

Sabbatical Leave Report (Fall-2008 to Spring-2009)

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1. Goal and Motivation: The research focus of my group is experimental nano-scale science and engineering. Due to the multi-disciplinary nature of this field, I have planned my sabbatical leave to learn new research techniques, establish new collaboration, and strengthen some existing interaction with other colleagues in the related field. Most activities indicated in the approved proposal were realized.

2. Itinerary and Activities: This was a two-semester leave started from October 10, 2008 and ended on July 2, 2009. The “late start” was due to the defense schedule of two master students (co-supervised) and the whole tenure was wrapped-up by attending an international conference.

2.1. October 10, 2008 to January 5, 2009: Stanford University

The major goal was to learn biomedical techniques on using nanotubes for drug-delivery and medical treatment. The host was Professor Xiaoyuan Chen in the Department of Radiology, School of Medicine. Our goal was to use boron nitride nanotubes (BNNTs) for medical application. Chen’s group has the access to animal imaging facilities and was collaboration with Professor Hongjie Dai’s group on the same application using carbon nanotubes. In addition to learning the related techniques in Chen and Dai groups, I have had the chances to visit and interact with various research groups in the university and its micro- and nano- fabrication and characterization facilities. A seminar was also conducted (and video recorded):

Yoke Khin Yap, “Carbon, BN, ZnO, and Si Nanotubes: Growth, Properties, and Potential Applications,” in the Center for Cancer Nanotechnology Excellence (CCNE) Nano-Bio Seminar Series, Molecular Imaging Program at Stanford (MIPS), Department of Radiology, Stanford University School of Medicine, Dec 4, 2008.
http://mips.stanford.edu/public/nanobiotech_seminar.adp#081204

I have also finalized three book chapters and completed the editing of a new book during my stay in California. This book was published in the summer of 2009:

Yoke Khin Yap (Editor), B-C-N Nanotubes and Related Nanostructures, Lecture Notes in Nanoscale Science and Technology (Springer), Vol. 6, (2009) Approx. 310 pages, 159 illustrations, 32 in color, Hardcover.
<http://www.springer.com/materials/nanotechnology/book/978-1-4419-0085-2>

Chee Huei Lee, Vijaya K. Kayastha, Jiesheng Wang, and Yoke Khin Yap, “Introduction to B-C-N materials,” in Chapter 1 of B-C-N Nanotubes and Related Nanostructures, Lecture Notes in Nanoscale Science and Technology (Springer), Vol. 6, Yoke Khin Yap (Ed.) (2009) pp 1-22.

Jiesheng Wang, Chee Huei Lee, Yoshio Bando, Dmitri Golberg, and Yoke Khin Yap, “Multiwalled Boron Nitride Nanotubes: Growth, Properties, and applications,” in Chapter 2 of B-C-N Nanotubes and Related Nanostructures, Lecture Notes in Nanoscale Science and Technology (Springer), Vol. 6, Yoke Khin Yap (Ed.) (2009) pp 23-44.

Kah Chun Lau, Yoke Khin Yap, and Ravindra Pandey, “Boron and Born Carbide Materials: Nanostructures and Crystalline Solids,” in Chapter 9 of B-C-N Nanotubes and Related Nanostructures, Lecture Notes in Nanoscale Science and Technology (Springer), Vol. 6, Yoke Khin Yap (Ed.) (2009) pp 271-291.

2.2. November 8-12, 2008: University of Southern California (USC) and University of California, Los Angeles (UCLA)

I have also visited USC and UCLA. The following seminar was conducted:

Yoke Khin Yap, "Carbon and Non-Carbon Nanotubes: Growth, Properties, and Potential Applications," The Department of Physics and Astronomy, University of Southern California, November 10, 2008. (<http://physics.usc.edu/Colloquia/ViewTalk.php?t=2339>, <http://physusc.wordpress.com/>)

The host at USC was Professor Jia Grace Lu (Physics). Interaction with other faculties was also arranged. I have also visited my collaborator in UCLA (Professor Richard Kaner, co-director of the California NanoSystems Institute) to discuss about our collaboration.

2.3. December 7-10, 2008: Osaka University Forum 2008, "Bio-Environmental Chemistry" (<http://www.osaka-u-sf.org/news16.shtml> , <http://www.osaka-u-sf.org/news.shtml>)

I have attended a forum in San Francisco organized by my former graduate school. I presented a seminar in the University of California-Berkeley (video recorded):

Yoke Khin Yap, "Carbon, Boron Nitride, Zinc Oxide and Silicon Nanotubes: Growth, Characterization and Potential Applications," in BERKELEY SENSOR & ACTUATOR CENTER (BSAC), University of California, Berkeley, December 9, 2008. (<http://www-bsac.eecs.berkeley.edu/calendar/lunch.php?mode=1>)

2.4. December 14-16, 2008: University of California-Berkeley

Due to the scheduling issue, my seminar in UCB was ahead of my laboratory tours. I have visited multiple research groups including those of Professor Peidong Yang (Chemistry), Professor Alex Zettl (Physic), Professor Ali Javey (EECS), and the Molecular Foundries.

3. January 10-May 10, 2009: University of Malaya (UM) and the Multimedia University (MMU), Kuala Lumpur, Malaysia

I have continued my leave to Asia. The first stop is sponsored by the Brain Gain Malaysia (BGM) program. This is a multi-investigator project involving two local universities. In addition to research collaborations, an international meeting and multiple seminars have been conducted.

Yoke Khin Yap, "Carbon, Boron Nitride, Zinc Oxide and Silicon Nanotubes: Growth, Properties and potential Applications," in the Third International Meeting on Frontiers of Physics (IMFP2009), 12 – 16 January 2009, Awana Genting Highlands Golf & Country Resort, Malaysia.

Yoke Khin Yap, "Carbon and Non-Carbon Nanotubes: Controlled Growth, Properties and Applications," in the Department of Physics, University of Malaya, Kuala Lumpur, Malaysia, February 20, 2009.

Yoke Khin Yap, "Introduction to Nanotechnology: Promises and Challenges," in the Proceed. 2009 Physics Research Colloquium, 13th-14th, April 2009, Department of Physics, University of Malaya, Kuala Lumpur, Malaysia, page 2 (2009).

http://www.flurl.com/video/41410114_2009_physics_research_colloquium_invited_talk_2_introduction_to_nanotechnology_part_2.htm etc..

Yoke Khin Yap, "Electron Field Emission: Is this a Pure Quantum Tunneling Process?" in the Department of Physics, University of Malaya, Kuala Lumpur, Malaysia, April 17, 2009.

Yoke Khin Yap, "Carbon versus Non-Carbon Nanotubes: Controlled Growth and Applications," in the NMES Lab Cyberjaya & Melaka, Multimedia University, Malaysia, April 22, 2009.

<http://research.mmu.edu.my/announcement/research-lecture-carbon-vs-non-carbon-nanotubes-controlled-growth-and-applications>

Yoke Khin Yap, "Nanotechnology: Promises and Challenges," in the NMES Lab Cyberjaya & Melaka, Multimedia University, Malaysia, April 22, 2009. <http://research.mmu.edu.my/announcement/research-lecture-nanotechnology-promises-and-challenges>

A review article has also been published:

Yoke Khin Yap, "Growth Mechanisms of Vertically-aligned Carbon, Boron Nitride, and Zinc Oxide Nanotubes," AIP Conf. Proc. **1150**, 126 (2009).

<http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=APCPCS001150000001000126000001&idtype=cvips&gifs=yes&ref=no>

This BGM project is a two-year program. I will need to visit UM and MMU for another one month in summer 2010.

4. May 24-June 27, 2009: The Institute of Physics, Beijing, China

The second stop in Asia was Beijing. The host was Professor Enge Wang (General Secretary, Chinese Academy of Sciences; Director, Beijing National Laboratory for Condensed Matter Physics; Director Emeritus, Institute of Physics). Professor Wang is my collaborator for several years and this was my first visit to his research group. A seminar was conducted during my stay:

Yoke Khin Yap, "Carbon and Non-Carbon Nanotubes: Controlled Growth and Applications," in the Surface Physics Lecture Series, State Key Laboratory for Surface Physics, Institute of Physics, Chinese Academy of Sciences, Beijing, May 27, 2009. <http://surface.iphy.ac.cn/onews.asp?id=82>

I have also interacted with multiple young faculties in the institute. In addition, I have also visited several colleagues in the area including Professor Jin Zhang in Peking University, Professor Weizhong Qian/FeiWang in Tsinghua University, and Professor Zhanggui Hu in the Technical Institute of Physics and Chemistry.

Finally, I have attended an international meeting in Beijing and presented two papers:

Archana Pandey, Abhishek Prasad, Jason Moscatello, and Yoke Khin Yap, "Enhanced Field Emission Stability and Density by Conical Bundles of Carbon Nanotubes," in the Tenth International Conference on the Science and Application of Nanotubes, Beijing, China, June 21-26, 2009.

Chee Huei Lee, Jaroslav Drelich, and Yoke Khin Yap, "Boron Nitride Nanotubes for Self-Cleaning Anticorrosive Coatings," in the Tenth International Conference on the Science and Application of Nanotubes, Beijing, China, June 21-26, 2009.

5. June 30-July 1: Stanford University

On the way back to the U.S., I have stop by the university to exchange the progress status of our collaboration. This is needed before the collaborator move to his new position at the National Institute of Biomedical Imaging and Bioengineering (NIBIB). We have succeeded in functionalize BNNTs and cut them to short segments. We hope to establish progress on the use of these BNNTs for biomedical applications.

6. Conclusion: This sabbatical leave has been productive in terms of strengthen networking and establish new collaboration and new research experiences. Hopefully these will induce new external funded research activities.