

## POLIMI FOR EXPO: INTERNATIONAL RESEARCHERS POSTER SESSION

This poster session aims on present the research projects of the International Researchers from all over the world working at Politecnico, covering many disciplines including:

- *Design*
- *Architecture*
- *Urban Studies*
- *Environment Science and Engineering*
- *Mechanical engineering*
- *Physics*
- *Chemistry*
- *Energy Conversion*

The main characteristics of these projects is innovation. For example, one of these projects focuses on the transfer of space technology to design sustainable houses on Earth, showing how innovation may be used for human development. Moreover, all the projects are characterized, by their originality and feasibility, as well as by the quality of the methodology applied.

**TARGET** (open to the public for free):

- Researchers, professors, professionals, students from Politecnico, ...
- People interested in innovative and international research from different fields on sustainability and/or innovation for social benefit.

**TIME FRAME** (confirmed):

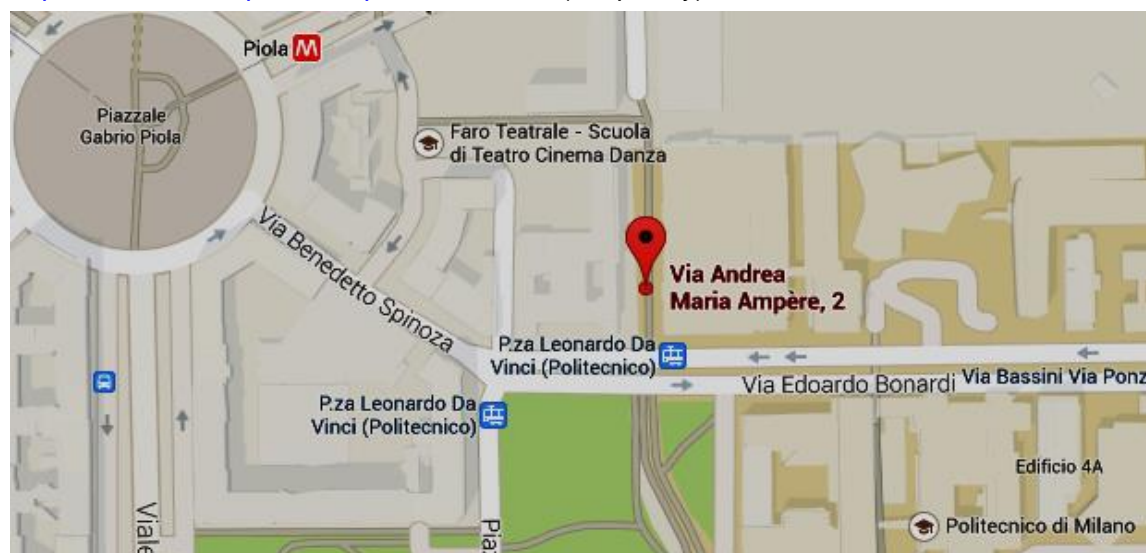
- Opening & poster presentation **7.5.2015 from 17:00 to 19:00**
- Exhibition: from 7.5.2015 to 14.5.2015 Patio Architettura.

**LOCATION** (confirmed):

Politecnico di Milano, Campus Leonardo, **Patio della Scuola di Architettura**, Via Ampère 2

**ON LINE:** [www.extreme-design.eu/PIFevent.html](http://www.extreme-design.eu/PIFevent.html) (permanent)

[https://www.eventi.polimi.it/#poster\\_session](https://www.eventi.polimi.it/#poster_session) (temporary)



## GROUP OF AUTHORS

The group is composed of international experts from different disciplines working at Politecnico, who want to present to the public of EXPO2015 their research selected for its excellent contribution to innovation and social development. In particular the main group is composed of the Polimi International fellows (PIF)

Below is a list of the members of the proposing group and their topics:

### 1. Irene Lia Schlacht [irene.schlacht@gmail.com](mailto:irene.schlacht@gmail.com)

Department: Design (Bovisa)

Nationality: Italian

Original Affiliation: Technische Universitaet Berlin

Field: Design & Human Factors

Poster: From Space Station to Smart Houses: Design for the transfer of sustainable habitat

### 2. Chawchen Ting (Ding) [d@ldjj.com](mailto:d@ldjj.com)

Department : Design (Bovisa)

Nationality : Taiwanese

Original affiliation : Beijing Institute of Fashion Technology

Field : Design & Education

Poster: Mind Your Deep Breath: communicating pollution issues in China through visual artifacts. Authors: Chawchen Ting, Xiaomin Zai, Yuxin Zhang

### 3. Stephan Jung [stephan.jung@aladlabs.net](mailto:stephan.jung@aladlabs.net)

Department: Design (Bovisa)

Nationality : German

Original affiliation : Politecnico di Milano

Field: Design/ Architecture

Poster: Urban Acupuncture: the widespread improvement of the urban habitat through the use of integrated micro-devices

### 4. Sara Bagherifard [sara.bagherifard@polimi.it](mailto:sara.bagherifard@polimi.it)

Department: Mechanical Engineering (Bovisa)

Nationality: Iranian

Original Affiliation: Politecnico di Milano

Field: Mechanical Engineering

Poster: Surface Treatments to Obtain Bio-Functional Nanomaterials

### 5. Masoumeh Meskinfam Langroudi (Mahnaz) [meskinfam@gmail.com](mailto:meskinfam@gmail.com)

Department: Chemical engineering

Nationality: Iranian

Original Affiliation: Islamic Azad University, Lahijan branch, Iran

Field: Chemistry

Poster: Biomaterial: Designing novel hybrid scaffold for bone regeneration.

### 6. Bischi Aldo [aldo.bischi@gmail.com](mailto:aldo.bischi@gmail.com)

Department: Engineering (Bovisa)

Nationality: Italian

Original Affiliation: Norwegian University of Science and Technology

Field: Energy Conversion

Poster: Optimization of the Energy consumption: Distributed power generation for a rational use of primary energy (optimal design and operation planning)

### 7. Fenjuan Wang [fenjuan.wang@polimi.it](mailto:fenjuan.wang@polimi.it)

Department: Civil and Environmental Engineering (Leonardo)

Nationality: Chinese

Original Affiliation: National Climate Center

Field: Environment Science and Engineering

Poster: Climate change of our earth from the past to future

**8 Zhenyi Zhang** zhenyi.zhang@polimi.it

Department: Civil and Environmental Engineering (Leonardo)

Nationality: Chinese

Original Affiliation: Tsinghua University

Field: Environment Science and Engineering

Poster: Nutrient and Energy Recovery from Wastewater Treatment Plants

**9. Ifigeneia Kokkali** ifigeneia.kokkali@gmail.com

Department: Architecture (Leonardo)

Nationality: Greek

Original Affiliation: Institut Français d'Urbanisme, Université Paris-Est

Field: Urban Studies

Poster: Unpacking urban diversity: insights from Milan

**10. Eaton Shane** shane.eaton@gmail.com

Department: Physics (Leonardo)

Nationality: Canadian

Original Affiliation: University of Toronto, Canada

Field: Femtosecond laser micromachining

Poster: Ultrafast laser fabrication of green microdevices for environmental sustainability.

Authors: Vibhav Bharadwaj, Diego P. Lopes, Rebeca Martínez Vázquez, Shane M. Eaton

**11. Surya SK Guduru (Sameer)** sameer.sssu@gmail.com

Department: Physics (Leonardo)

Nationality: Indian

Original Affiliation: Center for Nanoscience and Technology, Istituto Italiano di Tecnologia & Politecnico di Milano, Italy

Field: Femtosecond laser micromachining

Poster: Femtosecond laser micromachining of optical components and microfluidic structures for wavelength selective light harvesting in lab- on-chip applications.

Authors : Surya S. K. Guduru, Shane M. Eaton

**12. Toney Teddy Fernandez** toney.teddyfernandez@gmail.com

Department: Physics (Leonardo)

Nationality: Indian

Ph.D. Affiliation: Mahatma Gandhi University, Kerala, India

Field: Femtosecond laser micromachining

Poster: 3D femtosecond laser microfabrication for telecom and bio-sensing applications.

Authors : Toney T. Fernandez, Belén Sotillo, Shane M. Eaton

**13. Name: Vikas Kumar** nasavikas@gmail.com

Department: Physics (Leonardo)

Nationality : Indian

Original affiliation: Devi Ahilya University, Indore, India

Field: Physics

Poster: Coherent Raman Microscopy for Biomedical applications

**NOTE:** The poster session is open also to other international researchers from Polimi.

**PIF team thanks:** Scuola di Architettura & Area Comunicazione e Relazioni Esterne, Politecnico di Milano

For communication: irene.schlacht@mail.polimi.it

## APPENDIX: some examples of contributions

### 1. Irene Lia Schlacht [irene.schlacht@gmail.com](mailto:irene.schlacht@gmail.com)

Nationality: Italian

Original Affiliation: Technische Universitaet Berlin

Field: Design & Human Factors

Poster: From Space Station to Smart Houses: Design for the transfer of sustainable habitat. Spacecraft are self-sufficient habitats that work in extremely isolated environments without access to resources. They have enormous potential for our everyday lives e.g. megacities (overpopulation needs space and resources), catastrophes (break down of the access to resources), isolated contexts that require self-sufficiency or for smart house and environmental friendly dwellings. However, the transfer from extreme to domestic environments should consider a different target instead of astronauts. As a consequence, it is necessary to integrate human factors in the design right from the start of the project in order to support interaction with common users. The project will establish the basis for implementing habitability (quality of life and performance of the habitat system) for self-sufficient habitats based on technology and know-how from Space, integrating a multidisciplinary approach that includes cultural and scientific disciplines.

Poster: Dalle Stazioni Spaziali alle Smart House: Il design per il trasferimento degli habitat sostenibili.

Le stazioni Spaziali sono habitat autosufficienti che funzionano in luoghi estremamente isolati senza accesso alle risorse. Questi habitat hanno enormi potenziali per applicazioni in contesti di vita quotidiana ex. Megacities (sovrappopolazione necessita spazio e risorse), catastrofi (con l'interruzione delle reti che distribuiscono risorse), contesti isolati che richiedono autosufficienza, smart house e habitat sostenibili per l'ambiente.

Il trasferimento dagli ambienti estremi a quelli comuni domestici dovrebbe considerare un target non addestrato come gli astronauti. Di conseguenza è emerso il bisogno di integrare il design dello human factors dall'inizio del progetto per supportare l'interazione con utenti comuni. Questo progetto mira a stabilire le basi per sostenere l'abitabilità (qualità della vita e performance del sistema abitativo) per habitat autosufficienti basati sulla tecnologia e il know-how dello Spazio, integrando un approccio multidisciplinare che include discipline umanistiche e scientifiche.

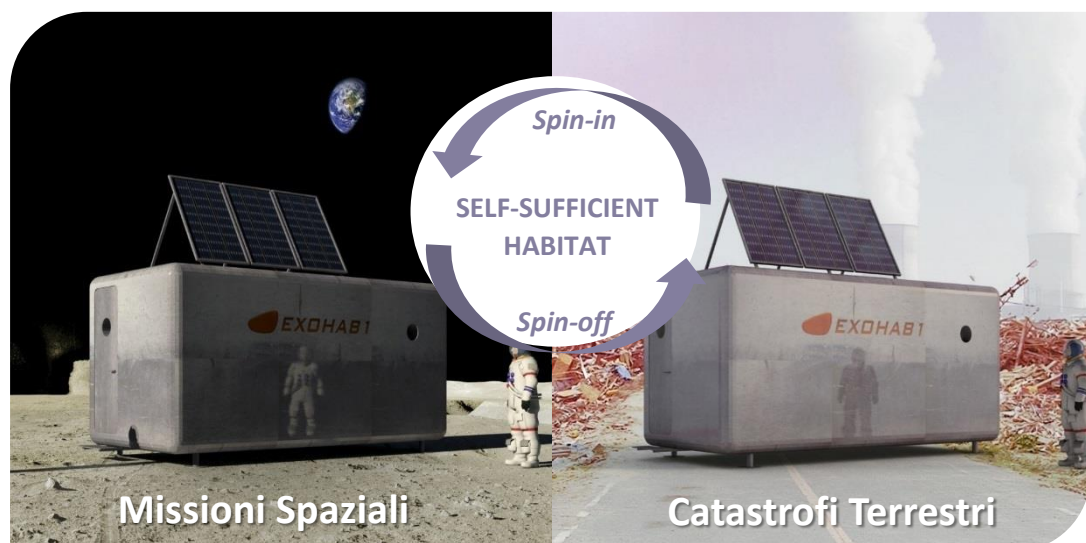


Image: From Space Station to Smart Houses: Design for the transfer of sustainable habitat.



## 2. Chawchen Ting (Ding) d@ldjjj.com

Nationality : Taiwanese

Original affiliation: Beijing Institute of Fashion Technology

Field : Design & Education

Poster: Mind Your Deep Breath:  
communicating pollution issues in China through visual artifacts.

(Prendi coscienza del tuo respiro profondo:  
 comunicare problemi di inquinamento in Cina attraverso artefatti visivi.)

Authors: Chawchen Ting, Xiaomin Zai, Yuxin Zhang

Deep Breath is a design initiative responding to poor air quality with the intent to inform the public and to inspire social changes. The initiative was planned to span three years and the interventions will be designed to awaken dialogue about air pollution and invite the audiences to respond and act. Deep Breath Initiative echoes a philosophy in design to embrace an integrated approach across boundaries of design disciplines.

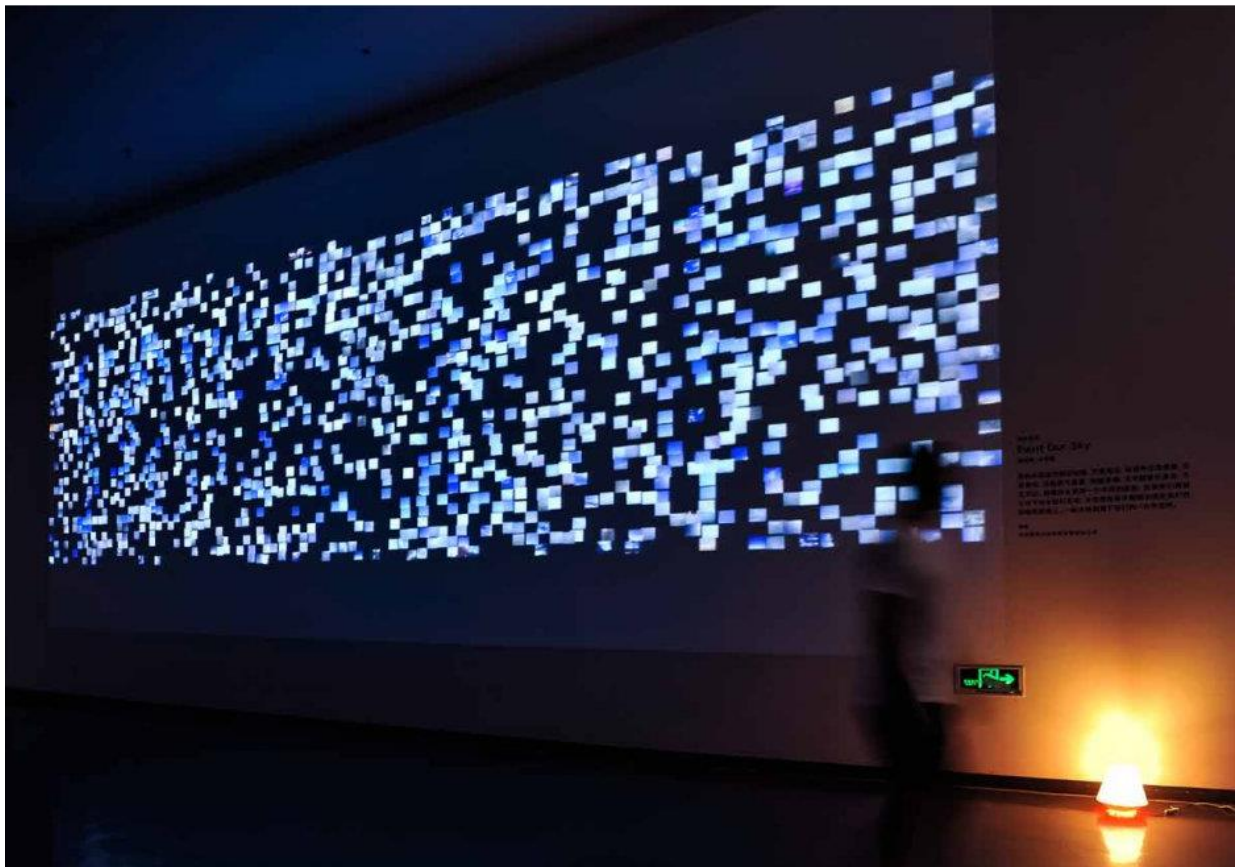


Image: PAINT OUR SKY, a design enlisted in Deep Breath 2014 project

### 3. **Stephan Jung** [stephan.jung@aladlabs.net](mailto:stephan.jung@aladlabs.net)

Nationality: German

Original affiliation: Politecnico di Milano

Field: Design & Architecture

Poster: Urban Acupuncture: the widespread improvement of the urban habitat through the use of integrated micro-devices

The research URBAN ACUPUNCTURE consists of a series of experimental temporary installations en plein air (The Urban Prototype Project) aimed at the improvement of the environmental quality of the city and of urban culture. These days developments in technology are mainly applied on the level of the individual, favouring intangible aspects. But their extension to the urban habitat has also the potential to expand their innovative aspects to the physical realm. [www.urbanprototypes.net/aladlabs.net](http://www.urbanprototypes.net/aladlabs.net)

Poster: Agopuntura urbana: il miglioramento delle abitazioni urbane attraverso l'uso di micro-attrezzi integrati.

La ricerca URBAN ACUPUNCTURE consiste nella sperimentazione di una serie di allestimenti temporanei en plein air (The Urban Prototype Project) rivolti a migliorare la qualità ambientale nella città e la cultura urbana. Mentre gli sviluppi della tecnologia vengono oggi applicati prevalentemente solo a livello della singola persona, privilegiando gli aspetti immateriali, una loro estensione all'habitat urbano permetterebbe di ampliarne gli aspetti innovativi, anche sotto il profilo fisico. [www.urbanprototypes.net/aladlabs.net](http://www.urbanprototypes.net/aladlabs.net)



Image: Urban Acupuncture

**4. Sara Bagherifard** sara.bagherifard@polimi.it

Nationality: Iranian

Original affiliation: Politecnico di Milano

Field: Mechanical Engineering

Poster: Bio-Functional Nanomaterials: Nanostructured Severely Shot Peened Stainless Steel with Selective Behavior towards Bacteria and Bone Cells

Severe plastic deformation techniques provide the treated material with novel mechanical properties and can be adopted to modify surface characteristics, affecting interactions with the biological environment. This in vitro study demonstrates the advantages of the proposed shot peening treatment to produce multifunctional 316L stainless steel materials for improved implant functions.

Poster: Nanomateriali Bio-funzionali: Acciaio inossidabile nanostrutturato tramite pallinatura severa con comportamento selettivo nei confronti di batteri e cellule ossee

Le tecniche di deformazione plastica severa permettono di ottenere nuove proprietà meccaniche sul materiale trattato, e possono essere adottate per modificarne le caratteristiche superficiali, in modo da modificarne l'interazione con gli ambienti biologici. Questo studio in vitro dimostra i vantaggi del trattamento di pallinatura proposto per realizzare materiali in acciaio inossidabile 316L multifunzionali per migliorarne le funzioni negli impianti ortopedici.

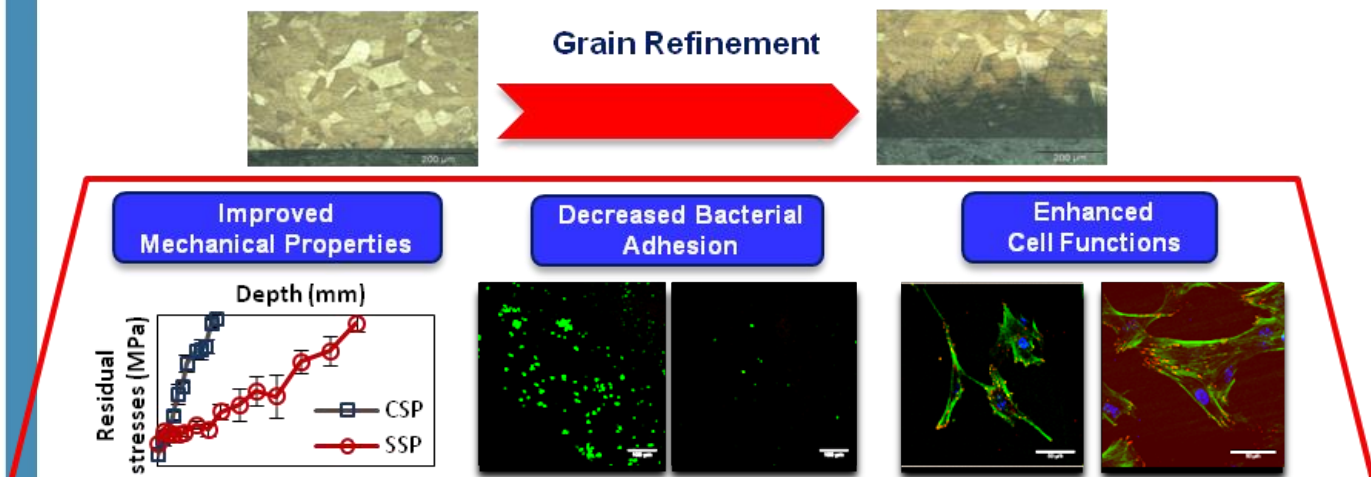


Figure: Functions achieved by surface nanocrystallization



**5. Masoumeh Meskinfam Langroudi (Mahnaz) meskinfam @ gmail.com**

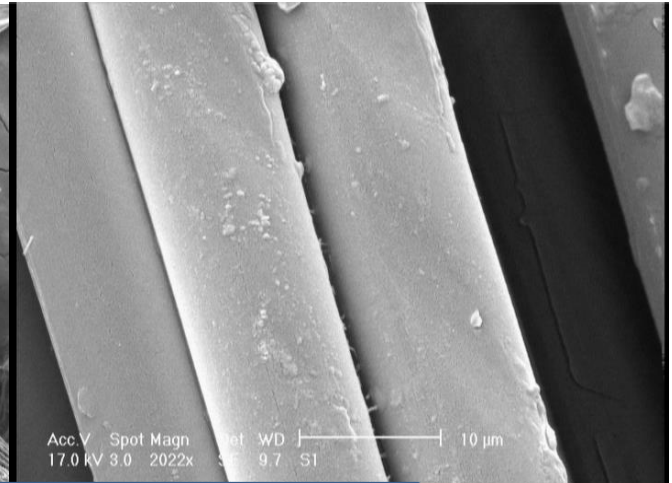
Nationality: Iranian

Original Affiliation: Islamic Azad University, Lahijan branch, Iran

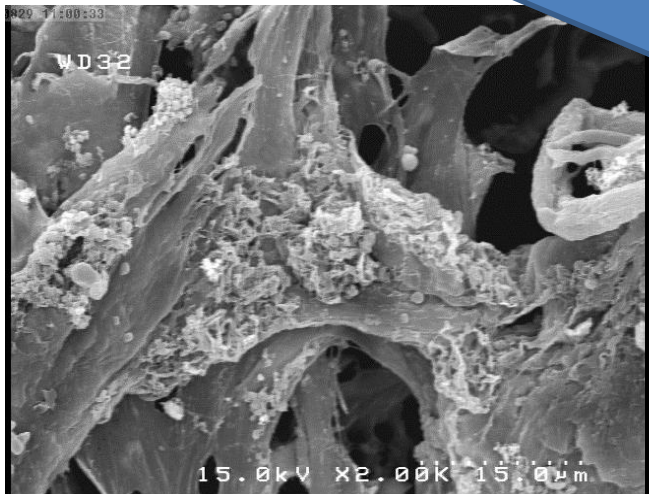
Field: Chemistry

Poster: Biomaterial: Designing novel hybrid scaffold for bone regeneration.

(Biomateriali: progettando una nuova metodologia per la rigenerazione delle ossa)



**Bone marrow stem cell  
seeding**





**7. Fenjuan Wang** [fenjuan.wang@polimi.it](mailto:fenjuan.wang@polimi.it)

Nationality: Chinese

Original Affiliation: National Climate Center

Field: Environment Science and Engineering

Poster: Climate change: A warming earth from past to further  
(Il cambiamento climatico: surriscaldamento della terra dal passato al futuro)

In the last 130 years (1880-2012), the globally averaged surface temperature shows a warming of 0.85°C. The average CO<sub>2</sub> concentration increase from the last three decades, mainly contributed by anthropogenic emissions, has a clear correlation with the increasing temperature (Figure 1). Recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, occur more frequently and have consequences for alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality.

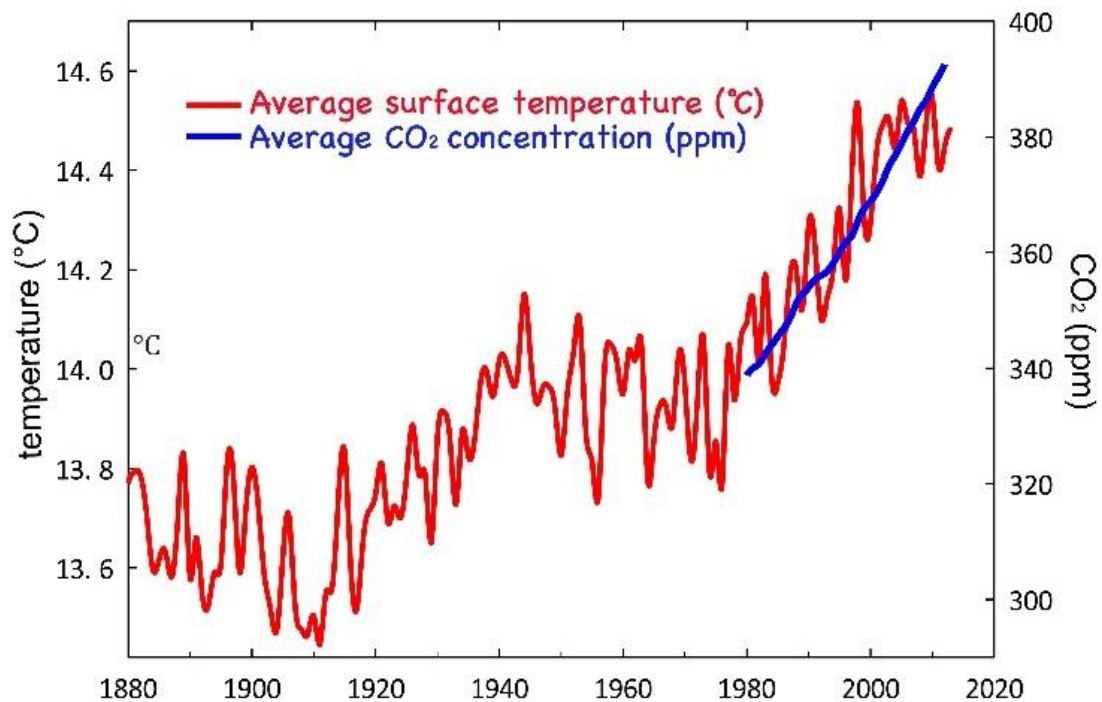


Image: A warming earth—from past to further

**8 Zhenyi Zhang** zhenyi.zhang@polimi.it  
Nationality: Chinese  
Original Affiliation: Tsinghua University  
Field: Environment Science and Engineering

**Poster: Nutrient and Energy Recovery from Wastewater Treatment Plants**

Wastewater treatment plants generally obtain qualified water at cost of energy and meanwhile produce sludge waste. Some technologies under research may turn wastewater into water, nutrient, and energy instead of water, and waste. The recovery of nutrient and energy from wastewater treatment plants will benefit the global sustainable development.

**Poster: Nutrient and Energy Recovery from Wastewater Treatment Plants**

Recupero di Nutrienti e Energia negli Impianti di Trattamento delle Acque Reflue  
Impianti di trattamento delle acque reflue in genere ottenere acqua qualificata a costo di energia e nel frattempo producono rifiuti fanghi. Alcune tecnologie nell'ambito della ricerca possono trasformare le acque reflue in acqua, nutrienti e di energia invece di acqua, e dei rifiuti. Il recupero di nutrienti e di energia da impianti di trattamento delle acque reflue beneficerà dello sviluppo sostenibile globale.

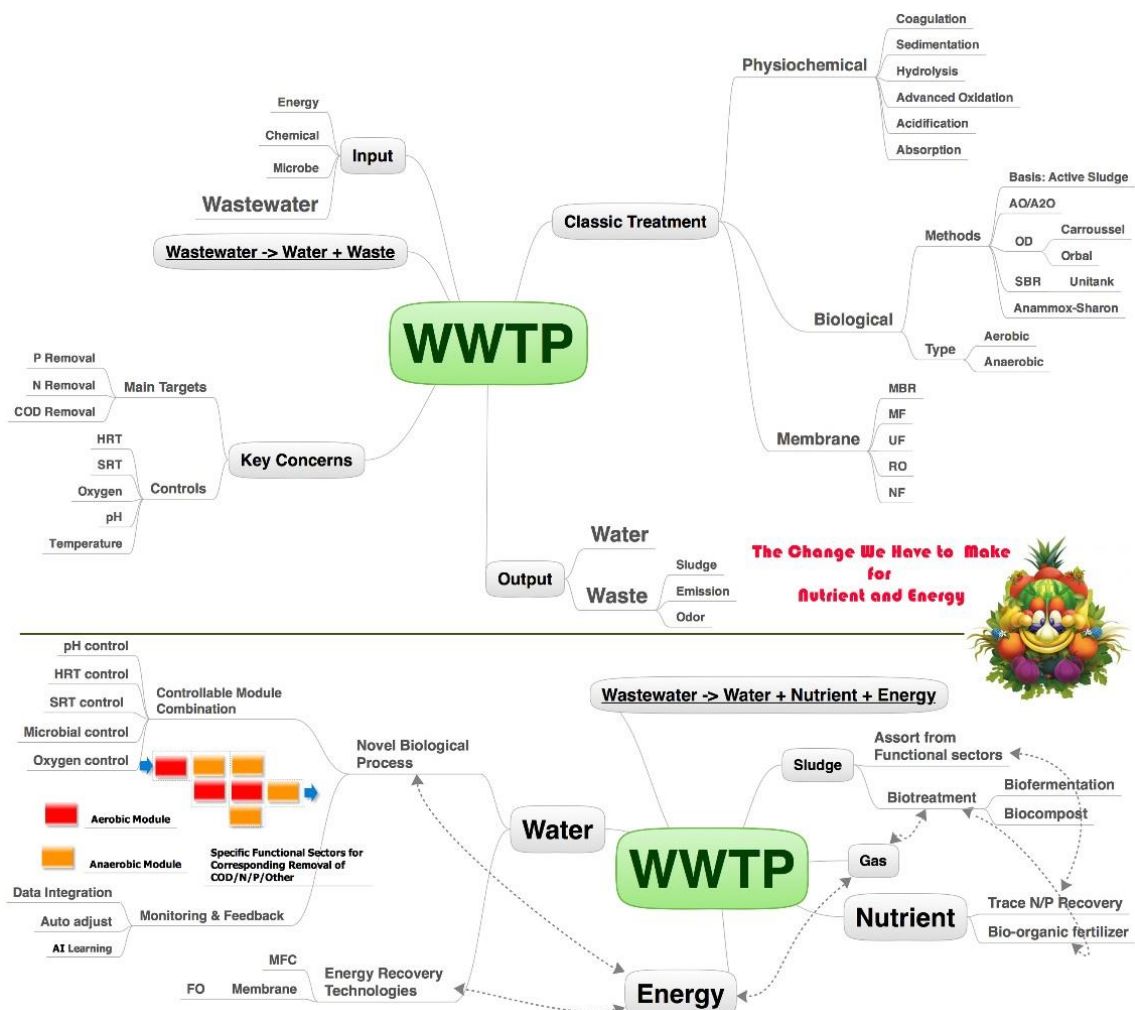


Figure: Schema of Nutrient and Energy Recovery from Wastewater Treatment Plants

**9. Ifigeneia Kokkali** *ifigeneia.kokkali@gmail.com*

Nationality: Greek

Original Affiliation: Institut Français d'Urbanisme, Université Paris-Est

Field: Urban Studies

*Poster: Unpacking urban diversity: insights from Milan*

Profound transformations in the world economy, together with increasing human mobility have contributed to the spectacular diversification of urban dwellers across the globe, be it ethno-cultural, religious, linguistic, gender, class, or of lifestyles. The expression of this diversity gradually becomes visible in all the big cities of Europe, including Milan.

*Poster: Disimballando diversità urbane: intuizioni da Milano*

Le profondi trasformazioni degli ultimi anni nell'economia mondiale assieme con l'aumento della mobilità umana hanno contribuito ad una spettacolare diversificazione delle abitazioni umane in tutto il mondo con diversità etno-culturale, religiosa, linguistica, di genere, di classe o di stili di vita. L'espressione di questa diversità diventa gradualmente sempre più visibile in tutte le grandi città Europee, tra cui Milano.



Figure: "Capodanno Cinese" Milano 2015



**10. Eaton Shane** shane.eaton@gmail.com

Nationality: Canadian

Original Affiliation: University of Toronto, Canada

Field: Physics

Poster: Ultrafast laser fabrication of green microdevices for environmental sustainability.

(Scrittura col laser a femtosecondi di circuiti microfluidici a favore dell'ambiente)

Vibhav Bharadwaj, Diogo P. Lopes, Rebeca Martínez Vázquez, Shane M. Eaton

Artificial photosynthesis, a process which captures sunlight to store its energy in the chemical bonds of molecular hydrogen and oxygen, has been demonstrated using photo-electrochemical cells which combine light absorbing molecules for photo-induced redox processes, water oxidation catalysts, hydrogen evolving catalysts, anode/cathode for an external circuit pathway for electrons, and a membrane to physically separate the products. Here we demonstrate how femtosecond laser microfabrication is applied to create a microfluidic device able to achieve artificial photosynthesis under sunlight exposure, where reagents flow in microchannels, mimicking the capillaries of a natural leaf. A microfluidic approach to this artificial photosynthesis is beneficial since it uses less reagents, enables precise flow conditions, shorter reaction and times, in a reusable platform.

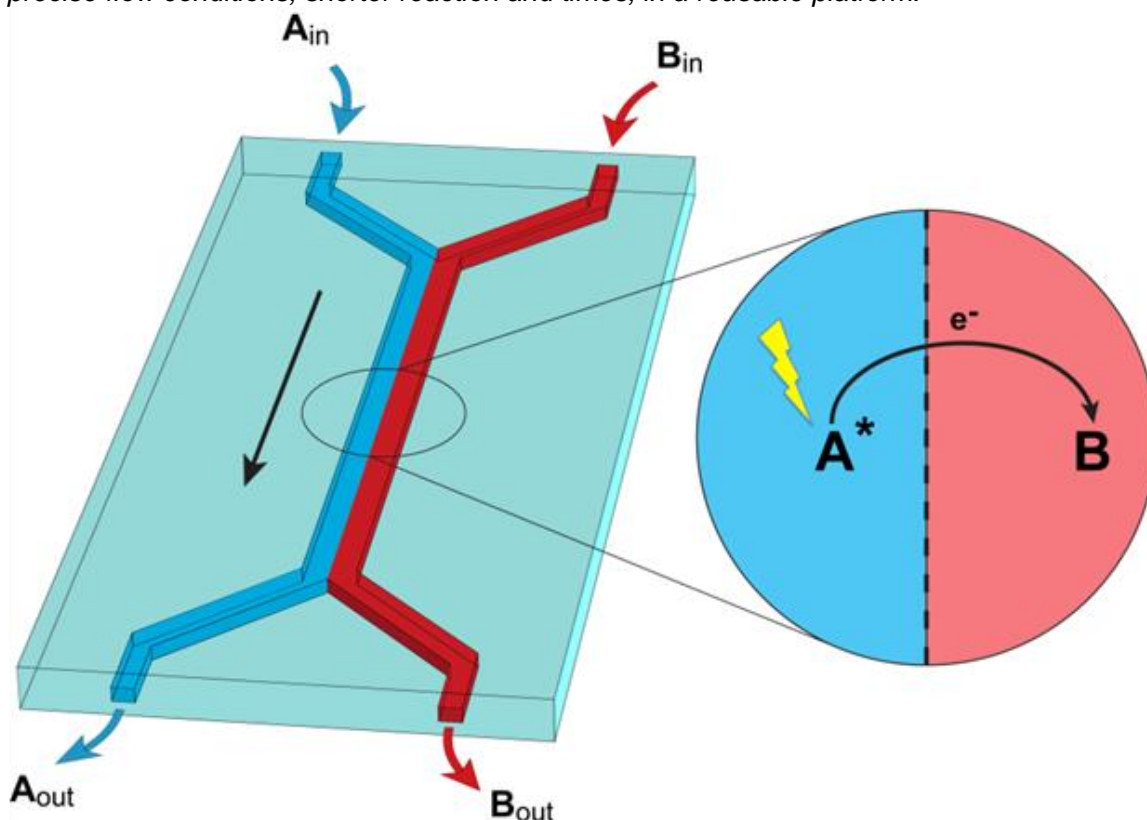


Figure: Microfluidic bi-channel network formed by femtosecond laser featuring a laminar flow of donor and acceptor solutions, where photoinduced electron-transfer processes at the interface is optimized.

**11. Surya SK Guduru (Sameer) sameer.sssu@gmail.com**

Nationality: Indian

Original. Affiliation: Center for Nanoscience and Technology, Istituto Italiano di Tecnologia & Politecnico di Milano, Italy

Field: Physics

Poster: Femtosecond laser micromachining of optical components and microfluidic structures for wavelength selective light harvesting in lab-on-chip applications.

(Scrittura col laser a femtosecondi di componenti ottici per raccogliere la luce per lab-on-chip)

Authors: Surya S. K. Guduru, Shane M. Eaton

We demonstrate a new modality of femtosecond laser microfabrication where bulk glass is first gently exposed to focused femtosecond laser pulses and then etched by acid to produce smooth microchannels with easily tuned geometries, either on or below the surface. Such micrometer-sized channels, together with laser-formed optical waveguides and Fresnel lenses, are used for energy-saving lab-on-chip and light harvesting applications.

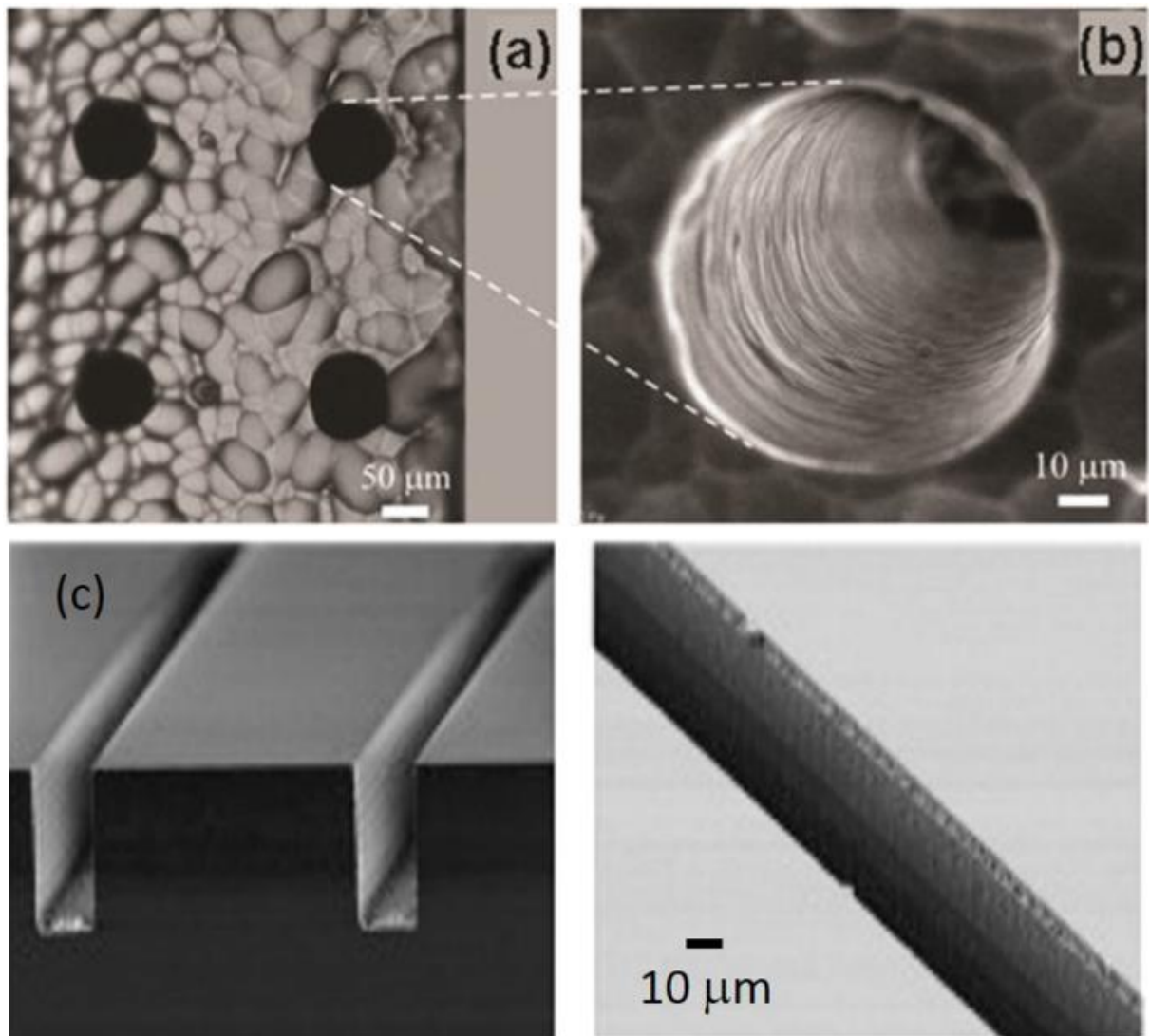


Figure: Buried microchannels (a),(b) and surface microchannels (c) formed by femtosecond laser irradiation followed by chemical etching.

**12. Toney Teddy Fernandez** [toney.teddyfernandez@gmail.com](mailto:toney.teddyfernandez@gmail.com)

Nationality: Indian

Original Affiliation: Mahatma Gandhi University, Kerala, India

Field: Physics

Poster : 3D femtosecond laser microfabrication for telecom and bio-sensing applications.  
 (Scrittura col laser a femtosecondi di circuiti fotonici)

Authors : Toney T. Fernandez, Belén Sotillo, Shane M. Eaton

Femtosecond laser microprocessing is a direct, maskless fabrication technique that has attracted much attention in the past 10 years due to its unprecedented versatility in the 3D patterning of transparent materials. Two common modalities of femtosecond laser microfabrication include buried optical waveguide writing and surface laser ablation, which have been applied to a wide range of transparent substrates including glasses, polymers and crystals. In two photon polymerization, a third modality of femtosecond laser fabrication, focused femtosecond laser pulses drive photopolymerization in photoresists, enabling the writing of complex 3D structures with submicrometer resolution. In this paper, we discuss several microdevices realized by these diverse modalities of femtosecond laser microfabrication, for applications in telecommunications and bio-sensing.

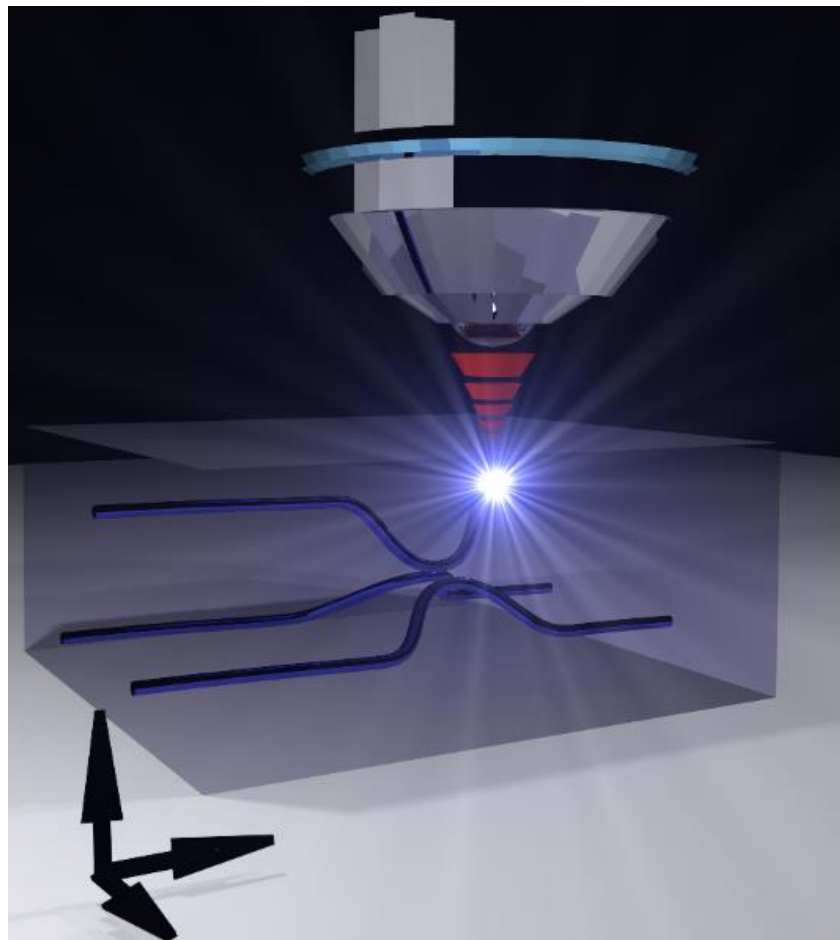


Figure: Focused femtosecond laser pulses are used to write optical waveguides in 3D geometries for telecom and bio-sensing applications.



**13. Name:** **Vikas Kumar** [nasavikas@gmail.com](mailto:nasavikas@gmail.com)

Nationality : Indian

Devi Ahilya University, Indore, India

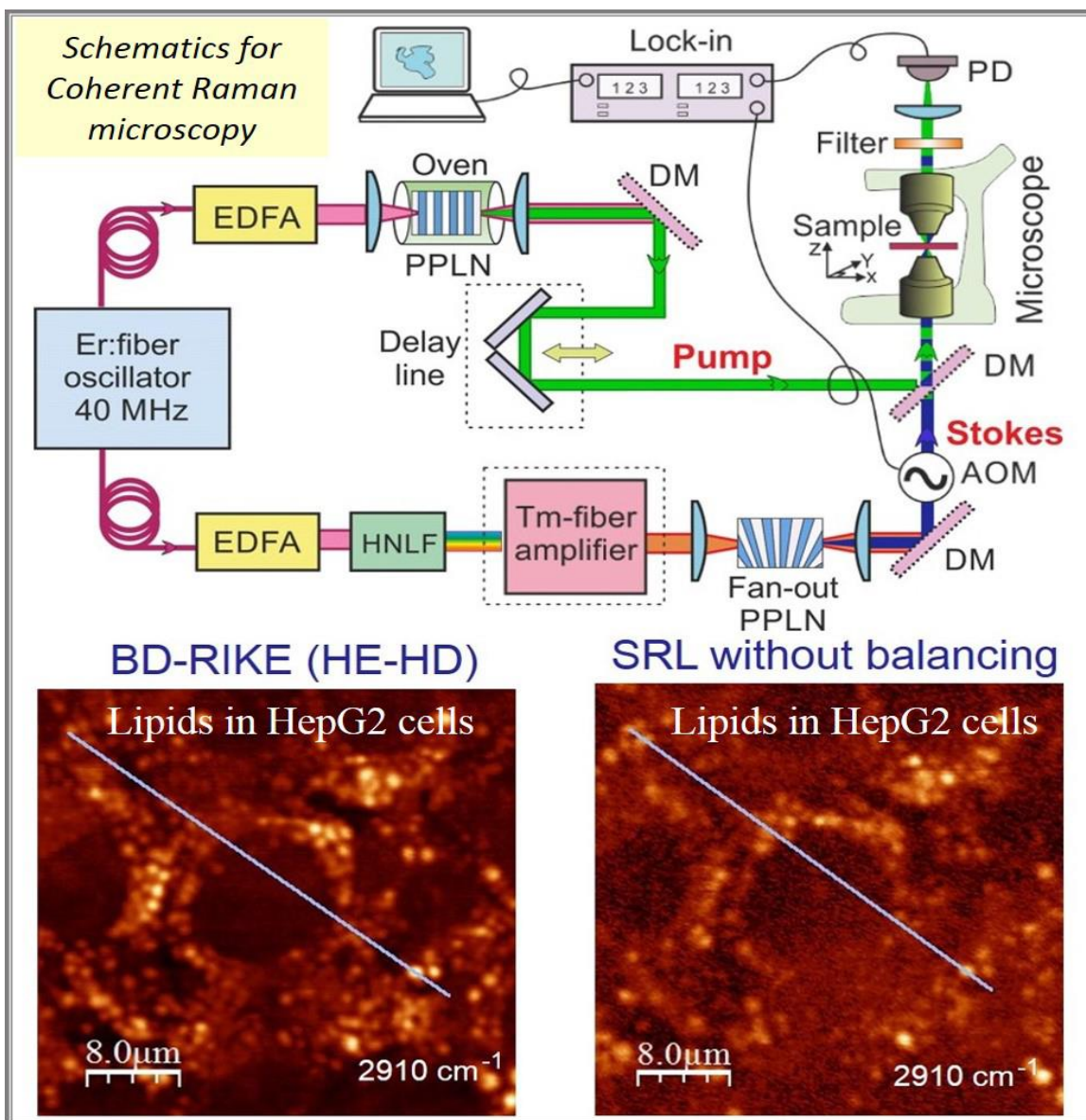
Field: Physics

Poster: Coherent Raman Microscopy for Biomedical applications

*Microscopia Raman coerente per applicazioni biomediche*

Authors : Vikas Kumar\*, Francesco Crisafi, Gustavo Ciardi, Dario Polli, Marco Marangoni, Giulio Cerullo.

Coherent Raman scattering (namely CARS & SRS) is a label-free vibrational contrast imaging technique. The vibrational contrast enables the selective probing of a wide variety of molecules that are essential to cellular life, ranging from lipids, water and proteins, to carbohydrates and nucleic acids. The vibrational method is thus able to investigate the signatures of healthy and diseased tissue by directly visualizing the tissue's most essential ingredients. In addition, external agents such as topically applied drugs can be seen through select molecular vibrations, which is directly relevant to pharmaceutical research.



Thanks for your attention  
PIF team & friends

