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POSTECH Newsletter

SPRING / SUMMER 2008 Vol.46 www.postech.ac.kr

Residential College System in Action

2008 POSTECH Sunrise Festival

The Annual POSTECH Sunrise Festival was celebrated for 2 days on May 15th and 16th, 2008 during which Postechians deviated from their rigorous and strenuous routine, savoring the rare moments of pure glee and jollity.

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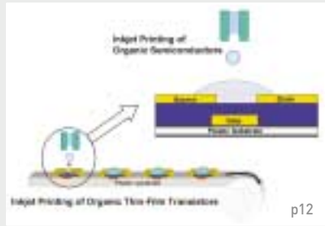

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POSTECH NEWSLETTER SPRING / SUMMER 2008 VOL. 46

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Cover Page:
Newly constructed Residential College Building, home to POSTECH Freshman and Sophomore Classes. (p17)

Design: Dongin Forum Tel: +82-2-521-0725

Origin and Biogenesis of Chloroplasts, the Factory of Photosynthesis, in Plant Cells

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It is well known that plants can fix carbon dioxide (CO_2) into sugar. In plant cells, the chloroplast is responsible for fixing carbon dioxide into sugar. Thus chloroplasts as the factory for sugar production play essential roles not only for plants themselves but also for most of living organisms on Earth. However, chloroplasts are not just carbon dioxide fixing factory but also responsible for producing a large number of chemical compounds that are essential for plant growth and development. Interestingly, chloroplasts in plant cells are thought to be originated from ancestral cyanobacterium which is carbon fixing bacteria. It is generally accepted that it must have occurred very long time ago (approximately 1.5 to 1.2 billion years ago) during evolution of eukaryotic cells. However, there is no way to understand exactly how and when this occurred during evolution of the cell.

A generally accepted idea for the origin of the chloroplast is that during evolution, an ancestral cyanobacterium, being capable of photosynthesis, entered an ancestral eukaryotic cell and became an organelle of the host cell. Thus, we call the chloroplast as an endosymbiotic organelle. The symbiotic cyanobacterium, the ancestral cyanobacterium which entered the host cell, had the genome that encodes all proteins necessary for the biological processes such as translation, import and export of ions and chemicals from the environment because it was a free living bacterium before it had entered into the host cell. However, during the process of becoming an organelle of the host cell, the symbiotic ancestral cyanobacterium must have transferred most of its genetic content to the host nuclear genome. Now the chloroplast in the plant cell contains a small genome encoding only about 200 genes, and depends on the host's genome for most of its proteins for a variety of chloroplast functions including photosynthesis, and import and export of ions and chemicals. Therefore, in the process of the symbiotic cyanobacterium becoming a functional organelle, chloroplast, the most critical process must have been to set up the protein import mechanism to the chloroplast during evolution. By this protein import mechanism, the chloroplast can obtain from the host cytosol proteins necessary for photosynthesis and provide fixed sugars to the host cell.

The chloroplast has two envelop membranes, and the proteins located at the outer envelope membrane are vital in chloroplast functions because they are involved in a variety of biological processes such as import of proteins, ions and chemical compounds into chloroplasts. It was not known how chloroplast outer envelope membrane proteins that are translated in the cytosol are targeted specifically to the chloroplast outer envelope membrane. In fact, in the cell, a large number of different organelles exist. Therefore, chloroplast proteins must be targeted to the chloroplasts and at the same should not be delivered to other organelles. In our lab, we discovered that a protein called AKR2 plays an essential role in delivering specifically chloroplast outer envelope membrane proteins to the chloroplast outer envelope membrane. AKR2 consists of two isoforms, AKR2A and AKR2B. Both proteins play identical role in the cell. In the cytosol of the plant cells, AKR2 picks up only chloroplast outer membrane proteins among the large number of proteins and delivers them to the chloroplasts. The specificity that is the specific recognition of chloroplast membrane proteins by AKR2 is achieved by the interaction between AKR2 and the transmembrane domain plus a short lysine-rich motif next to the transmembrane domain of chloroplast membrane proteins. We think that AKR2 has ability to interact with both chloroplasts and ribosomes. Thus, AKR2 recognizes nascent chloroplast outer membrane proteins at ribosomes during translation and escorts them to the chloroplasts during navigation through the cytosol. I mentioned earlier that setting up the protein import mechanism at the chloroplasts must have been an essential step during evolution of chloroplasts. Indeed without this protein in plant cells, outer membrane proteins were not targeted to the chloroplast. In mutant plants without AKR2, chloroplasts cannot develop into a mature form because chloroplast cannot obtain the outer membrane proteins, which in turn results in abnormal plants with yellow leaves. This mutant plant that has a defect in chloroplast biogenesis cannot grow into a mature plant and cannot produce seeds.

Information on how a protein is delivered to the chloroplast is very basic knowledge. However this basic knowledge can provide an opportunity to imagine how a plant cell has evolved during the long period time of evolution. In addition, this basic knowledge will be the basis for the biotechnology in 21st century by providing tools to reprogram chloroplasts for the purpose of improving plant productivity. As I mentioned earlier, the chloroplast is a chemical factory of plant cells and also can store a large amount of proteins. Thus, we can reprogram chloroplasts to produce a new compound if we provide a new protein to the chloroplast or to store a large amount of valuable proteins. For example, if we reprogram the chloroplast in the leaf cells of lettuce or broccoli to store a large amount of pepsin, trypsin or lipase, these plants can be used to help digestion of old people with poor digestion. In addition, we can reprogram the chloroplast to improve its ability to fix carbon dioxide so that plants with the reprogrammed chloroplasts can absorb more CO_2 into sugars and these plants with improved ability to fix carbon dioxide will be useful for solving the green house problem caused by high levels of CO_2. Thus, this kind of basic knowledge can be used in a variety of different ways depending on your imagination. Only the limit may be the limitation of your imagination.

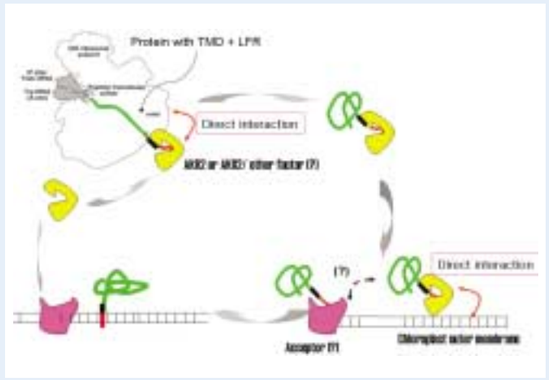

Figure 1. A working model for the mechanism of AKR2.
AKR2 binds to nascent chloroplast outer envelope membrane during its translation by recognizing the transmembrane domain plus the lysine-rich C-terminal flanking region (TMD+ LFR) at the ribosome. After translation, a complex of AKR2 and chloroplast outer membrane protein migrates to the chloroplasts. AKR2 recognizes the chloroplasts by binding to chloroplast-specific lipids. At the chloroplast, AKR2 delivers the outer membrane protein directly to the chloroplasts or a putative receptor located at the outer envelope membrane and then returns to the cytosol.

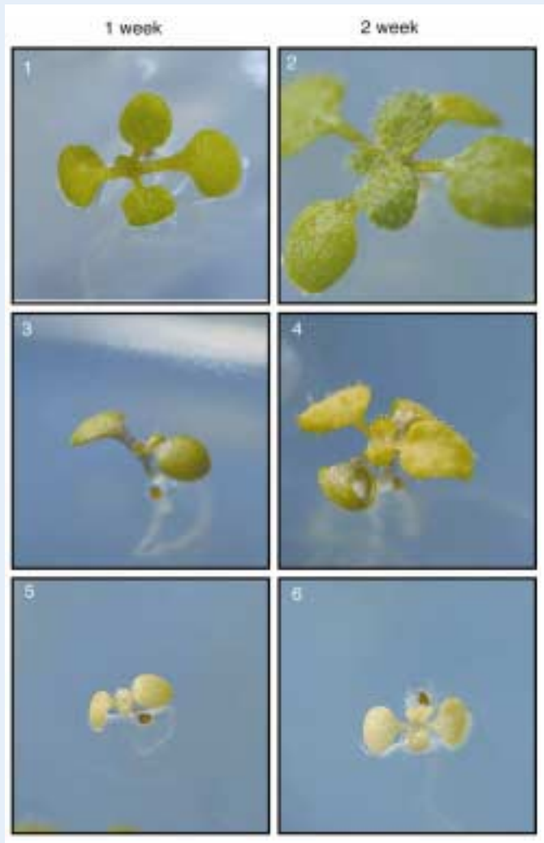

Figure 2. The phenotype of plants without AKR2.
Wild-type (panels 1 and 2) and akr2 knock-down mutants (panels 3-6) were grown for 1 week or 2 weeks after planting. In contrast to the healthy looking wild-type plants, the akr2 knock-down plants look yellow and do not grow well. The yellow phenotype indicates that the plants have defects in chloroplasts.

Hybrid Nanostructure Fabrication Using an AAO Nanotemplate and Highly Conformal ALD

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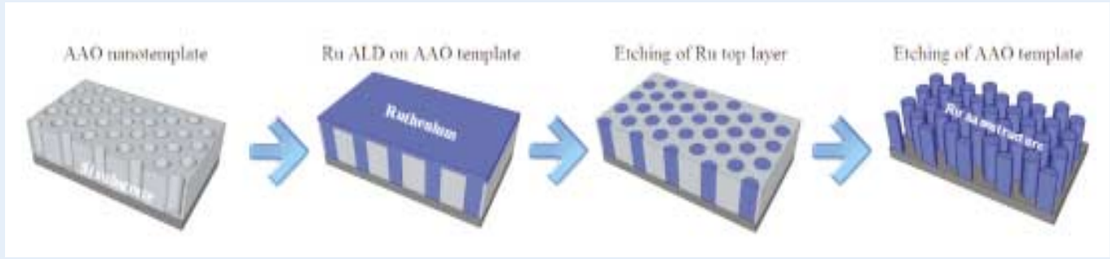
Nowadays the term of 'nano', which means 10^{9} as the SI prefix, is commonly mentioned in the media. Usually, a human hair is taken as a means for lifelike recognition of 1 nanometer. One nanometer is 1/100,000 of a hair, which is too small to observe through optical microscope. When we consider that 1 nm is 3 or 4 atomic scale at the most, similar to DNA with the size of 2 nm, its very small size is true to nature for us. Hence, to control an individual atom and to reveal the mystery of the DNA of human body, 'nanotechnology' has been attracting great attention as one of the essential topics especially in modern scientific technology field. In particular, the fabrication of nanostructures with nanometer dimension in size is the starting point and essential part for the nanotechnology research.

Overcoming limitations of the conventional technology: finding a clue from self assembled nanotemplate

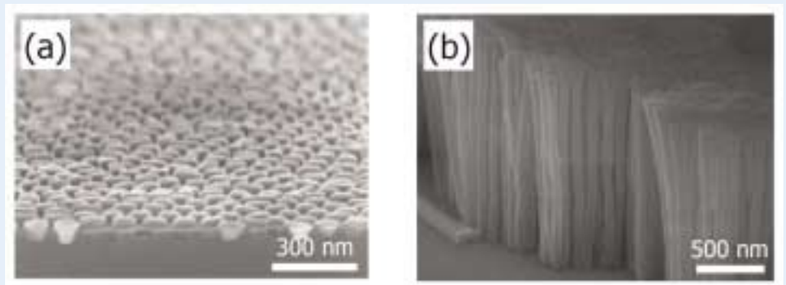
So far, device fabrication techniques for the computer memory as a representative example have been developed based on the top-down patterning process. However, as continuous scaling of the electronic devices with high integrity, currently used conventional optical lithography faces up to the resolution limitation in sub-30 nm scale regime. The techniques being used in nanoscale patterning with a high resolution are electron beam lithography, focused-ion beam etching, and scanning-probe-based writing. However, they may not be proper solutions because of their high cost, low throughput and time consuming techniques especially for large scale nanopatterning. Accordingly, a novel approach is needed for nanoscale device fabrication.

Hereupon, to overcome these drawbacks, a bottom-up process put down roots as a new paradigm for the next generation device fabrication. This is in contrast to currently used top-down nanopatterning techniques as mentioned above. This process is to fabricate the nanoscale structure through the reaction between atoms or molecules. Nanostructures such as nanodot, nanotube, and nanowire have recently attracted considerable scientific and commercial attention because of their unique electronic, magnetic, and optical properties. However, to build nanostructures for the practical applications to the nanodevices, technologies to control the regular arrays of nanostructures are required. From this point of view, nanopatterning technologies based on self-assembled nanotemplates such as diblock copolymer, polycarbonate and anodic aluminum oxide (AAO) have attracted a great deal of interest for well ordered nanostructure fabrication. Self-assembly means that the structure is organized by itself during the fabrication process without any additional process.

Among the various nanotemplate technologies, AAO nanotemplate represents one of the exciting frontiers in the nanotemplate research. This builds up the highly ordered hexagonal cell array of nanoholes under the electric field applied during the anodizing process. Deriving force for hexagonal arrangement is the repulsion originated from volume expansion in the alumina layer. Holes are formed by transfer of aluminum ion and oxygen ion at the interface such as alumina/electrolyte, Al/alumina, and pore bottom. AAO make it possible to fabricate nanostructure with the aspect ratio we desire because its interpore distance, hole size and depth can be easily controlled from variation of anodization conditions. For practical device applications, however, AAO templates should be formed directly on substrates to avoid problems such as complicated post processes. Meanwhile, to build nanostructures by filling the high aspect ratio holes of the nanotemplates, the quality of the resulting nanostructure is fundamentally determined by the conformability of the thin film deposition process. Based on this point of view, atomic layer deposition (ALD) is a promising process, which exhibits a good conformality as well as a good uniformity, atomic scale thickness controllability and low impurity contamination at a low growth temperature.



Schematic drawings of process flows for Ru nanodot or nanowire arrays on Si substrate.



FE-SEM images of Ru nanostructures on Si substrates: (a) the tilt view image of Ru nanodot arrays on Si substrate, (b) the tilt view image of Ru nanowire arrays on Si substrate.

Novel hybrid process for the nanostructure fabrication

Professor Hyungjun Kim and his research team successfully developed the novel technique for the nanostructure fabrication. The team suggests that a hybrid nanofabrication process combining ALD with an AAO nanotemplate has good opportunities for the fabrication of well-ordered nanostructures. The fabrication of metal nanostructures using ALD combined with a nanotemplate has rarely been reported although metallic nanostructures have various applications such as memory devices, fuel cells, nanosensors and nanocatalysts. So far, electrodeposition has been extensively used to fabricate metal nanostructures using AAO templates. Although electrodeposition has a good gap filling ability, it requires a conducting seed layer, which makes the whole process complicated. Moreover, the fabrication of nanotube structure is quite difficult by electrodeposition. Meanwhile, ALD is a proven technology for mass production, especially in the semiconductor device industry, and nanotubes can be easily produced by ALD.

The research team performed the newly developed hybrid process. The AAO nanotemplates with various aspect ratios and hole sizes were fabricated directly on Si substrates, which exclude the complicated post processes. By combining Ru ALD and AAO, they fabricated various Ru metallic nanostructures including nanodots, nanowires and nanowire array devices.

The research was published as the cover story of the January 2008 issue of *Nanotechnology* with the title of "Ru nanostructure fabrication using an anodic aluminum oxide nanotemplate and highly conformal Ru atomic layer deposition."

Digital Non-Volatile Polymer Memory Device Developed: An Efficient, Low-Cost Means of Permanent Data Storage

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Improvements in performance and reductions in cost of silicon-based non-volatile memories, such as flash random access memory (flash-RAM), have rendered floppy discs and many other forms of portable storage obsolete. But for many uses that require data to be written only once, such as archiving and security applications, their cost effectiveness is limited. So-called write-once-read-many (WORM) memories made from low-cost polymer materials could provide a solution.

The devices, developed by Professors Moonhor Ree, Ohyun Kim, Su-Moon Park and their research teams, are based on hyperbranched copper phthalocyanine (HCuPc) polymer. The starting material of the HCuPC polymer is copper phthalocyanine (CuPc) which is a common organic semiconductor. The CuPc material, which is usually grown by vacuum deposition techniques, does not usually exhibit switching behaviour that could be used for data storage.

But when fabricated from solution to form thin polymer films, the HCuPC reveals electrical switching characteristics.

The HCuPc polymer films initially exhibited a high-conductivity state (ON-state). The conduction processes within the device were found to be dominated by hole injection rather than electron injection. The active layer in the devices is short-circuited during the ON-state. Specifically, when a voltage of just over 2.5 V is applied across such an HCuPC film sandwiched between indium-tin-oxide and gold contacts, it switches from the ON-state to low conductivity state (OFF-state). This switching-OFF process of the devices is influenced by the magnitude of the injection current. This switching-OFF process is thought to be governed by the rupture of filaments which takes place when a voltage greater than the turn-off voltage is applied. The conductivity of the OFF-state was found to be more than millions of times smaller than the ON-state, making it

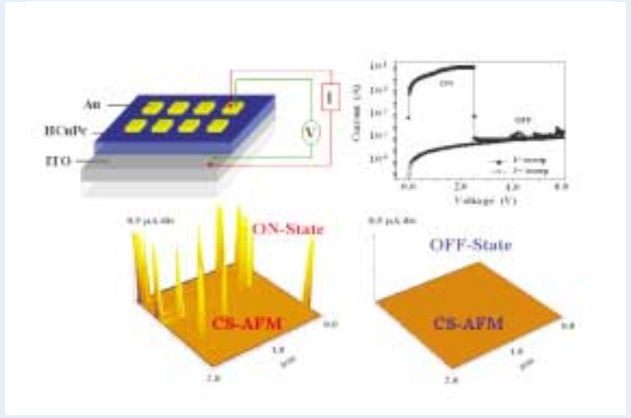

Fig. 1. A schematic structural diagram of the nonvolatile WORM memory device based on HCuPc polymer thin film. A typical current-voltage curve of the ITO/HCuPc/Au devices. Current sensing atomic force microscopy (CS-AFM) images of HCuPc polymer films coated onto ITO and Au substrates.

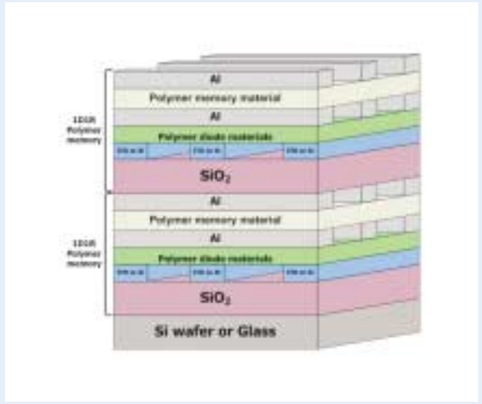

Fig. 2. A schematic structural diagram of the 3D array nonvolatile WORM memory devices.

Fig. 3. A schematic structural diagram of the 3D array nonvolatile WORM memory devices based on HCuPc polymer thin films fabricated on flexible polymer carriers.

easy to read the state of a device. And once switched to the OFF-state the devices remained permanently in that state, even when tested again a full year later.

The simplicity of the devices and the fact that the films of which they are based can be fabricated from solution, not only makes them potentially much cheaper than silicon-based memories, it could enable them to store much larger amounts of data more efficiently.

The density of the data that can be stored in silicon-based memories can only be improved by making the size of individual memory cells smaller. This is because they can only be fabricated in two-dimensions on the surface of a silicon chip. In contrast, because the HCuPC films are fabricated from solution, it should be possible to build 3-dimensional (3D) arrays of devices by spin-coating or dip-coating multiple layers, to achieve very high storage densities.

Overall, the HCuPc devices exhibited excellent WORM memory characteristics. These properties open up the possibility of a low-cost mass production of highly dense, and very stable digital non-volatile WORM memory devices.

These research results were published in the journal *Advanced Materials* (volume 20, 1766-1771, 2008), and further highlighted by *Nature Asia Materials* (June 4, 2008).

QUANTUM-RING LASERS:
Whispering-Cave-Mode Lasers Emit in Blue-Violet

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Lord Rayleigh wrote about the two-dimensional whispering gallery mode (WGM) in 1910 after a visit to the dome of St. Paul's cathedral in London. The whispering cave mode (WCM) is a three-dimensional (3D) effect—a toroid with circular helix symmetry—which recent studies have shown can be used to create photonic-quantum-ring (PQR) lasers that emit in the blue-violet part of the spectrum.

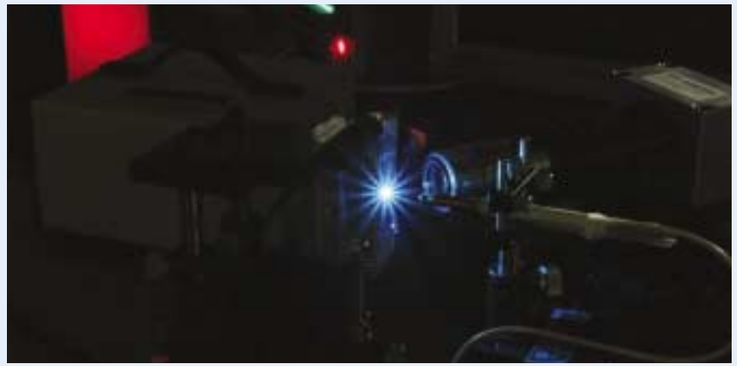
A research team at Pohang University of Science and Technology (POSTECH, Pohang, Korea) first created 3D WCM lasers that emit in the infrared and red part of the spectrum. To achieve this, professor O'Dae Kwon and his group stacked mesas of vertically reflecting distributed-Bragg-reflector (DBR) structures above and below a few active 80 Å gallium-arsenide and gallium-indium-phosphide quantum wells. The resulting 3D WCM laser of photonic quantum rings avoided the problem of in-plane light spreading found in 2D WGM lasers, and generated a donut-like band of 3D helical modes. One such photonic-quantum-ring device of 15 µm in diameter featured an ultra-low-threshold current of 11.5 µA, about a thousandth of that needed for vertical-cavity surface-emitting lasers (VCSELs) of the same diameter. These multimode devices emitted around a central wavelength of 848 nm, exhibiting increasing threshold current and decreasing linewidth with larger device diameter. The team observed the narrowest linewidth with an optical spectrum analyzer to date from a 10 µm PQR of 0.55 Å at an injection current of 800 µA.

The next iterations of the infrared PQR device involved single-mode electrically pumped lasers made of a hyperboloid drum shape only 0.9 µm across. These devices exhibited a linewidth of 0.46 Å at 838.5 µm, and a tiny threshold current of 300 nA, the smallest ever observed among quantum well, wire, or dot-type lasers. Although the external quantum efficiency suffered from soft lasing turn-on behavior, the emission efficiency of the PQR laser was very high—more favorable than that of light-emitting diodes (LEDs). Such lasers could be used to replace LEDs in high-end displays in the near future.

The researchers then used various vertical gallium-nitride (GaN) structures to extend their PQR work to blue wavelengths from 420 to 470 nm (see Fig.). In one version, a "reverse-mesa" approach with microholes etched in the vertical-quantum-well structure enabled unexpected "convex whispering-gallery" lasing via gain-guiding effects. This "weird" laser also exhibited very low quantum-ring-like thresholds (6 µA per pixel for 256x256 arrays, and 0.3 µA per pixel for mega-pixel arrays at room temperature) and surface-normal dominant multimode emissions. The hole lasers are easily fabricated, readily scalable, and, says Kwon, may become sought-after for next-generation interconnects or nano-bioengineering for its potential to anchor submicron fibers.

"In general," said Kwon, "the blue laser has been like a holy grail—it has been very difficult to achieve surface-normal lasing. Existing blue photonic-crystal LDs still require relatively high current. The new blue PQR achieves surface-normal lasing easily, even with the modest design of less than 95% to 70% vertical-pair reflection, thanks to the unique 3D helix WCM phenomena. And its ultralow threshold implies it can outperform LEDs while overcoming the thermal and material problems of the LED."
Future challenges associated with 3D WCM PQR lasers include studies of 3D device theory and simulations, angular moment studies, understanding of carrier-photon interactions, and chaotic dynamics research on modified structures.

[*Laser Focus World*, Volume: 44 (March, 2008)]



A blue photonic-quantum-ring laser showcases 3D whispering-cave-mode emission with ultra-low-threshold current less than that of VCSELs or LEDs.

A New View on Quantum Complementarity

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According to laws of quantum mechanics a physical entity may possess either particle-like or wave-like properties. A particle exhibits wave properties when one cannot tell the path the particle may take among different paths available. Once the path information is obtained, however, the wave-like properties of a particle are supposed to disappear. In any case, it is not possible to observe both the wave and particle properties simultaneously, which is known as complementarity of a physical entity. In early days around the advent of quantum mechanics the concept of complementarity was considered only in hypothetical thought experiments. More recently, however, the progress in the nano-scale artificial fabrication technique enables one to examine the validity of complementarity through the direct experimental realization. To that purpose, one can resort to the double-slit-type interference involving photons, atoms, or electrons in solids.

Traditionally the reduction of the wave properties to the particle ones was thought to result from a momentum transfer to a physical entity while getting its path information. If one attempts to find the path that a physical entity (i.e., an electron) takes in a double-path interferometer, for instance, a momentum transfer causes uncertainty in the phase of the affected wave packet in one path, which results in the suppression of the interference between the partial waves along the two paths. Although this point of view was physically easy to accept, it began to face a challenge since the late twentieth century. It was debated that, in a certain circumstance, only the quantum correlation or the entanglement may lead to the path information even without a momentum transfer, which in turn suppresses the quantum interference.

In this study, we adopt a "closed-loop-type" Aharonov-Bohm electron interferometer [Fig. (a)] to find a clue to the fundamental cause of complementarity. The electron interferometer was fabricated on a two-dimensional electron gas existing at the interface of a GaAs-AlGaAs heterojunction semiconducting wafer. Electrons in the two-dimensional gas are laterally confined to be transferred along the two arms of the Aharonov-Bohm interferometer by the electron-confining gates patterned on the surface of a heterojunction wafer and negative voltages applied on them. In the interferometer, a quantum dot is embedded in one arm of the interferometer. The detection of the electrons through this quantum dot is made by monitoring the conductance of the quantum point contact (QPC), which is placed in proximity to the quantum dot and thus electrostatically coupled to the quantum dot. Once the electron path information is obtained by the QPC detector in this double-path interferometer the quantum interference is supposed to be suppressed in proportion to the electron detectability. Complementarity of electrons in this kind of solid-state double-path interferometer was already observed in 1998 by Moty Heiblum's group in Weizmann Institute of Science, Israel.

Different from the multi-terminal open-loop-type double-path interferometer used by the Weizmann group, our closed-loop-type electron interferometer has only two terminals (the source and the drain). Thus, in our interferometer, multiple turns of electron passage around the interferometer loop is possible in principle. In the case of the double-path interferometer with only a single turn of electron passage, the charge detection always provides the path information. In this case, one cannot tell whether the suppression of the interference due to the charge detection is caused by a momentum transfer or simply by the quantum entanglement. In our closed-loop interferometer, however, the charge detection does not necessarily provide the path information. In Figure (b) the detector responds to the electrons passing the red path only; thus, the path detection is equivalent to the path information. But for the multiple-turn path shown in Fig. (c) both the red and blue paths are through the quantum dot once so that the charge detection does not provide the path information. If only the path information, irrespective of the momentum transfer, suppresses the wave nature of electrons the charge detection will suppress the first-harmonic interference for the path in Fig. (b) but will not affect the second-harmonic interference for the path in Fig. (c). In case the momentum transfer is the cause of the suppression of the interference both the first and second harmonics of the interference will be affected by the charge detection. In our measurements the amplitudes of the first and second harmonic interferences were monitored as a function of the voltage bias of the charge detector. Measurements show that the first harmonics decrease linearly with the voltage bias of the detector while the second harmonics remain unaffected. The results of this study decisively demonstrate that the path information itself rather than the momentum transfer is the essential element of determining the particle-wave nature of an electron or quantum complementarity.

Quantum mechanical complementarity probed in a closed-loop Aharonov-Bohm interferometer, Dong-In Chang, Gyong Luck Khym, Kicheon Kang, Yunchul Chung, Hu-Jong Lee, Minky Seo, Moty Heiblum, Diana Mahalu, Vladimir Umansky, *Nature Physics*, Vol. 4, 205 (2008).

Stepping Toward Printed Electronics: Inkjet Printing of Organic Semiconductors

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Direct printing of functional electronic materials may provide a promising route to low-cost fabrication of integrated circuits. From this point of view, ink-jet printing has received special attention as a direct patterning technique for the cost-effective fabrication of organic electronic devices such as organic thin-film transistors (OTFTs) (Figure 1) and organic photovoltaic cells.

Professor Kilwon Cho and Ms. Jung Ah Lim of the Department of Chemical Engineering have succeeded in fabricating high-performance OTFTs by inkjet printing of organic semiconductor. This result entitled "Self-Organization of Inkjet-Printed Triisopropylsilylethynyl Pentacene via Evaporation-Induced Flows in a Drying Droplet" was published and introduced in the January issue of the *Advanced Functional Materials* as the cover story.

To produce organic electronic devices with high performance via inkjet printing, the uniform deposition of organic semiconductor thin-film with desired molecular ordering by inkjet printing has become an essential challenge because charge carrier transport in organic electronic devices is strongly influenced by the crystalline microstructure and morphology of the organic semiconductor film.

However, the uneven distribution and random orientation of organic semiconductor molecules were commonly observed in most of organic semiconductor films printed from homo-solvent, which was disadvantageous to electrical property of the devices.

Prof. Cho's research group reported for the first time that inkjet printing of organic semiconductor films with uniform morphology and a desired molecular orientation can be achieved by varying the composition of the solvent mixture. They found that self-aligned crystals of organic semiconductor with highly ordered crystalline structures can be inkjet printed in presence of the minor solvent, which has a higher boiling point and a lower surface tension than the major solvent (Figure 2). These self-aligned organic semiconductor crystals can be used successfully to produce high-performance organic transistors.

They illustrated that this approach makes use of the evaporation-induced flows, in particular the convective and Marangoni flows that occur in an inkjet printed droplet during drying process. The convective flow that transports the molecules in a droplet to the perimeter of droplet can be counterbalanced, depending on the solvent composition, by the Marangoni flow that is induced by the surface tension gradient between the periphery and the interior of the droplet from regions with low to regions with high surface tension.

They have confirmed that high performance inkjet-printed transistors can be obtained by optimizing the deposit morphology and crystalline structure of inkjet-printed organic semiconductor films by controlling the evaporation-induced flow in the printed droplets. This finding may offer an excellent way to control the molecular ordering of organic semiconductors for the direct-write fabrication of high-performance organic electronics. This development of printed electronics will realize new electronic products such as wearable electronics in garments, electronic toys in giveaways, or even electronic bar code on a yogurt cup in the near future.

Prof. Kilwon Cho (Dept. of Chemical Engineering) received his Ph.D in polymer science from the University of Akron in 1986, and worked as a researcher at IBM Research Center. He has taught at POSTECH since 1988.

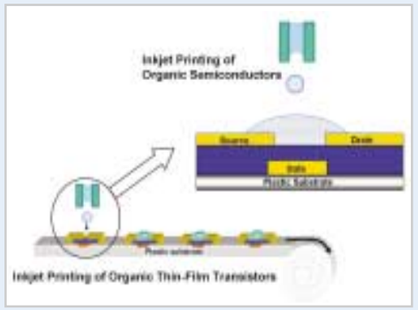


Figure 1. Schematic representation of fabrication process of OTFTs by inkjet printing of organic semiconductors and device cross-section of OTFTs.

Figure 2. Optical microscope image of self-organization of inkjet-printed organic semiconductor with highly ordered crystalline structures produced by the evaporation-induced recirculation flow in a drying droplet, which was featured as the cover of the January issue of the *Advanced Functional Materials*.

Dr. Jaejoon Lee Appointed Lecturer at Lancaster University

Dr. Jaejoon Lee, who holds a Ph.D. in Computer Science and Engineering and an M.S. in Computer and Communications Engineering both from POSTECH, was appointed a Lecturer in the Computing Department at Lancaster University, a prestigious institute in the United Kingdom, in January 2008. He has specialized in software product line engineering and before joining Lancaster University, he worked as a researcher and project manager at Fraunhofer Institute for Experimental Software Engineering (IESE) in Kaiserslautern, Germany, from October 2005 to December 2007.

Lancaster University is known to have decided on the recruitment of Dr. Lee based on his outstanding research achievements in software product line engineering demonstrated by numerous publications presented by relevant institutes and journals, and also the fact that he is a pupil of the internationally recognized expert of the field, Professor Kyo-Chul Kang of POSTECH. What caught special attention was Dr. Lee's elaboration on Professor Kang's best known research "A Feature-Oriented Reuse Method" and extension of it to mobile products such as ubiquitous computer system and ambient intelligence.

Dr. Lee's appointment is considered to have proved POSTECH's highly competent talents, who are ready to be accepted internationally, as well as its competitive research facilities and outstanding faculty.

Dr. Lee said he wished to "continue bringing forth improvement in recognition of POSTECH and Korea's IT capability." He also expressed his affection for POSTECH and encouraged his junior Postechians to "have ambition and vision to persevere in their efforts to march into the world."

Professor Su-Moon Park Receives Khwarizmi International Award

Professor Su-Moon Park (Department of Chemistry) won the 21st Khwarizmi International Award conferred by the Iranian Research Organization for Science and Technology (IROST). Professor Park has been recognized for his distinguished research achievements in the field of electrochemistry, and the Khwarizmi Award was presented to Professor Park for the establishment of "Fourier transform analysis of chronoamperometric currents obtained during staircase voltammetric experiments" in particular. Professor Park has been selected as one of the 'Highly Cited Researchers' in materials science by the Institute of Scientific Information (ISI).

The Khwarizmi International Award was established in 1987 by the Iranian Government, paying tribute to the Persian mathematician Al Khwarizmi, who had used the concept of 'algebra' for the first time in history. International agencies including United Nations Educational, Scientific and Cultural Organization (UNESCO) and The Third World Science Academy sponsor this annual prize which is awarded to researchers who have accomplished outstanding achievements.

The 21st Award ceremony was held on February 5th, 2008 in Teheran, Iran, and Professor Park's lecture on his research results was one of the celebratory events. This year, the Award was given in 3 different areas of basic sciences, applied research, and innovation, and 11 acclaimed scientists, including Professor Park, received the prize.

Professor Hyunbo Cho Elected Co-Chair of TaMIE TC, OASIS

Professor Hyunbo Cho (Department of Industrial and Management Engineering) was elected Co-Chair of Testing and Monitoring Internet Exchanges (TaMIE) Technical Committee (TC) of Organization for the Advancement of Structure Information Standards (OASIS) in February 2008. TaMIE TC executes tasks related to establishment and application of e-business standards. Professor Cho shares the position with Jacques Durand, director of Engineering and Standards at Fujitsu Software, and leads evaluation of new e-business standards and their use in the business process.

Some 600 organizations from over 100 countries are participating members of OASIS, an international civil organization established in 1993, which aims to standardize major issues of Internet usage, such as e-government, e-business and web-service. There are, in total, 67 technical committees operating under OASIS. The headquarters are located in the United States, Japan, Australia and the Netherlands.

Professor Wonyong Choi Appointed Chief Editor of *Journal of Hazardous Materials*

Professor Wonyong Choi (School of Environmental Science and Engineering) was appointed chief editor of *Journal of Hazardous Materials*, the professional environmental journal of international recognition. Published by Elsevier of the Netherlands and acknowledged as the world-best in the fields of science and medicine, *Journal of Hazardous Materials* is issued semimonthly, mainly containing content on the latest research activities on topics such as analysis and disposal of toxic substances, evaluation and supervision of the degree of toxicity, and control and restoration progress. As a Chief Editor, Professor Choi will share with the other Chief Editors the task of evaluation of some 2,500 theses a year and decision on their publication. Professor Choi is a distinguished scholar of environmental science including photocatalysis and advanced oxidation process. He was awarded "The Young Scientist Award" in 2005 by the Korean Ministry of Science and Technology.

Professor Gyu-Chul Yi Scores Hat Trick at International Invention Exhibition

Professor Gyu-Chul Yi (Department of Materials Science and Engineering) swept the table at the 36th Geneva International Advanced Invention Technology Exhibition held at Geneva, Switzerland. Professor Yi and his team's presentation of the patented manufacture process of nanodevice and transistors containing nanodevice won the Gold Medal. In addition to the Gold Medal, 2 special prizes were awarded to Professor Yi's group and its members, which made it a hat trick score for the team. The Prize of the Federal Agency for Science and Innovation of Russia given by Mr. Vlacheslav Voronin, Head of Division, was awarded to the POSTECH group, and a team member, Young Joon Hong, a doctoral student at POSTECH, received the Prize of the Bauman Moscow State Technical University, given by the Rector of the University, Mr. I.B. Fedorov, for his outstanding research achievements.

The new technology allows flexible adjustment of location, size, and shape of nanostructure, overcoming limits of the photolithographic procedure. Furthermore, the process uses the existing silicon boards, which makes low cost large area processing possible. The technology is expected to bring forth effective production of highly integrated semiconductor nanodevice, Field Emission Display, and photonic crystal.

Professor Yi stated that he hoped for utilization of the technology "in many diverse fields including production of high density photoelectric elements and electronic device."

Professor Yi and his team's research achievements were published in the materials science journal of world renown, *Advanced Materials.*

POSTECH Goes Worldwide in Efforts to Attract Top-Class Faculty

POSTECH acted upon the launch of its "International Recruitment Fair," successfully hosting events in the United States. The first of the series took place in Boston, Massachusetts, on March 16th, 2008. At the home of Massachusetts Institute of Technology (MIT) and Harvard University, President Sunggi Baik and 6 other professors of POSTECH introduced the institute and its core research areas to some 130 young, talented scientists from the area.

The sequel, which followed on May 30th, 31st, and June 1st, 2008, was held on the West Coast of the United States. Hosted in San Francisco and Los Angeles, the events were attended by almost 200 promising future leaders of science from prominent institutes such as Stanford University, California Institute of Technology (Caltech), University of California, Berkeley, and University of Southern California.

POSTECH plans to hire 70 distinguished professors including 10 world renowned scholars by the end of the year, ultimately expanding the number of total faculty members from 237 of the present to 300 by the year 2011. President Baik emphasized that procurement of top-class faculty is the key to successful advancement of the University, and that realization of the POSTECH vision of becoming one of the top 20 research oriented institutes of the world by the year of 2020 calls for participation of qualified, talented individuals of diverse nationalities. POSTECH is making every endeavor to acquire state-of-the-art resources to further improve faculty research facilities.

NSB POSTECH Cooperates with Fred Hutchinson Cancer Research Center

NanoSurface Biosciences (NSB) POSTECH tied up with Fred Hutchinson Cancer Research Center, a Seattle-based institution of worldwide reputation, which has borne 3 Nobel Laureates.

NSB POSTECH concluded an agreement with Fred Hutchinson Cancer Research Center on March 18th, 2008 in Seattle. They will cooperate on high-performance biochip technology, utilizing NSB POSTECH's own 'Nanocone' surface technology.

Professor Joon Won Park (Department of Chemistry), NSB POSTECH's CEO, said he expected that "this agreement with Fred Hutchinson, which is one of the top-3 cancer research centers of the United States, will provide a great help in NSB POSTECH's advancement into a global diagnostic corporation."

NSB POSTECH, first established in June 2006 as the first university enterprise of POSTECH, gained its independence as a corporation in February 2008. Using the 'Nanocone' technology, NSB POSTECH has been producing glass slides, ingredient of DNA chips. And using the glass slide manufacturing technology, it is getting down to manufacturing of diagnostic instruments. NSB POSTECH also revs up on development of diagnosis substance to be used in diagnosis of diseases.

Graduate School for Wind Energy Open

POSTECH Graduate School for Wind Energy (GWE) held its opening ceremony on May 14th, 2008. GWE's establishment resulted from selection among applications for the Korean Ministry of Knowledge Economy's 'New and Renewable Energy Human Resources Training Project.'

Because of the high rise in the demand for specialists in new and renewable energy, large investments are being made to build a solid supply pool of human resources in research and development in the field.

GWE will produce yearly 20 Masters and Doctors of wind energy related studies for the next 5 years. It also plans to host international conferences on new and renewable energy. Building close collaborations with government, industry, and other educational institutes and research centers, GWE seeks to prepare its students to be wind energy experts of the highest caliber.

Applications for admission will be accepted starting in August 2008, and the first classes will take place in March 2009. The School will operate 4 professional laboratories of Fluid Flow, System Design, Composites & Structural Design, and Power Electronics.

POSTECH and APCTP Join Hands with Max Planck Gesellschaft

Max Planck Gesellschaft, the natural science research institute considered world's best, chose POSTECH and Asia Pacific Center for Theoretical Physics (APCTP) as its first Korean partners. Peter Gruss, Max Planck's Chair of the Board, visited POSTECH on January 5th, 2008, and signed the joint research agreement with POSTECH President Sunggi Baik and APCTP Director Peter Fulde, agreeing to jointly found and operate a Junior Research Group at APCTP, the international research institute located on POSTECH campus.

Through this agreement, Max Planck Gesellschaft has established itself a bridgehead in international joint research in Korea and Asia at large. As for POSTECH, such a substantial collaboration with a reputable institute will make a timely opportunity to secure its position as a leading research-oriented institute of global recognition and also to initiate and vitalize international joint research in the Korean scientific scene. APCTP has gained with the establishment of the 'Junior Research Group' a foothold in becoming one of the top research institutes of the world.

The reason behind Max Planck Gesellschaft's selection of POSTECH and APCTP as its partners lies in the world class research infrastructure, such as the radiation accelerator and nano technology integration research center, and in the abundant human resources of top quality. POSTECH will provide the program with research infrastructure and promote POSTECH students' participation in the researches as well as support researchers to hold teaching positions at POSTECH. POSTECH hopes that active promotion of joint researches with Max Planck Gesellschaft will not only bring about more attraction for the international research population, but also provide fosterage of materials science and other major scientific areas, resulting in growth into a world-leading university.

Max Planck Gesellschaft, first founded under the name of Kaiser Wilhelm Institute in 1911, changed its name in 1918 after the Nobel Laureate in Physics, Max Planck, the progenitor of quantum mechanics. Max Planck Gesellschaft has some 15,000 researchers working in affiliated, cross-disciplinary research institutes of natural sciences, medicine, economics, law, arts, and humanities. Its yearly budget extends to US $1.7 billion, and it has produced 17 Nobel Laureates. In 2006, Max Planck Gesellschaft was placed the best research institute in natural sciences by The Times of Great Britain.

Introducing POSTECH English Certification System

POSTECH announced implementation of the English Certification System. POSTECH's signature customized-education-for-the-select reinforced, each student will need to successfully complete his/her own designer-English-requirements in order to graduate.

The system applies to the freshman class of 2008 (Class of '12) who took speaking and writing tests upon matriculation and was consequently placed in 5 different levels. Completion of the highest level (Level 1) of the system is the new graduation requirement at POSTECH, but the number of prerequisite classes before reaching the highest level varies, from as many as 9 classes for the students placed in the lowest level (Level 5) to none for those whose English skills are competent enough to waive the requirements.
Skipping of levels is not allowed unless some special occasion, such as participation in English language programs at institutions in English speaking countries or completion of military service in the Korean Augmentation to the United States Army (KATUSA) is taken under consideration. 11 classes, focused on speaking and writing, were newly opened in March to provide students with diverse possibilities in their selection.

Since 1995 up until last year (2007), a TOEFL score of 550 or higher was a prerequisite for graduation at POSTECH. Professor Dong-Whan Cho (Department of Humanities) explained that the new system would prove to be a unique and efficient way of better evaluating and advancing each student's English skills according to individual needs. Program authorities plan to manage the classes so that after completing the highest level, students' English skills would be equivalent to 90-100 on IBT TOEFL (perfect score, 120), which is the standard range of scores required by graduate schools in the United States as admission prerequisite, they added.

POSTECH Embarks upon Residential College System

POSTECH had invested US $18 million into the 2-year-long construction of the new residential college building, and its completion ceremony was held on February 29th, 2008. The freshman class (Class of '12) began their POSTECH life at the new residential college and the entire sophomore class (Class of '11) moved into the new building as well.

Each floor accommodates 50 students, a supervising professor titled 'Residential Master' and 2 'Residential Advisor's', who are selected from upperclassmen of high academic and behavioral standing. They are appointed as students' mentors to reside and work with them, sharing common grounds. The ninth floor is an English-only-environment where an English professor resides as Residential Master to help improve students' English skills.

During the 2-year-mandatory-stay, students will be provided not only advice in their major studies, but more of a 'holistic' education where they will be offered to improve themselves through close, personal bond with preeminent professors, numerous athletic and voluntary team projects, and other programs such as leadership classes, workshops and lectures on multidisciplinary topics given by distinguished guest lecturers. The planning, organization and proceeding of Residential College Colloquia will be directed by students themselves with the guidance of professors.

The Residential College System utilizes dormitories for not only residential, but also educational purposes. The system provides services outside of schoolwork; students are allowed opportunities to build close relationships with professors and seniors, which lead to concurrent benefit of the mentors' advice, and through various humanistic and athletic programs, younger students are able to build a strong tie with one another and adapt to the college life quickly.

Dean Moo Hwan Kim of Student Affairs explained that POSTECH thought it important to provide students in their freshmen and sophomore years, while nursing constituency in their major academic fields, with advice of mentors and training in human development. He also stated that as POSTECH implements the first 2-year residential college system in Korea, it aims to improve students' global mindset as well.

Gold Button Math Competition

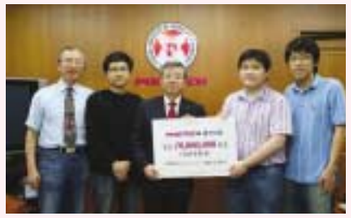
Since January 2008, the Department of Mathematics at POSTECH has been hosting a monthly math competition for undergraduate students. On the 14th of every month, a single mathematics problem is given. Among students who present the right answer, one who offered an answer strictly based on the rudimentary knowledge available to him/her is named MVP. Here comes the fun part: MVP's are bestowed a gold button that weighs approximately 3.75g, made of pure gold.

The event is named 'The Five-Gold-Button Math Competition' because to the student who has accumulated 4 gold buttons, 1 more gold button is given and also a vest to be embellished with the buttons.

Hyuk Joon Kwon, a freshman in the Department of Mathematics, was named MVP in both January and February. He was the center of attention when he won twice in a row even before his official enrollment at the University which followed in March.

Professor Sung Pyo Hong of the Department of Mathematics explained the purpose of the competition to be "to provide students with interesting ways to be exposed to mathematics." POSTECH plans to keep promoting the event and to collect students' answers and publish them.

PLUS Conquers International Hacking Contest



PLUS members, Byung Wook Bae (24, Electronic and Electrical Engineering), Jae Hyuk Song (23, Computer Science and Engineering) and Sung Kwang Lee (22, Electronic and Electrical Engineering) scored highest points in the final round of Codegate 2008, the first international hacking contest held in Korea with the total prize money of US $100,000.

PLUS had passed the preliminaries with the highest score as well, impressing the judges by solving a java technology problem in mere 10 minutes. Born in 1992 under the purpose of strengthening POSTECH's network security, PLUS has secured its position as one of the leading university-based security clubs in Korea. Last year, 2 of the club members were included in an allied team which took the 6th place in the finals of the DEFCON CTF. PLUS also has a history of winning 3 consecutive years at the "POSTECH-KAIST (Korea Advanced Institute of Science and Technology) Science War".

A total of 600 teams from the United States, China, Australia, Taiwan, Japan, and European countries as well as Korea participated in Codegate 2008. PLUS won a cash prize of ₩40,000,000, 20% of which the members donated for the training of domestic security experts.

Siemens Invests US $50 Million in Pohang

Gyeongbuk Province, the city of Pohang, and Siemens signed a Memorandum of Understanding on March 21st, 2008, on a US $50 million-project of manufacture, and research and development of high-tech machinery such as ultrasound system. The first step of the agreement includes Siemens' investment that amounts to US $21 million by the year of 2012 in the manufacture of the contact transducer, precision machinery which is the core part of the ultrasound system.

Siemens took up a research area of 4293m² in the 3 Venture-dong of Pohang Technopark and started research and manufacture in late March. For the project, 150 personnel, including 20 in the research and development, is to be hired this year, and another 186 next year. Total sum of US $50 million is to be invested in full by the year of 2016.

Siemens, the global powerhouse in industry, energy and healthcare sectors specializing in electronics and electrical engineering, plans to nurture Pohang into the Asian Mecca of medical machinery by organizing close network with industrial, governmental and educational institutes of Gyeongbuk Province. Siemens' selection of Pohang was made based on abundant research facilities including POSTECH Biotech Center, POSTECH National Center for Nanomaterials Technology and Pohang Accelerator Laboratory, and excellent human resources available in the area.

Brain Awareness Week Observed at POSTECH

March 13th, 2008 POSTECH Brain Research Center (Director, Professor Se-Young Oh, Department of Electronic and Electrical Engineering) hosted an open lecture titled 'Brain, Mind and Robot' in observance of the Brain Awareness Week (BAW).

The event started with Director Se-Young Oh's lecture on 'Brain and Robot' followed by Professor Sang Ki Park (Department of Life Science)'s lecture on 'Disease of Brain, Disease of Mind', rounded out with a tour of the research center.

The BAW campaign, launched in 1996 in the United States, works towards promoting public awareness of brain and nervous system research, and is now observed every year during the third week of March in 57 countries. The occasion disembarked in Korea in 2002.

Director Oh of the POSTECH Brain Research Center said that he wished the event "would not only provide an opportunity for Brain Science experts and the public to meet and discuss the importance of Brain, but also lead teenagers to dream of becoming brain specialists."

Hands-on Robot Museum Steals Hearts

Pohang Institute of Intelligent Robotics (PIRO) opened Robo-Life Museum, the hands-on museum where you can see for yourself how the fascinating machines with humanlike skills work, and even have a go at operation.

The Museum is divided into 3 exhibition halls. The Hall of Interest presents robots used in everyday life for home, industry, and medical uses. Robots that draw the curtain at a push of a button or flutter its wings at a clap may be touched and operated in this hall. The Hall of Experience shows in detail the principles and procedures behind the way a robot senses, thinks, and acts, and a humanoid robot is exhibited for demonstration. The Hall of Exploration houses models of future robots such as those in movies, and spaceships and futuristic vehicles, to allure and motivate young scientists.

Since its opening in January 2008, the Museum, for whose construction Korean Ministry of Commerce, Industry and Energy, the Gyeongbuk Province, and the city of Pohang provided US $2 million, has become a popular attraction. Not only residents of Pohang but people from all over the country are lining up to get a peek inside Korea's first experiential robot museum.

Grand Challenge: $200,000 at Stake

Pohang Institute of Intelligent Robotics (PIRO) is hosting its annual Robot Grand Challenge on October 18th. This year's competition may be even hotter a battle; no one took the winner's prize last year, carrying over the prize money and making this year's reward a total of US $200,000.

Mission to be accomplished before seizing the cash: robot takes the elevator, goes up to the designated floor and into the particular room, approaches the person specified out of a group, and returns to the starting point with the appointed article in possession, all on its own and within 20 minutes.

Accomplishment of the mission requires self-controlled navigation, voice and image recognition, and flexible joint functions similar to those of human hands and fingers. Display function is also necessary in order to relay the images the robot perceives to outside sources.

The same task was presented last year to no one's success. The site of the competition will not be disclosed until the day of the contest due to the sensitivity involved with the matter: familiarity of the surroundings makes the success rate about 50% higher. So the rule is no practice in the building for all competitors, fair and square.

"We are confident that the event will bring about great advancement in the robotics technology," Director Youngil Youm of PIRO expected of the event. Anyone holding Korean nationality is eligible to enter the competition. Applications are accepted online between June 1st and June 27th at http://gc.piro.re.kr.

A Step into the World

Dae Hyoung Lee
Department of Life Science
Junior

In my humble opinion, it is absolutely necessary for people to be placed in challengeable circumstances at least once in their lifetime. It is especially true for us, POSTECH students (Postechians), who have little opportunity to participate in extramural activities and who may easily become frogs in the well, knowing nothing of the great ocean.

I was born and brought up in Pohang, a small city where Pohang University of Science and Technology (POSTECH) is located. Most part of my life ranging from education to the duty of national defense was completed in Pohang. Because of the simple and monotonous life pattern in one small city, my experience, knowledge, and scope were unavoidably narrow and restricted. Therefore, I have always felt keenly and strongly about the necessity of broadening my outlook in life. Moreover, I always believed that It was totally essential for me to make progress into the world wider than Korea.

Last fall semester, after 6 years of waiting, I eventually snatched at a precious chance to develop myself. Thanks to POSTECH, I was given an opportunity to take part in the Study Abroad Program. I chose the University of Washington (UW) as my nest, one of the prestigious universities in Seattle, and thus, my challenge began.

I had been able to improve myself in many different aspects through some cultural activities and travels out of the university as well as through classes at the university. I would like to begin my story with the classes at UW. There were a couple impressive classes, Architectural Photography and Organic Chemistry, out of the four that I had taken.

Through the organic chemistry class, my potential possibility was definitely confirmed, and I could recover my self-confidence. In fact, I had been somewhat anxious about the level of lectures in the U.S. Moreover, while serving in the army for 3 years, I had been far from my studies, and the long gap, above all, had made me lose self-confidence. However, I immediately perceived during the organic chemistry class that it was unnecessary apprehension, and I was astonished at the level of lectures that I had taken at POSTECH. Although never was the organic chemistry class at UW easy, I could outstandingly conquer it with the bases that I had learned at POSTECH.

In addition, architectural photography class was a kind of vitamin for my U.S. life. In fact, I love photography as much as I love my major, biology. When I walk up and down looking for objects for photography with a camera in my hand, everything in the world seems to show its own intrinsic meaning. That kind of impression always makes me feel refreshed because it is hardly found in usual life. My main subject for class was typical American home, which recalled harmonious and united family in my mind. In the lab class, the professor once asked me why I always took pictures of houses, and I answered, “My object is not just a house but a ‘home’, and my concept of this class is ‘harmony.’” After that, one of my pictures was picked out as one of the ‘Top 7’ by the professor, and I was very happy.

While imagining united families and taking pictures of American homes, I wondered what real American family life was like. Thus, my friends and I decided to take part in the event providing daily hosts for international students on Thanksgiving Day. We visited Mrs. Rose’s home which was located in Poulsbo, Olympic Peninsula. She, a retired history teacher, was living alone because her husband had already passed away. However, she gathered her friends, and temporarily made a united family for us. Our “united” family cooked and had turkey and pumpkin and chocolate pie for the Thanksgiving Day supper. Although it was my first time to have turkey, it was delicious enough to fascinate me. After dinner, all of us, regardless of age, played Mexican train, a board game, until midnight, and I won the top place. It was comfortably warm night like a mother’s bosom.

While staying in the U.S., I traveled to several other cities as well as Seattle. I traveled from Washington D.C. to Boston for 10 days after a quarter. In fact, the theme of my travel was “To trace the roots of world top 20”. Thus, I visited famous universities in each city where I stopped off, and took looks around the libraries in order to find out a mirror of POSTECH. In my opinion, Massachusetts Institute of Technology (M.I.T.) would be the best paragon for us because of its similarities with POSTECH. Although M.I.T., like POSTECH, is relatively small compared to other universities that I had visited, I could see why it was of the most prominent standing in the world by observing the M.I.T. students. They seemed to study much harder than students anywhere else. At least to my own eyes, that was how it seemed. In addition, visiting M.I.T., I was provided a clear motivation to be a leading scientist in the near future.

To make a long story short, the 4-month-stay in the U.S. was a substantially desired and profitable experience for me. I encountered novel circumstances that I had never experienced before, and repeated attempts and failures. However, I did my best to develop greater discipline, stronger health, and clearer motivation and I could eventually discover myself in the world through the experiences in the U.S. It is undeniable fact that POSTECH is the leading institute in the field of science and technology in Korea. However, it is also the stern reality that POSTECH is an elite enclave, geographically speaking, which might be its only drawback. Therefore, we, Postechians, must pull out all the stops in order to overcome our shortcomings. I am certain that Study Abroad Program is an excellent aid. I keenly and strongly recommend many Postechians to participate in the program.

Finally, with sincere thanks to Julie Kim who had assisted me in many aspects, I would like to put a period to my humble writing.

Adieu, thou POSTECH!

Tobias Baumgarten
Department of Mathematics
Technische Universität Berlin

Hello. I am Tobias, a mathematics undergraduate student who took the exchange program from Technische Universität Berlin (TU-Berlin) for the fall semester of 2007 and the spring semester of 2008. I arrived at POSTECH in August 2007 with many expectations, and I was open-minded to new things, one of the important issues when going abroad to a totally different culture, in my opinion.

The first problem I was faced with in Korea occurred directly after arriving in Pohang around 1 A.M. when I wanted to try my Korean language skills (I had taken a language class in Germany for 3 months) on the taxi driver. Unfortunately, I stood, after a short drive in the middle of the night, on the empty parking lot at Pohang College. Luckily, I found a kind Korean who brought me back into town, so I could catch another cab and finally find my way to POSTECH.

In the first days, I had the normal problems nearly every foreigner would have, with things like spicy Korean food, eating with chopsticks, weather and jet lag. But after a while, I got used to those things, and now, I appreciate most of them. There were some things I missed, though; for example, I wasn't able to cook because the dormitory buildings weren't equipped with kitchen facilities yet. I would have liked to learn to cook Korean food and also share German dishes with Korean friends. What I really appreciated on the other hand was the sports facilities at POSTECH. As I like nearly all kinds of sports, you could find me at least 5 days a week somewhere in the gym, always trying something new.

Then the semester started and I was a bit surprised at how small the classes were and how close the connection to the professors was. The classes were of a kind of familial mood compared to the classes at TU-Berlin with up to 500 students. In the first few months, I met new people nearly everyday, but unfortunately, most of them were non-Koreans themselves, which was a bit sad as I wanted to learn more about Korea. My roommate was also German, so my Korean didn't really get any better even though I took the Korean language class at POSTECH. Instead, my English improved a lot, and I don't fear having a conversation in English anymore, which was the case before I left Germany.

The first semester was sooner over than I had expected. Time was running quickly as there were so many new things to discover. I have learnt a lot in these few months, even apart from my studies. Talking with so many people from different nations and cultures gives you a different view on things.

I also enjoyed exploring Korea; on campus during the Science War against KAIST, the POSTECH Festival, at the Log Cabin or just sitting around on the beautiful campus and enjoying the blue sky during a good Korean meal, or off campus, on the beaches near Pohang, in Seoul, Jeju-do, Seoraksan, and at the International Film festival in Busan. But the sad thing was that my motivation to learn the Korean language dwindled as days went by, because my stay wasn't so long and the preparation period of 3 months had been too short. Another German with whom I shared a few months at POSTECH had studied for 1.5 years in advance, and he succeeded at holding small conversations in Korean by the end of his stay.

Then the semester ended with a sad flavor, as many of my new friends left POSTECH for their home countries or to work at a company after graduation. Also, when the Christmas season came, I felt homesick for the first time in Korea, as it was the first time for me not to celebrate Christmas at home with my family. At that time the POSTECH Ski Camp came in at the right moment and blew away all the sadness in me. After celebrating New Year's Day in Seoul, I left Korea for the winter vacation and took the opportunity to travel around Asia, which was another unforgettable experience.

I arrived back in Incheon nearly at the same time as when I had first come from Germany, but if the bus-ride to Pohang then had been a travel into the uncertain 6 months, this time, it felt like a ride home. When I arrived in Pohang, it was raining, but I awoke the next morning to a beautiful white carpet of snow.

This semester I am taking a few classes, and like the fall semester of 2007, I was lucky that the professors switched their lectures to English for me. I felt a bit bad since for one person, all other students had it much harder to follow the lecture as it was not taught in their native language. But I think in the end they should be happy as learning English is a very important thing these days. As for my efforts in learning Korean, it was unfortunate that I finally had to drop the Korean language class after two weeks as I found myself again in between the beginner and the intermediate levels.

In the spring semester, I officially joined the D.O.G. (the-English–only Dormitory of Our Global dream) in which I had already been living since November 2007. It was a good decision as I got much more contact with Koreans. Also the whole atmosphere in the building was much friendlier than those of other dormitories. Everybody greeted one another and most of the time, had a short talk when meeting in the hall, not just passing by like robots. I think also the International House (DICE – Dormitory for International Culture Exchange), which is planned to open for the fall semester of 2008, is a good thing for everybody. On the one hand, Korean students who want to learn English would have better possibilities and motivations, and on the other hand, for the foreigners, it would be easier to make Korean friends.

After nearly one year, when I look back on my time in Korea, I am really happy that I took this opportunity which was given to me by my home university, TU-Berlin, and POSTECH. It was one of the best decisions in my life, and I didn't regret coming here any minute of my stay. In summary, I would say I learnt a lot about different cultures and life, and also about my studies. I made friends from all over the globe with the hope to visit them one day, and I saw so many nice things, especially during my trips in Korea and Asia. Also one of the most important things is that I learnt to speak in English and even though I cannot speak Korean well, at least, I am able to read it and my knowledge is enough to survive in Korea.