Pavia, 6th-7th-8th June 2018

Mathematical Modeling in Motor Neuroscience.
A short course and scientific meeting

in honor of Lance Optican
Understanding sensorimotor systems and neurological disorders through mathematical modeling: we are celebrating Lance Optican’s career with a three-day meeting in Pavia, Italy, June 6th – 8th.

In order to stimulate the interest the interdisciplinary field of mathematical modeling applied to both eye movements and other sensorimotor systems we have organized the event based on two programs.

In the mornings, there will be a Short Course with didactic lectures, aimed at introducing more basic and clinical researchers to the use of mathematical models in scientific and clinical investigation. Most lectures will have two teachers: the first will present a mathematical modeling topic and the second will emphasize the implications of the proposed models both in health and disease, presenting interactions between basic physiology and clinical problems.

In the afternoons there will be a more traditional Research Meeting with platform and poster presentations on the various issues related to modeling in the field of motor neuroscience.

With this event we hope to attract a wide audience including students (hopefully some of whom will become future colleagues), postdoctoral fellows and junior scientists, as well as established leaders in our field, both in research and teaching.
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ORGANIZING COMMITTEE
COMMiMN
Comitato Organizzatore Mathematical Modeling in Motor Neuroscience
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SHORT COURSE

Short Course Topics:
1. From differential equations to linear control systems
2. Closed-loop and non-linear systems
3. State-space equations and learning
4. Integrators and optimal control
5. Bayesian modeling in perception and decision making
6. Maps and sensorimotor transformations
7. Neuromimetic models and oscillations

Confirmed Short Course Speakers:
**Engineering:** Henrietta Galiana, Stefan Glasauer, Philippe Lefèvre, Daniel Merfeld, John Van Opstal, Lance Optican, Maurice Smith.
**Clinical:** Joseph L. Demer, R. John Leigh, Janet Rucker, Barry Seemungal, Aasef Shaikh, Dominik Straumann.
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Wednesday 6th June 2018

SHORT COURSE
08.00 Registration
08.15 Institutional Welcome
08.30 Opening Introduction
   S. Ramat
From differential equations to linear control systems
08.45 H. Galiana
10.00 D. Straumann
10.30 Coffee break
Closed loop and nonlinear systems.
10.45 P. Lefèvre
12.00 J. L. Demer
12.30 Closing
12.30-13.00 Light lunch (Full Meeting participants only)

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Wednesday 6th June 2018

RESEARCH MEETING
13.30 Registration
14.00 Institutional Welcome
14.15 Opening Introduction
Scientific Committee

I Session
14.30 **Maurice Smith**
New insights into error-dependent motor learning
14.50 **Yoshiko Kojima**
A Neuronal Process for Adaptive Control of Primate Saccadic System.
15.10 **Bernhard Hess**
Ocular torsion in binocular visual matching
15.30 **Joe Demer**
Twisted Implications of Torques for Ocular Motor Modeling
15.50 **Christian Quaia**
Binocular summation for reflexive eye movements: A diagnostic tool for stereoanomalies
16.10 Coffee break
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Wednesday 6th June 2018

II Session
16.30 Stewart Judge
The dual interactive controller model for control of accommodation and convergence of the eyes: is it useful?

16.50 Anja Horn
Extraocular muscles involved in convergence are supplied by an additional set of palisade endings that may differ in their excitability

17.10 Yoshikazu Shinoda
Input-output Organization of Omnipause Neurons and their Functional Role in Saccade Generation

17.30 Barry Richmond
Using chemogenetic tools (DREADDs) to study reward sensitivity

17.50 John van Opstal
Microstimulation in a spiking neural network model of the midbrain superior colliculus elicits normometric saccadic eye movements

18.10 Closing
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Wednesday 6th June 2018

18.15-19.30 Guided visit. Back to the past: Motor Neuroscience in Pavia

19.30 Welcome cocktail at Broletto Palace, the old City Hall

The Broletto place is the oldest broletto of Lombardy, and it rises on the area occupied once by the Bishop of Pavia, erected in the VIII century.

It was the site of the city administration from the Middle Ages to 1874 when the municipal offices moved to Mezzabarba palace
Mathematical Modeling in Motor Neuroscience.  
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Thursday 7th June 2018

PROGRAM

SHORT COURSE
08.30  Registration

State-space equations and learning
08.45  M. Smith
10.00  A. Shaikh
10.30  Coffee break

Integrators and optimal control
10.45  D. Merfeld
11.45  R. J. Leigh

Bayesian modeling in perception and decision-making
12.15  S. Glasauer
13.00  Closing

13.00-13.30 Light lunch (Full Meeting participants only)

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Thursday 7th June 2018

RESEARCH MEETING

13.45  Registration

III Session

14.20  Ji Soo Kim
       Central positional nystagmus: a modeling approach

14.40  Jorge Kattah
       Oculomotor and vestibular correlates in autoimmune and paraneoplastic ataxia syndromes

15.00  Adolfo Bronstein
       Visual Control of Balance

15.20  Dan Merfeld
       Natural variations in vestibular perceptual thresholds impact balance in healthy asymptomatic “normal”

15.40  Stefan Glasauer
       Explaining perceptual signs and symptoms following unilateral lesions of vestibular pathways

16.00  Coffee break
Mathematical Modeling in Motor Neuroscience. A short course and scientific meeting

Thursday 7th June 2018

IV Session

16.20 Alessandra Rufa
The cerebellum-mediated latency-duration balance minimizes the endpoint variability in anti-saccadic eye movements

16.40 Thomas Eggert
The variability of saccade trajectories explained by the superposition of planning noise, premotor noise, and motor noise

17.00 Chrystalina Antoniades
Oculomotor effects of medical and surgical treatments of Parkinson’s disease

17.15 Anna Sadnicka
A unifying motor control framework for task-specific dystonia

17.30 Mayu Takahashi
Brainstem Neural Circuits for Horizontal and Vertical Saccadic Eye movements and their Frame of Reference

17.45 Closing
Mathematical Modeling in Motor Neuroscience.
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Thursday 7th June 2018

18.30-19.30 Guided visit. Walking tour: Pavia and its history

19.30 Social dinner at Bellisomi-Vistarino Palace

In the 18th century the Bellisomi-Vistarino Palace was the residence of a noble family. It is situated in the heart of Pavia, facing the Ticino River. It is a proper “Villa of delight”, with frescoed rooms, spaces reserved for music, for reading and conversation, a park, a viewpoint, a chapel and stables.

The palace has recently been brought to life by extensive renovation works and it is the site of the University Foundation Alma Mater Ticinensis, which organizes high level training courses, conferences, seminars and concerts.
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Friday 8th June 2018

PROGRAM

SHORT COURSE
08.30 Registration
Maps and sensorimotor transformations
09.00 J. Van Opstal
10.15 B. Seemungal
10.45 Coffee break
Neuromimetic models and oscillations
11.00 L. Optican
12.15 J. Rucker
12.45 Short course closing remarks
13.00-13.30 Light lunch (Full Meeting participants only)
The conference venue can be reached by bike, by bus, by shuttle
Mathematical Modeling in Motor Neuroscience. A short course and scientific meeting

Friday 8th June 2018

RESEARCH MEETING
13.45  Registration

V Session
14.20  Amir Kheramand
The role of temporo-parietal cortex in upright perception and the link with torsional eye position
14.35  Diego Kaski
A theoretical framework for ‘unexplained’ dizziness in the elderly
14.50  Catherine Cho
Vestibulocerebellar basis of mal de debarquement syndrome
15.05  Oleg Komogortsev
The use of oculomotor plant models and eye movements in cybersecurity research
15.20  Michael Brodsky
Essential Infantile Esotropia: Potential Role of Extended Subcortical Neuroplasticity
15.35  Pierre Daye
Event-based control using inter-events duration reaches arbitrary accuracy and increases control dynamic range
15.50  Coffee break
Mathematical Modeling in Motor Neuroscience. A short course and scientific meeting

Friday 8th June 2018

VI Session
16.10  Faisal Karmali
Optimal velocity storage models for changing vestibular function
16.25  Jorge Otero-Millan
Rebound nystagmus, a window to the oculomotor integrator
16.40  Giovanni Bertolini
Nonlinearity in gaze holding: experimental results and possible mechanisms.
17.10  Kenichiro Miura
A model of optokinetic responses that consists of two different visual motion processing pathways
17.25  Sinem Balta Beylergil
A machine learning approach characterizes the tremor irregularity in dystonia
17.40  Elena Pretegiani
Temporal coupling of action and perception in health and Parkinson’s disease
18.00 Closing remarks
### Mathematical Modeling in Motor Neuroscience
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**POSTER SESSION** 6th /7th/ 8th June 2018

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<tr>
<td>1</td>
<td>Balta Beylergil</td>
<td>Sinem</td>
<td>Vestibular heading perception in Parkinson’s disease patients treated with deep brain stimulation</td>
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<td>2</td>
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<td>Federighi</td>
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<td>Dynamic properties of saccades distinguish different forms of spinocerebellar ataxia</td>
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<td>Laurent</td>
<td>The relations between the mathematics and the neurophysiology of visually-guided eye movements</td>
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<td>Hudson</td>
<td>Todd</td>
<td>Eye-hand re-coordination in chronic stroke</td>
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<td>Karmali</td>
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<td>Mayadali</td>
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<td>Myrov</td>
<td>Vladislav</td>
<td>A new approach for estimation of spiketrain patterns in basal ganglia</td>
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<td>13</td>
<td>Özdemir</td>
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<td>Improving the estimation of two rate models in visuomotor reach adaptation by advanced preprocessing methods</td>
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<td>Role of proprioception in the integrative network model for dystonia</td>
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<td>Can erroneous sensory processing explain functional dizziness? An experimental approach based on predictive coding</td>
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<td>16</td>
<td>Rizvi</td>
<td>Macym</td>
<td>Hyperexcitable reciprocally innervating mesencephalic network causes paraneoplastic seesaw nystagmus and opsinclonus</td>
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<td>17</td>
<td>Sadnicka</td>
<td>Anna</td>
<td>When enough is enough! High motor variability in DYT1 dystonia is associated with impaired visuomotor adaptation.</td>
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<td>A unified computational framework for visual attention dynamics</td>
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SOCIAL PROGRAM

Wednesday 6th June 2018
18.10 Closing Research Meeting
18.20 Meet your storytellers at aula Foscolo
Guided tour of the historical lecture halls of Pavia University
• Aula Foscolo
• Old Library
• Aula Scarpa (anatomic theatre)
• Aula Volta (physics cabinet)
• A stroll through the courtyards of the University building, talking about Golgi and other protagonists of the Golden Age of the local athenaeum
• Transfer to Pavia main square and then to the Broletto, the ancient city hall, were the participants will receive the official greetings of the mayor
• Welcome aperitif at the Broletto

Thursday 7th June 2018
17.45 Closing Research Meeting
17.55 Meet your storytellers at aula Foscolo
History Walk through the streets of the city centre: an involving journey through art, history and the protagonists that have made Pavia one of the most charming art cities of Lombardy.
The stroll will finish at Palazzo Vistarino - former residence of one of the noblest families of the city – where participants will enjoy a social dinner
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GENERAL INFORMATION

Conference venue:

Short Course 6-7-8 June, mornings
Fondazione Mondino Istituto Neurologico Nazionale
a Carattere Scientifico | IRCCS
Via Magenes 27100 Pavia - Italia

Research Meeting 6-7-8 June, afternoons
Aula Foscolo - Università degli Studi di Pavia
Corso Strada Nuova, 65 – 27100 Pavia - Italia

Official language:

The official language is English. Simultaneous interpretation is not provided. It is therefore expected that authors are able to present their research more or less fluently in English.
The image shows on the left hand side the drawing of the cerebellum presented by Camillo Golgi at his Nobel lecture in 1906, on the right hand side a drawing of the human head by Antonio Scarpa (1801), and, overlayed on both drawings, a mathematical model of the saccadic system by Lance Optican (2017) in Optican LM and Pretegiani E (2017) A GABAergic Dysfunction in the Olivary–Cerebellar–Brainstem Network May Cause Eye Oscillations and Body Tremor. II. Model Simulations of Saccadic Eye Oscillations. Front. Neurol. 8:372. doi: 10.3389/fneur.2017.00372). Both Antonio Scarpa and Camillo Golgi were professors in the Faculty of Medicine at the University of Pavia.
Technology partner:
EyeSeeTec

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