



IBB *POSTECH* Integrative Biosciences & Biotechnology

Newsletter **Fall 2009**

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Division of IBB newly organized at POSTECH as part of the World Class University(WCU) project

As part of the World Class University project, division of Integrative Biosciences and Biotechnology (IBB) has been organized at POSTECH. We invites 10 international scholars who possess advanced research skills to collaborate with POSTECH faculty members and establish new academic programs in key growth-generating fields.

IBB graduate course offers a multidisciplinary graduate program that educates and trains students to acquire a basic understanding of various biological phenomena centering on the cell surface and an ability to do quantitative, systematic, and integrative thinking through a coursework that integrates basic science and engineering.

The division of IBB aims to become a new international leader in basic life science and bio-engineering and also in training and educating graduate students to become world-class scientists who can contribute to the national economy.



IBB workshop held from Mar. 4 to 6, 2009

IBB Workshop was held for 3 days from March 4 to 6, 2009 at POSTECH Biotech Center.

The workshop was attended by 21 faculty members of the division of IBB, including 9 international scholars from overseas.

The workshop started with an opening remark by division chairman, Professor Inhwang Hwang, then all participants were given opportunities to share their research interests and activities, which were followed by free discussion.

While the period in which the workshop was held, 2 international scholars, Professor Charles Surh and Jonathan Sprent, had an open seminar for POSTECH students at life science building.

The purpose of the workshop was to assemble all IBB professors at POSTECH, as a new semester was about to begin, discuss WCU program and the division organization and understand each professor's research area and exchange information.



1. Opening Address
2. IBB Presentation at the meeting room

POSTECH Graduate Fair held May 17, 2009, in Seoul

2010 POSTECH Graduate Fair was held in May 17, 2009 at the POSCO Center in Seoul. This fair has been held every year in Seoul and, for the first time, division of IBB was taken part in the fair as one of graduate course at POSTECH after organized.

Students interested in studying at POSTECH graduate courses registered their name on POSTECH website for attending and came to know more detailed information of their interesting POSTECH graduate course and have a chance to meet their preference professors at the fair.

The fair started with an opening address by President Sunggi Baik, followed by introductory presentation by each department at the conference hall, and all attendants moved to the meeting room of each department to get more detailed information. On behalf of division of IBB, Professor Sung-Key Jang presented the division introduction, IBB graduate course, regulations for the award of the degrees and entrance examinations for admission. Free conversation with questions and answers were followed.

IBB overseas professors, Wonhwa Cho and Myoung-Ho Jang attended and total 7 students visited IBB meeting room.



1. Opening ceremony
2. Outdoor activity (Gyeongju Tour)
3. Banquet dinner for the last day

POSTECH Bio-Fair held from Jun. 29 to Jul. 3, 2009

POSTECH Bio-Fair was held on POSTECH campus from June 29 to July 3, 2009 for 5 days. 82 undergraduate senior students from Korea and overseas who wanted to enter Bio-studying related graduate schools visited POSTECH and had a chance to share a well of information regarding POSTECH's Bio-related studies and courses.

The purpose of the fair was to provide information on bio-sciences and related areas and vision of 21st bio-sciences to undergraduate students who are interested in pursuing graduate studies at the Division of Molecular and Life Science, the School of Bioscience and Bioengineering (I-Bio), and Division of Integrative Biosciences and Biotechnology (IBB) at POSTECH. The participating students had the chance to meet professors and graduate students at these three bio-science related graduate programs as well.

The program was comprised of special lectures by distinguished scholars and bio-business CEO, introduction to research activity of individual labs, Conversation with POSTECH graduate students, Outdoor activity (Gyeongju tour), Laboratory exhibition and tour and Banquet dinner on the last day. Professor Sung-Key Jang presented the division of IBB and Professor Myoung-Ho JANG, Yeon-Kyun Shin, Wonhwa Cho, You-Me Kim and David E. Somers as IBB overseas Professors were attended.

POSTECH Bio-fair is going to be held every year.

POSTECH and WCU-IBB Program

POSTECH has made remarkable progress since its founding 23 years ago and now has basic elements of a world-class university, including excellent faculty, students, facilities, and financial resources. It is therefore fitting that POSTECH hosts several new WCU programs, including Integrative Biosciences and Biotechnology (IBB). I decided to join the WCU-IBB program last year because I saw the great potential at POSTECH and the unique opportunity to be part of developing an ambitious new interdisciplinary program there. As a person who was raised and educated in Korea, I am well aware of chronic problems of the Korean educational system and fully understand why the WCU program was initially greeted with skepticism and criticism. However, I thought that the time was ripe for Korean universities to adopt this type of stimulus program that has worked well in other Asian countries and that its positives outweighed negatives. After completing my first year tenure at POSTECH, I'd like to reflect on my experience and also make a suggestion to improve our IBB department.

Overall, I think that my first-year stay at POSTECH was productive and enjoyable and for that I'd like to thank all faculty, staff, and friends who made it possible.

Through generous support from POSTECH and our department head, I set up a new laboratory equipped with state-of-art instruments. New equipment will certainly expand my research horizons and facilitate the research of POSTECH colleagues. I also established new collaboration with many POSTECH faculty and had opportunities to interact with excellent POSTECH students and researchers. I believe in face-to-face discussion and brainstorming that can never be replaced by email correspondence or videoconferencing. In this sense, the WCU program has succeeded to serve one of its purposes; that is, fostering collaboration among POSTECH and international participants. Having been associated with the chemistry department for all my career, I have never had such ample opportunities to talk with biologists and engineers and this experience

helped me gain different perspectives. In my opinion, POSTECH is one of rare Korean institutions where researchers do talk about their research seriously and this research-first culture creates a stimulating atmosphere for collaboration and intellectual exchanges. It was also refreshing to find that many POSTECH students were still genuinely interested in research and strongly motivated to pursue a research career.

I am an optimist but I know I would sound naive or even oblivious if I said everything went so great and would be even better next year. As is the case with any academic department, there are problems associated with the new department. A key idea behind the IBB program is to break down the traditional department barriers. Due to a unique situation at POSTECH, however, I am afraid that the IBB program may have actually generated a new barrier within the Life Science department. For the IBB program to succeed, this invisible fence must be torn down and its program and activities should be nicely coordinated and integrated with other Life Science programs. Everyone should realize that the WCU program can actually serve as catalyst to enhance the visibility and competitiveness of our whole Life Science programs, thereby bringing in more resources, benefits, and perhaps most importantly, better students and research personnel to POSTECH. Undoubtedly, it will take sincere and open-minded effort from all faculty to achieve this goal and I know I will continue to try my best to make positive contribution.



Written by
Professor Wonhwa Cho

POSTECH Bio-Fair

I am a senior student at Korea University, and my major is Life Science & Biotechnology.

I participated in the first Bio-Fair at POSTECH and it was a priceless experience for my decision to apply IBB.

When I was surfing internet this spring, I happened to find an article about the graduate school fair by POSTECH held in Seoul. I had always thought about going on to graduate school, so I wanted to get some information on various fields of life science. I attended the fair with my friend. Although I have been interested in pursuing my studies in graduate school in the field of life science since I entered Korea University, I myself was lazy at searching, and was ignorant of the areas of my major. It was at that fair that I learned about the wide range and application of the research in the life science field, and I got information about the Bio-Fair.

Bio-Fair was kind of a new and fresh experience I have never had. At first, I thought the 4-night schedule was too long for a fair and it could be little bit boring. However, it was felt rather short for us to enjoy the whole opportunities Bio-Fair offered; lectures of scholars and bio-business CEO, beer party with exhibition, introduction to individual labs, conversation with graduate students, outdoor activity, laboratory tour, interview with individual professor, and a banquet dinner.

I liked the introductory lectures given by individual professors to their labs and research fields the most, and interviewing professors was also a valuable time. I attended lectures on plants, protein structure, bio-imaging, immunology, and molecular psychiatry. I was especially surprised by the complexity and application possibilities of plants because I did not take many classes about plants in undergraduate school. Also, integration of bioscience and biotechnology was very attractive, for I was not aware of the close connection of two areas. Having conversation with professors was a new and good experience to feel their enthusiasm



Conversation with POSTECH graduate students

for research and affection toward students. There were few chances to talk with professors in person even though we took many classes in undergraduate school for 4 years. Therefore, I was nervous when I planned to interview at first, but during the interview, professors encouraged us to pursue our study at POSTECH and gave us wide perspectives.

Bio-Fair was a great chance to affirm my future path, which was to apply for IBB.

First of all, I was moved by the passion of professors, who guided students to variety of activities themselves and always welcomed even our trivial questions. Meeting so many students who had same goal was also an important experience, for I have few fellows at school who want to go on graduate school. I realized there were so many friends in my studying field and it made me resolve to study harder for my further career. From a participant's point of view, I would recommend other students who major in this Bio-related studying field to participate in Postech Bio-Fair.



Written by **Young-Ji Jung** who was one of POSTECH Bio-fair participants and will take IBB graduate course from Mar. 2010

IBB LABORATORY TOUR

This section is to introduce newly set-up IBB laboratories.

Laboratory of Neurotransmission

Location

Room 113, Life Science Building

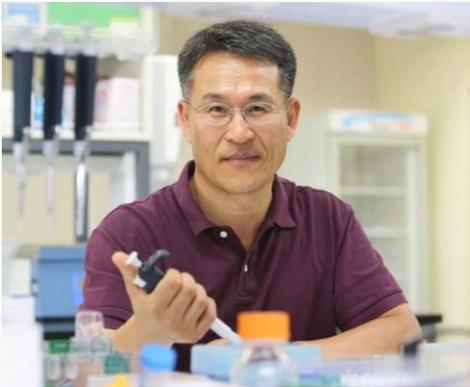
Member

Professor : Yeon-Kyun Shin

Research Assistant Professor

: Mal-Gi Choi

Researcher : Yoon-Seo Choi, Jae-Il Shin

**Laboratory news**

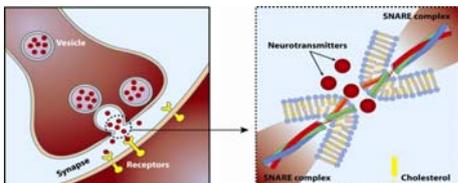
- Mechanism of membrane fusion
- Mechanism of neurotransmitter release
- Mechanism of secretion and trafficking in cells
- Structure and dynamics of membrane proteins with single molecule spectroscopy

Neurotransmitter release at the synapse underlies fundamental brain functions such as cognition and memory. The release requires the fusion of synaptic vesicles with the plasma membrane. SNAREs are the central unit of the membrane fusion machinery by formation of helical bundle structure. The primary goal of research in my laboratory is to reconstitute synaptic fusion using a minimal set of proteins. We also intend to understand the structural and dynamic bases of membrane fusion. We use newly developed fluorescence single molecule techniques to dissect and analyze the fusion steps. In addition, we use EPR to investigate the structural basis of the fusion mechanism. This new innovative approach has uncovered new and exciting features of synaptic membrane fusion in unprecedented details.

If interested or for laboratory visit, please call 82 54 279 8072 or email to malgichoi@postech.ac.kr

Research area

Membrane fusion -fundamental process for neuronal communication



PRESS RELEASE

from the Garvan Institute website

Major breakthrough in transplantation immunity

6 April, 2009

Australian scientists have made a discovery that may one day remove the need for a lifetime of toxic immunosuppressive drugs after organ transplants.

Professor Jonathan Sprent and Dr Kylie Webster from Sydney's Garvan Institute of Medical Research, in collaboration with colleagues, Dr Shane Grey and Stacey Walters, have successfully tested a method, in experimental mice, of adjusting the immune system for just long enough to receive a tissue transplant and accept it as 'self. At no stage, during or after the procedure, is there any need for immunosuppressive drugs.

The results are now online in the current edition of the prestigious *Journal of Experimental Medicine*.

"Under normal circumstances, the body would attack a transplanted organ unless immunosuppressive drugs such as cyclosporin were given," said Sprent.

"In this project, mice were given a substance, or 'complex', that altered their immune systems, so that they accepted transplanted cells as their own."

Sprent developed the 'complex' with **Professor Charles Surh** from California's Scripps Research Institute and Dr Onur Boyman, physician and Head of the Basic Immunology Unit at the University Hospital of Lausanne in Switzerland.

The complex combines a molecule, interleukin-2 (IL-2), with an antibody in order to stimulate immune cells known as T regulatory cells.

"In broad terms, IL-2 is a growth factor for T cells," explained Sprent. "My colleague Onur Boyman discovered that by combining IL-2 with different antibodies you can control its action, boosting specific populations of T cells, while subduing others. For this project we needed to boost the numbers of T regulatory cells."

"T regulatory cells quiet the immune system, subduing the body's killer T cells when it's time to stop

fighting an infection."

"The other side of the coin is that a superabundance of T regulatory cells prevents killer T cells from functioning. And you wouldn't want to be without killer T cells for long because they fight infections and cancers."

"For this project, we boosted T regulatory cells temporarily, in a procedure that we believe might be very useful clinically, particularly for preventing rejection."

It was the task of postdoctoral researcher Kylie Webster, working with Stacey Walters, to see if she could make the T regulatory cell response work in a clinically realistic setting.

"We took normal, healthy mice, injected them for three consecutive days with the complex, then transplanted insulin-producing cells on the fourth day," said Kylie. "By the time of transplant there were huge numbers of T regulatory cells in their systems, making graft-destroying T cells ineffective."

"The numbers of T regulatory cells dropped over time, and the immune systems returned to normal in about two weeks. By that time 80% of the mice had accepted the grafts of insulin producing cells as their own."

"This acceptance rate is very high for transplantation, with mice normally rejecting grafts within 2-3 weeks."

"A graft is considered accepted if it's tolerated after 100 days. We took some mice out to 200-300 days, and not one of them rejected."

While cautious, Professor Sprent is very encouraged by the results.

"We have yet to determine exactly how the complex works. Once we do, I believe a clinical trial of this very non-toxic agent would be worthwhile."

"Our approach works well with pancreatic islets, or insulin-producing cells, but we have yet to try other

clinically-relevant grafts such as kidneys and hearts, which are technically very difficult in mice," he said. "I am also aware that effective approaches in mice do not necessarily give good results in humans because of subtle differences in the immune systems of mouse and man."

"Those provisos given, if we were able to duplicate this experiment in humans, it would fulfill the dream of everyone in the transplant field."



ABOUT GARVAN

The Garvan Institute of Medical Research was founded in 1963. Initially a research department of St Vincent's Hospital in Sydney, it is now one of Australia's largest medical research institutions with nearly 500 scientists, students and support staff. Garvan's main research programs are: Cancer, Diabetes & Obesity, Immunology and Inflammation, Osteoporosis and Bone Biology, and Neuroscience. The Garvan's mission is to make significant contributions to medical science that will change the directions of science and medicine and have major impacts on human health. The outcome of Garvan's discoveries is the development of better methods of diagnosis, treatment, and ultimately, prevention of disease.

AWARDS & HONORS



Professor Per-Olof Berggren received an award for The 22nd Annual Edwin G. Krebs Lecture in Molecular Pharmacology, University of Washington, Seattle, June 2, 2009. He was appointed to the member of Editorial Board of Interdisciplinary Bio Central (IBC), 2009 and also the member of Academia Europaea, 2009

PUBLICATIONS

David E. Somers

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Per-Olof Berggren

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- Pulling force generated by interacting SNAREs facilitates membrane hemifusion. MH ABDULREDA, A BHALLA, F RICO, P-O BERGGREN, ER CHAPMAN & VT MOY. Integr Biol 1:301-310, 2009.

You-Me Kim

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- Park B, Brinkmann MM, Spooner E, Lee CC, Kim YM, Ploegh H (2008) Proteolytic cleavage in an endolysosomal compartment is required for activation of Toll-like receptor 9 Nature Immunology 9, 1407-14

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