking, and Managing the Return Home.

Group one led off on the Work-Life Balance theme by pointing out that for Faculty for the Future Fellows, life comes in a variety of formats—some are married, some are single and some are involved in “complicated” relationships.

The backbone of achieving balance is time management, said group one, and this often requires making difficult decisions when prioritizing work and family obligations. Work pressures are a big issue. Many of the Fellows work 10-hour days, seven days a week, and find themselves juggling family

Many problems can be solved by simply increasing the level of communication and by being honest, frank and straightforward with each other





commitments with the high expectations of their supervisors, some of whom “don’t think we work enough, or believe we should publish more.” On top of that there is the issue of gender imbalance—often male students are able to spend more time in the lab, whereas female students feel a need to also focus on their families.

Family pressures are another big issue. Conflict can arise when the workload is not shared, but in the interest of achieving harmony in the home many times it is the woman who makes the compromises. Conflict typically creates stress, and the group thought that a big part of the solution is to create strategies for reducing stress levels.

Strategic planning includes setting goals and developing the discipline to achieve a healthy work-life balance. This includes sharing child care responsibilities and making a clear distinction between your work and your private life.

Many problems can be solved by simply increasing the level of communication and by being honest, frank and straightforward with each other. If possible, discuss your career plans with your partner before marriage. It might mean having an honest discussion with your supervisor, or posting a timetable at home. Whatever method you choose, it is important to be systematic in your approach.

Another solution is to make time for relaxation and fun. Simplify your life—the less complicated, the better. If necessary, ask relatives and friends for help with the kids.

A fourth solution proposed by the group is to work toward increasing government and employer support for women. Initiatives could include flexible working arrangements, strict maximum hours, compulsory leaves, more child care and breastfeeding centers and helping develop policies for work-life protection. Underscoring the difficulty of achieving action on these fronts, however, group one superimposed over its solutions diagram an image of a stuck gear being hit with a hammer to get it moving.

Group two focused on the theme of managing the return back to the home country at the conclusion of their studies. The Fellows are expected to return home as role models, but because some Fellows are returning to guaranteed positions while others anticipate having to search for a position, dividing into two subgroups made sense for this group.

Each subgroup identified different issues and problems. Availability of positions can be an issue back home. Is it the right position? The right university? Is the timing right? Targeting a university at the outset of your studies, and following up at regular intervals with professional networking is a good strategy, as is making sure the right people at that university know about the research you are conducting while abroad. It also helps to ensure that the research you are doing is research that is needed back home.

Determining the job requirements in advance is another crucial issue. Know what qualifications are expected by your target university,

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Issues that often arise with home universities include the difficulty of keeping in contact while away

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and make sure your experience and publication record will serve you best when it comes time to apply for a position.

The third issue is managing personal expectations, not only might a position be hard to obtain, but it might involve administrative duties or other tasks that interfere with your research agenda. Keep in contact with the university you want to work at, and make sure they know what you want to get out of the arrangement and what you are expecting from them.

Fourth is dealing with peers. When you go home you are the new person, potentially giving rise to professional jealousies and unwanted competitiveness. The solution to this is to be diplomatic. Maintain a calm demeanor, and avoid confrontation.

A final issue identified is the availability of funding and resources. Will it be possible to carry on with the same level of research that you were used to at your host university? If not, what can be done to overcome this issue? Collaboration is a key part of the solution, according to the group. Build bridges between local and international institutions, or create a community for interdisciplinary research. Also, consider how networking can help as you explore local and international funding avenues.

Issues for those who are returning to positions in their home countries centered around the problems associated with settling in back home after an extended stay overseas. Issues that often arise with home universities include the difficulty of keeping in contact while away, and with having a low profile due to an extended absence. Coming back, the group discussed how that administrative assignments were often made part of the job description, interfering with research. Saying no to this is difficult, but one solution is to negotiate a reasonable compromise before leaving for international studies. Maintaining the ability to continue doing research is also a potential issue. It is important to negotiate the workload to accommodate time for research, and to secure adequate funding. Establishing networks while abroad is essential—in many emerging economies access to adequate research

facilities and even to basic academic journals can be difficult to obtain. It is also important to involve students in your research, as it increases the value to employers. Because some universities in emerging economies lack adequate infrastructure, it may be possible to propose a collaborative venture with your host university in terms of information systems.

The group also highlighted that consideration should be given to contributions that Faculty for the Future Fellows can make to teaching and research at their home university. It may be possible to assist, for example, in helping the home institution improve teaching methodologies and update course content, or by offering to teach advanced courses. In addition, you can offer to manage a research database, help establish a new research lab, develop a networking collaboration or organize summer programs and conferences when you go back home.

Group three, Mentoring & Networking, began with two role-playing exercises. In the first, a hesitant mentee was rebuffed while approaching a busy mentor for advice, while in the second role-playing exercise a more positive outcome resulted for the mentee. The exercise served to illustrate the delicate nature of the relationship between mentors and mentees.

A good mentor is someone who can help you help yourself, the group said. The relationship is based on mutual respect, trust and open communication





A good mentor is someone who can help you help yourself, the group said. The relationship is based on mutual respect, trust and open communication. Mentors must be prepared to spend time listening in a non-judgmental manner, and it must be a good match. The main issue for mentees is how to find a good mentor, and how to maintain an effective relationship with one. Mentors face the issue of a lack of training in what, for many, is an ill-defined role as part counselor and part supervisor.

Issues include how to be remembered, overcoming intimidation, following up and maintaining communication. It helps to have a business card on hand, to ask questions, seek training and step out of your comfort zone. Do your homework in advance, pick the person you most want to meet at an event and have someone introduce you. Keep in touch immediately following the event. Use online networking and establish a memorable online presence. Body language is important, as is looking people in the eye and shaking hands with a firm grip. Conferences are good places to network, as are attending research talks, becoming involved in academic organizations and joining professional societies.

A good mentor is someone who can help you help yourself

The benefits of mentoring and networking include obtaining grants, raising visibility, finding research and faculty positions, sharing resources and simply being inspired. ■

PROFILE: JENNY HO

Developing better vaccines to achieve immunity to disease

The eldest child in a family of five, Jenny Ho was born and raised in Malaysia, where she obtained her bachelor's degree in chemical engineering with first-class honors from the University of Technology Malaysia.

Currently a post-doctoral Fellow in bioengineering at Monash University in Australia, her research focus is in genetic therapeutics, especially targeting delivery for DNA vaccines and protein biopharmaceuticals.

Using nano- and bio-material technologies, Ho is working at sub-microscopic levels to improve the delivery of drugs and vaccines within the body. She develops formulations for drug and vaccine delivery that can improve the therapeutic effects of biomolecules—effectively letting doctors prescribe lower amounts of more potent drugs that work for longer periods in the body.

"You won't need to go back for several injections," she says, "You will just be able to take a pill."

Her research aims to develop feasible and scalable production methods to reliably produce therapeutic products that facilitate the cellular uptake of biopharmaceuticals such as plasmid DNA and antibodies for infectious diseases and cancer therapies.

"One of my main goals is to create a particle that can deliver a vaccine via nasal inhalation. This could be of huge benefit when immunizing populations in areas with limited access to trained medical staff, or in the case of a pandemic."

With the experience and expertise she has obtained, she hopes to help advance biotechnology research in her home country and around the world. "In developing countries like Malaysia the workload is in teaching, but for me it is important to be able to continue my research, so I think it is important to build collaborations while I am away. This is the time to build up my professional network," she says.

When she completes her current work as a post-doctoral Fellow to gain research experience, Ho will return to Malaysia where she hopes to land a university position and continue her research. ■



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One of my main goals is to create a particle that can deliver a vaccine via nasal inhalation. This could be of huge benefit when immunizing populations in areas with limited access to trained medical staff

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CONCLUDING REMARKS

Pick two or three main issues to resolve, and fix those first

Ranaa Riyamy, operations manager in the Schlumberger Drilling & Measurements group and a Schlumberger Foundation board member, summed up the proceedings by saying she thinks that many of the issues facing the Fellows—including putting in long hours—also exist within industry.

When it comes to managing time, Riyamy pointed to the importance of time management. “In paying attention to time wasters, one realizes that 20 per cent of the root causes result in 80 per cent of the observed waste. Pick two or three main issues to resolve, and focus on fixing those things first.”

Citing as one time-saving example a decision she made to ban email from her smart phone, she said, “The trick is to make the time.”

Addressing the issue of managing the return home, Riyamy said the danger in studying abroad is that making the decision to return home can be difficult. “It is very easy to go out and suddenly—four years turn into ten.”

While the Schlumberger Foundation has an interest in ensuring the return home is managed properly, it is up to the Fellows to assist in this effort by, for example, providing evidence of what they have done to encourage additional funding, or by showing how they have promoted themselves.

Staying in touch on a regular basis is key to maintaining links within your home country. “Go home on your breaks, and update them regularly on the progress of your research,” she advises. “If necessary, consider tweaking your research to make it more relevant to your home university.”

Networking is important, said Riyamy, because when you interact with the right people back home they become your agents who can promote you while you are away. Know who the decision makers are, and get to know those people. Don’t wait until you have finished your studies, because by then it may be too late. The ideal situation is one in which “everyone is eagerly awaiting your return.”



To assist in networking within the home country, Riyamy said Schlumberger Foundation board members have recently started discussing the possibility of implementing “return grants” that could be used to fund periodic trips back home related to the scope of study and to assist with settling back into their home countries.

With respect to mentoring, Riyamy pointed out that most of Fellows are at a stage in their careers where they are interested in becoming mentees, but mentees eventually transform into mentors and pass on their lessons learned. The mentor-mentee relationship is tricky to maintain, and it is important to respect the boundaries.

It is also important to use the time while studying abroad to market yourself. Marketing yourself includes making sure that your contacts back home know what is in it for them. It can help to take a course on developing your presentation skills. Making sure that a certain amount of your time is spent promoting yourself is a “fantastic” idea, she concluded. “You should market yourself in every way possible.” ■

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The mentor-mentee relationship is tricky to maintain, and it is important to respect the boundaries

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PROFILE: BETTY PURWANDARI

Researching ways to help improve the mobile web in emerging economies



When Betty Purwandari started using the World Wide Web in the mid-1990s she was astounded at the amount of information she found at her fingertips. At the time she thought, “This is the sort of thing that will really change people’s lives.

She then read a book about Tim Berners-Lee, inventor of the World Wide Web, and decided to make web science her field of study. After earning her undergraduate degree in computer science at the University of Indonesia, Purwandari obtained her MSc in data communications, networks and distributed systems at University College London in the United Kingdom. She is now pursuing her PhD in web science at the University of Southampton in the United Kingdom, where her interest is in improving the mobile web in emerging economies.

In her research Purwandari is developing a methodology to measure the impact of accessing the web from mobile phones, which is called the mobile web, on people in emerging economies. Most of the infrastructure is created in and for advanced countries, she says, but developing countries have different requirements. Her research goal is to identify and evaluate the interplay between the mobile web and its stakeholders in the developing world, where mobile phones are often the only means of communication due to a lack of fixed telephone lines.

“People in developed countries are using advanced web applications on iPhones or other smartphones, but in the developing world they are using five-year old phones running very simple browsers. Nevertheless, if we program the web application properly it can still be run on those older phones, and if we modify the application it can still work on those older browsers,” she explains.

Language issues and reliability of mobile networks are two other issues being addressed in her research. Because in developing countries the signal is often unstable, she is working to develop applications running on older phones that can save some information even when the signal is off. When the signal returns, the data can be transferred to a server and be transmitted from there to the user’s phone.

Purwandari says the experience of attending the Faculty for the Future Forum in Abu Dhabi was an eye-opener. “Before I came to the Forum I thought it was a community that only existed online, but when I met the other Fellows and we shared our experiences I was really inspired. Faculty for the Future provides more than just money, it provides community.”

Purwandari is married to an industrial engineer, and she says it’s a good thing she has the full support of a close-knit, extended family including her sister and brother —her passion for learning is so strong that she left her husband and two children behind in Jakarta while she completes her PhD in the United Kingdom.

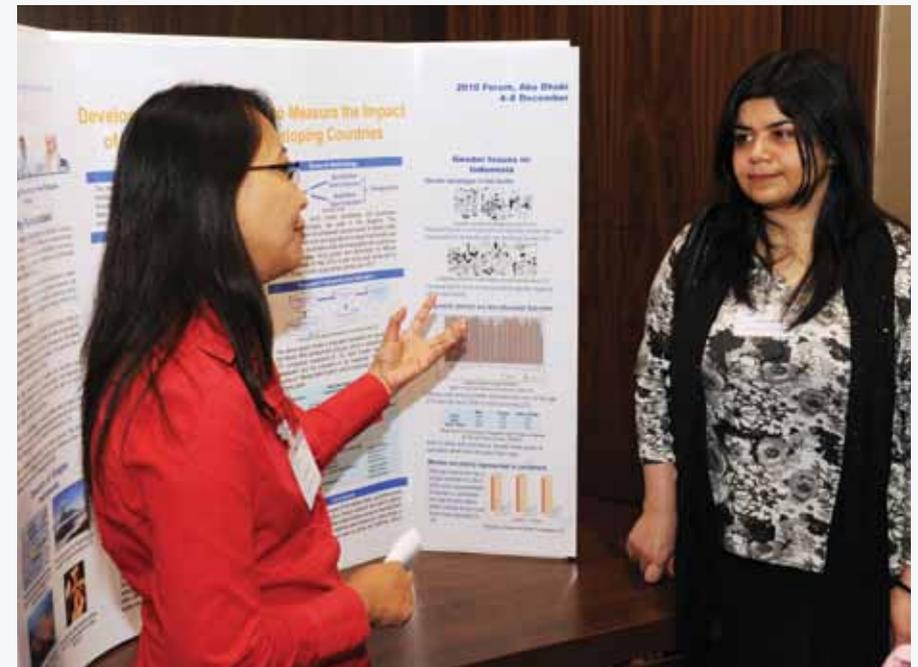
“It seems like I am juggling several balls—research, career, family—but thankfully I have people helping me catch the balls before they hit the floor,” she smiles.

When she completes her doctorate, Purwandari intends to teach and continue web science research at the University of Indonesia in Jakarta. ■

“

Before I came to the Forum I thought it was a community that only existed online, but when I met the other Fellows and we shared our experiences I was really inspired

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APPENDICES

Appendix A: Foundation Board and Staff Members

Appendix B: Fast Facts

Appendix C: Research Abstracts

SCHLUMBERGER FOUNDATION

Board and Staff

BOARD OF DIRECTORS

Jean-Marc Perraud	Chairman & President (Retired Chief Financial Officer, Schlumberger)
Jean Chevallier	Vice-Chairman (Retired Vice-President, Schlumberger Industry Affairs)
Sola Oyinlola	Vice-President (Chairman Africa, Schlumberger)
Stephanie Cox	Vice-President (Vice-President Personnel, Schlumberger)
Ranaa Riyamy	Vice-President (Operations Manager, Schlumberger Drilling & Measurements, Qatar & Yemen)
Hatem Soliman	Vice-President (President, Schlumberger Latin America)

OFFICERS

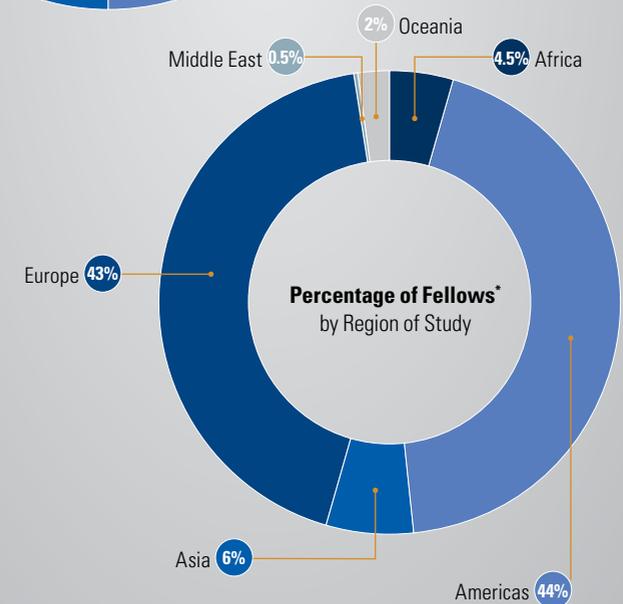
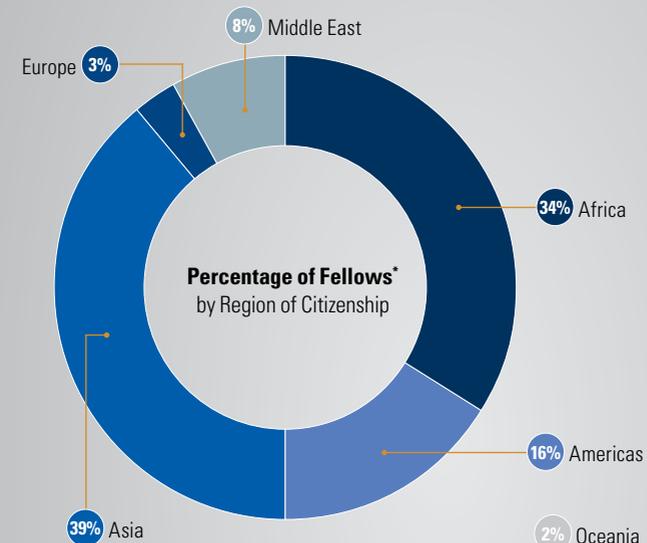
Sola Oyinlola	Executive Director and Treasurer
Darryl Rigot	Financial Accountant
Eileen Hardell	Executive Secretary
Bram Verburg	Controller

FACULTY FOR THE FUTURE STAFF

Regina Hand	Governance & Administration Manager
Eve Millon	Communications and Community Coordinator
Véronique Tournier	Assistant

FACULTY FOR THE FUTURE

Fast Facts in 2011



*Fellows refers to the entire Faculty for the Future community since the inception of the program (including the current grantees and the alumni).

FACULTY FOR THE FUTURE

2011 Country Map



Research Abstracts

The Faculty for the Future Forum included three 45-minute poster sessions in which the Fellows learned about each other's work, established synergies, forged new connections and discussed a number of potential collaborations. Standing beside the posters they had prepared, the Fellows took turns describing their research focus, methods and goals. Measuring three feet by four feet (90 cm X 120 cm), each tri-fold poster board featured technical information about the Fellow's research in the form of an abstract with accompanying diagrams in addition to brief personal descriptions, capsule country profiles and, for many, a discussion about gender issues back home. When set up in rows on two long tables in the large hall, the academic posters served as a powerful visual statement about intellectual prowess.

To view the full set of poster presentations, please refer to the DVD in the back of this booklet.



SUMAN ANAND

Optical Manipulation and Freezing of Aerosol Particles



Suman ANAND

Home Country:

India

Degree:

Post-Doctorate
in Physics

Expertise:

Optical Coherence,
Laser Tweezers

Research Focus:

Optical Trapping
of Aerosol Particles

Host University:

University of Dundee,
United Kingdom

Fellowship

Awarded:

2010

RESEARCH ABSTRACT

Aerosols play a pivotal role in many areas of science, from atmospheric chemistry and physics through to combustion science and the delivery of drugs to the lungs. Although there are several techniques to probe chemistry at liquid interfaces but only few are there for probing the chemistry of aerosols directly. Of particular topical relevance is the fact that aerosols are responsible for climate cooling and play an important role in the overall radiative forcing balance in the atmosphere. Current climate models often ignore aerosols completely and, for example, ice nucleation is a process that needs further study to enable a deep understanding of the process to be developed and to enable ice properties to be included in scattering and albedo models. A new technique, Optical tweezers, has been proposed to develop and carry out a range of pioneering experiments to explore aerosol properties. Optical tweezers is shown to trap and manipulate aerosols in a controlled, non-destructive way, allowing dynamic processes to be followed. They work by using the optical forces generated by a tightly focused laser beam, with the particle of interest trapped at the beam focus. The primary objective is to design and implement new techniques for probing the chemical and physical transformation of aerosols, and study how it affects the global climate change and, also, to interface this with my ongoing research on aerosol dynamics.

In a previous experiment, it is demonstrated that light can be used to create microchannels in ice. Free space and fibre coupled infrared laser light is used to produce microchannels with diameters down to 100 microns in diameter. It is shown that the channels can be created in a timescale of seconds by controlling the input power that they can be stabilised over a timescale of several minutes using powers as low as 30mW. It is also demonstrated that liquid samples can be inserted into the channels and particle movement is observed using a combination of optical and thermally induced forces. The data looking at droplet freezing within the microchannels is also presented. The preliminary results looking at dual beam coupling into such optofluidic channels and examine prospects for using such channels as rapid microfluidic prototypes are shown. The possibility of using optically shaped ice channels as a means to study aerosol nucleation processes is further discussed. ■

JEANNE THERESE HILARIO ANDRES

The Interaction of Chemical Kinetics and Fluid Flow in the Geological Storage of Carbon Dioxide



Jeanne Therese Hilario ANDRES

Home Country:
Philippines

Degree:
PhD in Chemical Engineering

Expertise:
Chemical Engineering

Research Focus:
Carbon Dioxide Capture and Storage

Host University:
University of Cambridge, United Kingdom

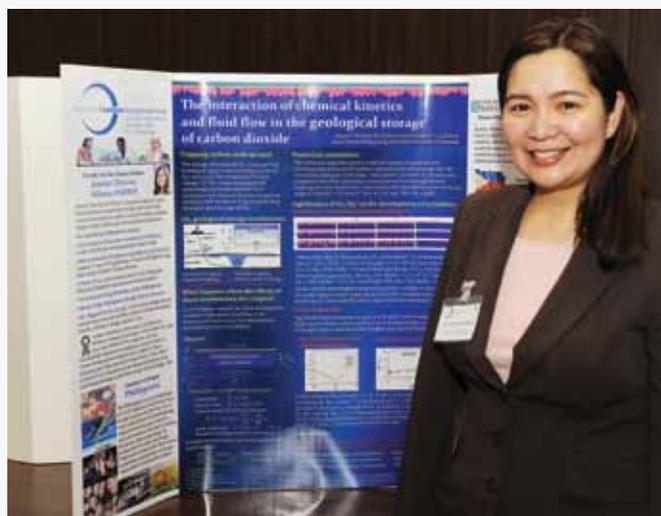
Fellowship Awarded:
2008

RESEARCH ABSTRACT

To investigate the fundamental interaction between fluid mechanics and chemical kinetics in the geological storage of CO₂ in deep saline aquifers, a model was developed to simulate single-phase fluid flow in the presence of reaction in a two-dimensional homogeneous porous medium.

Using scaling, we show that the stability of a buoyant boundary layer in a porous medium in the presence of a first-order chemical reaction is fully determined by the nondimensional number, where is the Damköhler number and is the solutal Rayleigh number. Increasing decreases the growth rate of the instability, delays and suppresses finger interaction, and increases the time for onset of convection. Above a critical, no convection occurs as reaction stabilizes the diffusive layer at a finite thickness.

Our results suggest distinct regimes for CO₂ transport and storage in saline aquifers, depending on the strength of CO₂-rock reactions. ■

**RANA BILBEISI**

Subcomponent Self-Assembly of Face-Capped Tetrahedral Cages



Rana BILBEISI

Home Country:
Jordan

Degree:
PhD in Chemistry

Expertise:
Chemistry

Research Focus:
Drug Delivery Systems

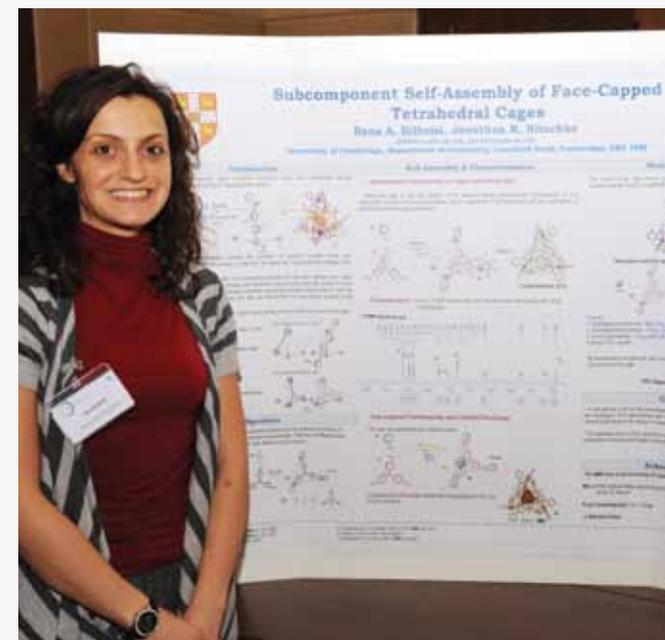
Host University:
Cambridge University, United Kingdom

Fellowship Awarded:
2010

RESEARCH ABSTRACT

Tetrahedral metal-organic cages (molecular containers) have shown interesting applications due to their well defined cavities where guest molecules get encapsulated. Guest encapsulation allows the behavior and reactivity of guest molecules to be studied. In some cases guest behavior can be modulated (example: protecting sensitive species like P4 from the environment).

This study offers a general method for the preparation of a new class of face-capped tetrahedral cages via subcomponent self-assembly. Four triamines with different ligand lengths were employed to generate a library of four face-capped cages with different cavity sizes. Magnetic and host guest chemistry properties of the cages were greatly influenced by the metal employed. ■



PELIN CANDARLIOGLU

Strontium Substituted Bioactive Glasses Promote Osteogenesis

**Pelin CANDARLIOGLU****Home Country:**

Turkey

Degree:

PhD in Materials Science

Expertise:

Bioengineering

Research Focus:

Bone Tissue Engineering and Regenerative Medicine

Host University:

Imperial College London, United Kingdom

Fellowship**Awarded:**

2010

RESEARCH ABSTRACT

Bone replacement procedures to treat non-healing fractures and restore bone lost are common. Autologous bone harvested from the iliac crest is the 'gold standard' for such procedures, however, the amount of bone that can be transferred is limited. One potential therapy stems from tissue engineering, a field that aims to repair or replace diseased and/or damaged tissues and organs with laboratory produced living constructs. Strategies call for a biocompatible scaffold material that can provide a three-dimensional structure, while stimulating either implanted cells or the body's own progenitors to remodel and/or replace it. This necessitates the development of effective bone scaffold materials that are osteoconductive, osteoinductive, osteointegrative and bioresorbable.

Osteoporosis is common among the elderly and is marked by an imbalance in the normal process of bone remodelling. Osteoporosis-related fractures and other indirect costs are significant. Because of its chemical similarity, strontium can replace calcium in bone. However, the strontium ion itself does not just become incorporated into bone mineral, it has also been shown to affect osteoblasts and osteoclasts eliciting anti-catabolic and anabolic effects. Indeed, strontium has been shown to avert bone loss and significantly increased bone density and strontium delivered as the osteoporosis drug, strontium ranelate (Protelos®), prevents vertebral and non-vertebral fractures in post-menopausal women.

In 1969, Hench and colleagues invented a soda lime phosphosilicate glass which could bind to living tissue. 45S5 Bioglass® binds to bone upon dissolution and the ions it releases during this process have been shown stimulate osteoblast proliferation and promote enhanced bone growth in vitro. We have combined the osteoinductive properties of Sr with the osteoconductive properties of bioactive glasses and created both a local delivery system of strontium, also a new more osteogenic biomaterial for various bone tissue engineering applications.

With collaboration of RepRegen, the 'smart biomaterials' company known as BioCeramic Therapeutics, the strontium substituted bioactive glass received CE mark approval with the name StronBone in May 2010. This year StronBone is planned to be tested on clinical phase with 68 patients in the first trial. Further research on the subject is ongoing. ■

CANDRA DEWI OVA

Low Carbon Eco-City Development—Sustainable Regional Decision Support Model on Waste Management

**CANDRA DEWI Ova****Home Country:**

Indonesia

Degree:

PhD in Environmental Science

Expertise:

Solid Waste and Urban Management

Research Focus:

Municipal Solid Waste Management

Host University:

Hamburg University of Technology, Germany

Fellowship**Awarded:**

2006

RESEARCH ABSTRACT

Low Carbon Eco-City, in particular the contribution of waste management sector, is a concept of living in low rate of carbon generation, using fewer natural resources, and encouraging waste reduction at source by increasing the used material quality. This concept also performs a transition of waste as waste/garbage to waste as material resources.

Many planners and decision makers in the area of Municipal Solid Waste are lack of thorough understanding of the whole chain of waste management system and its impact on environmental quality and public health. By fact they own role on engendering the influence on the urban population and the cityscape formation. The Decision Support Models (DSMs) for regional sustainable waste management are constructed to assist the planners and decision makers in finding the optimum way to manage the solid waste, mainly based on the local value.

This study is aiming as a pilot project to develop Sustainable Regional Decision Support Model on Waste Management for developing country, particularly in Indonesia. However the need of such models are urgent in Developing Countries, mainly due to the hygienic issues and current inappropriate waste management. The challenge is to develop as such which could avoid wrong decision taking. The integration of waste management, urban planning and environmental policy to develop "Sustainable Regional Decision Support Model on Waste Management" toward Low Carbon Eco-City is expected to synergize the environmental, economical and social sustainability.

This work is targeted to reach their bullets on building the local capacity, empowering the housewife and prioritizing the children education, while also reducing the Green House Gas Emission generation factors. The core of the study is Low Carbon Eco-City Development. ■

VIVIEN SUPHANDANI DJANALI

Preconditioning in the Fractional Step-Method of the Navier-Stokes Solutions

**Vivien Suphandani DJANALI****Home Country:**
Indonesia**Degree:**
PhD in Mechanical Engineering**Expertise:**
Computational Fluid Dynamics**Research Focus:**
Preconditioning in the Fractional-Step Methods of Navier-Stokes Equations**Host University:**
The University of Sydney, Australia**Fellowship Awarded:**
2009**RESEARCH ABSTRACT**

Computational fluid dynamics plays an important part in fluid flow investigation. Although experiments are considered as the most accurate tools, these methods are expensive and often limited for simple geometries and/or problems.

Complexity in the simulation for incompressible flow is added by the coupling between the pressure and the velocity, which does not appear in the compressible flow simulation. Fractional-step methods are applied to the Navier-Stokes equations to simplify the coupling.

This results in two separate equations, i.e. the momentum equations and a separate pressure poisson equation. Although the pressure poisson equation is solved only once in each momentum-pressure iteration, its computation requires most of the total solution time.

This study is undertaken to improve the performance of the solver, particularly by accelerating the convergence of the pressure poisson equation. One important characteristic of the pressure poisson equation is that the coefficient matrix remains constant. This characteristic will be of benefit along with the approximate inverse preconditioning methods as accelerators. The preconditioners need to be constructed only once, and are recalled at each subsequent time-step. The advantages of these methods are their implementation in the solvers requires matrix-vector products, and thus, easy to parallelise. The code is written in Fortran language and tested in two-dimensional and three-dimensional cases. Since this study focuses on nonsymmetric problems, the results can be applied for a wide range of incompressible flow problems.

It is expected that, with more efficient solver, the computing time and cost can then be greatly reduce. This home-built code can replace the use of commercial software and provide complementary data which is difficult to obtain from experiment. ■

ISMUDIATI PURI HANDAYANI

Charge Dynamics in Multiferroic TbMnO₃

**Ismudiati Puri HANDAYANI****Home Country:**
Indonesia**Degree:**
PhD in Optical Condensed Matter Physics**Expertise:**
Physics**Research Focus:**
Spin and Polarization Dynamics in Multiferroics and Frustrated Systems**Host University:**
University of Groningen, The Netherlands**Fellowship Awarded:**
2006**RESEARCH ABSTRACT**

A multiferroic is a compound where the magnetic and electric degree of freedom are tightly coupled. Any change in magnetic ordering results in direct changes in the electric polarization. It has been discussed that the exploitation of this coupling of the electric and magnetic properties in multiferroics may hold a bright future for memory^[1,2] and information processing technologies^[3].

We are studying the charge dynamics in the multiferroic TbMnO₃. This compound shows a transition to a sinusoidal antiferromagnetically ordered phase at 41K and a transition to a spin spiral structure at 28K. This latter low temperature phase is the multiferroic phase in which the material also shows a spontaneous polarization. We observe that the charge dynamics in this material is strongly influenced by the antiferromagnetic order occurring below 41K. This is evidenced by a remarkable change of the transient reflectivity, and an strongly increasing charge carrier relaxation time below 41K. We interpret our results in terms of a magnetic order induced localization of the photo excited charge carriers leading to a decrease in the electron-phonon coupling, and hence in a slowing down of the phonon mediated energy relaxation of the optically excited electrons. ■

^[1] J.F. Scott, Nature Materials 6, 256 (2007)^[2] M. Gajek et al., Nature Materials 6, 296 (2007)^[3] P. Rovillain et al., Nature Materials 9, 975 (2010)

JENNY HO**SPIONS for Delivering Malaria DNA Vaccine, Next Generation of Vaccine****RESEARCH ABSTRACT**

Efficient DNA transfection is crucial for DNA vaccine delivery, as often low efficacy is observed in many *in vitro* and *in vivo* studies. To overcome the problem due to cell barriers, the gene vector can be associated with narrow size superparamagnetic nanoparticles, followed by application of an external magnetic field to target the vector to its desired direction.

This technique has been proven to result in excellent cell transfection level and to speed up the duration of the process from hours to a few minutes. Thus, the undesired toxicity of magnetic nanoparticles is also reduced. The objective of this study is to improve the delivery of malaria DNA vaccine, which containing plasmodium falciparum merozoite surface protein (MSP-1(19)), a prime candidate for a blood-stage malaria vaccine. One of the important factors influencing the performance of the transfection agent is the size of the complexes. Aqueous dispersion of superparamagnetic Fe₃O₄ nanoparticles (SPION) with narrow size distribution were synthesized via a co-precipitation method using ferric and ferrous salts with a Fe³⁺/Fe²⁺ mole ratio equal to 2. Among the polycations presently used for gene delivery, poly(ethyleneimine) PEI has emerged as a very interesting candidate due to its potential for endosomal escape. The magnetic nanoparticles were coated with PEI at different PEI: iron mass ratio. The plasmid DNA vectors encoding malaria protein were condensed on the nanoparticles with different N/P (molar ratio of PEI Nitrogen to DNA Phosphate). The binding capacity of PEI-coated SPION nanoparticles for plasmid MSP-1(19) was confirmed by 1% agarose electrophoresis assays. For a study on transfection efficiency *in vitro*, COS-7 cells were cultivated in a complete RPMI 1640 medium. Western blotting analysis was used to detect MSP-1(19) plasmid expression at different N/P ratio, while the 3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide (MTT) assay was used to investigate the cell biocompatibility/toxicity effects of the samples. ■

Jenny HO

Home Country:
Malaysia

Degree:
Post-Doctorate
in Bioengineering

Expertise:
Chemical Engineering
and Bioengineering

Research Focus:
Genetic Therapeutics

Host University:
Monash University,
Australia

**Fellowship
Awarded:**
2008

EDU INAM**Trace Elements in Ground and Packaged Water in Akwa Ibom State, Nigeria****RESEARCH ABSTRACT**

About 20 trace elements were measured in 165 ground water samples, 8 commercial brands of bottled and sachet water in Akwa Ibom state, Nigeria to ascertain their quality and suitability for drinking purposes. A comparison of the elemental concentrations with World Health Organization (WHO) guidelines and Nigerian Standard for Drinking Water Quality (NSDWQ) showed that with the exception of aluminium, cadmium, lead, and iron in some of the ground and packaged water samples, the levels of all the other elements investigated were below the maximum allowable limits. Hierarchical cluster analysis grouped 16 sampling local government councils into four clusters of similar water quality characteristics. Based on the obtained information, it is possible to design a future optimal sampling strategy for continuous ground monitoring program in the state to safeguard public health. ■

Edu INAM

Home Country:
Nigeria

Degree:
Post-Doctorate
in Chemistry

Expertise:
Groundwater
Monitoring

Research Focus:
Environmental
Monitoring and
Risk Assessment

Host University:
Gwangju Institute
of Science and
Technology, Republic
of Korea (South Korea)

**Fellowship
Awarded:**
2008



FARHANA JABEEN**Distributed Spatial Analysis in Wireless Server Network****Farhana JABEEN****Home Country:**

Pakistan

Degree:PhD in Distributed
and Adaptive Systems**Expertise:**

Computer Science

Research Focus:Ad-Hoc Wireless
Sensor Networks**Host University:**University of
Manchester,
United Kingdom**Fellowship****Awarded:**

2009

RESEARCH ABSTRACT

Wireless sensor networks (WSNs) allow us to instrument the physical world in novel ways. WSNs are on the way to becoming an important tool for the modelling of spatially and temporally extended physical phenomena. However, support for high-level and expressive spatial-analytic tasks that can be executed inside WSNs is still incipient. By spatial analysis we mean the ability to explore relationships between spatially-referenced entities (e.g., whether the mist is adjacent, or inside, or outside a vineyard) and to derive representations grounded on such relationships (e.g., the geometrical extent of that part of a vineyard that is covered by mist as the intersection of the geometries that characterize the vineyard and the weather front, respectively). The motivation for this endeavour stems primarily from applications where important decisions hinge on the detection of an event of interest (e.g., the presence, and spatio-temporal progression, of mist over a cultivated field may trigger a particular action) that can be characterized by an event-defining predicate (e.g., humidity greater than 98 and temperature less than 10). At present, in-network spatial analysis in WSN is not catered for by a comprehensive, expressive, well-founded framework.

The research contributions reported here include (a) the definition of a framework for representing induced geometries (i.e., transient, dynamic physical phenomena) as well as asserted geometries (i.e., permanent geometries like buildings or rivers) and derived geometries that can be computed from existing geometries by the application of spatial-valued operators (i.e., Union, Intersection, etc.); (b) the detailed characterization of an algebra of spatial operators closely inspired, in its scope and structure, by the Schneider-Guting ROSE algebra over the geometries representable by the framework above; (c) distributed in-network algorithms for the operations in the spatial algebra over the representable geometries, thereby enabling (i) new geometries to be derived from induced and asserted ones, and (ii) topological relationships between geometries to be identified; (d) an algorithmic strategy for the evaluation of complex algebraic expressions (i.e., spatial task) that is divided into logically-cohesive components; (e) the development of a task processing system that each node is equipped with, thereby with allowing users to evaluate spatial tasks on nodes; and (f) an empirical performance study of the resulting system. ■

SHEEJA JAGADEVAN**Sequential Fenton's-Biological Treatment For Remediation Of Recalcitrant Metalworking Fluid Wastewater****Sheeja
JAGADEVAN****Home Country:**

India

Degree:PhD in Engineering
Science**Expertise:**Environmental
Engineering**Research Focus:**Toxic Metalworking
Fluid Wastewater**Host University:**University of Oxford,
United Kingdom**Fellowship****Awarded:**

2010

RESEARCH ABSTRACT

Disposal of operationally exhausted metal working fluids (MWF) biologically is an attractive option, since it is effective and has low energy demands. However, it is enormously challenging since they are chemically complex including the addition of toxic biocides which are added specifically to retard biodegradation whilst operational.

In this study the feasibility of employing a sequential Fenton-biological oxidation for the treatment of recalcitrant components of MWF wastewater which were resistant to bacterial treatment was investigated. A statistical experimental design was employed to address Fenton reagent [H_2O_2 , Fe^{2+}] dose optimisation which ensured minimal concentrations of the reagents, thus making the treatment environmentally and economically viable. This was achieved by employing a five-level-two-variable central composite design.

The results demonstrated that Fenton treatment of the MWF effluent which remained after biological treatment greatly improved biodegradability (BOD_5/COD increased from 0.160 to 0.538) with a synchronous lowering in the toxicity of the wastewater, making the recalcitrant component more amenable to subsequent biological treatment step. An overall decrease of 92% and 85% in COD and TOC respectively was achieved by the two-step treatment method developed, thus making this treatment amenable for dealing with the recalcitrant components, which are currently the pinch point in waste biological treatment approaches. Our studies have demonstrated that from an environmental, economic and social point of view the use of non-pathogenic microorganisms to remediate organic materials present in MWF wastewater is a favourable alternative to energy demanding physical and chemical treatment options. ■

WITRI LESTARI

Functionalized Ligands for the Synthesis of Catalytically Active Metal–Organic Frameworks

**Witri LESTARI****Home Country:**

Indonesia

Degree:

PhD in Science

Expertise:

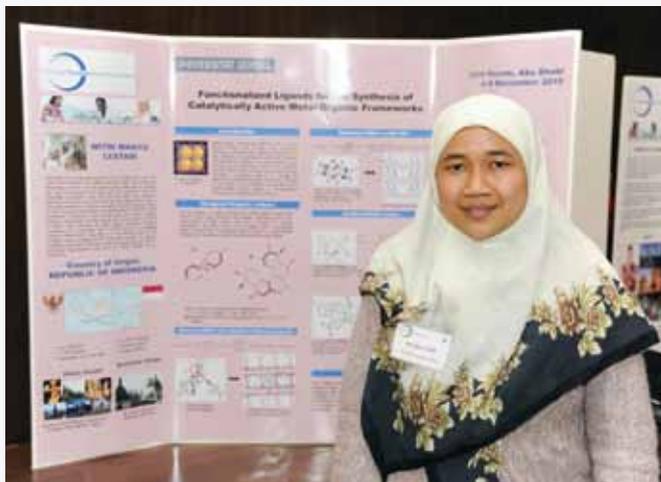
Chemistry

Research Focus:Organometallic
Co-ordination Chemistry**Host University:**University of
Leipzig, Germany**Fellowship****Awarded:**

2010

RESEARCH ABSTRACT

Metal–organic frameworks (MOFs) consisting of metal-containing nodes and organic linkers have potential applications in numerous areas, such as separation technology, gas storage, and catalysis, due to the possibility to design and modify the size and rigidity of the organic linker as well as to include catalytically active sites in the nodes or linkers. Functionalized biphenyl and binaphthyl linkers that show axial chirality are interesting and promising innovative linkers for the synthesis of chiral MOFs (CMOFs) for applications in asymmetric catalysis. Furthermore, CMOFs combine the advantages of homogeneous (high selectivity) and heterogeneous catalysts (easy separation and recyclability of catalyst). We have succeeded in employing the biphenyl ligand 4,4'-dicarboxy-2,2'-dimethoxy-1,1'-biphenyl as linker in MOFs, e.g., in $[\text{Zn}_4\text{O}\{4,4'-(\text{CO}_2)_2-2,2'-(\text{OMe})_2-1,1'-(\text{C}_6\text{H}_3)_2\}_3]_n$ (IRMOF Wit-1), which has the same topology as the so-called IRMOF series. Other fascinating frameworks were also obtained with Pb^{2+} , i.e., $[\text{Pb}_6\text{O}_2\{4,4'-(\text{CO}_2)_2-2,2'-(\text{OMe})_2-1,1'-(\text{C}_6\text{H}_3)_4\}_4 \cdot 2\text{EtOH}]_n$. We are now working on novel modified binaphthyl linkers, which should facilitate higher rigidity of the network. These results will also be presented. ■

**EREES QUEEN MACABEBE**

Investigation of Device and Performance Parameters of Photovoltaic Devices

**Erees Queen
MACABEBE****Home Country:**

Philippines

Degree:

PhD in Physics

Expertise:

Photovoltaics

Research Focus:Solar Cells and
Photovoltaic Modules**Host University:**Nelson Mandela
Metropolitan University,
South Africa**Fellowship****Awarded:**

2006

RESEARCH ABSTRACT

Parameter extraction programs that can be used to characterize various PV devices were developed in this project. Device parameters such as series resistance R_s , shunt resistance R_{sh} , saturation current I_0 and ideality factor n are extracted from the current-voltage (I-V) characteristics of solar cells and PV modules. Moreover, performance parameters such as short-circuit current I_{sc} , open-circuit voltage V_{oc} , maximum power P_{max} , fill factor FF and conversion efficiency η_c are determined from the light I-V characteristics of the devices.

In order to investigate the influence of parasitic resistances, saturation current and diode ideality factors on the performance of photovoltaic devices, parameter extraction routines employing the Standard Iteration (SI) method and the Particle Swarm Optimization (PSO) method were developed to extract the device parameters from the I-V characteristics of solar cells and PV modules. The well-known one- and two-diode models were used to describe the behavior of the I-V curve and the parameters of the models were determined by approximation and iteration techniques.

The extraction programs developed were used to characterize devices for several purposes: (1) assess the suitability of the different solar cell models, (2) relate the performance and device parameters of Cu-based devices at different fabrication conditions and (3) relate the device parameters extracted from dark and light I-V characteristics of PV modules under different environmental conditions. An analysis of the parameters provides insights into the mechanisms involved in the operation of the device under dark and illuminated conditions, and the effects of these mechanisms on the device performance parameters. The implementation of the solar cell parameter extraction methods using PSO yielded, within a few seconds, results having lower std dev and better R^2 values which shows that it is a useful characterization technique. ■

RADHIKA MADHAVAN

Large-Scale Single-Synapse Resolution Maps of the Hippocampus

**Radhika MADHAVAN****Home Country:**
India**Degree:**
PhD in Bioengineering**Expertise:**
Bioengineering**Research Focus:**
How Learning Modifies Neuronal Connections in the Brain**Host University:**
Georgia Institute of Technology, United States**Fellowship Awarded:**
2006**RESEARCH ABSTRACT**

Brain mapping techniques have come a long way since the work of Ramón y Cajal. Nevertheless, we are far from reading out network-wide synaptic weights and large-scale connection maps. In this study, we experimentally evaluate a new hybrid method to build large-scale synapse-resolution functional connection maps by combining electrical stimulation and optical readouts. This method constructs the connectivity matrix for the CA3-CA1 network in the slice by detecting potential synaptic contacts and estimating their synaptic weights. Input electrical stimulation was provided to the Schaffer collaterals through an electrode array, and responses of individual CA1 neurons loaded with calcium indicator were monitored optically in a rat hippocampal slice preparation.

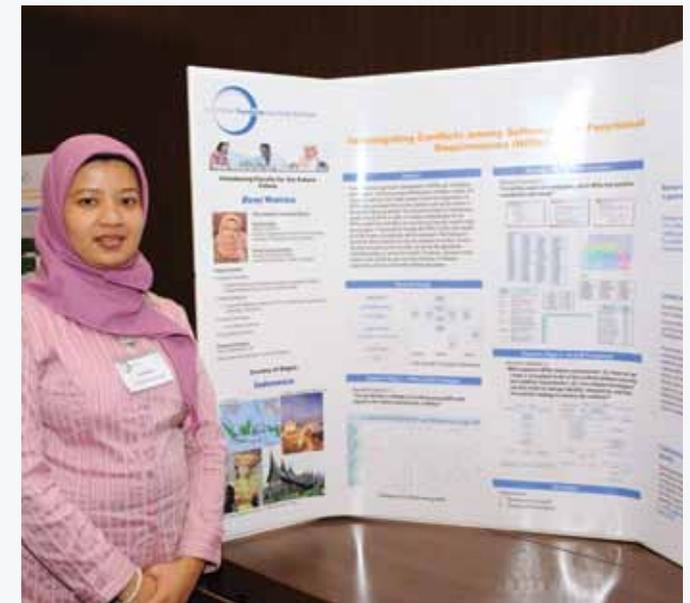
The basic experimental protocol was to deliver a strong baseline stimulus to a block of Schaffer collateral axons to bring the CA1 cells above firing threshold. Riding on the baseline stimulus, minimal stimulation was delivered to another probe electrode. We reduced stimulus current and monitored EPSCs and response statistics to ensure that this minimal stimulus activated a single axon projecting onto the patched neuron. By comparing the statistics of responses to the 'baseline' and 'baseline+probe' stimuli, the presence and synaptic weight of potential synapses were estimated from optical signals (Bhalla, PLOS Comp. Biol., 2008). Whole-cell patch recordings from loaded neurons were used to validate these optical predictions, and to directly measure synaptic weights. We anticipate that such detailed wiring diagrams that specify individual synaptic connection weights between distinct input axons and output neurons will provide valuable insights into hippocampal connectivity and changes induced by learning. ■

DEWI MAIRIZA

Investigating Conflicts among Software Non-Functional Requirements

**Dewi MAIRIZA****Home Country:**
Indonesia**Degree:**
PhD in Computer Science**Expertise:**
Software Engineering**Research Focus:**
Investigating Conflicts Among Non-Functional Requirements**Host University:**
University of Technology Sydney, Australia**Fellowship Awarded:**
2006**RESEARCH ABSTRACT**

Two of the most significant characteristics of NFRs are "interacting" and "relative". Interacting means NFRs tend to interfere, conflict, and contradict with one other while relative means the interpretation of NFRs may vary depending on many factors, such as the context of the system being developed. This research focuses on investigating conflict among NFRs in order to increase understanding of how NFRs conflict with and affect one another and how this conflict might be managed. A framework to manage the NFRs conflict with respect to NFRs relative characteristic will be developed. This framework should be able to identify not only the existence of conflict, but also the type and significance of conflict, as well as the appropriate potential strategy to resolve the conflict. Therefore, outcomes of this research will contribute not only to the discipline of software engineering, but also will benefit software developers. ■



SIDROTUN NAIM

Preliminary Study on the Potential of Shrimp-Tilapia Polyculture in Reducing Shrimp Disease Risk

**Sidrotun NAIM****Home Country:**

Indonesia

Degree:

PhD in Environmental Science and Pathobiology

Expertise:

Aquaculture

Research Focus:

Reducing Viral and Bacterial Disease in Shrimp Farming

Host University:

University of Arizona, United States

Fellowship**Awarded:**

2010

RESEARCH ABSTRACT

Many shrimp ponds in coastal areas have been abandoned in many parts of the world due to diseases, poor management such as overstocking, and environmental degradation. Black tiger shrimps (*Penaeus monodon*), whiteleg shrimps (*Litopenaeus vannamei*) and tilapia (*Oreochromis* spp.) are commonly cultured in extensive, semi-intensive, or intensive systems in tropical countries includes Indonesia. Traditional farming is typically classified as extensive system which means that shrimps are stocked at low density, feed and fertilizer inputs are generally low, and environmental impacts from nutrient release are mild. The polyculture of shrimp-tilapia at low stocking density may provide an opportunity to develop a sustainable aquaculture system to best utilize abandoned shrimp ponds. To investigate the potential of shrimp-tilapia polyculture for traditional farming setting, a preliminary study has been conducted in the field with shrimps as the main species in Aceh and East Java provinces, Indonesia. Shrimp's survival and growth rates were increased in polyculture compared to in monoculture.

A laboratory study was conducted to describe how the presence of tilapia can help the shrimps. With continue exposure to sunlight in an aquarium system, it was obvious that tilapia stimulates microalgae growth. This green water helps maintaining the water quality. Challenge study with *Vibrio harveyi*, a pathogenic bacteria for shrimps, was found that the number of the Vibrio on TCBS media was lower in a polyculture system. Interestingly, the system stimulates other bacteria to grow based on Heterotrophic Plate Count on TSA media. Molecular study with PCR technique found that different bacteria attached on the fish mucus after the Vibrio injection into the water.

Follow up study in the laboratory has been conducted to find the major factor that responsible in lowering the Vibrio count. It could be the tilapia itself secreting a kind of natural antibiotics, or the microalgae which has that ability, or the other bacteria that competing and minimizing the growth of the Vibrio. Follow up in the field will include the study on freshwater shrimp-tilapia polyculture. If the system works well, polyculture would be a good model as a sustainable and profitable farming system in both freshwater and brackishwater aquaculture. ■

DADE NURJANAH

A Collaborative Authoring Approach for Authoring Adaptive Learning Resources

**Dade NURJANAH****Home Country:**

Indonesia

Degree:

PhD in Computer Science

Expertise:

Computer Science

Research Focus:

Adaptive Educational Hypermedia

Host University:

University of Southampton, United Kingdom

Fellowship**Awarded:**

2008

RESEARCH ABSTRACT

Learning is considered as a process of transforming information and experiences aimed at making learners to have more knowledge through a set of activities according to a pedagogical manner. With the fast growth of information technology, research on learning has lead to the development of online learning. One issue about online learning is that whether it can replace face-to-face meeting with teachers or not. The answer for such question can be varied. Some research studies consider the importance of face-to-face meeting in classroom with online learning as a complementary activity. On the contrary, some research considers online learning as the main activity and face-to-face meeting with teachers is conducted as a supporting activity. In such ways, learning is conducted as what we called as blended learning.

The next generation of learning system is adaptive learning system, called Intelligent Tutoring System (ITS). It offers adaptation in learning based on the uniqueness of students including their education backgrounds, learning styles, interests, learning goals, and competences. ITS, however, has a drawback that it fully controls learning activities and do not give learners any opportunity to explore lessons on their initiatives. Adaptive Educational Hypermedia (AEH) was then developed as a solution. It controls learning adaptively and supports students for free exploratory on lessons.

With the advantages of such tools, the development of adaptive learning resources has remained a challenge. To support adaptation, knowledge spaces consisting of three kinds of elements: domain-related knowledge, pedagogical knowledge, and learning content are needed. A former paper has identified four problems in authoring for adaptive learning systems which include usability, interoperability, efficiency, and collaboration. This PhD research focuses on the development of a collaborative authoring approach for developing adaptive learning resources. The advantages of the proposed approach lie on the application of collaborative techniques, the use of learning standard (IMS Learning Design) to gain reusability and extensibility, and the repurpose of learning materials available in existing open content systems. The evaluation will be carried to get learners' and authors' views about how collaborative techniques affect the quality of authoring process and its output. ■

NIMALIKA PERERA**Microbially Derived Biomaterials and Energy****Nimalika PERERA****Home Country:**

Sri Lanka

Degree:

PhD in Physics

Expertise:

Chemical Engineering

Research Focus:Cost-Effective
Renewable Energy
Source for Fuel Cells**Host University:**University of
Cambridge,
United Kingdom**Fellowship****Awarded:**

2010

RESEARCH ABSTRACT

Most of the industrial materials and energy has been produced using huge amounts of non-renewable sources such as fossil fuels and its derivatives. The rapid depletion of these resources has spotlighted the need of more extensive research work on sustainable energy and material generation methods such as biosynthesis. Biosynthesis of materials and energy becomes more exciting due to its eco-friendliness, sustainability, abundance of raw materials and the ability to solve the waste disposal problems of the future world. Therefore, microbially derived materials and energy have the ability to impact the economies of the developing countries such as Sri Lanka.

A conventional microbial fuel cell, which is a bio-electrochemical cell, uses microbes to harness electricity from organic substrates. This system collects the electrons which are generated as intermediate products of their metabolic process, with large electrode surfaces. A membrane is used to separate the two half-reactions and a mediator supports the electron transfer between the microbes and the electrode. Although the air cathode system, which eliminates the need of an external oxidizing agent and a membrane, is much more cost effective than the conventional MFC it needs to be developed for efficient electron and oxygen transfer. The current energy generation levels being around 2.4W/m² (of the anode surface area), the technology insists on further developments through good understanding of the biological and electrochemical systems. Therefore, this research work is focused on developing a cost effective electrode membrane assembly for a MFC and identification of the suitable microbes for such a system.

Meanwhile, a parallel consideration will be on the applications of biopolymers (polyhydroxyalkanoates) which is a microbially derived polymer. Due to the biopolymer's biodegradability and melt-processable semi-crystalline thermoplastic properties it will be studied for its suitability to encapsulate drug materials as an alternative to the conventional non-renewable polymeric materials in the medical field. ■

PREMALADHA Poddutoori**Biomimetic Molecular Assemblies for Solar Fuels****Premaladha Poddutoori****Home Country:**

India

Degree:Post-Doctorate in
Organic Chemistry
and Materials Science**Expertise:**Organic Chemistry
and Materials Science**Research Focus:**Highly Efficient
Systems for Solar
Fuel Generation**Host University:**Northwestern
University,
United States**Fellowship****Awarded:**

2009

RESEARCH ABSTRACT

Light harvesting, charge separation, and catalysis leading to the storage of solar energy in photosynthetic proteins is carried out by well-ordered assemblies of photofunctional chromophores and catalysts within them. Artificial photosynthetic model systems designed to generate H₂ must include a chromophore that serves to harvest light and transfer reducing equivalents to the catalyst, a proton reduction catalyst, a sacrificial electron donor and a proton source. Noble metal-based (Pt, Pd and Rh *etc.*) compounds have been extensively studied as catalysts. Their low abundance and consequent high cost has limited their large scale application and has led to the search for molecular systems that utilize earth-abundant first-row transition metals to photogenerate H₂.

Hydrogenases are highly efficient enzymes that catalyze biological hydrogen activation i.e., reduction of protons to yield hydrogen and the oxidation of hydrogen to yield protons in a wide variety of microorganisms. [NiFe]-hydrogenases tend to be more involved in hydrogen oxidation whereas [FeFe]-hydrogenases catalyze proton reduction to molecular hydrogen with a catalytic activity of 6000-9000 molecules of H₂ s⁻¹ per site under optimal conditions.

Hence we have synthesized and investigated electron transfer chemistry of Fc-ZnP-NMI-Fe₂S₂(CO)₆ and Fc-Ph-ZnP-NMI-Fe₂S₂(CO)₆ along with their model dyads Fc-ZnP, Fc-Ph-ZnP and ZnP-(NMI-Fe₂S₂(CO)₆), where Fc is ferrocene, ZnP is a Zn meso-tetrapheynlporphyrin derivative, and NMI-Fe₂S₂(CO)₆ is the naphthalene monoimide dithioalate diiron hydrogenase active site mimic. In Fc-ZnP-NMI-Fe₂S₂(CO)₆, Fc and ZnP are directly linked via one of the phenyl rings of ZnP, while in Fc-Ph-ZnP-NMI-Fe₂S₂(CO)₆, an additional phenyl spacer is introduced to increase the distance between Fc and ZnP. ■

BETTY PURWANDARI

Developing a Methodology to Measure the Impact of the Mobile Web in Developing Countries



**Betty
PURWANDARI**

Home Country:
Indonesia

Degree:
PhD in Web Science

Expertise:
Web Science

Research Focus:
Impact of Mobile Web
on Emerging Economies

Host University:
University of
Southampton,
United Kingdom

**Fellowship
Awarded:**
2009

RESEARCH ABSTRACT

Mobile phone penetration in the developing world demonstrates remarkable growth patterns. However, mobile cellular penetration in developed countries is much higher than in developing countries, where around 80 per cent of the world population live. It indicates saturation of mobile telecommunication markets in the developed world, along with a huge number of potential subscribers in the developing world. As a consequence, mobile operators and service providers increasingly compete in developing countries. This has allowed mobile operators to offer services to browse the Web 1,000 times cheaper than to send texts. Furthermore, browser enabled handsets have become affordable to low-income people in the developing world.

Despite rapid Mobile Web adoption in developing countries, there has been no comprehensive research methodology to define, identify and measure the impact of Mobile Web use on society and Web technology. The absence of that methodology hinders understanding of the intertwining between Mobile Web and its various stakeholders. It creates problems to Mobile Web stakeholders anticipating Mobile Web potential effects on society. Besides, it hampers the advancement of Mobile Web technology in order to better meet the need of its users in the developing world. A research question is raised, "What is a specific methodology to measure the impact of Mobile Web in developing countries?"

To address the question, an impact analysis methodology is explored in this research. It is part of Web Science research, which studies the Web as a whole. The Web does not only connect machines; but it also connects people. When a hyperlink is followed, it is a person who decides to follow it. Hence this research is inherently interdisciplinary embracing computer science, mobile technology and social science. It uses mixed methods, which involve quantitative and qualitative research methodologies. The quantitative method encompasses questionnaires to Mobile Web stakeholders, Web tools and applications to study how people use Mobile Web. Quantitative data are triangulated with qualitative data from interviews, focus groups and observation on Mobile Web stakeholders. In May 2010, a pilot study was conducted in Nairobi, Kenya to try the impact analysis methodology. The results are used to refine the methodology that will be tested in Indonesia. ■

SUJATA RAY

Catchment Responses to Acidic Deposition in India in a Changing Climate



Sujata RAY

Home Country:
India

Degree:
Post-Doctorate
in Earth Sciences

Expertise:
Civil and Environmental
Engineering

Research Focus:
Carbon Dioxide Storage
in Deep Saline Aquifers

Host University:
University of
Cambridge,
United Kingdom

**Fellowship
Awarded:**
2007

RESEARCH ABSTRACT

India's rapid industrialization and population growth is likely to cause further deterioration of its water quality and in so doing jeopardizes sustainable development. A warming climate is likely to alter precipitation patterns, which in turn, will alter the impact of industrial pollutants, such as acidic deposition on water quality. The extent to which this will be expressed in soil, runoff and groundwater varies with catchment geology, extent of riparian zones, vegetation and land use. To date, however, there has been no systematic assessment of the current chemical status of surface waters in regions immediately downwind of some of the largest power plants, industrial hubs or areas most geologically sensitive to acid deposition. Documenting the baseline levels of variability in these ecosystems can maximize their sustainable development, use, and preservation.

We propose to study the effect of changing precipitation patterns on catchment based responses to acidic deposition. For example, changes in rainfall distribution may affect catchment responses to acidification by: (a) altering the amounts of acidic or base cation deposition, (b) changing surface water concentrations of elements of geological origin, and (c) changing soil infiltration and, in turn, the soil biogeochemical processes. In India changes in the distribution of the monsoon rainfall have been observed in Meghalaya, which also contains acid sensitive regions, such as the catchment of the Kopili hydro-electric power plant reservoir, where pH has fallen to 2.76. Likewise, soils in the Western Ghats are also believed to be sensitive to acidification.

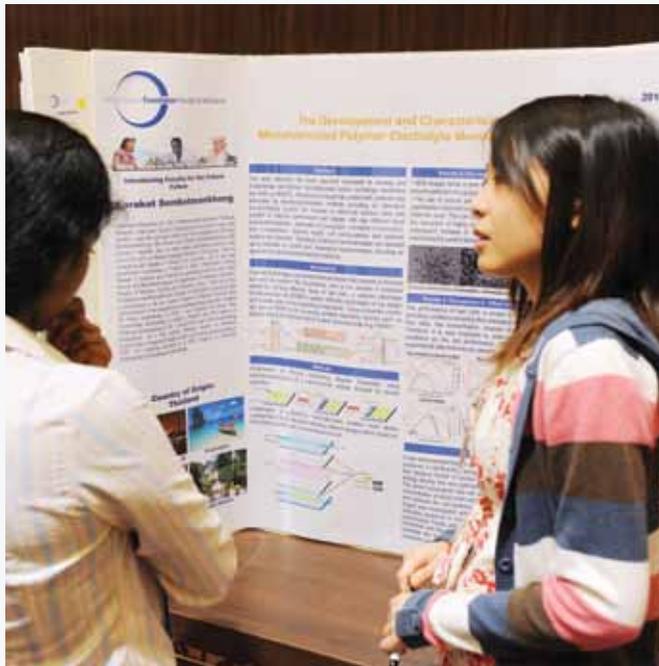
This study will combine elements of survey, monitoring and modeling to begin to develop an understanding of the risks posed by atmospheric contaminants on Indian surface water, and how these are expected to change with a changing water cycle and further societal development. ■

KORAKOT SOMBATMANKHONG

The Development and Characterisation of Microfabricated Polymer Electrolyte Membrane Fuel Cells

**Korakot SOMBATMANKHONG****Home Country:**
Thailand**Degree:**
PhD in Chemical Engineering**Expertise:**
Fuel Cells**Research Focus:**
Micro-Fabrication Techniques for Micro-Fuel Cells**Host University:**
University of Cambridge, United Kingdom**Fellowship Awarded:**
2009**RESEARCH ABSTRACT**

This work describes the novel approach employed to develop and characterise well-defined microfabricated proton exchange membrane fuel cells (μ -PEMFC). Microporous polypyrrole coated with platinum was fabricated by electropolymerisation methods providing an alternative electrocatalytic support. An increase in electrode surface area was created to improve performance and assess with two different liquid fuel/oxidant systems. Application of convection, orientation of convection, fuel concentration, channel height, cell configurations and platinum loading are reported. Operating conditions characterisation is reported using potential vs. current and impedance measurements, providing an approach to optimise experimental conditions. ■

**WIRATNI BUDHIJANTO**

Improved Design of Low-cost Anaerobic Digesters for Household Biogas Production in Indonesian Rural Areas

**Wiratni BUDHIJANTO****Home Country:**
Indonesia**Degree:**
Post-Doctorate in Engineering**Expertise:**
Bioprocess Engineering**Research Focus:**
Small-Scale Continuous Bio-Digesters**Host University:**
Cornell University, United States**Fellowship Awarded:**
2009**RESEARCH ABSTRACT**

A low-cost anaerobic digester was developed with a 0.3-m diameter PVC pipe and was subsequently installed and tested in ~ 30 households in Indonesian rural areas. Diluted cow manure was fed to one end of the digester while effluent was collected from the other end for land application. For each digester, enough biogas was accumulated in a gasbag to cook for ~ 1 h/day. However, some of these plug-flow digesters clogged after a one-year operating period.

This research optimized the digester configuration to guarantee maximum methane yields while preventing clogging. Controlled experiments were performed with four laboratory-scale digesters operated with a 21-day hydraulic retention time. All four digesters were fed with dairy manure (40 g/L volatile solids [VS]) and operated at $27 \pm 1^\circ\text{C}$. Two control reactors were operated as conventional plug-flow digesters, while either internal mixing or effluent recycle was tested for two treatment digesters. The performance of each digester was compared based on measured parameters, such as VS removal efficiencies and methane yields, for an operating period exceeding 200 days.

During most of the operating period, solids accumulation was more pronounced in the control reactors compared to the treatment reactors. The internal mixing reduced solids accumulation compared to the control reactors, however, the methane yields were also lower for most of the operating period due to a shorter solids retention time. Recycling effluent produced more methane, but we observed more solids accumulation than the digester with internal mixing. At the end of the operating period of ~ 220 days, steady-state conditions were approached with methane yields for all reactors that were similar (~ 0.15 L CH₄/VSin). Therefore, for optimized long-term performance, a simple internal mixing device prevented solids accumulation with similar steady-state methane yields. ■

EUIS TINTIN YUNINGSIH

The Metallogenic Context of the Arinem Te-bearing Gold-Silver-Base Metal Deposit, West Java, Indonesia

**Euis Tintin YUNINGSIH****Home Country:**
Indonesia**Degree:**
PhD in Geology**Expertise:**
Economic Geology**Research Focus:**
Epithermal Gold, Silver and Base Metal Mineralization in West Java, Indonesia**Host University:**
Hokkaido University, Japan**Fellowship Awarded:**
2009**RESEARCH ABSTRACT**

The Arinem vein system is a gold-silver-base metal mineralization with Late Miocene (~8.8 Ma) age located in the Arinem area in the southwestern part of Java Island, Indonesia. The main mineralization in the area is represented by Arinem vein zone with a total length of about 5,900m, including an unexposed vein to the south and north. The inferred reserve is approximately 2 million tones at 5.7 g/t gold and 41.5 g/t silver at a cut-off of 4 g/t Au. This equates to approximately 12.5t of Au and 91.4t of Ag with a high content of Zn, Pb and Cu. The deposits consists predominantly of sulfide (pyrite, chalcopyrite, sphalerite, galena), sulfosalt of As and Sb, and a diverse range of Au-Ag tellurides. Silver-gold telluride content is a unique aspect of Arinem deposit which is one of few Te-bearing gold-silver deposits in Indonesia. Fluid inclusion, stable isotope and thermodynamic data suggest that the majority of the mineralization and hydrothermal alteration in these deposits was caused by near-neutral to slightly acid (pH 4–6) fluid. Although the deposit exhibits many of the geologic characteristics of low-intermediate sulfidation, volcanic-hosted, Au-Ag epithermal deposits, it seems to have influent of essentially magmatic source of ore. ■

**BANAFSHEH ZAHRAIE**

Application of Stochastic Varying Chromosome Length Genetic Algorithm in Operation Optimization of Multi-Reservoir Systems

**Banafsheh ZAHRAIE****Home Country:**
Iran**Degree:**
Post-Doctorate in Operation Optimization of Multi-Reservoir Systems**Expertise:**
Water Resources Engineering and Management**Research Focus:**
Evolutionary Computing in Water Engineering**Host University:**
University of Tehran, Iran**Fellowship Awarded:**
2007**RESEARCH ABSTRACT**

A Stochastic Varying Chromosome Length Genetic Algorithm model is developed in which reservoir inflow uncertainties have been taken into account. In this model, the basic concept of the Varying Chromosome Length Genetic Algorithm model (VLGA) has been used to develop a multi-objective stochastic GA model for reservoir operation optimization. The Fast Elitist Non-Dominated Sorting Genetic Algorithm (NSGA-II) has also been utilized in development of the optimization model in order to be able to consider multiple objectives. The search and selection methods for the initial solutions are developed to increase the convergence speed of the model in order to be able to apply this model to multi-reservoir systems. The developed model is applied to the cascade system of reservoirs on Dez River in Southwest of Iran. ■



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Real success will come down the road, when this community becomes recognized for having fostered academic and scientific female leaders in countries where they are lacking, and when their leadership has inspired many more young women to enter the sciences

Jean-Marc Perraud,
Chairman and President, Schlumberger Foundation

”



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