



1-2 February 2010
KORANET PARTNERING EVENT

Research for life-long health

Functional Optical Imaging of Brain

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South Korea and Turkey

감사합니다



World Cup 2002, Korea

www.bme.boun.edu.tr





Neuro-Optical Imaging Lab

Our Lab, Idea, Expertise, Partnering, Contact Details

- Established under Institute of Biomedical Engineering



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PROJECT IDEA I

Our Lab, Idea, Expertise, Partnering, Contact Details

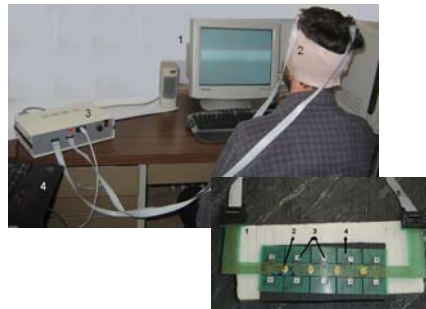
- Functional neuro-optical imaging of brain provides rapid, accurate and non-invasive access to the pathophysiology.

Optical Tomography: Neuro-optical Imaging

Light Propagation in Brain



NIROSCOPE 301



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PROJECT IDEA II

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- Brain Disease = $f(\text{anatomical, physiological})$
 - Anatomical Problems: Vascular, morphological, tumor
 - Physiological Problems : Molecular, Metabolic, Electrical, Signaling, etc
- Functional neuroimaging techniques allow non-invasive, early detection and characterization of impaired brain function **well before** any morphological changes are detectable
- Proposal: Use functional Neuro-optical imaging in early diagnosis and prognosis of neurodegenerative diseases.



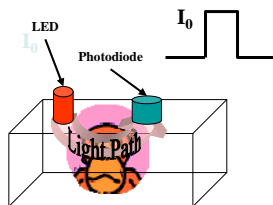
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EXPERTISE I

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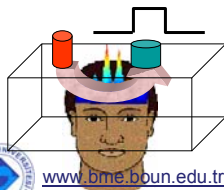
Neuro-Optical Imaging (aka optical tomography, diffuse optical imaging, functional near infrared spectroscopy: fNIRS):



Beer-Lambert Law

$$I(\lambda) = I_0 10^{-(\alpha_{HB}^{\lambda} C_{HB} + \alpha_{HBO_2}^{\lambda} C_{HBO_2})L}$$

$$\Delta OD(\lambda) = \log_{10} \frac{I_0^{\lambda}}{I^{\lambda}} = (\alpha_{HB}^{\lambda} \Delta C_{HB} + \alpha_{HBO_2}^{\lambda} \Delta C_{HBO_2})L$$



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$$\text{Oxygenation} = \Delta C_{HbO_2} - \Delta C_{Hb}$$

$$\text{Blood Volume} = \Delta C_{HbO_2} + \Delta C_{Hb}$$





EXPERTISE II

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- **Biomedical Engineering:**
 - **Instrumentation:** Measuring the **Holly Grail of Neuroscience** multi-modal data collection (EEG-fNIRS, fMRI-fNIRS, etc)
 - **Information Processing:** Advanced processing, information analysis
 - **Clinical data collection**
 - **Systems Biology:** Modeling of neurovascular coupling to understand relation between cognition and brain states

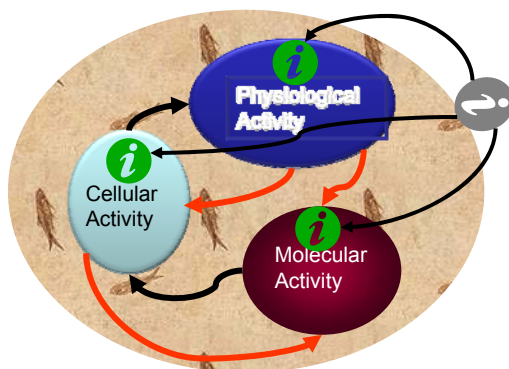
What is Homer thinking now?



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In plain words



Multi-modality Imaging



Data fusion



Systems biology



Characteristic parameters



Individualized Medicine

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PARTNER SOUGHT

Our Lab, Idea, Expertise, Partnering, Contact Details

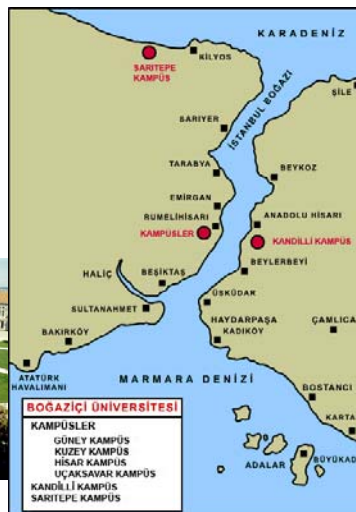
- Life Science expertise: Neurophysiologist, neuroimaging, neuropsychologist to help evaluate the efficacy of using fNIRS in clinics
- Opto-electronic Engineering: Improve the design of fNIRS
- Embedded Systems Engineering: OEM production of fNIRS devices



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