

2010 Biomedical Circuits and Systems Conference

(BioCAS 2010)

**Paphos, Cyprus
3 – 5 November 2010**



IEEE Catalog Number: CFP10837-PRT
ISBN: 978-1-4244-7269-7

BioCAS Table of Contents

A1L-A Circuits and Systems for Neuroscience

Time: Thursday, November 4, 2010, 09:30 - 11:00

Place: Plato Hall

Chair(s): Themis Prodromakis, *Imperial College London, UK*

Wouter A. Serdijn, *Delft University of Technology, The Netherlands*

A1L-A.1	An Implantable Neuroprocessor for Multichannel Compressive Neural Recording and on-the-Fly Spike Sorting with Wireless Telemetry.....	1
	F. Zhang, M. Aghagolzadeh, K. Oweiss <i>Michigan State University, United States</i>	
A1L-A.2	A Phase Synchronization and Magnitude Processor VLSI Architecture for Adaptive Neural Stimulation	5
	K. Abdelhalim, V. Smolyakov, R. Genov <i>University of Toronto, Canada</i>	
A1L-A.3	Adaptive Threshold Spike Detection Using Stationary Wavelet Transform for Neural Recording Implants.....	9
	Y. Yang, A. Kamboh, A. Mason <i>Michigan State University, United States</i>	
A1L-A.4	On-Chip Feature Extraction for Spike Sorting in High Density Implantable Neural Recording Systems.....	13
	A. Kamboh, A. Mason <i>Michigan State University, United States</i>	
A1L-A.5	A Nonlinear Signal-Specific ADC for Efficient Neural Recording.....	17
	M. Judy ² , A. Sodagar ³ , R. Lotfi ¹ ¹ <i>Ferdowsi University of Mashhad, Iran</i> ; ² <i>Khajeh Nasir Toosi University of Technology, Iran</i> ; ³ <i>Khajeh Nasir Toosi University of Technology & University of Michigan, United States</i>	

A2L-A Wireless Circuits and Systems

Time: Thursday, November 4, 2010, 11:30 - 13:00
Place: Plato Hall
Chair(s): Philipp Häfliger, *University of Oslo, Norway*
 Tor Sverre Lande, *University of Oslo, Norway*

A2L-A.1	A 200Mbps, 0.66nJ/bit DTR UWB Receiver for High Data Rate Wireless Biotelemetry Applications	21
	C. Kim ² , S. Nooshabadi ¹ ¹ <i>Michigan Technological University, United States; </i> ² <i>University of New South Wales, Australia</i>	
A2L-A.2	Sub-GHz UWB Biomedical Communication	25
	M. Stoopman, W. Serdijn <i>Delft University of Technology, The Netherlands</i>	
A2L-A.3	A Carrier-Frequency-Independent BPSK Demodulator with 100% Data-Rate-to-Carrier-Frequency Ratio.....	29
	F. Asgarian ¹ , A. Sodagar ² ¹ <i>Khajeh Nasir Toosi University of Technology, Iran; </i> ² <i>Khajeh Nasir Toosi University of Technology & University of Michigan, Iran</i>	
A2L-A.4	Ultra Low Power Wireless ECG System with Beat Detection and Real Time Impedance Measurement	33
	T. Torfs, R. Firat Yazicioglu, S. Kim, H. Kim, C. Van Hoof, D. Buxi, I. Romero, J. Wijsman, F. Massé, J. Penders <i>IMEC, The Netherlands</i>	
A2L-A.5	Respiration Monitoring Based on Magnetic Induction Using a Single Coil	37
	D. Teichmann, J. Foussier, S. Leonhardt <i>RWTH Aachen University, Germany</i>	

A3L-A Biosignal Processing

Time: Thursday, November 4, 2010, 14:30 - 16:00
Place: Plato Hall
Chair(s): Ralph Etienne-Cummings, *Johns Hopkins University, USA*
Tor Sverre Lande, *University of Oslo, Norway*

A3L-A.1	Compressive Sampling of ECG Bio-Signals: Quantization Noise and Sparsity Considerations	41
	E. Allstot, A. Chen, A. Dixon, D. Gangopadhyay, D. Allstot <i>University of Washington, United States</i>	
A3L-A.2	The WiNAM Project: Neural Data Analysis with Applications to Epilepsy	45
	W. Juffali, J. El-Imad, A. Eftekhar, C. Toumazou <i>Imperial College London, United Kingdom</i>	
A3L-A.3	Permutation Entropy: a New Feature for Brain-Computer Interfaces	49
	N. Nicolaou, J. Georgiou <i>University of Cyprus, Cyprus</i>	
A3L-A.4	Radar Cross Section of the Human Heartbeat and Respiration	53
	Ø. Aardal ¹ , S. Hamran ¹ , T. Berger ¹ , J. Hammerstad ¹ , T. Lande ² ¹ <i>Forsvarets forskningsinstitutt, Norway</i> ; ² <i>University of Oslo, Norway</i>	
A3L-A.5	Motion-Tracking Adaptive Persistence and Adaptive-Size Median Filter for Color Doppler Processing in Ultrasound Systems on Multicore Platform	58
	C. Zhan, K. Chang, Y. Chen, P. Li, A. Wu <i>National Taiwan University, Taiwan</i>	

A4P-B Lab on Chip

Time: Thursday, November 4, 2010, 16:00 - 17:30
Place: Zenon
Chair(s): Mohamad Sawan, *École Polytechnique de Montréal, Canada*

A4P-B.1	Integrated Magnetic Array for Bio-Object Sensing and Manipulation	62
	F. Abu-Nimeh, F. Salem <i>Michigan State University, United States</i>	
A4P-B.2	Authentication and Self-Correction in DNA Identification Based on Agarose-Gel Images	66
	V. Fotopoulos, A. Sgourou, A. Skodras <i>Hellenic Open University, Greece</i>	
A4P-B.3	Fabrication and Characterization of a Silicone Fluorescent Oxygen Sensor	70
	S. Herman, J. Blain Christen <i>Arizona State University, United States</i>	
A4P-B.4	An Integrated and Mixed Technology LOC Hydrodynamic Focuser for Cell Counting Application	74
	A. Laki ² , I. Rattalino ² , A. Sanginario ² , N. Piacentini ² , K. Ivan ¹ , D. Lapadatu ³ , J. Taylor ⁴ , D. Demarchi ² , P. Civera ²	

¹*Pazmany Peter Catholic University of Budapest, Hungary;* ²*Politecnico di Torino, Italy;* ³*SensoNor Technologies AS, Norway;* ⁴*thinXXS Microtechnology AG, Germany*

A4P-C Biomedical Analysis and Signal Processing

Time: Thursday, November 4, 2010, 16:00 - 17:30

Place: Zenon

Chair(s): Timothy Constandinou, *Imperial College London, UK*

A4P-C.2	An Effective Heart Rate Variability Processor Design Based on Time-Frequency Analysis Algorithm Using Windowed Lomb Periodogram	82
	S. Tseng, W. Fang <i>National Chiao Tung University, Taiwan</i>	
A4P-C.3	Automatic Parapapillary Atrophy Shape Detection and Quantification in Colour Fundus Images	86
	C. Lu ² , T. Tang ² , A. Murray ² , A. Laude ¹ , B. Dhillon ¹ ¹ <i>Pricess Alexandra Eye Pavilion, United Kingdom; </i> ² <i>University of Edinburgh, United Kingdom</i>	
A4P-C.4	A Stream-Based Hebbian Eigenfilter for Real-Time Neurophysiological Signal Processing	90
	B. Yu ² , T. Mak ² , X. Li ³ , F. Xia ² , A. Yakovlev ² , Y. Sun ³ , C. Poon ¹ ¹ <i>Massachusetts Institute of Technology, United States; </i> ² <i>Newcastle University, United Kingdom; </i> ³ <i>Tsinghua University, China</i>	
A4P-C.5	Multiple Protein Structure Alignment Using Time-Frequency Processing Techniques	94
	L. Ravichandran ¹ , A. Papandreou-Suppappola ¹ , A. Spanias ¹ , Z. Lacroix ² ¹ <i>Arizona State University, United States; </i> ² <i>Arizona State University & Translational Genomics Research Institute (TGen), United States</i>	

A4P-D	Neural Circuits and Systems
Time:	Thursday, November 4, 2010, 16:00 - 17:30
Place:	Zenon
Chair(s):	Philipp Häfliger, <i>University of Oslo, Norway</i> Wouter A. Serdijn, <i>Delft University of Technology, The Netherlands</i>
<hr/>	
A4P-D.1	A CMOS Chip with Active Imaging and Stimulation Pixels for Implantable Retinal Prosthesis
	98
	X. Zhang, W. Pei, B. Huang, H. Chen <i>Institute of Semiconductors, Chinese Academy of Sciences, China</i>
A4P-D.2	Extracellular Recording System Based on Amplitude Modulation for CMOS Microelectrode Arrays
	102
	N. Joye, A. Schmid, Y. Leblebici <i>École Polytechnique Fédérale de Lausanne, Switzerland</i>
A4P-D.3	A Smart 16-Channel Front-End System for Extracellular Neural Recording
	106
	B. Huang, Y. Gui, X. Zhang, W. Pei, H. Chen <i>Institute of Semiconductors, Chinese Academy of Sciences, China</i>
A4P-D.4	A Least-Voltage Drop High Output Resistance Current Source for Neural Stimulation.....
	110
	C. Sawigun, W. Ngamkham, M. van Dongen, W. Serdijn <i>Delft University of Technology, The Netherlands</i>
A4P-D.5	A Programmable Bioamplifier on FPAAs for in Vivo Neural Recording
	114
	A. Zbrzeski ² , P. Hasler ¹ , F. Kölbl ² , E. Syed ² , N. Lewis ² , S. Renaud ² ¹ <i>Georgia Institute of Technology, United States</i> ; ² <i>Université de Bordeaux, IMS, IPB, CNRS, France</i>
A4P-D.6	A Reconfigurable Neural Spike Recording Channel with Feature Extraction Capabilities
	118
	A. Rodríguez-Pérez, J. Ruiz-Amaya, O. Guerra, M. Delgado-Restituto <i>Institute of Microelectronics of Seville, Spain</i>
A4P-D.7	Towards a Next Generation Neural Interface: Optimizing Power, Bandwidth and Data Quality
	122
	A. Eftekhar, S. Paraskevopoulou, T. Constandinou <i>Imperial College London, United Kingdom</i>
A4P-D.8	An Additive Instantaneously Companding Readout System for Cochlear Implants
	126
	C. Bes, C. Sawigun, W. Serdijn <i>Delft University of Technology, The Netherlands</i>
A4P-D.9	A Hardware-Efficient Lowpass Filter Design for Biomedical Applications
	130
	P. Demosthenous, N. Nicolaou, J. Georgiou <i>University of Cyprus, Cyprus</i>

A5L-A	Biochemical Sensors	
Time:	Thursday, November 4, 2010, 17:30 - 19:00	
Place:	Plato Hall	
Chair(s):	Jennifer Blain Christen, <i>Arizona State University, USA</i> Ralph Etienne-Cummings, <i>Johns Hopkins University, USA</i>	
A5L-A.1	A Bulk-Driven ISFET-Based Chemical Mixer	134
	W. Wan Zain, T. Prodromakis, C. Toumazou <i>Imperial College London, United Kingdom</i>	
A5L-A.2	An Electrochemical Array Sensor with CMOS Signal Processing Circuits Integrated on a Single Chip.....	138
	T. Yamazaki, T. Ikeda, M. Futagawa, F. Dasai, M. Ishida, K. Sawada <i>Toyohashi University of Technology, Japan</i>	
A5L-A.3	Complete Microsystem Using SOI Photodiode for DNA Concentration Measurement	142
	O. Bulteel, N. Van Overstraeten-Schlögel, P. Dupuis, D. Flandre <i>Université catholique de Louvain, Belgium</i>	
A5L-A.4	Multiplexing pH and Temperature in a Molecular Biosensor.....	146
	S. Carrara ¹ , M. Torre ¹ , A. Cavallini ¹ , D. De Venuto ² , G. De Michelis ¹ ¹ <i>École Polytechnique Fédérale de Lausanne, Switzerland; </i> ² <i>Politecnico di Bari, Italy</i>	
A5L-A.5	Blood Glucose Optical Bio-Implant: Preliminary Design Guidelines	150
	A. Trabelsi, M. Boukadoum, M. Siaj <i>Universite du Quebec a Montreal, Canada</i>	

B1L-A	Implantable Electronics	
Time:	Friday, November 5, 2010, 09:30 - 11:00	
Place:	Plato Hall	
Chair(s):	Yong Lian, <i>National University of Singapore</i> Mohamad Sawan, <i>École Polytechnique de Montréal, Canada</i>	
B1L-A.1	A Low-Power Implantable Device for Epileptic Seizure Detection and Neurostimulation.....	154
	M. Salam ² , D. Nguyen ¹ , M. Sawan ²	
	¹ <i>Centre Hospitalier de l'Université de Montréal, Canada;</i> ² <i>École Polytechnique de Montréal, Canada</i>	
B1L-A.2	Design of a Low Power 100 dB Dynamic Range Integrator for an Implantable Neural Stimulator	158
	M. van Dongen, W. Serdijn	
	<i>Delft University of Technology, The Netherlands</i>	
B1L-A.3	Design of a Current-Steering Implantable Stimulator with Electric Field Shifting for Deep Brain Stimulation.....	162
	V. Valente ¹ , A. Demosthenous ¹ , R. Bayford ²	
	¹ <i>University College London, United Kingdom;</i> ² <i>University of Middlesex, United Kingdom</i>	
B1L-A.4	Design of a Stimulator ASIC for Active Electrode Books.....	166
	X. Liu, A. Demosthenous, A. Vanhoostenberghe, N. Donaldson	
	<i>University College London, United Kingdom</i>	
B1L-A.5	Individually Addressable Optoelectronic Arrays for Optogenetic Neural Stimulation.....	170
	P. Degenaar, B. McGovern, R. Berlinguer-Palmini, N. Vysokov, N. Grossman,	
	V. Pohrer, E. Drakakis, M. Neil	
	<i>Imperial College London, United Kingdom</i>	

B2L-A	Bioinspired Systems	
Time:	Friday, November 5, 2010, 11:30 - 13:00	
Place:	Plato Hall	
Chair(s):	Ralph Etienne-Cummings, <i>Johns Hopkins University, USA</i> Pantelis Georgiou, <i>Imperial College London, UK</i>	
<hr/>		
B2L-A.1	Small-Signal Neural Models and its Application to Determining Model Parameters.....	174
A. Basu ² , P. Hasler ¹		
¹ <i>Georgia Institute of Technology, United States; </i> ² <i>Nanyang Technological University, Singapore</i>		
B2L-A.3	Analysis and Design of a Versatile Synthetic Network for Inducible Gene Expression in Mammalian Systems	182
A. Polynikis ³ , G. Cuccato ² , S. Criscuolo ¹ , S. Hogan ³ , M. Di Bernardo ³ , D. Di Bernardo ²		
¹ <i>Telethon Institute of Genetics and Medicine, Italy; </i> ² <i>Telethon Institute of Genetics and Medicine (TIGEM), Naples, Italy; </i> ³ <i>University of Bristol, United Kingdom</i>		
B2L-A.4	Biophysical Neural Spiking and Bursting Dynamics in Reconfigurable Analog VLSI	186
T. Yu ² , T. Sejnowski ¹ , G. Cauwenberghs ²		
¹ <i>Salk Institute, United States; </i> ² <i>University of California, San Diego, United States</i>		
B2L-A.5	A Spike Based 3D Imager Chip Using a Mixed Mode Encoding Readout.....	190
A. Harrison, R. Özgün, J. Lin, A. Andreou, R. Etienne-Cummings <i>Johns Hopkins University, United States</i>		

B3L-A	Circuits and Devices for Neural Interfacing
Time:	Friday, November 5, 2010, 14:30 - 16:00
Place:	Plato Hall
Chair(s):	Yong Lian, <i>National University of Singapore</i> Themis Prodromakis, <i>Imperial College London, UK</i>

- B3L-A.1** **A Conformable Microelectrode Array (cMEA) with Integrated Electronics for Peripheral Nerve Interfacing** **194**
 L. Guo, I. Clements, D. Li, R. Bellamkonda, S. Deweerth
Georgia Institute of Technology, United States
- B3L-A.2** **Two-Dimensional Multi-Channel Neural Probes with Electronic Depth Control..** **198**
 T. Torfs³, A. Aarts³, M. Erismis³, J. Aslam³, R. Yazicioglu³, R. Puers³, C. Van Hoof³,
 H. Neves³, I. Ulbert², B. Dombovari², R. Fiath², B. Peter Kerekes², K. Seidl¹,
 S. Herwijk¹, P. Ruther¹
¹*Albert-Ludwigs-Universität Freiburg, Germany*; ²*Hungarian Academy of Sciences, Hungary*; ³*IMEC, Belgium*
- B3L-A.3** **Implantable Stimulator for Bipolar Stimulation Without Charge Balancing Circuits** **202**
 H. Chun, T. Lehmann, Y. Yang
University of New South Wales, Australia
- B3L-A.4** **Design of a Stimulator ASIC for an Implantable Vestibular Neural Prosthesis....** **206**
 D. Jiang, A. Demosthenous, D. Cirmirakis, T. Perkins, N. Donaldson
University College London, United Kingdom
- B3L-A.5** **In Vivo Electrical Characterization of Deep Brain Electrode and Impact on Bio-Amplifier Design.....** **210**
 F. Kölbl, A. Zbrzeski, E. Syed, S. Renaud, N. Lewis
Université de Bordeaux, IMS, IPB, CNRS, France

B4P-B	Circuits for Medical Applications	
Time:	Friday, November 5, 2010, 16:00 - 17:30	
Place:	Zenon	
Chair(s):	Jennifer Blain Christen, <i>Arizona State University, USA</i>	
<hr/>		
B4P-B.1	A Quasi-Delay-Insensitive Dual-Rail Low-Pass Filter Working in Subthreshold Region	214
X. Chang, Y. Lian <i>National University of Singapore, Singapore</i>		
B4P-B.2	A Ultra Low Power, Wide Input Range Mics Band Channel Selection Filter on 65 nm CMOS	218
J. Yang, N. Tran, S. Bai, M. Fu, E. Skafidas, I. Mareels, M. Halpern <i>University of Melbourne, Australia</i>		
B4P-B.3	An Ultra Low-Power Peak-Instant Detector for a Peak Picking Cochlear Implant Processor.....	222
C. Sawigun, W. Ngamkham, W. Serdijn <i>Delft University of Technology, The Netherlands</i>		
B4P-B.4	A Power Efficient Programmable Gain Boosting Current Mirror for Biomedical Electronics.....	226
H. Chun, T. Lehmann <i>University of New South Wales, Australia</i>		
B4P-B.5	A High Output Impedance CMOS Current Driver for Bioimpedance Measurements	230
H. Hong ¹ , A. Demosthenous ¹ , I. Triantis ² , P. Langlois ¹ , R. Bayford ³ ¹ <i>University College London, United Kingdom; </i> ² <i>University College London,, United Kingdom; </i> ³ <i>University of Middlesex, United Kingdom</i>		
B4P-B.6	Intimate Mixing of Analogue and Digital Signals in a Field-Programmable Mixed-Signal Array with Lopsided Logic	234
S. Bamford, M. Giulioni <i>Istituto Nazionale di Fisica Nucleare / Istituto Superiore di Sanita, Italy</i>		
B4P-B.7	A CMOS Frequency-Mixing Transimpedance Amplifier with 5 nArms Input Noise for Frequency-Domain Near-Infrared Spectroscopy	238
R. Yun, V. Joyner <i>Tufts University, United States</i>		
B4P-B.8	A Compact Parasitic-Insensitive Dual-Frequency Delta-Sigma Modulated CMOS Capacitive Architecture	242
R. Singh ¹ , K. Abdelhalim ² , R. Genov ² ¹ <i>University of Texas, Austin, United States; </i> ² <i>University of Toronto, Canada</i>		

B4P-C Bioinspired and Neuromorphic Circuits and Systems

Time: Friday, November 5, 2010, 16:00 - 17:30

Place: Zenon

Chair(s): Andrew Mason, *Michigan State University, USA*

-
- B4P-C.1 Biologically Inspired Image Sampling for Electronic Eye 246**
F. Robert-Inacio¹, R. Scaramuzzino², Q. Stainer², E. Kussener-Combier¹
¹IM2NP, France; ²ISEN, France
- B4P-C.2 A Biologically Inspired Collision Detection Algorithm Using Differential Optic Flow Imaging 250**
M. Sarkar³, D. San Segundo Bello², C. van Hooft², A. Theuwissen¹
¹Delft University of Technology & Harvest Imaging, The Netherlands; ²IMEC, Belgium; ³IMEC & Delft University of Technology, The Netherlands
- B4P-C.3 Biomimetic Frame-Free HDR Camera with Eventdriven PWM Image/Video Sensor and Full-Custom Address-Event Processor..... 254**
C. Posch, D. Matolin, R. Wohlgemant, M. Hofstätter, P. Schön, M. Litzenberger, D. Bauer, H. Garn
AIT Austrian Institute of Technology, Austria
- B4P-C.4 A High Dynamic Range Low Power Oscillating Pixel for a Bio-Inspired Sensor . 258**
N. Massari, M. De Nicola, G. Pedretti, M. Gottardi
Fondazione Bruno Kessler, Italy
- B4P-C.5 A Device Mismatch Compensation Method for VLSI Neural Networks..... 262**
E. Neftci, G. Indiveri
Institute of Neuroinformatics, University of Zurich and ETH Zurich, Switzerland
- B4P-C.6 A Model of Stimulus-Specific Adaptation in Neuromorphic aVLSI 266**
R. Mill², S. Sheik¹, G. Indiveri¹, S. Denham²
¹Institute of Neuroinformatics, University of Zurich and ETH Zurich, Switzerland;
²University of Plymouth, United Kingdom
- B4P-C.7 Exploring Olfactory Sensory Networks: Simulations and Hardware Emulation.. 270**
M. Beyeler¹, F. Stefanini¹, H. Proske², G. Galizia², E. Chicca¹
¹University of Zurich and ETHZ, Switzerland; ²Universität Konstanz Fachbereich Biologie, Germany

B4P-D Biomedical Systems

Time: Friday, November 5, 2010, 16:00 - 17:30
Place: Zenon
Chair(s): Pantelis Georgiou, *Imperial College London, UK*

B4P-D.1	Massively Parallel Processor Array for Mid-/Back-End Ultrasound Signal Processing.....	274
	D. Truong, B. Baas <i>University of California, Davis, United States</i>	
B4P-D.2	A Versatile Nurse Support System Using Bluetooth and FeliCa	278
	M. Shimojima ¹ , A. Eguchi ¹ , T. Iwanaga ² , Y. Mizuno ¹ , K. Setoguchi ¹ , S. Watanabe ¹ , Y. Sato ² , Y. Tanaka ¹ ¹ <i>Nagasaki Institute of Applied Science, Japan; </i> ² <i>SFK Medical Corporation, Japan</i>	
B4P-D.3	An Open-Source Platform for the Development of Microcontroller Based Multi-Wavelength Oximetry	282
	O. Guven, F. Geier, D. Banks, C. Toumazou <i>Imperial College London, United Kingdom</i>	
B4P-D.4	Locomotion Processing Unit	286
	K. Mazurek ¹ , B. Holinski ² , D. Everaert ² , R. Stein ² , V. Mushahwar ² , R. Etienne-Cummings ¹ ¹ <i>Johns Hopkins University, United States; </i> ² <i>University of Alberta, Canada</i>	

B5L-A	Biomedical Instrumentation	
Time:	Friday, November 5, 2010, 17:30 - 19:00	
Place:	Plato Hall	
Chair(s):	Timothy Constandinou, <i>Imperial College London, UK</i> Andrew Mason, <i>Michigan State University, USA</i>	
<hr/>		
B5L-A.1	Design of Limiting/Logarithmic Amplifier for Wideband Bioimpedance Measuring Devices.....	290
J. Ramos ¹ , J. Ausín ¹ , J. Duque-Carrillo ¹ , G. Torelli ² ¹ <i>Universidad de Extremadura, Spain; </i> ² <i>Università degli studi di Pavia, Italy</i>		
B5L-A.2	Amperometric Instrumentation System with On-Chip Electrode Array for Biosensor Application	294
L. Li, W. Qureshi, X. Liu, A. Mason <i>Michigan State University, United States</i>		
B5L-A.3	Design of a High-Voltage Analog Front-End Circuit for Integration with CMUT Arrays	298
P. Behnamfar, S. Mirabbasi <i>University of British Columbia, Canada</i>		
B5L-A.4	Design and Evaluation of a Capacitively Coupled Sensor Readout Circuit, Toward Contact-Less ECG and EEG	302
D. Svärd ¹ , A. Cichocki ² , A. Alvandpour ¹ ¹ <i>Linköping University, Sweden; </i> ² <i>Riken Brain Science Institute, Japan</i>		
? Ynk cfX=XYI		
'5 i H cf=XYI		