# Theme 9

## Neuroengineering, Neural Systems, Rehabilitation and Prosthetics


**Theme Chairs:**

**Thomas Stieglitz,**
IMTEK, Institute of Microsystem Technology University of Freiburg, Germany

**Milos R. Popovic,**
Institute of Biomaterials and Biomedical Engineering University of Toronto, Canada



### ABSTRACT:

Theme 9 focuses on the emerging fields of neural engineering for replacing lost sensory or motor functions and on the latest developments of rehabilitation aids and robotics as well as on novel prosthetics that use intelligent embedded systems to adapt to a changing environment or even communicate with neural interfaces to receive control commands from the user.

The tracks will cover all relevant aspects in the interdisciplinary field ranging from models and simulations to investigate phenomena in the brain and develop models to explain the underlying principles of therapies, e.g. for deep brain stimulation to emerging technologies in neural interface and implant developments. Therapeutical applications will cover the fields of pain, epilepsy, Parkinson's disease and severe psychiatric disorders. Rehabilitation experts report from the latest studies to support stroke treatment by means of electrical stimulation and rehabilitation robotics. The use of electrical stimulation to help paralyzed persons in cycling and rowing also shows beneficial effects on secondary effects like ostheoporosis and ulcer prevention.

Sensory Neuroprostheses to restore vision in the blind are currently in human clinical trials. Can they really give back sight? You can discuss with the world leading groups their latest results within our track. Successful neural prostheses of the future will take advantage of neural control signals. The current state of peripheral nerve signal decoding and cutting- edge research from brain-computer interfaces offers insights about what performance can be expected for the first "thought control" devices in clinical practice. The theme will be a unique platform of information exchanges on the latest research results in the fields of rehabilitation and neural engineering. Natural scientists, engineers, medical doctors and potential patients will profit from the interdisciplinary presentations and discussions to restitute or replace functions or therapy diseases by interfacing with the nervous system or residual limbs.


### TRACKS:

#### Innovative Orthotics and Prostheses for Amputees

**Track Chairs:**
**Marc Kraft,**
Technical University of Berlin, Germany

**N.N.**

#### Rehabilitation Robotics

**Track Chairs:**
**Robert Riener,**
ETH Zurich, Switzerland

**David A. Brown,**
Northwestern University, Chicago, USA

#### Vision Prostheses*

**Track Chairs:**
**Eberhart Zrenner,**
University of Tübingen, Germany

**Botond Roska,**
Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland

#### Brain Computer Interfaces

**Track Chairs:**
**Nils Birbaumer,**
University of Tübingen, Germany

**Andrew Schwartz,**
University of Pittsburgh, USA

#### Technologies for Neural Interfaces and Implants

**Track Chairs:**
**Thomas Stieglitz,**
University of Freiburg, Germany

**Nick Donaldson,**
University College of London, UK

#### Deep Brain Stimulation

**Track Chairs:**
**Wolfgang Eberle,**
IMEC, Leuven, Belgium

**Carmen Bartic,**
IMEC, Leuven, Belgium

#### Modelling, Simulation and Control in Neural Engineering

**Track Chairs:**
**Dominique M. Durand,**
Case Western Reserve University, Cleveland, USA

**Berj L. Bardakjian,**
University of Toronto, Canada

#### Electrical Stimulation in Rehabilitation

**Track Chairs:**
**Milos R. Popovic,**
University of Toronto, Canada

**Dejan B. Popovic,**
University of Aalborg, Denmark

#### Human Movement and Posture Analysis

**Track Chairs:**
**Jiri Hozman,**
The Czech Technical University in Prag, Kladno, Czech Republic

**N.N.**

*cross-referenced with Ophthalmology I, theme 11