

# EPS Young Minds

3<sup>rd</sup> Leadership Meeting Day

6<sup>th</sup> - 7<sup>th</sup> June 2014

Paris

**Maria Josè Lo Faro**

Ph.D. Student @

**University of Catania**

**CNR-IMM of Catania – CNR-IPCF of Messina**

[mariajose.lofaro@ct.infn.it](mailto:mariajose.lofaro@ct.infn.it)

# Outline

---

- EPS YM - Catania Section
- Activities
  - Past
  - 2014
- Future Projects





# About Catania





# EPS YM Catania Section



<http://www.matis.imm.cnr.it>

<https://www.opfocus.net>



# EPS YM Catania Section



<http://www.matis.imm.cnr.it>

<http://www.dfa.unict.it/csda>

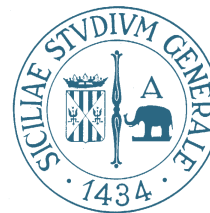


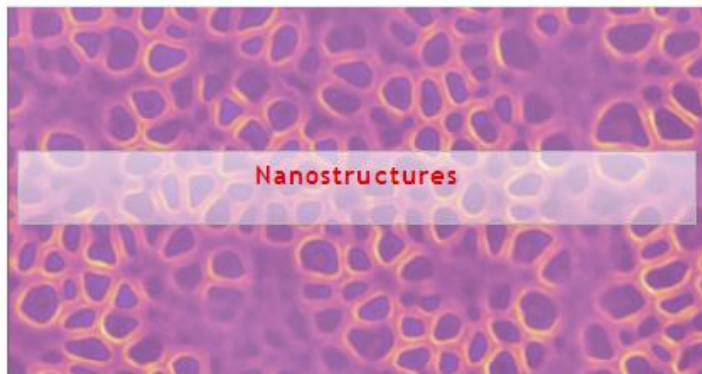
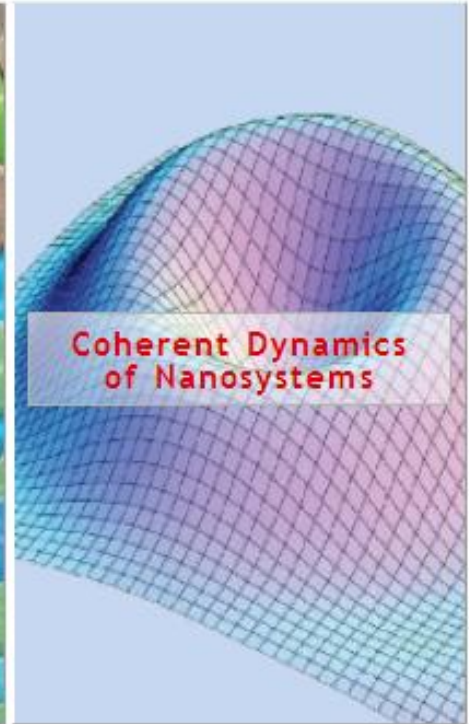
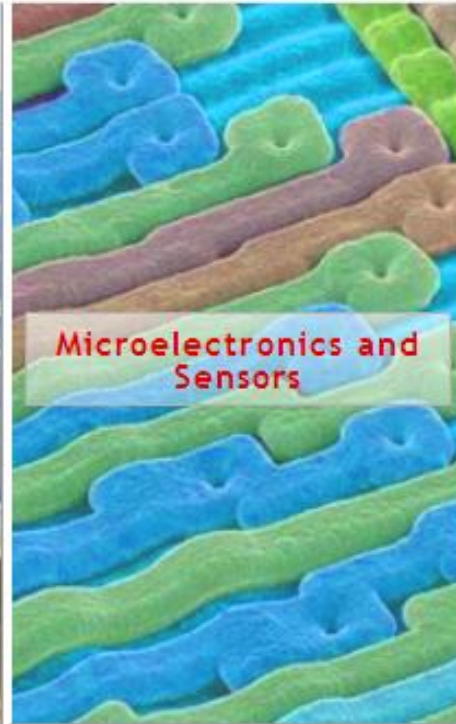
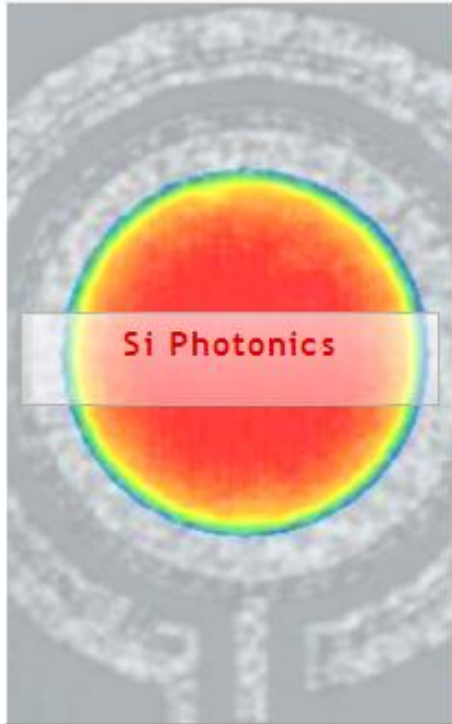


# EPS YM Catania Section



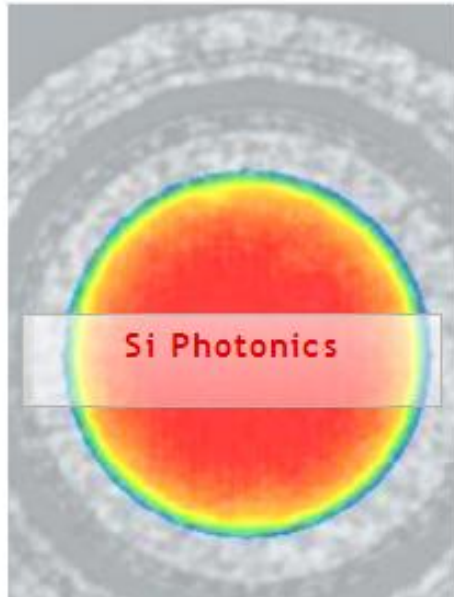
Young Minds  
Catania Section





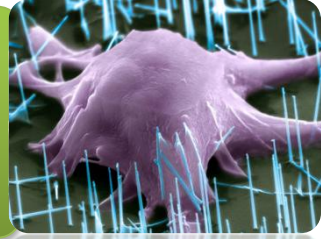


# Silicon Nanowires

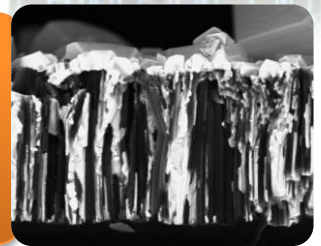


Si NWs

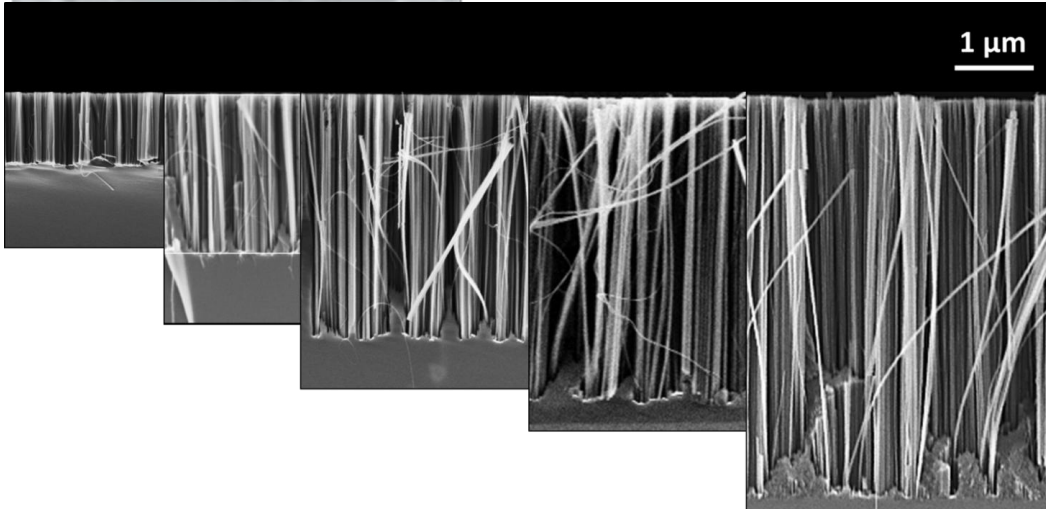
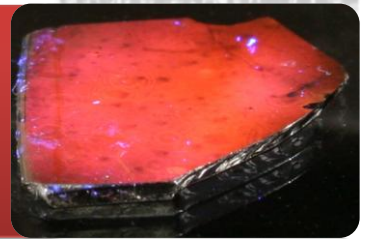
Sensors



Solar Cell



LED





# Past Activities

*January – June 2013*

## **TCO role for Photovoltaics Applications**

Dr. M. tucci – ENEA Roma

## **Chirality of Polymers in Excited States**

Prof. T. Nakano – Hokkaido University

## **Electromagnetically induced transparency from atoms to semiconductors**

Prof. G. La Rocca – Scuola Normale di Pisa

## **In vivo imaging of the brain network**

Dr. S.S. Sato – Ph.D @ Scuola Normale di Pisa



# Applicazioni del TCO in ambito fotovoltaico



**Dr. Mario TUCCI**



**Mercoledì, 30 Gennaio 2013**

**Aula F - ore 15:00**

**Dipartimento di Fisica e Astronomia,  
Via S. Sofia 64 Catania**

Nel seminario verranno descritte brevemente le attività di ricerca e sviluppo nell'ambito del fotovoltaico presenti in ENEA dal silicio cristallino al film sottile. Successivamente si descriveranno le applicazioni principali del TCO in ambito fotovoltaico prendendo in considerazione gli strati di ITO e ZnO:Al realizzati via RF magnetron Sputtering. In particolare si descriveranno le proprietà elettriche ed ottiche dei due materiali e gli effetti relativi alle applicazioni dei due materiali nelle architetture di cella a film sottile di tipo tandem amorfo microcristallino e nelle celle ad eterogiunzione silicio amorfo-silicio cristallino. Infine si presenteranno le proprietà ed il dimensionamento dello strato ZnO:Al in configurazione multilayer con strati di Ag per aumentarne la conducibilità.

**Coffee**

**start**

**@14.40**





## Chirality of Polymers in Excited States

L'Associazione Alumni SSC e EPS Youngminds Catania section organizzano un seminario tematico tenuto dal **Prof. Tamaki Nakano**

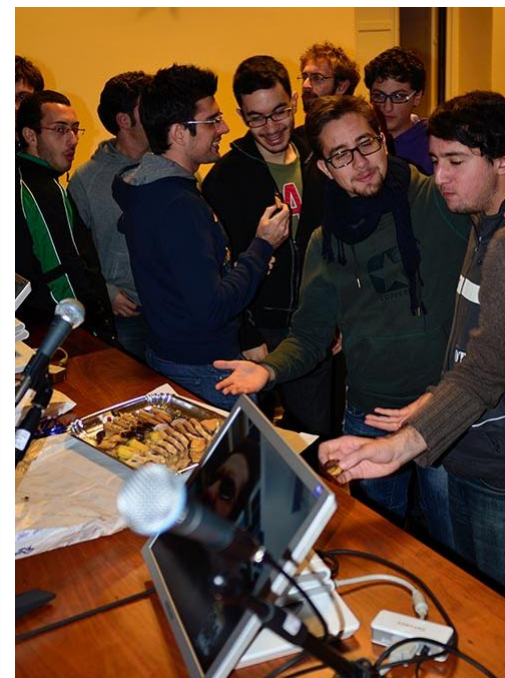
Giovedì 21 marzo 2013, ore 21

Villa San Saverio

Scuola Superiore di Catania

Fluorescent and phosphorescent organic polymers are an important class of materials for organic light-emitting diodes (OLEDs) based on their advantages that emission properties can be modified through molecular designs, that they are inherently light and flexible, and that they can be readily fabricated by solution processes. Among various polymers of this class, those emitting circularly polarized light (CPL) are of particular interest because of their potential for photonic devices such as 3D displays and energy-efficient backlights for LC displays. We have synthesized two types of CPL-emitting chiral polymers, i.e., a hyperbranched fluorenevinylene polymer (1) and poly[2,7-bis(4-*t*-butylphenyl)dibenzofulvene] (2). 1 and 2 emits green CPL and white CPL, respectively. It should be noted that 1 emits CPL at a high efficiency (anisotropy) in an amorphous film without any detectable inter-chain alignment. 1 may take a highly anisotropic structure in excited states that largely differs from the chiral structure in the ground state.

Tamaki Nakano, Ph.D. (Osaka University, 1991), is Full Professor at Catalysis Research Center, Hokkaido University since 2006. He was at Nagoya University, Cornell University and Nara Institute of Science and Technology. His interests include chiral polymers,  $\pi$ -Stacked polymers, molecular chirality induction to polymers using CPL, chiral supramolecular LCs.



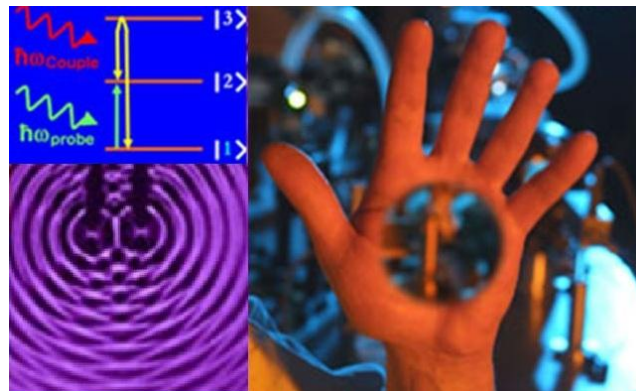
## Electromagnetically induced transparency from atoms to semiconductors

L'Associazione Alumni SSC e EPS Youngminds Catania section organizzano un seminario tematico tenuto dal **Prof. Giuseppe La Rocca**

Lunedì 22 aprile 2013, ore 21  
Villa San Saverio  
Scuola Superiore di Catania

Quantum coherence and interference can be used to control the light-matter interaction and the propagation of light in multilevel systems. A survey of one of the most attractive techniques, electromagnetically induced transparency (EIT), will be given from the discovery of coherent population trapping, through a few related milestones such as adiabatic transfer and amplification without inversion, up to the investigation of EIT proper. Our theoretical results on both cold atom systems and solid state systems, including new photonic crystal structures created via coherent optical nonlinearities, will be discussed.

Giuseppe La Rocca (Scuola Normale Superiore and CNISM, Pisa) è professore associato di Fisica dello Stato Solido alla Scuola Normale dal 2001. Normalista, ha ottenuto il Ph.D. in Fisica alla Purdue University (Usa). E' stato Alexander von Humboldt Research Fellow al Max-Planck-Institut für Festkörperforschung di Stoccarda. E' stato ricercatore nella Classe di Scienze alla Scuola Normale e professore associato presso l'Università di Salerno. I suoi interessi di ricerca riguardano la teoria della materia condensata, e segnatamente le proprietà elettroniche ed ottiche di semiconduttori organici ed inorganici e delle loro eterostrutture, l'interazione luce-materia e l'ottica non-lineare.





# In vivo imaging of the brain network

**Sebastian Sulis Sato**

*Scuola Normale Superiore di Pisa, laboratorio NEST*

**Friday, May 17<sup>th</sup> 2013**

**12.00 - Aula F**

**Dipartimento di Fisica e Astronomia**

Multiphoton microscopy is a spectroscopic imaging technique based on the excitation of common fluorescent molecules through low energy infrared light. This allows the use of fluorescence microscopy to study living tissues. In particular, the combination of this technique with ion-sensitive fluorescent dyes, such as calcium indicators, can provide useful insights on brain physiology in vivo. This presentation will show the state of the art of this technique.

Sebastian Sulis Sato is PhD candidate at the Scuola Normale Superiore di Pisa. He is coauthor of different high impact papers on molecular neuroscience.



**Young Minds**  
Catania Section



# Present Activities

*January – June 2014*

**Workshop:** Graphene Day

**Transparent Conductive Oxides**

Dr. E. Pecora – Stanford University

**Lectures on Nanoplasmonics & Nanophysics**

Prof. R. Carles – Toulouse University







# Graphene Day

## Workshop on Graphene and Graphene-Related Compounds

G. Compagnini	I. Deretzis
F. M. D. Pellegrino	F. Giannazzo
G. Barbarino	O. M. Maragò
V. Romano	F. Ruffino
A. La Magna	

Workshop: Friday, 7 February  
2014

Aula A - 8:30 - 18:30

Dipartimento di Fisica e  
Astronomia,

Via S. Sofia 64 Catania.





# Transparent Conductive Oxides: a new material platform for optoelectronic, plasmonic and photovoltaic.

*Dr. Emanuele Francesco Pecora*

*PostDoctoral Scholar  
Stanford University - CA, USA,  
Geballe Laboratory for Advanced Materials*

**SEMINAR: Wednesday, 8 January 2014**  
**Aula M - 15:30**  
**Dipartimento di Fisica e Astronomia,**  
**Via S. Sofia 64 Catania.**







The members of EPS young minds Catania Section and of the Archimedes Chapter would like to invite you to participate at a cycle of four lectures by Prof. Carles (from Toulouse Univ. and CEMES-CNRS) in the field of Plasmonics and Nanophysics. Here the programs of the first two lessons.

**PLASMONICS : the "missing link"  
between photonics and electronics**

Robert Carles

**First part (fundamentals) 5/5/2014**

- Surface plasmon-polariton excitations
- Dielectric response (scattering and absorption)
- Plasmonic modes partially propagative (2D, 1D)
- Plasmonic modes completely localized (0D)

**Second part (applications) 13/5/2014**

- Signal propagation : guides, transmission, diffraction
- Signal absorption : thermo-plasmonics (phonons generation...)  
photo-catalysis (electron-holes generation...)
- Signal scattering and amplification : spectroscopies (photons generation...)  
SERS, sensors, high contrast imaging





Centre d'Elaboration de  
Matériaux et d'Etudes  
Structurales (CEMES)

The members of EPS young minds Catania Section and of the Archimedes Chapter would like to invite you to participate at a cycle of four lectures by Prof. Carles (from Toulouse Univ. and CEMES-CNRS) in the field of Plasmonics and Nanophysics. Here the programs of the first two lessons.

## Nanophysics : confinement and spectroscopy of electrons and vibrations

*Robert Carles*

### Third Part (fundamentals) 04 giugno 2014 ore 15.30 - Aula E

Surface and quantum effects  
Confinement and quantum boxes (0D)  
Classical approximation : density of states  
Quantum wells (2D) and quantum wires (1D)  
0D - 3D transition  
Fermi gas and Bose condensate  
Quantum metrology

### Forth part (optical spectroscopy) 11 giugno 2014 ore 15.30 - Aula E

Optical spectroscopies  
"1 photon " (absorption, emission)  
"2 photons " (elastic and inelastic scattering, photoluminescence)  
Raman spectroscopy of nano-objects  
Enhanced spectroscopies (resonance-, plasmonic-, interference-)  
Spectroscopy at the nanoscale (single object, tip-enhanced)





# Future Projects



- Recruiting Day



- Effective and Communicative language



- Joint activities between EPS YM Catania & Messina Sections



From EPS YM Catania Section:



Thanks EPS YM

Thank You  
for your kind attention!

Special Thanks to:  
*Antigone Marino*  
*Ophélie Fornari*  
*& Pietro Artoni*

