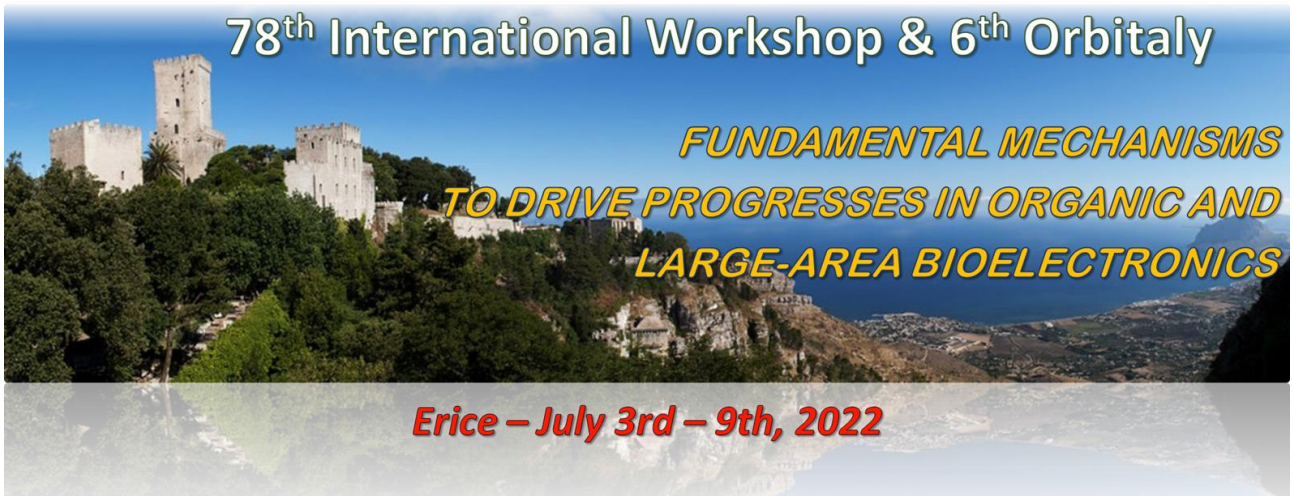
# International Workshop & Orbitaly 2020

## Ettore Majorana Foundation and Centre for Scientific Culture

## International School of Solid State Physics

ETTORE MAJORANA FOUNDATION AND CENTRE FOR SCIENTIFIC CULTURE
TO PAY A PERMANENT TRIBUTE TO GALILEO GALILEI, FOUNDER OF MODERN SCIENCE AND TO ENRICO FERMI, "THE ITALIAN NAVIGATOR", FATHER OF THE WEAK FORCES

OrBItaly 2020




### *Directors of the workshop*


Luisa Torsi


Alberto Salleo


Róisín M. Owens


Fabio Biscarini

### *Organizing Committee*


Nicoletta Ditaranto


Lucia Sarcina


Cinzia Di Franco


Francesca De Noto

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# Location and structures

The Ettore Majorana Foundation and Centre for Scientific Culture is named after an outstanding Italian physicist. Born in Sicily in 1906, Ettore Majorana's breadth of vision and exceptional contributions to theoretical physics moved Enrico Fermi to the following statement: «There are many categories of scientists, people of second and third rank, who do their best, but do not go very far. There are also people of first-class rank, who make great discoveries, fundamental to the development of science. But then there are the geniuses, like Galilei and Newton. Well, Ettore Majorana was one of them». Every year since 1963, authors of new discoveries and inventions come to Erice; 102 of them were awarded the Nobel Prize after their participation in the Ettore Majorana Schools and 49 were already Nobel laureates when they started to take part in the Centre activities. These scientific world leaders teach to students from all over the world who are eager to receive the latest knowledge directly from the mouth of its authors. Embracing 136 Schools, covering all branches of Science, the Centre is situated in the old pre-mediaeval city of Erice where four restored monasteries (one of which was the residence of the Viceroy of Sicily during the XIV and XV Centuries) provide an appropriate setting for high intellectual endeavour. These ancient buildings are now named after great scientists and strong supporters of the 'Ettore Majorana' Centre. The San Francesco Monastery (former Viceroy's residence) is now the Eugene P. Wigner Institute with the 'Enrico Fermi' Lecture Hall. The San Domenico Monastery is now the Patrick M.S. Blackett Institute with the 'Paul A.M. Dirac' Lecture Hall, 'Robert Hofstadter' Lecture Hall and 'John von Neumann' Lecture Hall. The San Rocco Monastery is now the Isidor I. Rabi Institute with the 'Richard P. Feynman' Lecture Hall, the Directorate and the main Secretariat of the Centre. The 'Ciclope' is now the Victor F. Weisskopf Institute with the 'John S. Bell' and 'Richard H. Dalitz' Lecture Halls. There are living quarters in all four Institutes for people attending the Courses at the Centre. The Polo Sismico, the first worldwide Network of Seismological Detectors (1981), is located in the I.I. Rabi Institute. The 'Paul A.M. Dirac' Museum is situated at the Patrick M.S. Blackett Institute.

# Keynote speakers

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| **Ana Claudia Arias** | *University of California, Berkeley (USA)* |
| **Richard Friend** | *University of Cambridge, Cambridge (UK)* |
| **Lo Gorton** | *Lund University (Sweden)* |
| **Olle Inganäs** | *Linköping University (Sweden)* |
| **Wolfgang Knoll** | *AIT Austrian Institute of Technology (Austria)* |
| **George Malliaras** | *University of Cambridge, Cambridge (UK)* |
| **Iain McCulloch** | *University of Oxford, Oxford (UK)* |
| **Thuc-Quyen Nguyen** | *University of California, Santa Barbara (USA)* |
| **Ronald Österbacka** | *Äbo Akademi University, Turku (Finland)* |

# Invited speakers

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| **Maria Rosa Antognazza** | *Istituto Italiano di Tecnologia, Milano (Italy)* |
| **Mario Barra** | *CNR-SPIN, Napoli (Italy)* |
| **Valentina Benfenati** | *CNR-ISOF, Bologna (Italy)* |
| **Luca Beverina** | *Università degli Studi di Milano Bicocca (Italy)* |
| **Michele Bianchi** | *Istituto Italiano di Tecnologia, Ferrara (Italy)* |
| **Davide Blasi** | *Università degli Studi di Bari (Italy)* |
| **Paolo Bollella** | *Università degli Studi di Bari (Italy)* |
| **Annalisa Bonfiglio** | *Università degli Studi di Cagliari (Italy)* |
| **Carlo Augusto Bortolotti** | *Università degli Studi di Modena e Reggio Emilia (Italy)* |
| **Mario Caironi** | *Istituto Italiano di Tecnologia, Milano (Italy)* |
| **Fabio Cicoira** | *Polytechnique Montreal (Canada)* |
| **Tobias Cramer** | *Università di Bologna (Italy)* |
| **Gianluca Maria Farinola** | *Università degli Studi di Bari (Italy)* |
| **Beatrice Fraboni** | *Università di Bologna (Italy)* |
| **Sahika Inal** | *KAUST (Saudi Arabia)* |
| **Guglielmo Lanzani** | *Istituto Italiano di Tecnologia, Milano (Italy)* |
| **Eleonora Macchia** | *Università degli Studi di Bari (Italy)* |
| **Michele Muccini** | *CNR-ISMN, Bologna (Italy)* |
| **Alessandro Pezzella** | *Università degli Studi di Napoli Federico II (Italy)* |
| **Jonathan Rivnay** | *Northwestern University, Evanston (USA)* |
| **Francesca Santoro** | *RWTH Aachen University (Germany)* |
| **Gaetano Scamarcio** | *Università degli Studi di Bari (Italy)* |
| **Eleni Stavrinidou** | *Linköping University (Sweden)* |
| **Fabrizio Torricelli** | *Università degli Studi di Brescia (Italy)* |
| **Yoeri van de Burgt** | *Eindhoven University of Technology (Netherlands)* |

# Fundamental mechanisms to drive progresses in organic and large-area bioelectronics

## Sunday July 3rd

**11:00 – 16:00** Arrival and Registration

**15:30 – 17:45** Opening Ceremony

- Welcome address and introductory remarks by the Directors of the workshop **Luisa Torsi, Alberto Salleo, Róisín M. Owens and Fabio Biscarini**
- Introduction to Sicilian History, to the Ettore Majorana Foundation and Centre for Scientific Culture by the Director of the School **Giorgio Benedek**
- Tribute speech to honor the memory of Prof. Gilles Horowitz by **Fabio Biscarini**
- Greeting address by the President Elected of the Italian Chemical Society **Gianluca M. Farinola**

### Chairperson: Alberto Salleo

**17:00 – 17:40** **KN1: O. Inganäs**
Title: *Inspired by Photosynthesis*

### Chairperson: Luisa Torsi

**17:40 – 18:20** **KN2: L. Gorton**
Title: *Bacterial Electrochemistry*

**20:00 – 22:00** Dinner
**22:00** Sicilian cakes, marsala and piano music in the “Marsala Room Cave”

## Monday July 4th

### Session I – Chairperson: Olle Inganäs

**9:00 – 9:35** **INV1: C. A. Bortolotti**
**Title:** *Electrolyte-gated transistors as label-free biosensors for healthcare applications and for fundamental investigation of biorecognition processes*

**9:35 – 10:10** **INV2: E. Macchia**
**Title:** *Selective Single-Molecule Detection of clinically relevant biomarkers with an Organic Transistor*

**10:10 – 10:25** **OR1: O. Bettucci**
**Title:** *Light-Responsive PEDOT:PSS-based blend with dynamic properties for bioelectronic applications*

**10:25 – 10:40** **OR2: F. Viola**
**Title:** *An ultra-thin and ultra-conformable all solution-processed organic transistor for tattoo/wearable electronics*

**10:40 – 10:55** **OR3: P. Cataldi**
**Title:** *An Electrically Conductive Oleogel Paste for Edible Electronics*

11:00 – 11:30 coffee break and poster session

### Session II – Chairperson: Lo Gorton

**11:30 – 12:05** **INV3: G. M. Farinola**
**Title:** *Interfacing photosynthetic microorganisms with electrodes for optoelectronics and photoelectrochemistry*

**12:05 – 12:40** **INV4: F. Cicoira**
**Title:** *Flexible, stretchable and healable bioelectronics*

**12:40 – 12:55** **OR4: G. Mallia,** D. Ravenscroft
**Title:** *Development of Enzymatic Fumarate Biosensor*

**12:55 – 13:10** **OR5: A. Imbriano**
**Title:** *Boolean Logic Network based Biosensor to Detect Wine Adulteration*

**13:10 – 13:25** **OR6: L. Aloisio**
**Title:** *Photophysical characterization of semiconductive protein based biofibers*

13:30 – 16:00 lunch and discussion time

### Session III – Chairperson: Carlo Augusto Bortolotti

**16:00 – 16:35** **INV5: F. Santoro**
**Title:** *In vitro biohybrid synaptic interfaces with neurotransmitter modulation*

**16:35 – 17:10** **INV6: Y. van de Burgt**
**Title:** *Organic Neuromorphic Electronics and Adaptive Biosensing*

**17:10 – 17:25** **OR7: C. Ausilio**
**Title:** *3D in vitro neuronal cultures with supported lipid bilayers*

**17:25 – 17:40** **OR8: A. Magni**
**Title:** *Membrane-targeted Molecule for Cell Optostimulation*

**20:00 – 22:00** Dinner
**22:00** Sicilian cakes, marsala and piano music in the “Marsala Room Cave”

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## Tuesday July 5th

### Session IV – Chairperson: Fabio Cicoira

**9:00 – 9:40** **KN3: G. Malliaras**
**Title:** *Mixed conduction in conjugated polymers devices*

**9:40 – 10:15** **INV7: G. Lanzani**
**Title:** *Organic actuators for cell opto stimulation*

**10:15 – 10:30** **OR9: A. García Fleitas**
**Title:** *Influence of Structural Colour in Molecular Mechanism of Photosynthetic Light Harvesting in Chondrus Crispus*

**10:30 – 10:45** **OR10: G. M. Paternò**
**Title:** *Photomodulation of Bioelectric Bacterial Signalling via a Membrane-Targeted Amphiphilic Azobenzene*

**10:45 – 11:00** **OR11: M. Moschetta**
**Title:** *Membrane targeted nanoactuators for cellular photostimulation*

11:00 – 11:30 coffee break and poster session

### Session V – Chairperson: Gianluca Maria Farinola

**11:30 – 12:05** **INV8: L. Beverina**
**Title:** *Conjugated materials from and into interface rich, water based microheterogeneous environments*

**12:05 – 12:40** **INV9: M. Muccini**
**Title:** *Beyond the two-dimensional field-effect charge transport view in molecular thin film transistors*

**12:40 – 12:55** **OR12: L. Salvigni**
**Title:** *Investigation of biochemical sensing mechanism in organic electrochemical transistors: effect of electrochemical potential and capacitance*

**12:55 – 13:10** **OR13: M. Galliani**
**Title:** *Assessing face mask barrier integrity with printed PEDOT:PSS sensor in Covid-19 pandemics*

**13:10 – 13:25** **OR14: F. Bonafé**
**Title:** *AC amplification gain in organic electrochemical transistors (OECTs) for impedance-based single cell sensors*

13:30 – 16:00 lunch and discussion time

**Session VI – Chairperson: Francesca Santoro**

**16:00 – 16:40** **KN4: T.-Q. Nguyen**
**Title:** *Self-doped Conjugated Polyelectrolytes for Organic Electrochemical Transistors*

**16:40 – 17:15** **INV10: S. Inal**
**Title:** *Organic Electrochemical Transistors for Protein Detection*

**17:15 – 17:50** **INV11: A. Pezzella**
**Title:** *Integration of Eumelanin into PEDOT:PSS: from blending to doping and beyond?*

**17:50 – 18:05** **OR15: K. Guo**
**Title:** *Rapid single-molecule detection of COVID-19 and MERS antigens via nanobody-functionalized organic electrochemical transistors*

**20:00 – 22:00** Dinner
**22:00** Sicilian cakes, marsala and piano music in the “Marsala Room Cave”

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## Wednesday July 6th

**Session VII – Chairperson: Sahika Inal**

**9:00 – 9:40** **KN5: R. Friend**
**Title:** *Coulomb interactions in organic semiconductors*

**9:40 – 10:15** **INV12: J. Rivnay**
**Title:** *Polymer-based Mixed Conductors for Applications In Bioelectronics*

**10:15 – 10:50** **INV13: E. Stavrinidou**
**Title:** *Controlling volume and mechanical properties of polythiophenes via electrochemical doping*

**10:50 – 11:05** **OR16: G. Mallia**
**Title:** *Graphene Solution-gated FET-based Electrocardiography Sensor*

11:05 – 11:30 coffee break and poster session

**11:30 – 12:05** **INV14: M. Caironi**
**Title:** *Thin, fast and edible electronics for future biosensing and bioactuating systems*

**12:05 – 12:40** **INV15: B. Fraboni**
**Title:** *Organic thin films as flexible, large area X-ray and proton detectors for medical therapy*

**13:00 – 20:00** **EXCURSION**

**20:00 – 22:00** Dinner
**22:00** Sicilian cakes, marsala and piano music in the “Marsala Room Cave”

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## Thursday July 7th

### Session VIII – Chairperson: Eleni Stavrinidou

**9:00 – 9:40** **KN6: R. Österbacka**
**Title:** *Functional Materials at the Biological Interface*

**9:40 – 10:15** **INV16: F. Torricelli**
**Title:** *Multifunctional bioelectronics with organic electrochemical transistors: biosensors, integrated amplifiers and iontronic multiplexers*

**10:15 – 10:50** **INV17: P. Bollella**
**Title:** *Enzyme based Amperometric Biosensors: From Direct Electron Transfer to Chimeric Enzymes*

**10:50 – 11:05** **OR17: A. Tricase**
**Title:** *Electrochemical and X-ray photoelectron Spectroscopy measurements for SAMs characterization*

11:05 – 11:30 coffee break and poster session

## Session IX – Chairperson: Ronald Österbacka

**11:30 – 12:05** **INV18: A. Bonfiglio**
**Title:** *Novel Approaches for the Development of high performing epidermal devices*

**12:05 – 12:40** **INV19: M. Bianchi**
**Title:** *Multiscale patterning of conducting polymers: applications in neurotechnology*

**12:40 – 12:55** **OR18: C. Ronchi**
**Title:** *Red light-absorbing conjugated polymer optically modulates Ca2+ dynamics in cardiomyocytes derived from human induced pluripotent stem cells*

**12:55 – 13:10** **OR19: A. Spanu**
**Title:** *Multifunctional, Organic Transistor-based Platforms for the in vitro Interfacing of 2D and 3D Cellular Cultures*

**13:10 – 13:25** **OR20: S. Perotto**
**Title:** *Quantum nanostructures for charge separation at the biological interface*

13:30 – 16:00 lunch and discussion time

## Session X – Chairperson: Thuc-Quyen Nguyen

**16:00 – 16:40** **KN7: I. McCulloch**
**Title:** *Semiconducting Polymers for High Performance OECT Applications*

**16:40 – 17:15** **INV20: V. Benfenati**
**Title:** *Glial engineering & interfaces: organic/hybrid materials and devices to probe and sense the "other brain"*

**17:15 – 17:30** **OR21: S. Pecorario**
**Title:** *Ultra-Thin Flexible OFETs Based on sp-Hybridized Organic Semiconductors and Insulating Polymer Blends*

**20:00 – 22:00** Dinner
**22:00** Sicilian cakes, marsala and piano music in the "Marsala Room Cave"

## Friday July 8th

### Session XI – Chairperson: Iain McCulloch

**9:00 – 9:40** **KN8: A. C. Arias**
**Title:** *Flexible printed arrays and their use in wearable medical devices*

**9:40 – 10:15** **INV21: T. Cramer**
**Title:** *Organic Bioelectronic Interfaces investigated by Multimodal Scanning Probe Microscopies*

**10:15 – 10:30** **OR22: M. Mas-Torrent**
**Title:** *Blends of small molecule semiconductors with insulating polymers to fabricate OFETs for sensing*

**10:30 – 10:45** **OR23: A. Kyndiah**
**Title:** *Direct Recording of Action Potentials of Cardiomyocytes Through Solution Processed Electrolyte-Gated Field-Effect Transistors*

**10:45 – 11:00** **OR24: F. Decataldo**
**Title:** *PEDOT:PSS OECTs as versatile devices for monitoring cytotoxicity and viral infection in real-time*

11:00 – 11:30 coffee break and poster session

### Session XII – Chairperson: Ana Claudia Arias

**11:30 – 12:10** **KN9: W. Knoll**
**Title:** *PNA versus DNA aptamers – a case study of cardiac Troponin I sensing*

**12:10 – 12:45** **INV22: G. Scamarcio**
**Title:** *Anatomy of transducing interfaces: the core of large-area label-free ultrasensitive electronic biosensors*

**12:45 – 13:20** **INV23: M. Barra**
**Title:** *Assessing the response of organic electrochemical transistors for sensing applications in biological fluids*

13:30 – 16:00 lunch and discussion time

### Session XIII – Chairperson: Róisín Owens

**16:00 – 16:35** **INV24: D. Blasi**
**Title:** *Multifunctional Organic Semiconductors Based on Polyhalogenated Thiele Hydrocarbons*

**16:35 – 16:50** **OR25: G. Chiaravalli**
**Title:** *Electrochemical and mathematical study of a Polythiophene-Electrolyte coupled device to understand the interaction occurring at abiotic/biotic interface*

**16:50 – 17:05** **OR26: F. Gobbo**
**Title:** *Surfactant-Free Conjugated Polymer Based Nanoparticles as Smart Photoactive Bio-Interfaces*

**17:05 – 17:20** **OR27: G. Tullii**
**Title:** *Micro/nanostructured conjugated polymer-based systems for the optical modulation of living cells activity*

**20:00 – 22:30** Conference Banquet

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## Saturday July 9th

### Session XIV – Chairperson: Wolfgang Knoll

**9:00 – 9:35** **INV25: M. R. Antognazza**
**Title:** *Light-sensitive Nano and Microstructures based on Conjugated Polymers: Optical control of the Cell Fate*

**9:35 – 9:50** **OR28: M. Sensi**
**Title:** *A Disposable and Label-free Reduced Graphene Oxide Electrolyte-Gated Transistor Immunosensor for Anti-Drug Antibody Detection*

**9:50 – 10:05** **OR29: D. Zakhidov**
**Title:** *Ionic Gating of Low Dimensional Materials as Inspiration for Future Hybrid Organic-Inorganic Bioelectronic Systems*

**10:05 – 10:20** **OR30: L. Sarcina**
**Title:** *Biosensors for Selective and Label-free Detection of Xylella fastidiosa*

**10:20 – 10:35** **OR31: C. Scandurra**
**Title:** *Implementation of Experimental Design Techniques to Optimize Immunoglobulins detection with Simoa SP-X*

**10:35 – 10:50** **OR32: M. Valentino**
**Title:** *Synthesis and characterization of molecularly imprinted based sensors for food contaminants detection*

11:00 – 11:30 coffee break and poster session

**11:30 – 11:45** **OR33: F. M. Ferrarese**
**Title:** *Food-grade solid-state electrolytes for fully edible EGOFET*

**11:45 – 12:00** **OR34: L. Maver**
**Title:** *Stem cell photostimulation mediated by organic bio-interface*

**12:00** Closing Ceremony

## POSTER SESSION

**P1: F. Decataldo**
**Title:** *Dissolved and gaseous oxygen sensing using Organic Electrochemical Transistors (OECTs) for monitoring cell hypoxia conditions and work-safety applications*

**P2: C. Di Franco**
**Title:** *Single molecule sensing via kelvin probe force microscopy*

**P3: R. Hasler**
**Title:** *Field-Effect Transistor with a Plasmonic Fiber Optic Gate Electrode as a Multivariable Biosensor Device*

**P4: C. Marzuoli**
**Title:** *Poly(3-hexylthiophene) porous materials for bio-photonics*

**P5: M. J. Ortiz-Aguayo**
**Title:** *Printed electrolyte-gated organic field-effect transistors on flexible substrates*

**P6: E. Yu. Poimanova**
**Title:** *BTBT-based electrolyte-gated organic field-effect transistors with grafted biotin-streptavidin interface layer for biosensing*

**P7: A. Ruggiero**
**Title:** *3D conjugated polymer-based vertical structures for bioelectronic devices*

**P8: S. Ruiz-Molina**
**Title:** *Electrolyte-Gated Field-Effect Transistors for sensing an Alzheimer's disease hallmark*

**P9: P.A. Shaposhnik**
**Title:** *Efficient electrolyte-gated field-effect transistor based on solution-proceed small molecule semiconductor*

**P10: S. Tanwar**
**Title:** *Imaging Functional Electrolyte-Gated Transistors at the Nanoscale*

**P11: I. Venturino**
**Title:** *Microcontact printing technique with femto laser ablated stamps to induce cells alignment*