

IEEE GOLDRush July 2008

The quarterly newsletter of IEEE GOLD for young professionals.



Message from 2008 MGA GOLD Committee Chair, Soon Wan

Dear GOLD members,

Summer is here in the Northern Hemisphere, temperatures are rising, and the GOLD community is continuing to grow with the following additional GOLD affinity groups. On behalf of Member and Geographic Activities (MGA) GOLD Committee, I would like to congratulate and welcome them to the GOLD Community.

- ❖ Ithaca GOLD (Region 1) with Omeed Momeni as GOLD Chair
- ❖ Long Island GOLD (Region 1) with William DeAgro as GOLD Chair
- ❖ Mohawk Valley GOLD (Region 1) with Tsu Kong Lue as GOLD Chair
- ❖ Springfield GOLD/WIE (Region 1) with Qi Qi as GOLD Chair
- ❖ Milwaukee GOLD (Region 4) with Rikki Green as GOLD Chair
- ❖ Red River Valley GOLD (Region 4) with Michael Kraft as GOLD Chair
- ❖ Denver GOLD (Region 4) with Jack Keith as GOLD Chair
- ❖ Victoria GOLD (Region 7) with Susan Perkins as GOLD Chair

That brings the total number of GOLD Affinity Groups worldwide to 138. I know several Sections are in the progress of forming

new GOLD groups. I strongly believe that the current and new GOLD Chairs will organize exciting activities for their GOLD members, and bring value to their membership.

The past IEEE president, Leah Jamieson, has commented, "Emerging technologies often cut across the boundaries of many of the IEEE's societies' traditional fields". Leah was the Chair of the IEEE New Technologies Directions Committee (NTDC) in 2005. She claimed "One of the key goals of the Focus on Technologies initiative is to identify opportunities for collaboration, so that the IEEE can quickly build new communities and hold workshops and conferences on emerging areas." At the New Technology Connections (<http://www.ieee.org/web/emergingtech/home/index.html>), you can connect with the IEEE that brings you access to a wealth of knowledge on new technologies.

In March 2008, MGA GOLD sponsored an online seminar on Nanotechnology: What is it? What are the opportunities? The speaker was Dr Meyya Meyyappan who is the president of the IEEE



Nanotechnology Council and chief scientist for exploration technology at NASA's Ames Research Center, in Moffett Field, CA. Meyya provided an overview of Nanotechnology, citing examples in several of the industry sectors and a discussion of opportunities for the IEEE community. About 250 members attended the online seminar. Besides the high attendance, the session topic was popular as also evidenced by the number of questions asked during the online session.

In summary, hot technologies are just an initial concept, some are being fine-tuned, and some are waiting for the right market conditions. Yet they all have something in common: each has potential to transform the future of engineering. Hope you will enjoy this GOLDRush issue.

Best Regards,
Soon Wan
2008 MGA GOLD Committee Chair

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Peer-reviewed GOLD member contributions

Choosing Your Boss Wisely

By Anthony Marino

Recently, while paging through my engineering management textbook, I noticed a section that immediately captured my attention. The author asserted that it is possible to choose your boss and subsequently posed the question – how can one accomplish this practically? I quickly flipped back through the chapter looking for more information but my search was for naught. I realized that this was an open ended question, meant to glean personal insight for the reader. After taking the time to consider the question, I now present to you my approach for finding your next boss, or any other figure of leadership that you may report to.

To start, be aware that your first boss most likely will not be of your choosing. With this in mind you need to gain as much knowledge as you can about your current boss. There are two approaches to consider when evaluating your boss, a direct and indirect method. Beginning with the direct method, request a one on one meeting to identify and discuss your career goals and expectations. During the course of your dialogue seek to gain an understanding of your boss's objectives. After the meet-

ing observe your boss's concern, or lack thereof, to your career strategy. At a minimum, the follow up to the meeting should include continued communication to assess the progress of the strategy. Ideally, a proactive boss should also work to secure training and work opportunities that will aid in achieving your goals and expectations. This is the type of boss that you want in your corner. Additional insight into your boss may also be garnered through the indirect method, querying other direct reports to your boss and by aligning yourself with a mentor. Finding a mentor who is at least on the same level as your boss will provide you with a broader perspective. These peripheral conversations will help you understand the reputation your boss has within the company. Knowledge gained through these two methods will help you decide if this is the type of leader you want to be aligned with going forward.

If you determine that your current boss is hindering your growth you need to start the search for a new one. Take solace in knowing that you have already started the search process during your talks with team members, mentors, and other assorted peers. This is your network of contacts

that can provide you with valuable feedback regarding projects, team leaders, managers, and anything in between. There is a high probability that several of these contacts will inevitably move into management roles. As you gain experience you will be able to recognize these people and align yourself with them accordingly. Building bonds with colleagues now may help them remember your motivation and technical abilities later which could help move you up the career ladder along with them. Another great way to gain visibility among other leaders is to apply for a job rotational program, assuming that one exists at your place of employment. Such a program will expose you to different managers and project leaders while also expanding your knowledge base. Throughout your search be cognizant of the fact that it is much easier to choose a new project team leader than it is a new manager. A manager will be more willing to assign you to a new project than relinquishing you to another manager.

The one thing that has not been articulated in detail is the assumption that you are a motivated employee and have demonstrated that you are an asset to the organization. Just because you



Anthony Marino is a Systems Engineer at Lockheed Martin Maritime Systems and Sensors in Moorestown, NJ. He recently received a Lockheed Martin Special Recognition Award for his demonstrated leadership.

want a new boss does not necessarily correlate to a boss wanting a new direct report. Therefore, to be in a position to choose your boss you need to learn as much as you can about your current boss, build and make frequent use of an extensive network of contacts, and finally prove your worth. Although we may not really be able to choose our next boss, we can identify the qualities we want in a boss and place ourselves in a position where our skills and talents are desired by company leaders. I challenge you to put yourself in that position!

Beginning the Graduate School Application Process

By Christopher Magnan

So you have recently received your Bachelor's degree and you are making your mark on the world. You have a great job, make a respectable salary, and still see your friends from your undergraduate days. But you have a desire to return to school for an advanced degree. Of course there are many benefits that come with an advanced degree; higher salary, better opportunities with your employer, and the opportunity to network and make new friends. But there are also the costs of pursuing an advanced degree; the change in lifestyle, time constraints, and money (commuting to class, parking, and fees that may not be reimbursed by an employer's education plan). The long-term benefits of a graduate degree definitely overcome the cost of obtaining it. But before you start filling out grad school applications, there are some questions that must be answered. Even though universities will have open houses and will try to present the strengths of their curriculums, some investigative research still needs to be done. The purpose of this article is to present these questions and provide some rationale. An exhaustive list is not presented, hence some questions and con-

cerns that some prospective students have may not be presented.

The most important question that must be addressed is what type of degree you want to pursue. The type of degree that you plan to pursue is defined by what interests you. If you enjoy the finance, marketing, or management aspects of your job, then either an MBA or Master's in Engineering Management may be your best option. If you enjoy researching solutions to complex problems that require extensive analysis, then the Ph.D. may be the best fit for your educational goals. A good approach to answering this question is to ask that question which most high school guidance counselors ask, "What do you want to do with the rest of your life?"

Currently, there are many different settings available for graduate school. You can go back full-time during the day, attend class part-time after work, or pursue the degree online. This depends on your job requirements as well as personal preference. If you would like to pursue a degree at your own pace, then maybe an online curriculum would be best for you. It may be a good idea to actually consult current students on the experience they have had with their education. Also, there are websites such as Vault.com that

provide insight into a student's experience at a particular university. Some points to consider are the accessibility of the support staff (for technical or administrative concerns), how does the university make you feel like a member of the community, and are there any networking opportunities outside of class available.

Finally, there is the reputation of the university. Do you personally want to be challenged, or are you looking to put in minimal effort? One way to determine a college's reputation is to simply gather information from reliable and trusted sources. You can either ask your coworkers or senior members of your local IEEE chapter their opinions about local universities. Of course, you may need to discern any biasing or preference for a particular university. But speaking with many people can definitely filter out this biasing. Also, there are many books that provide rankings on different colleges, though it has been reported that these rankings are somewhat biased and outdated. But the statistics provided by these sources as well as statistics published by the university (salaries of graduates and student retention) can provide some valuable information regarding the quality of the education.



Christopher Magnan is an RF Engineer at Antenna Research Associates in Beltsville, MD, United States. He received his Bachelor of Science in Electrical Engineering from Northeastern University in Boston, MA and Master of Engineering in Electrical Engineering from the University of Maryland, College Park.

To summarize, some work must be done before beginning graduate school. The best way to approach this is to gather information from a wide range of sources. Discover what motivates you. Integrate your motivation with your career goals. Experience what the university has to offer for prospective students. Inquire if you can sit in on a class session. After all, you had completed your undergraduate degree, so you are much savvier now than you were when you were deciding your undergraduate institution.

Biophotonics: Resonant detection of single molecules

By **Andrea Armani**

For many biological and chemical experiments, a sensor must have high sensitivity, high specificity, and fast response time. There are many technologies which are able to achieve one or two of these three requirements, but many still face fundamental sensitivity or response limitations.

Optical resonators are able to overcome these limitations because of the high quality factor (Q).^{1, 2} In their application as a biological sensor, the sensitivity is derived from the long photon lifetime inside the microcavity, and the specificity is derived from functionalization of the resonator

surface. Therefore, the sensitivity is directly related to the Q factor. Additionally, these devices are able to detect biological molecules or cells without the presence of a fluorescent label.

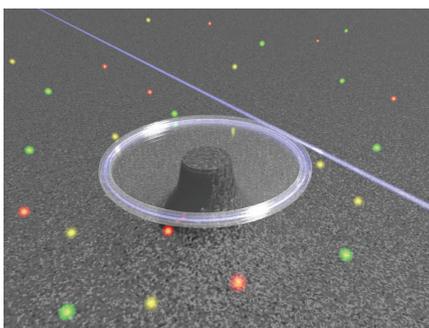
While there are numerous geometries of resonant cavities, a significant research effort has focused on the silica microsphere resonant cavity. In air, this whispering gallery mode resonant cavity has achieved Q factors greater than 1 billion making it extremely promising for biosensing experiments; however, in a liquid environment, this device has demonstrated Q factors of approximately 1 million. Using a microsphere resonator, the detection of bacteria, protein conformation states and the

discrimination between subtle DNA mutations has been demonstrated, despite the low Q factor.²⁻⁵ By increasing the Q above 1 million, it is possible to move into the single molecule detection regime. This improvement was recently demonstrated using planar toroidal microcavities, and Q factors above 100 million were achieved by testing in the visible where the material loss of water is low (Figure)⁶.

Based on this Q factor improvement, silica toroidal resonant cavities have demonstrated single-molecule, label-free detection of Interleukin-2 (IL-2), a signaling protein⁷. The detection mechanism is based on a refractive index increase which is induced when the molecule binds to the surface of the resonant cavity. Because the resonant wavelength is dependent on the refractive index, the resonant wavelength red-shifts, which is easily detectable in real-time using an oscilloscope. While IL-2 solutions were flowed across toroidal microcavity's surface, step-like shifts in resonance wavelength were recorded.



Andrea Armani has an AB in physics from the University of Chicago and an MS and PhD in Applied Physics from the California Institute of Technology. She is now a member of the Chemical Engineering and Materials Science faculty at the University of Southern California.



Artistic rendering of a toroidal microcavity resonator coupled to a tapered optical fiber waveguide. The whispering gallery mode resides in the periphery of the cavity and the device is shown operating on-resonance.

Future work is directed towards the integration of this device into microfluidic systems for improved fluid delivery and array design and fabrication for assay development.

¹C. Y. Chao, L. J. Guo, *Journal of Lightwave Technology* **24**, 1395 (Mar, 2006).

²S. Arnold, M. Khoshshima, I. Teraoka, S. Holler, F. Vollmer, *Optics Letters* **28**, 272 (Feb 15, 2003).

³M. Noto, D. Keng, I. Teraoka, S. Arnold, *Biophysical Journal* **92**, 4466 (Jun, 2007).

⁴H. C. Ren, F. Vollmer, S. Arnold, A. Libchaber, *Optics Express* **15**, 17410 (Dec 10, 2007).

⁵J. Topolancik, F. Vollmer, *Biophysical Journal* **92**, 2223 (Mar 15, 2007).

⁶A. M. Armani, D. K. Armani, B. Min, K. J. Vahala, S. M. Spillane, *Applied Physics Letters* **87**, 151118 (Oct 10, 2005).

⁷A. M. Armani, R. P. Kulkarni, S. E. Fraser, R. C. Flagan, K. J. Vahala, *Science* **317**, 783 (2007). (published online July 5, 2007 [DOI: 10.1126/science.1145002]. published online July 5, 2007 [DOI: 10.1126/science.1145002].).

GOLD News

Not only for Engineers!

By Carlos Rueda Artunduaga
(Computer Society GOLD Coordinator)

One of the current challenges of the IEEE is to attract new members that are not students of engineering programs or practicing engineers. Many people think that the IEEE is only for engineers, **but that is not true!** In Latin America, for example, for several years the tendency was to think that the IEEE was only for electrical and electronics engineers, so others such as industrial engineers, systems engineers, and designers have felt overlooked. But in more recent years in IEEE Region 9 (specifically in Colombia Section) we brought into “the IEEE fold” students of Systems Engineering, Industrial Engineering, Geographic Engineering, Industrial and Graphics Design, and other fields.

To qualify for IEEE membership, a person needs to be working or studying in one of six IEEE-designated fields: Engineering; Computer Science and Information Technology; Physical Sciences; Biological and Medical Sciences; Mathematics; and Technical Communications, Education, Management, Law, and Policy.

Many of the 38 IEEE societies investigate subjects and publish information of interest to professionals beyond the field of engineering. Here, we have some examples:

- Aerospace and Electronic Systems Society: Information of interest to Military Researchers.
- Components, Packaging and Manufacturing Technology Society: Informa-

tion of interest to Industrial Designers.

- Education Society: Information of interest to all kind of educators, especially those interested in using technological materials and tools to develop their work.
- Engineering in Medicine and Biology Society: Information of interest to Medical Doctors and Biologists.
- Geoscience and Remote Sensing Society: Information of interest to Geologists and Geographers.
- Industrial Electronics Society: Information of interest to Industrial Designers.
- Industry Applications Society: Information of interest to Industrial Designers.
- Lasers and Electro-Optics Society: Information of interest to Mathematicians and Physicists.
- Magnetics Society: Information of interest to Physicists.
- Nuclear and Plasma Sciences Society: Information of interest to X-Ray Researchers (Medical Doctors and Technicians).
- Oceanic Engineering Society: Information of interest to Marine Biologists and Oceanographers.
- Product Safety Engineering Society: Information of interest to Industrial Designers.
- Professional Communications Society: Information of interest to Web Developers, Journalists, Social Communicators, and others.

- Robotics and Automation Society: Information of interest to Industrial Designers.
- Society on Social Implication of Technology: Information of interest to Lawyers, Environmental Managers, Public Governors, Sociologists and Economists.

In addition to these Societies, the Computer Society has a great variety of technical information for Graphical Designers (Multimedia Magazine, Transaction on Visualization and Computer Graphics, and Computer Graphics and Applications Magazine), Biologists (Transaction on Computational Biology and Bioinformatics), Educators of all kind of knowledge areas (Transaction on Learning Technologies), and Managers (IT Professional Magazine), as well as Lawyers (Hacking, Forensics Informatics), Medical Doctors, Social Communicators and Journalists, among many others.

As you can see in these few examples, the IEEE is not only for engineers or students of engineering, it is for all the people who wants to increase to their productivity and competitiveness through the use of technology.

To find more details on the IEEE-designated fields, please visit <http://www.ieee.org/designatedfields>. In order to learn a little bit more about each IEEE Society, please visit <http://www.ieee.org/societies>. And if you want more information regarding the Computer Society, please visit <http://www.computer.org>.

ReTIS-08 in India

By **Dr. Jamuna Kanta Sing**
(Chairman, GOLD Affinity Group,
IEEE Calcutta Section)
E-mail: jkasing@ieee.org

The 2nd National Conference on Recent Trends in Information Systems (ReTIS-08) was held at the Department of Computer Science & Engineering, Jadavpur University, Kolkata, India, from February 7-9, 2008. The event was jointly organized by the CMATER, SRUVM Projects, CSE Dept. (TEQIP), Jadavpur University, **IEEE GOLD Affinity Group**, **IEEE Calcutta Section** and Computer Jagat. The purpose of the ReTIS-08 was to provide a common forum for researchers, scientists, engineers and stu-



Prof. S. Chakravorti, IEEE Distinguished Lecturer delivering an invited talk.

dents from India and abroad to present their latest research findings, ideas, developments and applications in the broader areas of information systems.

We received a total of 66 research papers from several educational institutes and industries within the country and abroad for consideration for presentation in the conference. After peer review, 47 papers were selected for oral presentation in the conference. All the 47 accepted papers were divided into 11 technical program sessions for oral presentation during February 8-9, 2008 and were included in the conference proceedings. The main conference was preceded by two tutorial sessions on February 7, 2008.

In addition to tutorial sessions and technical sessions, there were 4 invited talks during the conference. On February 8, 2008, Prof. B. Bhattacharya, *Fellow, IEEE* of Indian Statistical Institute, Kolkata delivered an invited talk on “*Geometric Primitives in Digital Images and Applications*” and Prof. A. Konar of Jadavpur University delivered a talk on “*Machine Intelligence in Mobile Robotics*”. On February 9, 2008, Prof. S. Chakravorti, *IEEE Distinguished Lecturer*, of Jadavpur University delivered a talk on “*Impulse fault diagnosis*



Prof. Janina Mazierska, IEEE R10 Director delivering her talk.

in transformers using fractal analysis” and Dr. S. Bandyopadhyay, *Senior Member, IEEE* of Indian Statistical Institute, Kolkata delivered a talk on “*Algorithms in Bioinformatics*”.

Prof. Janina Mazierska, IEEE R10 Director, was present during the opening ceremony of the main conference of the ReTIS-08. After the inaugural session, she spoke briefly about the importance of Information Systems and about the various activities of IEEE, especially in IEEE Region 10. The program was attended by many distinguished guests from several Universities and Institutes from all over the country.

GOLD-Related Potential Actions on IEEE Circuits and Systems Society

By **Elvis (Pui-In)**
(Region-10 GOLD Representative on
IEEE Circuits and Systems Society)

This article summarizes the top five actions suggested by GOLD representatives on Circuits and Systems Society (CASS) after the Board of Governors (BoG) Meeting in May 2008.

1. GOLD Visiting Researcher Fellowship
IEEE solid-state circuits society (SSCS) offers the Pre-Doctoral Fellowship to recognize young members that are studying in a PhD program related to the interests of SSCS.

The idea of this action in CASS is to financially support those postgraduate students who would like to be visiting re-

searchers at other universities through funding travel expenses. It should be made clear that the idea is not to help them find a place where they can go, but rather, if it is reasonable to help them get there. The fellowship must be awarded through the evaluation of a CAS-related research proposal written by the students and approved by their advisors, and both research centers.

2. GOLD Forum-Column in IEEE CAS Magazine or Newsletter

The idea is to have an article frequently keeps track the activities, or new initiatives of CASS that are highly relevant to GOLD members. Additionally, we have recommended a space for members to read about the new technologies, without requiring profound scientific knowledge.

3. GOLD Reception - Workshop in CAS Conferences

The idea is to provide a forum / workshop / space for GOLD members to discuss their

work and provide networking opportunities. This will give us a one-on-one contact with our GOLD members to find their needs. This also encourages more GOLD members to attend the conferences.

4. GOLD Student Paper Contest or Outstanding Paper Award from GOLD

The idea is to give more recognition to our GOLD members who write outstanding research work in ISCAS or Transactions journal papers. It can be based on/modified from the existed "ISCAS Best Student Paper Award" and "Outstanding Young Author Award".

Any comments can be directed to the members of the CASS BoG or the CASS GOLD representatives from different regions:

- Sunil Pai (Regions 1-7)
<sunilp@vitesse.com>
- Delia Rodriguez (Region 8)
<delia@imit.kth.se>
- Martin Di Federico (Region 9)
<mdife@ieee.org>
- Elvis (Pui-In) Mak (Region 10)
<pimak@umac.mo>

MGA GOLD committee meets in Kentucky

By Timothy Wong
(2008 Region 10 IEEE GOLD Summit Leader)

I had the pleasure of representing the Region 10 GOLD Coordinator, Helene Fung at the IEEE GOLD MGA meeting. This took place on February 14th-15th at the Downtown Marriott hotel in Louisville, Kentucky, USA. This meeting was attended by GOLD coordinators, ex-officios and GOLD society coordinators from most regions around the world.

I presented on the current progress and state of Region 10 GOLD on behalf of Helene. The report from Region 10 GOLD had provided a positive impression to the GOLD chair, Soon Wan and all of the meeting attendants. In particular, the concept of clustering was introduced. This generated a lot of interest among the delegates. This concept was first proposed to Helene by the Hong Kong GOLD IEEE affinity group. It involves grouping GOLD groups which operate in similar environments and has the potential to foster joint events between these groups. The manner in which clustering could occur is currently under consideration. So far Helene has

received positive interest and feedback about this concept from participants at the Region 10 GOLD Congress in India.

Helene wishes to take this concept a step further and translate information about IEEE GOLD to the regions with a low uptake in IEEE GOLD membership including China, Korea and Japan. The motivation behind this is to overcome the language barriers which affect the adoption of IEEE GOLD membership. Helene intends to pilot this concept initially in China and based on its success, expand it into other similar areas within Region 10. Translating information about IEEE GOLD into the local language will ensure that the local population can receive communications in their native language, and help overcome the language barrier.

The future direction of IEEE and strategies to achieve this were discussed in various meetings throughout this event. It involved the discussion of GOLD committee activities, membership development, GOLD coordinator reports and society GOLD coordinator reports.

On the second day, there were separate breakout meeting sessions which were divided into three groups: Regional GOLD

activities, Society GOLD activities and GOLD representatives. Throughout this meeting series, valuable contacts were made with other Regional GOLD coordinators and IEEE officers during this event. It was a fantastic opportunity to meet with past and present leaders and gain ideas on how to continue the day to day running of the IEEE and make improvements. I could sense the passion and drive towards the organization in all of the IEEE members that I met.

2007 Region 10 GOLD Coordinator, Yasuharu Ohgoe, has been handed the job of championing the IEEE GOLD summit which is due to be held in Quebec, Canada in September this year. This will be the first ever IEEE GOLD summit to be held, and is scheduled for September 18th and 19th, to coincide with Sections Congress. The event will bring the IEEE GOLD leaders and members together to discuss, plan and celebrate GOLD objectives and achievements.

I congratulate Soon Wan and the IEEE meeting staff for organizing such a productive meeting. I am looking forward to working with the IEEE GOLD team.

IEEE GOLD Field Trip to Aratiatia Hydro Power Station

By Sriram Ragnathan and Noel Gomes
(IEEE GOLD NZ North Section Committee)

On 3rd May 2008, the IEEE GOLD New Zealand North section along with 'engenerate' – the young engineers division of the Institute of Professional Engineers of New Zealand (IPENZ) jointly organised a field trip to the Aratiatia Power station. The event was well attended by GOLD members, IPENZ members and a number of young professionals.

The purpose of this event was to provide young professionals with an insight into the day to day operation of a hydro power station. The event started with a long three-and-a-half hour drive from Auckland. The journey traversed through New Zealand's largest thermal power station at Huntly, Carter Holt Harvey's Kinleith pulp and paper mill and a number of dairy factories owned by Fonterra. The onward drive concluded with a welcome stopover at the Aratiatia Rapids to witness the release of water from Lake Aratiatia into the rapids.

On reaching the hydro power station, we were greeted with information on the history of the power station, how it got its name and where it sits on the Waikato River chain with respect to the eight other hydro power stations. The displays also had information on (Mighty RiverPower's (the owner of the Aratiatia power station) involvement with the local community and its plans on future investment in wind and geothermal energy. The entrance of the hydro power station had big LCD screens with real-time live displays of the lake levels, power generated, frequency and voltage levels at each of the stations. This site visit coincided with an Open day organised by Mighty River Power for the local residents of the region and since we were a set of young engineers, we had

asked for a more detailed tour. It took us approximately 2.5 hrs to get around the hydro power station.

The tour began with a brief introduction of the plant, its capacity and illustration of the purpose of the surge tank. It was then followed by visits to the turbine pit, the generator floor, the transformer platform, the local control room and Transpower's 220 kV outdoor switchyard. Along the way, there were several stops made to explain the functionality of various equipments in the plant and to answer any specific questions relating to the equipment. The tour ended with a refreshing sausage sizzle funded by Mighty River Power.

Some of the highlights of the power station are:

- It is the smallest and the first hydro power station on the Waikato River and consists of three Francis turbines each of size 30 Mega-Watts (MW) which together generate an annual energy of 331 Giga-Watthours (GWh) at 11 kilo-Volts (kV).
- It has a 900m tunnel that takes water from Lake Aratiatia in to an 18 million-litre surge tank. The surge tank has main gates that control the water leading to each of the generators via three separate underground penstocks.
- In the turbine pit, the water from the penstock enters through a squirrel cage chamber which rotates the turbine propellers (runners). The turbine has series of wicket gates surrounding the runner which control the flow of water from the penstock. The movement of the wicket gates is controlled by a servo motor (PID controller) which receives hydraulic oil regulated by an actuator.
- The rotation of the rotor induces an



New Zealand's GOLD members enjoying the field trip.

electro-magnetic field on the windings of the stator, which then generates electricity. The output voltage at each generator is controlled by an Automatic Voltage Regulator (AVR) also called Exciter.

- The power generated at 11 kV and is stepped up to 220 kV via transformers. The outdoor switch yard facilitates this by providing an injection point for transmission over the national grid. The power station can be controlled manually or remotely from its local control room.

The initial feedback received during and after the event showed that it was a great success. The attendees were very well satisfied with the information provided and the extent of details covered by the tour



Aratiatia Hydro Power Station.

guide. The collaboration of IEEE GOLD and engenerate IPENZ was first of its kind for an event like this and provided a great networking opportunity for all the attendees. This field trip has strengthened our

ongoing relationship with IPENZ for future joint ventures. The committee would like to thank all the attendees for their participation and time. If you attended this event and have any suggestions or comments for

future events, please do not hesitate to contact the committee at gold.ieee.nz.north@gmail.com.

Engineering for Social Change

By Susan Karlin

(Reprinted with the permission of IEEE The Institute)

Sampathkumar Veeraraghavan's engineering interest emerged in a high school computer class. But this member's calling came after a friend lamented the dearth of services for his autistic child.

Visiting a local school for developmentally disabled children in Chennai, India, where he lives and works, Veeraraghavan saw children with autism, cerebral palsy, Down syndrome, and other disorders thrown into class together. Their differing needs made proper therapy impossible.

"India doesn't have a dedicated program for identifying and treating autism, so these children are not given the opportunity to learn and grow," he says.

Over the next three years, Veeraraghavan and a group of medical professionals, led by physician Karthik Srinivasan, developed an automated computational screening system for detecting possible autism in children as young as 18 months.

PROGRAMMED SCREENING The software, known as the Automated Screening System for Developmental Disorders, involves a 30-minute procedure that evaluates the child's fine and gross motor, social, and language skills through 48 questions

aimed at the primary caretaker, and includes artificial-intelligence gaming systems for the child. The screening system assigns each question or task a different numerical value that, when computed, add up to a score that could suggest symptoms of autism. If that happens, the results are automatically sent to Srinivasan's team, which contacts the parents for more professional and ongoing evaluations. Subsequently, the gaming system could be used to help autistic children improve eye contact and verbal and nonverbal communication.

The system grew out of a research group the team founded called Brahman (Hindu for "knowledge") to develop technology to improve the lives of disabled children, motivate students toward engineering careers, and help underprivileged women and children learn new skill sets and set up businesses. The program has also raised funds to provide free education for autistic and impoverished children, rescuing some from child labor.

Veeraraghavan's efforts have earned him the 2007 IEEE's Regional Activities Board GOLD Achievement Award and the Region 10 GOLD Award, not to mention lecture invitations from institutions around the world. That he is only 24 and has managed this program on four hours of sleep a night while working full time as a systems engineer at the Tata Consultancy Service, a global IT services firm, is testament to his

fervor.

"When I see a smile on the faces of the autistic children and parents—that's what keeps me motivated," he says.

ACTIVE IN IEEE Veeraraghavan graduated in 2005 from Anna University, in Chennai, with a bachelor's degree in computer science and engineering. He has been involved in IEEE since his university days, holding several positions including chair of the IEEE Madras (India) Section's GOLD committee.

"IEEE helped me identify a mentor and expand my horizons and connection with other engineers," he says. "The publications and conferences keep me updated with the latest industry happenings and technology." The organization also supports his desire to apply engineering to tackle social problems.

Autistic children benefit from early detection and treatment. But in India, early intervention is still difficult. It can take as long as two years for parents to find a doctor able to diagnose the severity of the disorder and recommend treatment. By then, they have often run out of money and patience. Treatment in rural areas is further hindered by superstitions, a plethora of regional languages, and poverty. Monthly treatments for autistic children run between US \$400 to \$500, compared to a farmer's income of \$10.

Jaya Krishnaswamy—director of the

Madhuram Narayanan Centre for Exceptional Children, which played a key role in field-testing the tool—told The Hindu newspaper in an interview, “Even a lay parent using the software can now be reassured that the child is attaining the development milestones.”

FREE FOR SCHOOLS The Brahman

team is now distributing the screening software free to schools across the state of Tamilnadu, in southern India, enabling teachers to test children suspected of developmental delays and refer them to medical staff. Also in the works are a multilingual version of the screener, an early-detection system for HIV-positive people, and a Web site that would classify types of disabilities.

Meanwhile, Veeraraghavan will begin a master’s program next fall in electrical engineering at Tufts University in Medford, Mass. But it’s unlikely to be his only focus.

“This experience has motivated me to take up more social projects that improve living conditions in a more direct way,” he says.

Nanotechnology Explained

By Kathy Kowalenko
(Reprinted with the permission of IEEE The Institute)

For something so small, nanotechnology gets a lot of attention. More than US \$60 billion in products incorporating devices of nanoscopic size were sold in 2007. It’s estimated that figure will grow to \$2.6 trillion by 2014. But a lot of engineers are mystified by what nanotechnology is and how they can be part of what is expected to eventually benefit so many areas, including electronics, medicine, and the environment.

To help young professionals get a handle on the field, the IEEE GOLD (Graduates of the Last Decade) group sponsored an online seminar in March called “Nanotechnology: What Is It? What Are the Opportunities?” More than 250 participants got the latest word on nanotech from IEEE Fellow Meyya Meyyappan, president of the IEEE Nanotechnology Council and chief scientist for exploration technology at NASA’s Ames Research Center, in Moffett Field, Calif.

“Nanotechnology is not a single technology; instead it is an enabling technology. It is not the end, it is the means,” Meyyappan says. “Many consider nanotechnology to be the technology of the 21st century, so that’s why we have an obligation to educate the future generation of scientists

and engineers about it.”

An archive of his live presentation is available at <https://admin.acrobat.com/a758482253/p83181394>.

THE BASICS Meyyappan covered the fundamentals and discussed current research. He explained that because metal nanoparticles melt at lower temperatures than the bulk metal they’re made from, the number of atoms on the surface increases, thereby changing the particles’ physical, chemical, electrical, mechanical, and optical properties.

“The number of atoms on the surface is going to be larger and the number of atoms on the bulk will be smaller, affecting nearly every application,” he notes.

BENEFITS The field of nanoelectronics is expected to offer more efficient processors with lower energy use and lower cost per gate. Researchers are attempting to produce mass-storage devices at multi-terabit levels that will be inexpensive, accurate, and consume little power. And integrated logic, memory, and sensors are predicted to pop up in kitchen appliances and other consumer products.

“Smart refrigerators will be outfitted with different sensors that will be able to not only count the number of eggs left in a carton and send a message to your grocery store to restock them, but also tell you

which eggs have gone bad,” Meyyappan says.

Nanotech is also making headway in genetics. Medical researchers are working with nanocores to speed up the process of DNA sequencing. A nanocore is a membrane only 1 or 2 nanometers thick that matches the size of DNA. Because DNA is conductive, when it goes through the nanocore, a background electric current drops because of the core’s tight fit. Researchers are working to reduce the time it takes to determine someone’s genetic makeup by measuring how much and for how long the current is suppressed, and correlating that information with the individual nucleus type.

“Someday you will deposit a sample of your DNA at your doctor’s office and know your genetic makeup in a few hours,” Meyyappan says. “This will lead to diagnostics and therapeutics based on one’s genetic makeup.”

Two other areas of research are biocompatible artificial tissues and organs, and early-warning sensors for cancer and other diseases.

Using nanomaterials to improve the environment is another active area. The materials have a large surface area per given volume. For example, four grams of carbon nanotubes have the same surface area as one U.S. football field. A carbon nanotube is the tubular form of carbon, and

its diameter is one nanometer (and up to two nanometers long).

Such large surface areas mean a bigger absorption rate for various gases and vapors, leading to the ability to support catalysts for conversion reactions.

“For example, to convert nitrous oxide into nitrogen and oxygen you need a large surface area that can support the catalyst,” Meyyappan says. “Using carbon nanotubes means your conversion reactor doesn’t have to be huge.”

Nanomaterials are also being used to improve the efficiency of solar and fuel

cells, as well as solid-state lighting for the home. Researchers are working to develop processes to reduce the manufacturing costs of such technologies.

CONCERNS Meyyappan, who acknowledges that not much is known about the health and safety aspects of nanomaterials, says the U.S. Environmental Protection Agency has taken the lead in asking for studies.

“We already have laws and regulations that apply to macromaterials, and the same will apply to nanomaterials,” he says.

“We need to spend a lot of time studying the safety aspects of these materials to develop the knowledge, and then we can apply the regulations.”

Meyyappan notes that new enabling technologies take about 20 years to put down their roots and about 50 to 60 years to build themselves up before they become commodities.

“It’s going to take another decade to see the massive impact of this technology,” he says. “We are early in the game. The bottom line is to be patient.”

Notices

IEEE EMBS-GOLD Networking Reception

By **Lisa J. Lazareck**
(**EMB Society GOLD Coordinator**)

In its effort to increase the value of IEEE and EMBS membership for young engineers, the IEEE Engineering in Medicine and Biology Society will host, for the third time, an IEEE EMBS-GOLD Networking Reception at its 30th Annual International Conference in Vancouver, British Columbia, Canada. EMBC’08 – “Personalized Healthcare through Technology” – will be held at the Vancouver Convention & Exhibition Centre from 20-24 August, 2008 (<http://www.embc2008.com/>).

The continuing goal of GOLD is to find out what students need from their Societies at this particular stage of their careers and how their Societies can in turn offer additional value of membership. The purpose of the joint EMBS-GOLD Reception is to establish, in an informal networking environment, what exactly these transitioning

members need, want and must-have from the EMB Society. The Reception is free of charge, includes beverages and accompanying snacks, and is an excellent opportunity to meet other GOLD members within the Society and from around the world. If you are a GOLD member attending EMBC’08, or a GOLD member living in Vancouver, or B.C., or Region 7 – you are most cordially invited to this free event! Last year, over 120 people attended the event, and the evening was an absolute success!

The Reception will be held on Friday, 22nd August, 2008 from 7:00-9:00 pm at the Vancouver Marriott Pinnacle Hotel (1128 West Hastings Street, Vancouver, B.C., V6E 4R5). Unfortunately, IEEE/EMBS/GOLD cannot provide any financial remuneration for your participation in the Conference or cover travel costs. Further reminders and details will follow over the summer. In the meantime, contact the EMB Society GOLD Coordinator (lisa.lazareck@eng.ox.ac.uk) for further details.

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IEEE Humanitarian Workshop '08



Many of us are fortunate to live in a relatively secure environment where we can pursue education and dreams. Far away from most of us - in Africa, or even close to home like New Orleans in the United States or Sichuan in China, where

catastrophes strike recently, there are tremendous needs for humanitarian aids. Engineers can play an active role in bringing hope, relieving pain, restoring livelihood, and accelerating economic progress in these areas through appropriate use of technology.

IEEE aims to develop a platform to create awareness among the younger engineers and students on how we can use our engineering knowledge and skills to bless the communities. Therefore, IEEE partners with a number of organizations, such as EWB-USA and UN Foundation to put together a 1-day workshop. At the end of the workshop, attendees will be more informed on how humanitarian organizations use technologies to positively impact the world we live in. Eventually, we hope attendees will obtain a more holistic understanding of how they can play a part in humanitarian efforts, and even be inspired to do so at the end of the workshop.



Technology for Humanity



"Understanding humanitarian works through the lens of engineering"



**18th Oct '08
9am-5pm (Sat)
Boston, USA**

**Boston University
Photonics Building (PHO)
8 St. Mary's Street
Boston MA**

Main Sponsor:



Tentative program

Keynote speeches:

- ✍ Humanitarian projects and technology
- ✍ How organizations stay involved in humanitarian outreaches?
- ✍ Research and field projects: case examples

Hands-on session:

- ✍ Solving problems faced in the field

Booth Visits:

- ✍ Connect with humanitarian organizations and project leaders

Lunch and refreshment will be provided



Organizers

✍ Institute of Electrical Electronics Engineers Inc. (IEEE) is a non-profit organization established to foster technological innovation and excellence for the benefit of humanity. Today, IEEE has more than 375,000 members worldwide, sponsors more than 850 conferences annually, and has nearly 1,300 standards under development. IEEE GOLD (Graduates Of the Last Decade), the young professional entity of IEEE, collaborates with Region 1 (Northeastern USA) and Boston Section to host this workshop. www.ieee.org, www.ieee.org/gold

✍ Engineers Without Borders - USA (EWB-USA) is a non-profit humanitarian organization established to partner with developing communities worldwide in order to improve their quality of life. The partnerships involve the implementation of sustainable engineering projects, while involving and training internationally responsible engineers and engineering students. www.ewb-usa.org



Main Speakers:

- ✍ Mr. Mitul Shah, Senior Director of UN Foundation
- ✍ Ms. Collen O'Holleran, Mr. Seth Kassels, and Ms. Rosemary Powers, Senior Managers of EWB-USA

IEEE GOLD Humanitarian Fellowship

Sponsorship is available for attendees who desire to participate in humanitarian projects. Interested attendees may compete for the IEEE GOLD Humanitarian Fellowship. 10 fellowships (each worth up to US\$3,000) will be awarded to applicants who fulfill the selection criteria. The details of the criteria will be provided at a later date. For more information, please contact Darrel Chong at dchong@ieee.org.

Humanitarian projects corresponding to each of the 10 fellowships will also be made known to attendees prior to the workshop. Recipients of the fellowship will take part in the humanitarian project that they have chosen at the time of application. At the end of the projects, recipients will share with IEEE the learning and experiences gained from being involved in grass root humanitarian work.



“Do not withhold good from those who deserve it, when it is within your power to act.”



Hands-on Session - Prizes for innovative solution

Problem solving is a norm for EWB-USA's field project teams. More often than not, the best solutions are not only effective, but also simple to implement and easy to learn. To allow the attendees to have a feel of solving some field-related issues, EWB-USA will be designing a mock session based on completed projects. The workshop will get attendees to brainstorm and propose solutions to challenges that are faced by EWB-USA. Teams that come up with the most innovation solutions, win prizes.



Registration

- ✍ Free for IEEE or EWB-USA members
- ✍ \$15 for non-members (\$10 for registration before September 21)
- ✍ Anyone who registers before Sept 21 will be eligible to win one of ten mysterious gifts.
- ✍ Registration closes on October 11

For registration, please go to www.ewh.ieee.org/reg/1/gold

Contact
humanitarian@ieee.org