

## Visit to Indian Institutions September 13-26, 2006

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This information is a result of Dr. Sonia Ortega's trip to India from September 13 to 26, 2006. She visited several institutions to explore opportunities for GK-12 PIs, Fellows and Teachers to collaborate with projects and peers in India. A summary of the places and people visited and potential venues for partnerships follows.

(Dr. Ortega began developing contacts based on a project submitted to NSF's Office of International Science and Engineering (OISE) by the Massachusetts Institute of Technology (MIT): U.S.-India Research Experience for Global Scientists and Engineers (proposal # 0623565) co-funded by OISE and GK-12. She sought further input from Marjorie Lueck (OISE), Dr. Luis Salicrup (National Institute of Health), some GK-12 PIs with links in India, and from Dr. Tuli Banerjee, Co-PI of the MIT proposal.)

### **In Delhi:**

- Salwan Public School
- National Council of Educational Research and Training
- U.S. Educational Foundation in India (USEFI) and Indo-U.S. Science and Technology Forum
- Indian National Science Academy
- Jawaharal Nehru University
- National Institute of Immunology
- Indian Institute of Technology
- U.S. Embassy

### **In Bangalore:**

- National Center for Biological Sciences
- Vidya Niketan School
- Bangalore International School
- International Institute of Information Technology
- Indian Institute of Science

### **In Hyderabad:**

- The Association of International Schools of India

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## DELHI

### **Salwan Public School**

I arrived in Delhi in the evening after a 15-hour flight from Newark. Early in the morning, I started my journey to Salwan Public School located in Gurgaon, south of Delhi. What was supposed to be an hour's drive took two-and-a-half hours because of traffic delays. Nevertheless, I finally arrived and was greeted by Dr. Indu Khetarpal, School Principal, several faculty, and students. Salwan is a Public School. In India, "Public Schools" are equivalent to U.S. private schools. U.S. public schools are Indian "Government Schools." Salwan has 1600 students from K-12 and follows a National Curriculum Framework developed in 2005.

I attended presentations by science and technology teachers. Science is age appropriate. Teachers engaged students in activity-based learning using examples from daily life. For example, they teach environmental studies integrated with the social sciences. Teachers develop themes such as relationships, family, food, travel, work and play, plants and animals. The same themes are used to construct knowledge as students move to the higher grades. The school has developed its own CDs and currently has 300 for students to use. Computer science is a separate subject. The school also engages students in music and the arts.

Salwan has a Science Park on its campus. Students demonstrated physics principles using the displays at the park. I visited the math labs and some of the classrooms. Students had the opportunity to ask me questions.

I described the GK-12 program to the Principal and teachers; all were very interested. They would welcome visits by Fellows and Teachers.

**Contact:** Dr. Indu Ketharpal, Principal

**Phone:** 91 124 233 3956

**Website:** [www.salwan-gurgaon.com](http://www.salwan-gurgaon.com)

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### **National Council of Educational Research and Training**

This institution is mainly in charge of developing science and mathematics textbooks to be used by all the schools in India. I visited with Prof. Hukam Singh who directs the Department of Education in Science and Mathematics. My visit with him was brief because he had an unexpected urgent meeting to attend.

**Contact:** Hukam Singh

**Phone:** 98 117 63907

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## **U.S. Educational Foundation in India (USEFI) and Indo-U.S. Science and Technology Forum**

Over lunch, I met with Drs. Jane Schukoske, Executive Director, Dr. Girish Kaul, U.S. Program Officer at USEFI, and Dr. Arabinda Mitra, Executive Director from the Indo-U.S. Science and Technology Forum. USEFI coordinates and offers the Fulbright Fellowships for U.S. students to visit India and for Indian students to visit and study in the United States. When I discussed the GK-12 program, there was interest in linking Fulbright with GK-12 to provide opportunities for Fellows as well as for K-12 teachers through the Fulbright Teacher Exchange Program. Having Indian teachers link with GK-12 teachers could be of great benefit to both. One possible collaboration would be to have a GK-12 site host a group of Indian teachers (participating in the Fulbright Teacher Exchange) when they arrive in the United States. We also discuss potential linkages through our websites to make the Fulbright opportunities available to GK-12 participants.

The Indo-US Forum is a non-profit society that promotes bilateral collaborations in science, technology, engineering and biomedical research through interaction among government, academia and industry. Dr. Mitra was intrigued with GK-12 and willing to explore further ways of collaboration with scientists funded through GK-12.

### **USEFI**

**Contacts:** Dr. Jane Schukoske, [jschukoske@fulbright-india.org](mailto:jschukoske@fulbright-india.org)  
Dr. Girish Kaul, [girish@fulbright-india.org](mailto:girish@fulbright-india.org)

**Website:** [www.fulbright-india.org](http://www.fulbright-india.org)

### **INDO-U.S. Forum**

**Contact:** Dr. Arabinda Mitra, [amitra@indousstf.org](mailto:amitra@indousstf.org)

**Website:** [www.indousstf.org](http://www.indousstf.org)

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## **Indian National Science Academy**

I met with Drs. S.K Sahni and A.K. Moitra from the Indian National Science Academy. I described the purpose of my visit and the GK-12 program and its goals. I learned that about 200 members of the Indian National Science Academy are very active in education. Every summer they engage college students and teachers in active research with them. I learned that the Indian Academy of Science in Bangalore also has a similar program. Both Drs. Sahni and Moitra were interested in learning more about GK-12 and seeking ways to link the Academy members with our Fellows and Teachers if there was interest in some of their research areas. They would like to start by linking our website with theirs and make information available to our respective communities.

**Contacts:** Dr. S.K. Sahni, Phone 91 11 232 21 931  
Dr. A.K. Moitra, Phone 91 11 232 21 931

**Website:** <http://www.insaindia.org>

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### **Jawaharal Nehru University (JNU)**

At JNU, I visited with Prof. Ramesh Bamezai, former Dean of the School of Life Sciences, and Current Director of the National Centre of Applied Human Genetics (NCAHG). JNU is a research-based university that awards Masters and Ph.D degrees and currently has about 5,000 students. The School of Life Sciences has 30 faculty and about 200 researchers. Prof. Bamezai commented that the School of Life Sciences has been using a holistic, interdisciplinary and integrated approach to science since 1970. The NCAHG has united Genetics, Molecular Biology, Computational and Structural Biology and Bioinformatics. The Centre also encourages research into the ethical, legal and social aspects related to genomic research and pursues educational outreach activities.

Dr. Bamezai was interested in learning about GK-12 and IGERT. He would welcome U.S. graduate students to work at the Centre. He thought that it would be very important to expose U.S. students to the Indian culture and to make it possible for them to visit other parts of India along with the universities and laboratories. He also thought that for GK-12 we could test individual and institutional approaches.

**Contact:** Dr. Ramesh Bamezai, [bame0020@mail.jnu.ac.in](mailto:bame0020@mail.jnu.ac.in)

**Website:** [www.ncahg.org](http://www.ncahg.org)

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### **National Institute of Immunology (NII)**

I briefly visited with Dr. Amulya Panda at the National Institute of Immunology. This organization is at the JNU complex, but operates independently. Dr. Panda was very interested in the GK-12 concept mainly because he is personally interested in education. He has written a Biology textbook for middle and high school students.

**Contact:** Dr. Amulya Panda, [amulya@nii.res.in](mailto:amulya@nii.res.in)

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### **Indian Institute of Technology (IIT)**

My contact was Roli Varma, an associate professor at the University of New Mexico, currently on sabbatical at IIT. Dr. Varma conducts research on Technology and Society and the gender disparities in Computer Science. He arranged for me to present to a group of faculty and graduate students in the Department of Social Sciences. The chair, Prof. Rukmini Bhaya Nair, attended my presentation. People asked questions related to NSF funding of the Social Sciences and GK-12 involvement in the Social Sciences. The

graduate students were intrigued with the GK-12 concept and interested in exchange programs with the United States. After my presentation, I met with Dr. Manoj Datta, Professor of Civil Engineering and Dean of Alumni Affairs and International Programs. Prof. Manoj thought that IIT would be an ideal place to have GK-12 Fellows and Teachers interact with its faculty and students.

**Contacts:** Dr. Roli Varma, [varma@unm.edu](mailto:varma@unm.edu)  
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Prof. Manoj Datta, [mdatta@civil.iitd.ac.in](mailto:mdatta@civil.iitd.ac.in)

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## BANGALORE

### National Center for Biological Sciences (NCBS)

A part of the Tata Institute of Fundamental Research, NCBS focuses on basic research in biology ranging from molecular to system biology. The National Center encourages applications from researchers with a variety of backgrounds in the natural sciences, mathematics and computer sciences. Recently NCBS started a new interdisciplinary program (iBIO) that seeks to apply and connect the physical sciences with biological problems.

At NCBS, I spent most of my time with Dr. Sumantra “Shona” Chattarji and his students. Dr. Chattarji has been very successful in sending students to MIT and bringing MIT students to his laboratory. He conducts research on neurosciences mainly on memory and implications of stress on the brain. Dr. Chattarji attributed the success of his U.S./Indo program to the fact that he personally takes care of all the details and minimizes the possibilities of failure. He sees tremendous benefits from having U.S. students in his lab interacting with his students. He suggested that we start by creating a web link between GK-12 and NCBS. Regarding specific connections with GK-12, he thought that rather than just announcing the possibilities of connections with India, we select and encourage a few projects to consider the possibility of linking with the country. Dr. Chattarji recommended that GK-12 projects that focus on conservation and/or environmental biology would be ideal especially because NCBS has a program on Wildlife and Conservation Biology, some of it related to tiger conservation and research. Dr. Chattarji is willing to have NCBS serve as an anchor for GK-12 connections.

**Contact:** Dr. Shona Chattarji, [shona@ncbs.res.in](mailto:shona@ncbs.res.in)  
**Website:** <http://www.ncbs.res.in/>

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### Vidya Niketan School

I briefly visited this school on my way to the Bangalore International School. It turned out that Dr. Chattarji’s wife Ruma is a teacher at Vidya Niketan, a private school for

elementary to 10<sup>th</sup> grades. It has about 1200 students and 100 teachers. Each class has 36 students. The school is well equipped with science labs and computer facilities. I talked with Ruma about GK-12; she and her school would be very interested in having Teachers and Fellows spend time there sharing methods and materials. I learned that many schools in Bangalore are in need of materials especially to teach environmental sciences. The Vidya Niketan School has links to and collaborates with government schools attended by less affluent children. Ruma is willing to help establish connections between GK-12 Fellows and Teachers and the government schools in Bangalore.

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### **Bangalore International School**

This school has 300 students from all over the world. I had a chance to attend a math class for 12<sup>th</sup> grade and a physics class for 9<sup>th</sup> grade. The physics teacher commented that she is using Science by Inquiry Teaching materials developed by Lillian McDermott, one of our GK-12 Co-PIs at the University of Washington (DGE #0338322). I presented about GK-12 to a group of teachers who would be very interested in hosting Fellows and Teachers at their school. The Principal, Mrs. Anu Monga, chairs a recently formed organization of all the international schools in India. These schools award International Baccalaureate degrees and are accredited by the International Council of International Schools. At the Bangalore International School, I met KumKum Dutta, a teacher, and the sister of Debaish Dutta, DGE former Acting Division Director. Geography teacher, Chandra Balachandran, is most interested in linking with GK-12 projects that are using GPS and GIS. Coincidentally he is an alumnus of Kent State University where we have a GK-12 project focused on GPS/GIS. This will be a natural connection.

**Contacts:** Mrs. Anu Monga, [principal@bisedu.co.in](mailto:principal@bisedu.co.in)  
Ms. KumKum Dutta, [kumkum.dutta@gmail.com](mailto:kumkum.dutta@gmail.com)

**Website:** [www.bangaloreinternationalschool.com](http://www.bangaloreinternationalschool.com)

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### **International Institute of Information Technology (IIIT) (formerly Indian Institute of Information Technology)**

IIIT is located in Electronics City where all the companies mentioned by Tom Friedman in his book, *The World is Flat*, are located. It took awhile to cross from one end of Bangalore to the other because of traffic and road construction. My host at IIIT was Dr. Jyotsna Bapat. I had corresponded with IIIT Director, Prof. Sadagopan, prior to my visit, but unfortunately, he had prior travel commitments during the time I was in the city. I met with six of the nine full-time faculty at IIIT. Most of them have degrees from U.S. universities. Their research interests range from wireless communication to the social impact of IT, effect of micro-loans on rural systems, and safety in computing systems. Most of the students who attend IIIT are from engineering and computer sciences. IIIT is highly competitive. There is a nationwide examination. Every year about 3,000 students

apply, 500 are interviewed, and 150 are accepted. IIIT grants mostly Master's degree. Recently, it started Ph.D. programs. In addition to the full-time and adjunct faculty, IIIT benefits from professional scientists and engineers from the many nearby industries who are interested in teaching there. IIIT has been participating in the MIT US-India program. US students interested in spending time at the Institute send their CVs for review by IIIT faculty who identify and select potential candidates. The IIIT group I met with suggested that it would be best to have U.S. students stay for a minimum of 3 months because of acculturation. Although IIIT is mainly a research-based institution, IIIT faculty members were open to the idea of having GK-12 Fellows spend time at their institution conducting research.

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## **Indian Institute of Science (IISc)**

Almost one hundred years old, the Indian Institute of Science is one of India's foremost research and teaching institutions in science and technology. IISc has forty departments. In general, it is a decentralized institution. In addition to the science and technology focus, it also offers continuing education and outreach programs.

I spent an entire day at IISc meeting with professors in several areas of research including biology, engineering and materials science. From my visit with Dr. Vikram Jayaram, professor of Metallurgy and Dr. Kamanio Chattopadhyay, Department Chair of Metallurgy, I learned about the IISc outreach program. This program encourages professors to visit schools and share their knowledge with high school students, however, graduate students are not involved. Dr. Chattopadhyay was supportive and excited about having U.S. graduate students and teachers at IISc, and thought that U.S. graduate students and their Indian counterparts could form teams to visit schools. He also suggested that IISc could help make connections with schools in Bangalore.

I met with Prof. Rahul Pandit, a Physics Professor and Chairman of the International Relations Cell. IISc has students from many parts of the world, but most are from Europe (France and Norway); few are from the United States. Dr. Pandit emphasized that IISc is mostly a research institution, but he was willing to follow up and find out if faculty would be interested in hosting U.S. students in their labs and also connecting them with nearby schools.

Through Vikram Kapila, a GK-12 PI from Polytechnic University, I met Dr. Seetharam Bhat in the Aerospace Engineering Department. Dr. Bhat has personally been involved in outreach. He mentioned a program by the World Bank related to Engineering Education in rural areas. Unfortunately, this program has not continued, in part because the equipment that had been purchased for it lacks personnel to maintain it. Dr. Bhat was interested in getting involved with GK-12.

In the Molecular Biophysics Unit, I met with Prof. Dipankar Chatterji. He has been involved in a program related to science education (KVPY). Students from 10<sup>th</sup> and 12<sup>th</sup> grades participate in summer programs to do research. He thought GK-12 Fellows and teachers could link with the KVPY program.

Prof. Chattopadhyay thought Dr. Gadagkar in the Center for Ecological Sciences would be interested in learning about GK-12 so kindly made the contact for me. Dr. Gadagkar is involved with the Indian Academy of Sciences and is also a foreign Associate of the National Academy of Sciences in the United States. Dr. Gadagkar told me how Indian Academy of Science members have taken an active role in undergraduate and teacher education. The Academy offers summer fellowships for undergraduates to work with Academy members. Every year, 3-4 Academy Fellows give a series of lectures across the country. The Academy offers 2-week science courses for teachers in different parts of India. Dr. Gadagkar was excited about GK-12 and thought that some links with the Indian Academy of Science and the Indian Science Academy in Delhi could be explored.

Prof. S. Ramasesha in the Solid State and Structural Chemistry Unit is mostly concerned about teacher training in India. He would like to develop a project to train 100 teachers at a time for 4 weeks. Although I mentioned to him that GK-12 is not a teacher-training program, he thought that GK-12 Fellows and Teachers certainly had much to offer.

My visit to IISc ended with a brief visit with Prof. P. Balaram, Director of the IISc. He mentioned the participation of U.S. students funded by Fulbright and would like to encourage more U.S. students visit his institution. He thought that GK-12 was an innovative program and would welcome IISc participation.

**Contacts:** Prof. Vikram Jayaram, [qjayaram@met.iisc.ernet.in](mailto:qjayaram@met.iisc.ernet.in)  
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## HYDERABAD

**The Association of International Schools of India**

In Hyderabad, I attended the launch of The Association of International Schools of India (TAISI). This meeting took place at ICRISAT (International Crops Research Institute for the Semi-Arid Tropics) in the outskirts of the city. I was invited by Mrs. Anu Monga, chair of TAIISI and principal of the International School in Bangalore (where I had visited earlier). TAIISI brought together representatives from several Technology Industries as well as representatives from all the International Schools in India. One of TAIISI's goals is to create linkages with other international schools around the world. A large part of the meeting centered on the role of technology in the teaching and learning of science in the schools. Representatives from Intel, Microsoft, Hewlett Packard and Pacsoft gave presentations and examples about anytime, anywhere learning by which students can use technologies. There were also talks and workshops about global trends in the integration of technology in education. Several speakers pointed out how education has changed from Instructor Centered to Learner Centered. Some presentations and workshops related to the role of teachers as leaders in schools. Attending this event provided a great opportunity to make contacts with teachers, principals, educators and technology specialists about what is working and not working in the schools in India. I had to keep in mind that International Schools target a selected group of students in India. Nevertheless, the people I met are involved in education issues that go beyond these schools.

**Website:** [www.taisindia.org](http://www.taisindia.org)

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### **U.S. Embassy**

I returned to Delhi and ended my trip with a lunch meeting with three people from the U.S. Embassy: Dr. Satish Kulkarni, who had kindly picked me up from the airport upon my arrival and who is the Counselor for Science, Technology, Environmental and Health Affairs; Dr. Nirupa Sen, Scientific Affairs Specialist; and Dr. Connie Johnson, Science Officer. I briefed them about GK-12 and gave them a printout with examples of projects. The U.S. Embassy is very interested in promoting science education especially inquiry-based methods. They were interested in learning about the possibilities of bringing GK-12 teams to India and offered to help with the logistics that such an endeavor involves. They were also interested in the possibilities of hosting an Embassy Fellow in the future.

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### **CONCLUSIONS AND FOLLOW UP**

People in general were receptive to collaborating with and hosting GK-12 Fellows and Teachers. From the suggestions I received, I developed these important points to consider:

- Identify scientists in India who understand the program and see gains for both U.S. and Indian participants
- Take care of logistics prior to any visit

- Anchor each project with people who are committed to seeing it succeed
- Use different approaches to find out what will work best
- Prepare U.S. participants in advance about Indian cultural issues
- Start small and plan well in advance
- Minimize potential for failure

I will be following up by disseminating information, creating web links, organizing workshops and identifying individuals and projects that are interested in establishing collaborations in India. I will continue to explore further possibilities with OISE and some of their programs (e.g., PIRE, Partnerships for International Research and Education).

### **PERSONAL NOTE**

India is an incredible and fascinating country. It is full of contrasts and color. Technology and tradition live side by side. The traffic in Delhi and Bangalore is worse than I had imagined. Delhi is a very green city with trees alongside streets. Bangalore is not the panacea that Tom Friedman makes us believe it is in his book *The World is Flat*. I heard people say that Tom Friedman had not been out of Electronics City and seen the “real Bangalore.” The food is delicious; the culture is amazingly rich; and the population is very diverse. Most of all I found the people in India warm, friendly, open and incredibly generous.