Workshop on Biomedical Optics 2009

When: 2009. 6. 1 (Mon) 1:30~5:30 P.M.

Where: GIST Haelim Hall (해림홀, 정보 B동)

Contact: Tel. 062-970-3263, smse@gist.ac.kr

1:30 Opening Ceremony

Session I

1:40 **Dr. Yeh-Chan Ahn** (Beckman Laser Institute, Univ. of California Irvine, USA)
"Optical coherence tomography"

2:40 **Dr. Jae Gwan Kim** (Beckman Laser Institute, Univ. of California Irvine, USA)
"Diffuse optical spectroscopy and imaging in biomedical applications"

Session II

3:50 **Dr. Chulhong Kim** (Biomedical Engineering, Washington Univ. in St. Louis, USA)
"In vivo photoacoustic imaging and its clinical application"

4:50 **Prof. Hyuk-Sang Kwon** (GMSE, GIST, Korea)
"Use of 3-D tissue cytometry on biomedical studies"

※ Registration Fee : Free
※ For more information, visit us at *http://smse.gist.ac.kr*

광주과학기술원
Gwangju Institute of Science and Technology

의료시스템공학연구소
Institute of Medical System Engineering (iMSE)

의료시스템공학학제전공
Graduate-program of Medical System Engineering (GMSE)

Welcoming Message

안녕하십니까?

여러분을 Biomedical Optics의 세계로 초대합니다!
건강한 삶에 대한 욕망과 IT산업의 원동력이었던 광학 기술의 접목이 전세계적으로 이루어지고 있습니다. 이에 M.D./Ph.D를 포함한 융합인력 양성 및 핵심기술 확보를 추구하고 있는 광주과학기술원의 GMSE (Graduate-program of Medical System Engineering) 및 iMSE (Institute of Medical System Engineering) 주관으로 젊은 과학자 네 분을 모시고 워크샵을 개최하고자 합니다. 규모는 작지만 세계적 기술을 선도하는 큰 내용은 담고 있으니, 부디 오셔서 우리가 상상하고 기대할 수 있는 미래 기술의 끝이 어딘지를 미리 감상해 보시길 바랍니다.

먼저, Beckman Laser Institute (BLI) 및 Medical Clinic at UC Irvine 에서 Project Scientist로 활동하고 계시는 안예찬 박사님은 비접촉/고해상/실시간 생체 단층영상술의 결정체인 OCT (Optical Coherence Tomography)에 대하여 강연을 해 주십니다. 특히 내시경과 결합된 3-D endoscopic OCT system과 생체 내에서 피의 흐름을 따로 읽어 낼 수 있는 Doppler OCT에 대한 강연이 기대됩니다.

같은 BLI에 근무하시는 김재관 박사님은 University of Texas at Arlington에서 2005년에 Biomedical Optics 분야로 학위를 하셨습니다. 빛으로 암을 진단하고 적외선으로 뇌의 활동을 실시간 모니터링할 수 있는 Diffuse optical spectroscopy and imaging (DOSI)의 세계로 우리를 안내할 것입니다.

Washington University at St. Louis의 김철홍 박사님은 Photoacoustic 분야의 세계적 대가이신 *Lihong Wang* 교수에게서 최근에 학위를 취득하셨는데 광파와 음파를 동시에 다루는 Photoacoustic 분야의 가장 최근 정보를 상세하고도 친절하게 들려 주시리라 생각합니다. 광파를 이용하여 high spatial resolution을 얻고 음파를 이용하여 high penetration을 얻는 방법을 소개하실 것이며, 특히 photoacoustic tomography, ultrasound-modulated optical tomography, fluorescence imaging, laser speckle contrast imaging 등을 소개해 주실 예정입니다.

마지막으로 GMSE의 권혁상교수님은 MIT에서 Two-Photon Microscopy로 박사학위를 취득하시고 2009년에 GIST에 합류하신 재원으로서 한국의 Biomedical Optics를 짊어지고 가실 포부와 계획을 밝히실 것으로 생각됩니다.

열심히 그리고 알차게 준비를 하였사오니 부디 참석하셔서 자리를 빛내주시기 바라며, 아울러 Biomedical Optics분야의 세계적 화두가 무엇인지도 함께 고민해 주시기 바랍니다.

감사합니다!

GMSE 책임교수 이종현 교수
워크샵 조직위원장 이병하 교수

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Time Table

1:30-1:35 **Prof. Byeongha, Lee** *(GIST, Korea)*
"Opening Ceremony"

1:35-1:40 **Prof. Jong-Hyun, Lee** *(GIST, Korea)*
"Introduction to iMSE/GMSE"

Session I

1:40-2:30 **Dr. Yeh Chan, Ahn** *(Univ. of California Irvine, USA)*
"Optical Coherence Temography"

2:30-2:40 Break

2:40-3:30 **Dr. Jae Gwan, Kim** *(Univ. of California Irvine, USA)*
"Diffuse optical spectroscopy and imaging in biomedical applications"

3:30-3:50 Break

Session II

3:50-4:40 **Dr. Chulhong, Kim** *(Washington Univ. in St. Louis, USA)*
"In vivo photoacoustic imaging and its clinical application"

4:40-4:50 Break

4:50-5:40 **Prof. Hyuk-Sang, Kwon** *(GIST, Korea)*
"Use of 3-D Tissue Cytometry on Biomedical Studies"

5:40-5:45 **Prof. Byeongha, Lee** *(GIST, Korea)*
"Closing remark"

Session I

■ **Title : Optical coherence tomography**

■ **Speaker : Dr. Yeh-Chan Ahn** *(Beckman Laser Institute, Univ. of California Irvine, USA)*

Optical coherence tomography (OCT) is an emerging technology that is capable of high resolution, minimally invasive, non-destructive, and real-time imaging. OCT is based on optical coherence reflectometry which is analogous to ultrasound imaging, but utilizes a broadband light source instead of sound waves to measure the intensity of back-reflection as function of depth in the sample. OCT has been used effectively for cross-sectional imaging in the fields of medicine and biophotonics. In order to provide access to the internal organs, various miniaturized OCT probes that provide either linear or rotational scanning have been developed. This talk covers a three dimensional endoscopic OCT system, employing a two axis microelectromechanical scanning mirror to achieve a fast 3-D imaging. Fourier-domain OCT (FD-OCT) provided high speed two dimensional (2-D) and three dimensional (3-D) imaging.

The second half will deal with Doppler OCT that can image and quantify microstructure and flow simultaneously in microfluidic channel. Doppler OCT is a three-dimensional, non-contact, high-resolution, real-time imaging technique that provides information of wall location and shape in microchannel, three-dimensional velocity profile, and mixing performance. It is a versatile and essential tool for engineers and scientists who want to study transport phenomena in microchannel, to design and test microfluidic components, and to monitor a flaw or malfunction in lab-on-a-chip in situ. System configuration and principle of Doppler OCT are described and several applications are demonstrated.

■ **Title : Diffuse optical spectroscopy and imaging in biomedical applications**

■ **Speaker : Dr. Jae Gwan Kim** *(Beckman Laser Institute, Univ. of California Irvine, USA)*

For the last few decades, diffuse optical spectroscopy and imaging (DOSI) has been actively investigated for various applications in biomedical research including cancer, brain function, critical care, etc. DOSI can detect signals from relatively deep tissues (~3cm) due to the low light absorption characteristics of tissues at near infrared wavelengths of light (650-1000nm). The detected signals can then be used to estimate the content of oxy-, deoxy-, and total hemoglobin, tissue oxygen saturation, lipid, and water in tissues. These intrinsic optical signals can be analyzed and used to understand the normal physiology and disease perturbed states of our body. For cancer research, DOSI has been preclinically and clinically applied to detect tumors in breast, skin, head and neck, and to monitor tumor responses to cancer treatments. DOSI has also been used to monitor brain activity by utilizing multiple light sources and detectors alone or in conjunction with EEG or functional MRI. In critical care research, DOSI has been applied to study hemorrhagic shock, sepsis, ischemia reperfusion injury, compartment syndrome, traumatic lung injury, etc. Despite some limitations of DOSI, such as providing poor anatomical information, the functional information provided by DOSI indicates its' promise for becoming a useful tool in clinical settings.

Session II

■ **Title : In vivo photoacoustic imaging and its clinical application**

■ **Speaker : Dr. Chulhong Kim** *(Biomedical Engineering, Washington Univ. in St. Louis, USA)*

High-resolution volumetric optical imaging modalities, such as confocal microscopy, two-photon microscopy, and optical coherence tomography, have become increasing important in biomedical imaging fields. However, due to strong light scattering, the penetration depths of these imaging modalities are limited to the optical transport mean free path (~1 mm) in biological tissues. Photoacoustic imaging, an emerging hybrid modality that can provide strong endogenous and exogenous optical absorption contrasts with high ultrasonic spatial resolution, has overcome the fundamental depth limitation while keeping the spatial resolution. The image resolution, as well as the maximum imaging depth, is scalable with ultrasonic frequency within the reach of diffuse photons. In biological tissues the imaging depth can be up to a few centimeters deep.

In this presentation, the following topics of photoacoustic imaging will be discussed; (1) multi-scale photoacoustic imaging systems, (2) non-invasive sentinel lymph node mapping using photoacoustic imaging and its clinical application, and (3) functional and molecular photoacoustic imaging.

■ **Title : Use of 3-D tissue cytometry on biomedical studies**

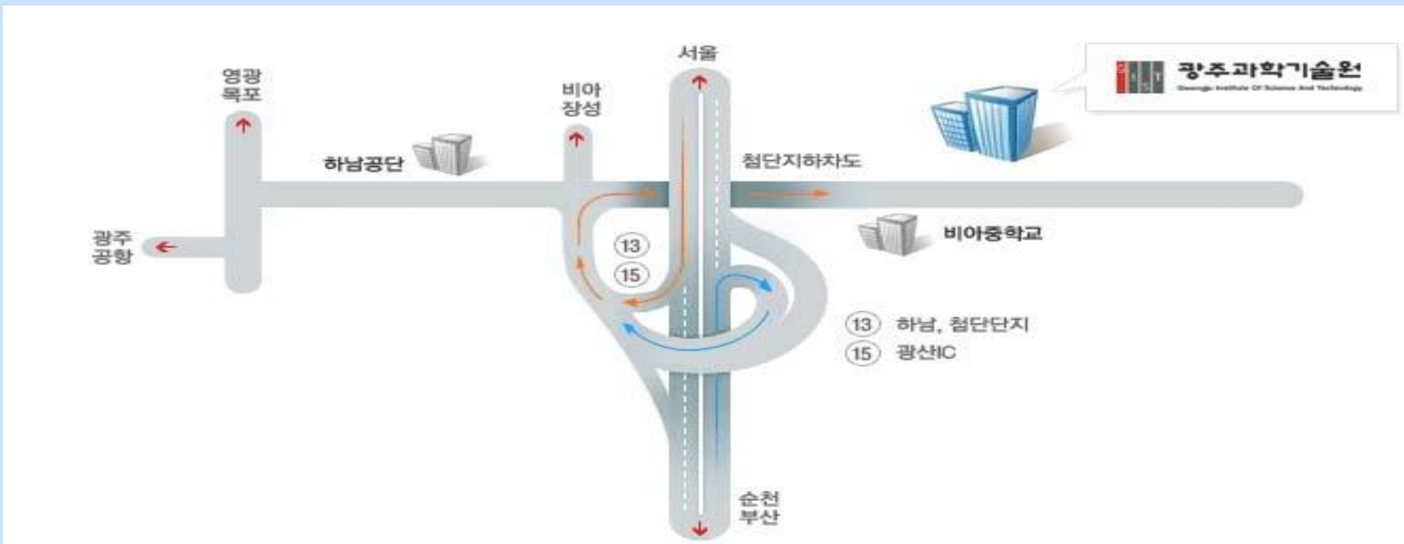
■ **Speaker : Prof. Hyuk-Sang Kwon** *(GMSE, GIST, Korea)*

The technology of 3-D tissue cytometry has been successfully developed to optimize biological specimen throughput by combining high speed TPM, automated x-y specimen stage, and precision specimen sectioning mechanism. We have developed and improved 3-D tissue cytometry based on TPM allowing the characterization of cell-cell, cell-tissue interaction to be quantified in 3-D tissue.

3-D tissue cytometry is capable of high-resolution, in situ 3-D imaging of tissue up to a volume of several mm3 with subcellular resolution. This high throughput tissue cytometry achieves an imaging rate of 2 mm^3/hour. We optimized the performance of this instrument by developing two new techniques. 3-D tissue cytometry is applied and used to study problems in two biomedical applications.

Location

자가운전차량 (고속도로) 이용 시



호남고속도록 하행선 방향 : 광주요금소를 지나 4km 지점에서 광산 IC(하남,첨단단지)로 빠져나와 첨단단지 방향으로 우회전한 후 터널을 지나 1Km 정도 직진하면 좌측에 광주과학기술원 위치

호남고속도로 상행선 방향 : 서광주 IC를 지나 광산IC(하남,첨단단지)로 빠져나와 첨단단지 방향으로 우회전한 후 터널을 지나 1Km 정도 직진하면 좌측에 광주과학기술원 위치

첨단지구 내 (버스노선 : 16,30,51,193 등)