# Monday, April 3, 2017

| | Ballroom I | Omega |
|---|---|---|
| **08:00-08:30** | **Registration** | |
| **08:30-09:30** | **Leon Chua: Holy Grail of non-volatile memristors found!** | |
| | **Theory I**<br>Chair: A. Ascoli — TU Dresden, DE | **Interfaces**<br>Chair: C. Papavassiliou — Imperial College London, UK |
| **09:30-10:00** | ***Keynote**: A Note on the So-Called Inverse Memristor*<br>D. Biolek, V. Biolkova, Z. Kolka | ***Keynote**: Influence of Interface Roughness on Resistance Switching in Undoped Amorphous Silicon Oxide*<br>A. Mehonic, M. Munde, W. Ng, M. Buckwell, L. Montesi, M. Bosman, A. Shluger, A. Kenyon |
| **10:00-10:15** | *Advanced Nonlinear Memristor Model with a Biolek Window Function and Voltage-Dependent Exponent*<br>V. Mladenov, S. Kirilov | *Influence of counter electrode materials on redox processes and switching kinetics in electrochemical metallization cells*<br>M. Lübben, S. Tappertzhoffen, S. Menzel, I. Valov |
| **10:15-10:30** | *Avoiding Discontinuities in Piecewise Linear Models for Memristor Oscillators*<br>E. Ponce, J. Ros, E. Freire, A. Amador | *Demonstration of low power $TiO_{2-x}/HfO_{2-y}/TiO_{2-x}$-based RRAM devices with synaptic properties*<br>P. Bousoulas, D. Tsoukalas |
| **10:30-11:00** | **Coffee Break** | |
| | **Technology**<br>Chair: M. Ogorzałek — Jagiellonian University, PL | **Materials and Devices**<br>Chair: D. Wouters — RWTH Aachen, DE |
| **11:00-11:30** | ***Keynote**: Fabrication, CMOS integration and applications of non-volatile 3D metal oxide crossbars*<br>G. Adam, B. Chakrabarti, B. Hoskins, H. Nili, D. Strukov | ***Keynote**: $HfO_x$-based memristive devices; from materials to applications*<br>S. Spiga, S. Brivio, E. Covi, J. Frascaroli |
| **11:30-11:45** | *Sub-15 nm High Density Crossbar Memristive Devices*<br>A. Khiat, P. Ayliffe, T. Prodromakis | *Three-terminal $CeO_{2-x}/La_{0.8}Sr_{0.2}MnO_3$ device demonstrating volume resistive switching based on the metal to insulator transition*<br>J. Sune, R. Ortega-Hernandez, M. Coll, J. Gonzalez-Rosillo, A. Palau, X. Obradors, J. Martin-Martinez, E. Miranda, T. Puig |
| **11:45-12:00** | *Memristive titanium, niobium and tantalum oxide films obtained by anodic oxidation*<br>S. Noori, A. Brenna, F. Corinto, M. Pedeferri, M. V. Diamanti | *Characterization and modelling of $HfO_2$-based devices showing second order memristor effects*<br>A. Rodriguez-Fernandez, C. Cagli, L. Perniola, J. Sune, E. Miranda |
| **12:00-12:15** | *Tranmistor: A Device-Level Approach to Resolving the Sneak Currents of Crossbar Arrays*<br>O. Bass, R. Giterman, A. Fish, D. Naveh | *I-V characteristics of nanowire based resistive change memory*<br>T. Aono, K. Sugawa, T. Shimizu, S. Shingubara, K. Takase |
| **12:15-12:30** | *Impact of Volatile Switching Selector on ReRAM crossbar readout operations*<br>S. Cortese, I. Messaris, A. Khiat, T. Prodromakis | *Resistance switching properties of silicon nitride material*<br>P. Karakolis, A. Speliotis, V. Ioannou-Sougleridis, P. Normand, P. Dimitrakis |
| **12:30-13:30** | **Lunch** | |
| **13:30-14:30** | **Joshua Yang: Diffusive memristor for computing** | |
| | **Characterisation**<br>Chair: P. Dimitrakis — NCSR "Demokritos", GR | **Applications I**<br>Chair: F. Corinto — Politechnico di Torino, IT |
| **14:30-15:00** | ***Keynote**: Effect of electrical measurement on the evolution of conductive filaments composed of oxygen vacancies in $HfO_x$- based ReRAM*<br>B. Attarimashalkoubeh, J. Sandrini, E. Shahrabi, Y. Leblebici | ***Keynote**: Understanding and Engineering Memristors for Memory and Computing Applications*<br>Y. Yang |
| **15:00-15:15** | *Electrochemical and C-AFM characterization of anodic $TiO_2$ with memristive behaviour*<br>S. Noori, T. Souier, M. Chiesa, M. Pedeferri, M. V. Diamanti | *Implementation of fuzzy-type logic learning with bidirectional, $BiFeO_3$-based artificial synapses*<br>H. Schmidt, N. Du, M. Kiani, D. Bürger, I. Skoru, R. Ecke, M. Di Ventra, O. G. Schmidt, S. E. Schulz |
| **15:15-15:30** | *Bipolar Resistive Switching Analysis in $Au/TiO_{2-x}/TiO_2/Au$ Memristor structure Employing Ex-situ Impedance Spectroscopy*<br>C. Dash, S. Sahoo, S.R.S Prabaharan | *Memristive Current Mode Threshold Logic Gates*<br>S. N. Mozaffari, S. Tragoudas |
| **15:30-17:30** | **POSTER SESSION I**<br>**Materials and Devices** | **MemoCIS**<br>**Management Committee Meeting** |

# Tuesday, April 4, 2017

| | Ballroom I | Omega |
|---|---|---|
| **08:30-09:30** | **Ilia Valov: Mechanisms in memristive switching: fundamental processes and limitations** | |
| | **Reliability**<br>Chair: A. Kenyon — University College London, UK | **Theory II**<br>Chair: D. Biolek — Brno University, CZ |
| **09:30-10:00** | ***Keynote**: Reliability issues on oxide-electrolyte-based RRAM*<br>M. Liu, Q. Liu, S. Liu, X. Zhao, H. Lv, S. Long | ***Keynote**: Vacancy Transport Unites Memristor Models*<br>I. Abraham |
| **10:00-10:15** | *Correlation analysis between V set, V reset, V forming, LRS and HRS in oxide-based ReRAMs*<br>J. Sandrini, E. Shahrabi, B. Attarimashalkoubeh, Y. Leblebici | *Role of electron and hole injection in electroforming of $SiO_2$ and $HfO_2$ based RRAM cells*<br>D. Gao, J. Strand, A. Mehonic, A. Kenyon, A. Shluger |
| **10:15-10:30** | *Highly reliable and flexible memristive device fabricated by all printed approach with an advanced 2D nanocomposite as the functional material*<br>M. M. Rehman, Y. J. Yang, S. W. Kim, K. H. Choi | *A compact Verilog-A ReRAM model*<br>I. Messaris, A. Serb, A. Khiat, S. Nikolaidis, T. Prodromakis |
| **10:30-11:00** | **Coffee Break** | |
| | **Bioinspired Sensors**<br>Chair: S. Carrara — EPFL, CH | **Logic**<br>Chair: D. Ielmini — Politechnico di Milano, IT |
| **11:00-11:30** | ***Keynote**: Wiring brain and artificial neurons together through memristive synapses: the first steps*<br>S. Vassanelli | ***Keynote**: Influence of ReRAM Device Characteristics on the Performance of Logic-in-Memory Concepts*<br>A. Siemon, L. Xie, S. Menzel, R. Waser, S. Hamdioui, D. Wouters |
| **11:30-11:45** | *Memristor-based Spike Sorting platform*<br>I. Gupta, A. Serb, A. Khiat, T. Prodromakis | *Functional complete Boolean logic methodology in memristors with optimized computation complexity*<br>Y. Li, Y. Zhou, Z. Wang, L. Cheng, X. Miao |
| **11:45-12:00** | *Neuromorphic Device Architectures using Electrolyte Gating*<br>P. Gkoupidenis, D. Koutsouras, G. Malliaras | *Transient Analysis of an Experimentally-Verified Memristor-Based IMPLY Gate*<br>M. Maestro, J. Martin-Martinez, A. Crespo-Yepes, M. Escudero, R. Rodriguez, M. Nafria, X. Aymerich, A. Rubio |
| **12:00-12:15** | *Energy and Area Efficient Image Compressor using Memristive Crossbar*<br>Y. Halawani, B. Mohammad, M. Al-Qutayri, S. Al-Sarawi | *mMPU: Memristive Memory Processing Unit*<br>S. Kvatinsky, R. Ben-Hur, N. Talati, N. Wald |
| **12:15-12:30** | *Neuromorphic Pattern Recognition Based on Bi-directional Analog Switching ReRAM Array*<br>P. Yao, H. Wu, B. Gao, H. Qian | *Memristive Probabilistic Arithmetic Unit*<br>H. Alahmadi, R. Naous, K. Nabil Salama |
| **12:30-13:30** | **Lunch** | |
| **13:30-14:30** | **Daniele Ielmini: Neuromorphic hardware for pattern learning with memristive synapses** | |
| | **Circuits and Control**<br>Chair: J. Georgiou — Univ. of Cyprus, CY | **Devices and Applications**<br>Chair: D. Querlioz — Univ. Paris-Sud, FR |
| **14:30-15:00** | ***Keynote**: On the use of offset calibration techniques for low-power memristor arrays read-out*<br>C. Mohan, J.M. de la Rosa, T. Serrano-Gotarredona, B. Linares-Barranco | ***Keynote**: "Tug of War" devices for interconnection of artificial synapses*<br>C. Lutz, T. Hasegawa, T. Chikyow |
| **15:00-15:15** | *Memristor-based control methods for a bio-inspired robot*<br>R. Tetzlaff, A. Ascoli, D. Baumann, M. Hild | *Pt/$TiO_x$/Pt Resistive switching devices for flexible applications*<br>A. Khiat, S. Cortese, A. Serb, T. Prodromakis |
| **15:15-15:30** | *Memristive-based Reconfigurable Analogue Blocks*<br>C.A. Angeles Ruiz, A. Serb, A. Khiat, C. Papavassiliou, T. Prodromakis | *How Mott insulator can implement a single component Leaky Integrate and Fire artificial neuron*<br>C. Adda, P. Stoliar, J. Tranchant, B. Corraze, M. P. Besland, M. Rozenberg, E. Janod, L. Cario |
| **15:30-17:30** | **POSTER SESSION II**<br>**Theory and Applications** | **MemoCIS**<br>**Working Group Meeting** |

# Wednesday, April 5, 2017

| | Ballroom I | Omega |
|---|---|---|
| **09:00-10:00** | **Giacomo Indiveri: Distributed heterogeneous memory structures in multi-core neuromorphic computing architectures** | |
| | **Applications II**<br>Chair: G. Sirakoulis — Democritus Univ. Thrace, GR | **Memristor-based Sensors**<br>Chair: S. Vassanelli — Univ. of Padova, IT |
| **10:00-10:30** | ***Keynote**: Computational memory based on phase-change memory devices*<br>A. Sebastian | ***Keynote**: Memristive Aptasensors for Theranostics*<br>I. Tzouvadaki, N. Aliakbarinodehi, G. de Micheli, S. Carrara |
| **10:30-10:45** | *Tuning individual and mutually synchronized spin Hall nanooscillators for associative memory neural networks*<br>M. Zahedinejad, A. Awad, A. Houshang, J. Åkerman | *Fabrication of Fluidic-based Memristor Sensor for Dengue Virus Detection*<br>N. S. M. Hadis, A.A. Manaf, S.H. Ngalim, S.H. Herman |
| **10:45-11:00** | *Processing with Memristors for Approximate and Stochastic Computing*<br>R. Naous, K.N. Salama | *Low-Power and Highly Stable Microscale $TiO_2$ Memristor for Gamma-Ray Sensing*<br>L. Mahmoud, M.A. Jaoude, M. Darweesh, H. Abunahla, G. Hitt, B. Mohammad |
| **11:00-11:30** | **Coffee Break** | |
| | **Neuromorphic Computation**<br>Chair: B. Linnares-Barranco — CSIC/Univ. of Seville, ES | **Non-Volatile Memories**<br>Chair: I. Valov — Forschungszentrum Jülich, DE |
| **11:30-12:00** | ***Keynote**: "Winner-Take-All" Neuromorphic Architectures with Phase-Change Synapses*<br>S. Sidler, S. Wozniak, Y. Leblebici, A. Pantazi, E. Eleftheriou | ***Keynote**: Memristor-Based Circuit Designs: From Nonvolatile Logics to Neuromorphic Computing Systems*<br>M.F. Chang, W.H. Chen, W.S. Khwa, K.T. Tang, C.C. Hsieh, M.S. Ho |
| **12:00-12:15** | *Unsupervised learning in probabilistic neural networks with multi-state MOx memristive synapses*<br>A. Serb, J. Bill, A. Khiat, R. Berdan, R. Legenstein, T. Prodromakis | *Multilevel Resistive Switching Effect in Bilayer Structures $Pt/TiO_2/Al_2O_3/Pt$*<br>L. Alekseeva, T. Nabatame, T. Chikyow, A. Petrov |
| **12:15-12:30** | *Full-hardware demonstration of unsupervised learning in ReRAM synaptic networks*<br>D. Ielmini, G. Pedretti, V. Milo, R. Carboni, S. Bianchi, S. Ambrogio | *The use of dielectric barrier layers for multibit operation in $TiO_x$-based memristors*<br>S. Stathopoulos, A. Khiat, M. Trapatseli, S. Cortese, A. Serb, T. Prodromakis |
| **12:30-12:45** | *Stochastic training and the impact of noise in memristive neuromorphic hardware*<br>G. Pedretti, V. Milo, R. Carboni, S. Bianchi, S. Ambrogio, D. Ielmini | *Investigation of the Multilevel Capability of $TiN/Ti/HfO_2/W$ RRAM Devices by Pulse Programming*<br>M. B. Gonzalez, S. Poblador, M. Muñoz-Mallol, J. Calvo, M. Zabala, M. C. Acero, F. Campabadal |
| **12:45-13:00** | *Double-layer perceptron based on memristive effect in metal-oxide nanostructures*<br>A. Mikhaylov, O. Morozov, P. Ovchinnikov, I. Antonov, A. Belov, D. Korolev, M. Koryazhkina, E. Gryaznov, O. Gorshkov, V. Kazantsev | *$TaO_x$ based resistive switching memory with $Al_2O_3$ interfacial layer in $W/Al_2O_3/TaO_x/TiN$ structure and evolution of switching mechanism*<br>S. Chakrabarti, S. Ginnaram, A. Roy, K. Singh, S. Jana, J.T. Qiu, S. Maikap |
| **13:00-14:00** | **Lunch** | |
| **14:00-15:00** | **Wei Lu: Memristive devices for computing** | |
| | **Neurosynaptic Dynamics**<br>Chair: G. Indiveri — ETH Zürich, CH | **Integration**<br>Chair: D. Tsoukalas — Nat. Tech. Univ. Athens, GR |
| **15:00-15:30** | ***Keynote**: Exploiting the Intrinsic Spike Timing Dependent Plasticity Effects of Electro-Chemical Metallization Cells for Low-Overhead Learning*<br>A.F. Vincent, S. La Barbera, D. Vuillaume, F. Alibart, D. Querlioz | ***Keynote**: Advances in 3D heterogeneous integration*<br>M. Ogorzałek |
| **15:30-15:45** | *Emulating neurological and psychological functions with ionic/electronic conducting titanates*<br>X. Guo | *Toward chip-Level ReRAMs-CMOS Co-Integration*<br>E. Shahrabi, J. Sandrini, B. Attarimashalkoubeh, Y. Leblebici |
| **15:45-16:00** | *Synaptic Plasticity implemented in $TiN/HfO_2/W$ structures*<br>J. Martin-Martinez, N. Jimenez, M. Pedro, M.B. Gonzalez, R. Rodriguez, M. Nafria, F. Campabadal | *Inkjet-printed resistive memory cells for transparent electronics*<br>B. Huber, J. Schober, M. Hange, S. Pschierer, M. Kaiser, A. Ruediger, C. Schindler |

# Thursday, April 6, 2017

| | **Memristor Technologies open issues and the near future<br>Ballroom I** |
|---|---|
| **09:00-09:15** | *Introduction*<br>P. Dimitrakis (Institute of Nanoscience & Nanotechnology, NCSR "Demokritos") |
| **09:15-09:30** | *Technology and Processing*<br>R. Yakov (TowerJazz Inc.) |
| **09:30-09:45** | *Devices*<br>A. Regev (Weebit-nano) |
| **09:45-10:00** | *Applications*<br>A. Sebastian (IBM) |
| **10:00-10:15** | *Tools*<br>R. Berdan (ArC Instruments) |
| **10:15-10:30** | *Embedded Applications*<br>W. Lu (Crossbar Inc.) |
| **10:30-11:00** | **Coffee Break** |
| **11:00-13:00** | **Panel discussion** |
| **13:00-14:00** | **Lunch** |