

## the future of **Biosensing**

February 2010



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**Waag Society**

[www.waag.org](http://www.waag.org)

### Content

Biosensing is the conversion of biological processes into useful information. Incorporating “a variety of means, including electrical, electronic, and photonic devices; biological materials (e.g., tissue, enzymes, nucleic acids, etc.) and chemical analysis” biosensing produces signals to detect biological elements, using related technologies to convert these signals into readable data. From biomedicine to food production, environment to security and defense, biosensing addresses a rapidly growing industry in this field. What is more, the Netherlands is home to a number of scientists who are currently working on a number of biosensors, promising to come up with groundbreaking new technologies in all. For the “Future of Biosensing” a few of these scientists are going to share some insights of their work to describe how our future might be effected as a result of these developments.

Biosensors are already reflected and integrated in gaming, interactive multimedia as well as in conceptual art. We are opening the door for an interesting dialogue about these applications and scientific developments.

*Concept: **Iclal Akcay**, research journalist & moderator*

► **Davide Iannuzzi**, Associated Professor, VU University Amsterdam  
**Fiber-top micromachined devices: biosensors on the tip of a fiber**

One of the most fascinating opportunities currently offered by microtechnology is the possibility to fabricate miniaturized instruments out of mechanical parts that can easily fit within the volume offered, for comparison, by a human hair. In this presentation, I will introduce a new generation of micromachined devices obtained by carving tiny diving boards on top of a 0.1 mm optical fiber, and I will discuss its potentiality for the future development of a new class of all-optical, user-friendly biochemical sensors.

► **Robert Shepherd**, Founder, Eduverse  
**Virtual worlds and biosensors**

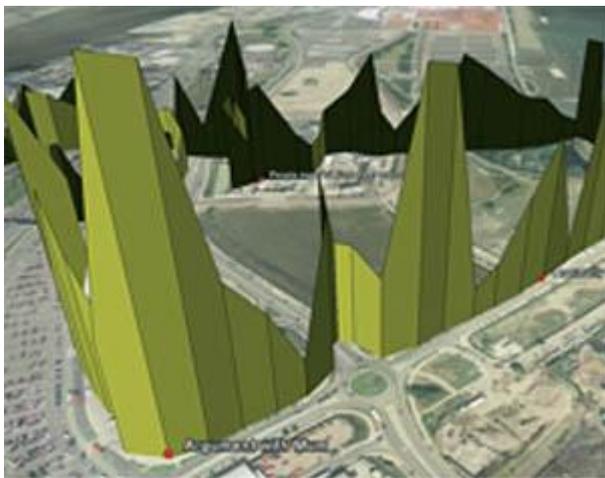
"Biosensing Feedback" - New interface modalities give us a better way to interpret biosensor data. This will be a talk about interface devices such as: The Brainport Tongue Device, The vOICe device, TNO Sensor Vest, Brain Control Devices, Rat brain robot, etc. and their possible application for interpreting biosensing data.

► **Bert Mik**, Scientist and anesthesiologist, Erasmus Medical Center  
**Towards bedside monitoring at the subcellular level**

Measurement of blood pressure, cardiac output and oxygen saturation of blood are standard of care in critically ill patients. However, treatment of these macroscopic parameters does not guarantee adequate delivery of oxygen to tissues and cells. Therefore, novel techniques to gain better insight in oxygen delivery and utilization at the (sub)cellular level are needed. I will present the first technique to measure oxygen inside mitochondria, the cellular organelles that consume oxygen and nutrients to generate the energy needed to sustain life.

► **Christian Nold**, artist, designer and educator  
"Bio Mapping" - an exhibition

The Bio Mapping project investigates the implications of creating technologies that can record, visualise and share with each other our intimate body-states. To practically explore this subject, I invented and built the Bio Mapping device, which is a portable and wearable tool recording data from two technologies: a simple biometric sensor measuring Galvanic Skin Response and a Global Positioning System (GPS). The bio-sensor, which is based on a lie-detector, measures changes in the sweat level of the wearers' fingers. The assumption is that these changes are an indication of 'emotional' intensity. The GPS part of the device also allows us to record the geographical location of the wearer anywhere in the world and pinpoint where that person is when these 'emotional' changes occur.



19:00 - 20:00

**Introduction** by our Moderator

► **Iclal Akcay**, Research Journalist

### Part I:

► **Davide Iannuzzi**, Associated Professor, VU University Amsterdam  
**Fiber-top micromachined devices: biosensors on the tip of a fiber**

► **Robert Shepherd**, Founder, Eduverse  
**Virtual worlds and biosensors**

► **Bert Mik**, Scientist and anesthesiologist, Erasmus Medical Center  
**Towards bedside monitoring at the subcellular level**

► **Christian Nold**, artist, designer and educator  
"Bio Mapping" - an exhibition

20:00 - 20:30

Coffee break with drinks and snacks.

20:30 - 21:15

## Part II: Open discussion



### **Davide Iannuzzi**

Associated Professor, VU University Amsterdam

After his PhD in Physics in Italy, D.I. worked for four years as a postdoctoral fellow at Bell Laboratories and Harvard University, where he studied the role of quantum electrodynamical forces in microtechnology. In 2005 he moved to the VU Amsterdam, where he is currently an Associated Professor, VIDI fellow, and ERC fellow. His research activity is focused on the investigation of fundamental phenomena at the micron scale and in the development of new approaches in microtechnology. He is author of 4 patent applications and more than 50 publications, and has received several awards and research grants in recognition of his ideas, his inventions, and his teaching achievements.

[www.nat.vu.nl/CondMat/iannuzzi](http://www.nat.vu.nl/CondMat/iannuzzi)



### **Robert Shepherd**

Founder, Eduverse

Robert Shepherd is a graduate from the University of Toronto and the Ontario College of Art. He has been working with electronic media since 1978. His goal is to create more intuitive integration between abstract/synthetic worlds and the real world. In Feb 2008 he established The Eduverse Foundation to further his goals of promoting virtual environments for educational purposes. In this short time the Eduverse has had 3 symposia, initiated the emocracy project and the MEP, presented at the ibc and the Waag Society, acted as educational consultant to surfnets and kennisnet, been involved with TEDxAmsterdam, Picnic and ESUG and has taught virtual world strategies to educators from various universities in The Netherlands. His client list includes ING Bank, IBM, NASA and Microsoft.

[www.eduverse.org](http://www.eduverse.org)

[www.micropolisonline.com](http://www.micropolisonline.com)



### **Bert Mik**

Scientist and anesthesiologist, Erasmus Medical Center

Bert Mik studied applied mathematics and physics at the Technical University Eindhoven before becoming a medical doctor. He is working on optical techniques for studying tissue oxygenation and developed the first technique to measure mitochondrial oxygen tension in vivo. He is currently a resident in anesthesiology at the Erasmus Medical Center in Rotterdam and his research focuses on

tissue oxygenation in the perioperative setting. He is author of several patent applications and (co)authored over 20 scientific papers in this field. Recently, together with two partners, he founded Photonics Healthcare B.V., a company aimed at bringing innovative optical technology for monitoring of mitochondrial function into clinical practice.

[www.erasmusmc.nl](http://www.erasmusmc.nl)

[photonicshealthcare.com](http://photonicshealthcare.com)



### **Christian Nold**

artist, designer and educator

Christian Nold is an artist, designer and educator working to develop new participatory models for communal representation. In 2001 he wrote the well received book 'Mobile Vulgus', which examined the history of the political crowd and which set the tone for his research into participatory mapping. Since graduating from the Royal College of Art in 2004, Christian has led a number of large scale participatory projects and worked with a team on diverse academic research projects. In particular his 'Bio Mapping' project has received large amounts of international publicity and been staged in 16 different countries and over 1500 people have taken part in workshops and exhibitions. These participatory projects have a strong pedagogical basis and grew out of Christian's formal university teaching. He is currently based at the Bartlett, University College London.

[www.softhook.com](http://www.softhook.com)



### **Iclal Akcay**

Research Journalist

Having worked in Turkey and Germany as a tv reporter and radio editor Iclal Akcay has recently earned an MSc degree in Science and Technology Studies at the University of Amsterdam. Her master thesis was concentrated on the World Health Organization and the Bird Flu. In researching and elaborating her interests in politics and women's issues she has developed a socio-scientific understanding rooted in a multidisciplinary approach. Currently she is particularly interested in investigating the relationship between various emerging theories and developing technologies based on the plasticity of the brain.