



Biofotonica

NanoMedicina e Biotecnologie

G. Chirico

M. Collini

L. D'Alfonso

L. Sironi

M. Borzenkov

M. Bouzin

Out of the randomness....

Ambiti di ricerca

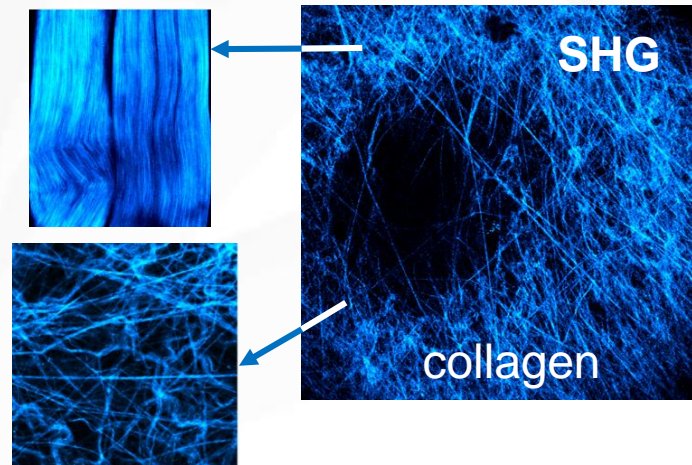
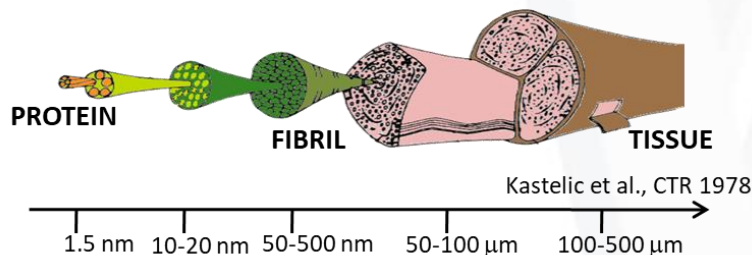
- **Tecniche di imaging ottico per le biotecnologie**
- **Spettroscopie e microscopie ottiche di correlazione e super-risoluzione**
- **Nanomedicina: devices nanostrutturati per la terapia**

Ambiti di ricerca

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Non-linear Microscopy and Spectroscopy

- Two-photon excitation microscopy (GA)
- Second and Third Harmonic generation microscopy
- Distributed Phasor (FT) analysis on images
- Digital pathology



SCIENTIFIC REPORTS

Correction: Author Correction

OPEN
2017

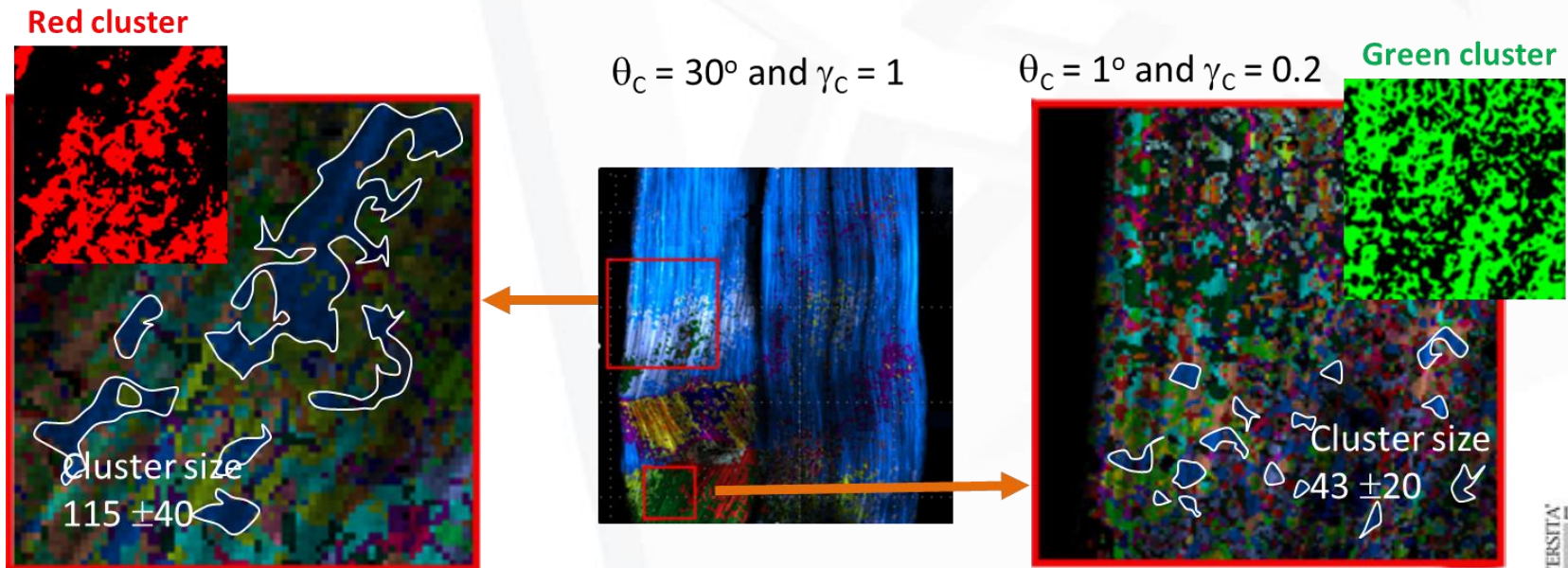
μ MAPPS: a novel phasor approach to second harmonic analysis for in vitro-in vivo investigation of collagen microstructure

Received: 24 August 2017

Accepted: 28 November 2017

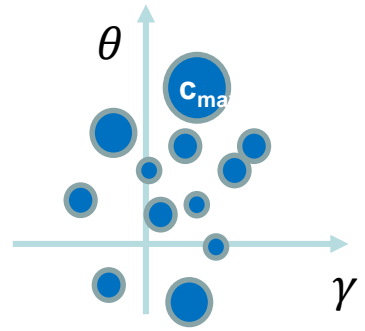
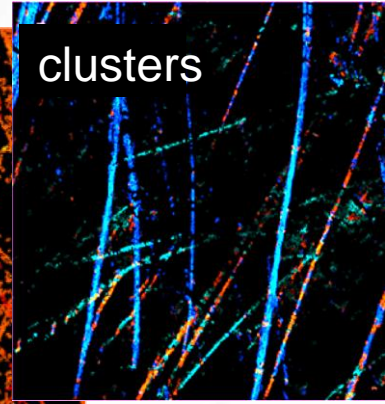
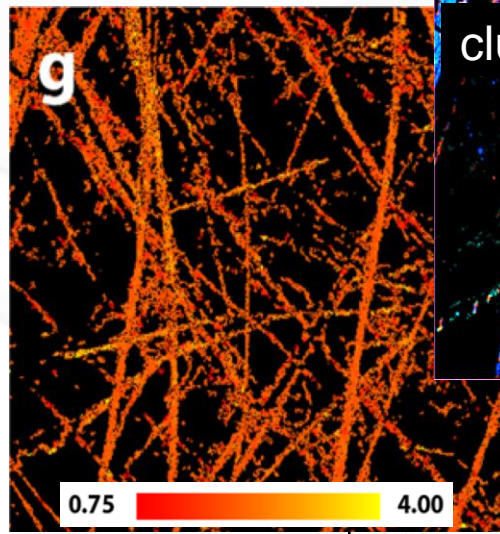
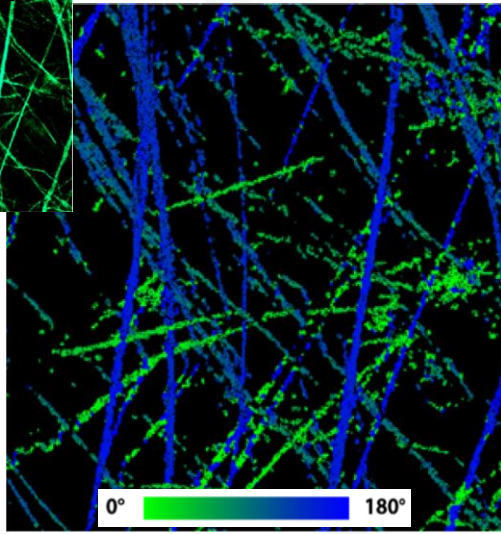
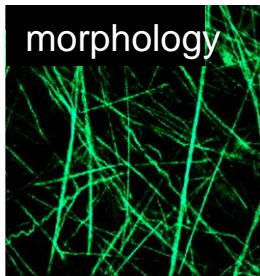
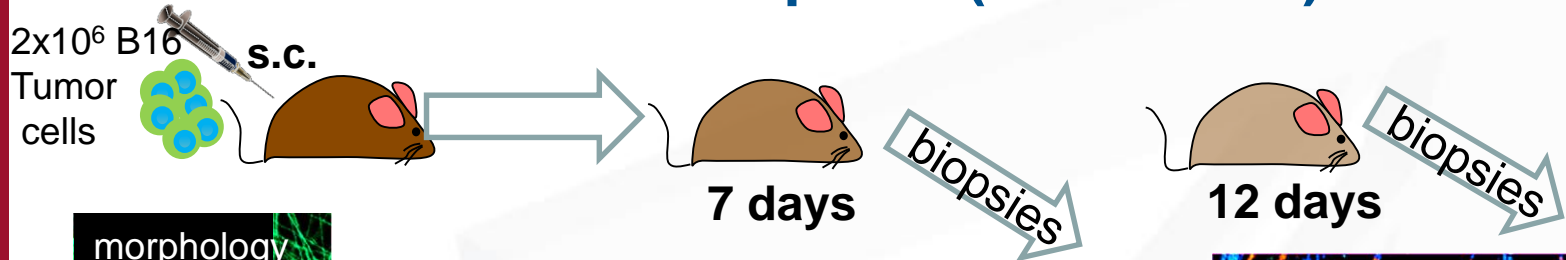
Published online: 12 December 2017

F. Radaelli¹, L. D'Alfonso¹, M. Collini^{1,3}, F. Mingozzi², L. Marongiu², F. Granucci², I. Zanoni^{2,4}, G. Chirico^{1,3} & L. Sironi¹

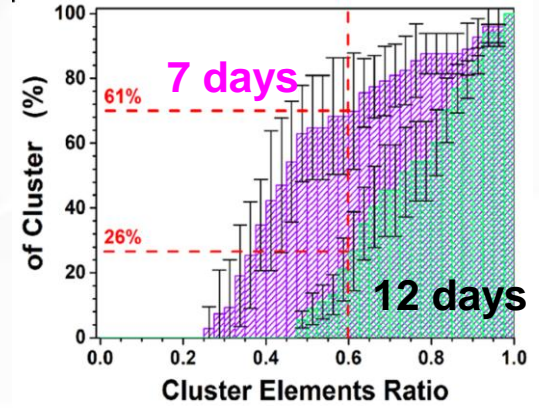


Second Harmonic microscopy and clusterization \rightarrow Machine Learning

Tumor ECM in biopsies (melanoma)



$$CER_i = \frac{Size_i}{Size_{max}}$$



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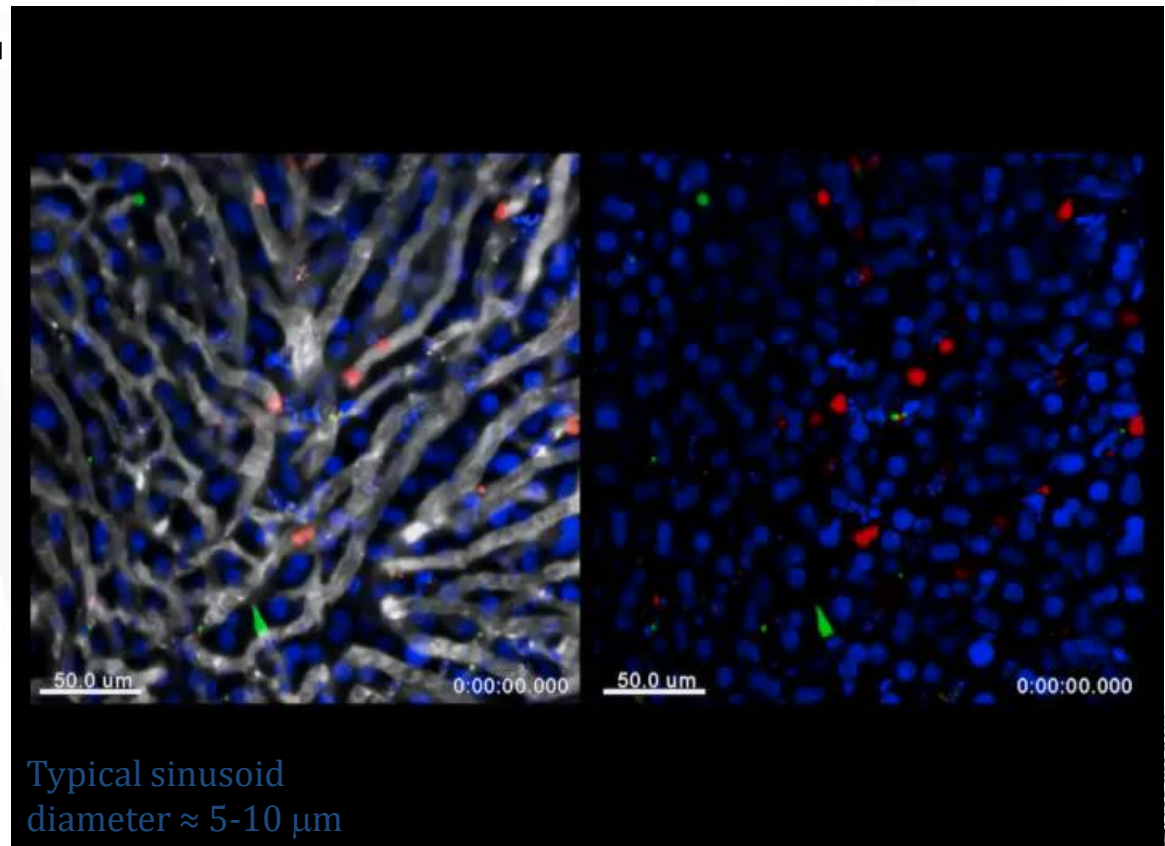
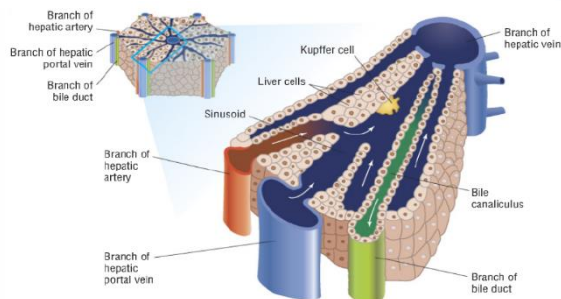
OPEN
2014SUBJECT AREAS:
PERMEATION AND
TRANSPORT
MICROSCOPY

In Vivo Flow Mapping in Complex Vessel Networks by Single Image Correlation

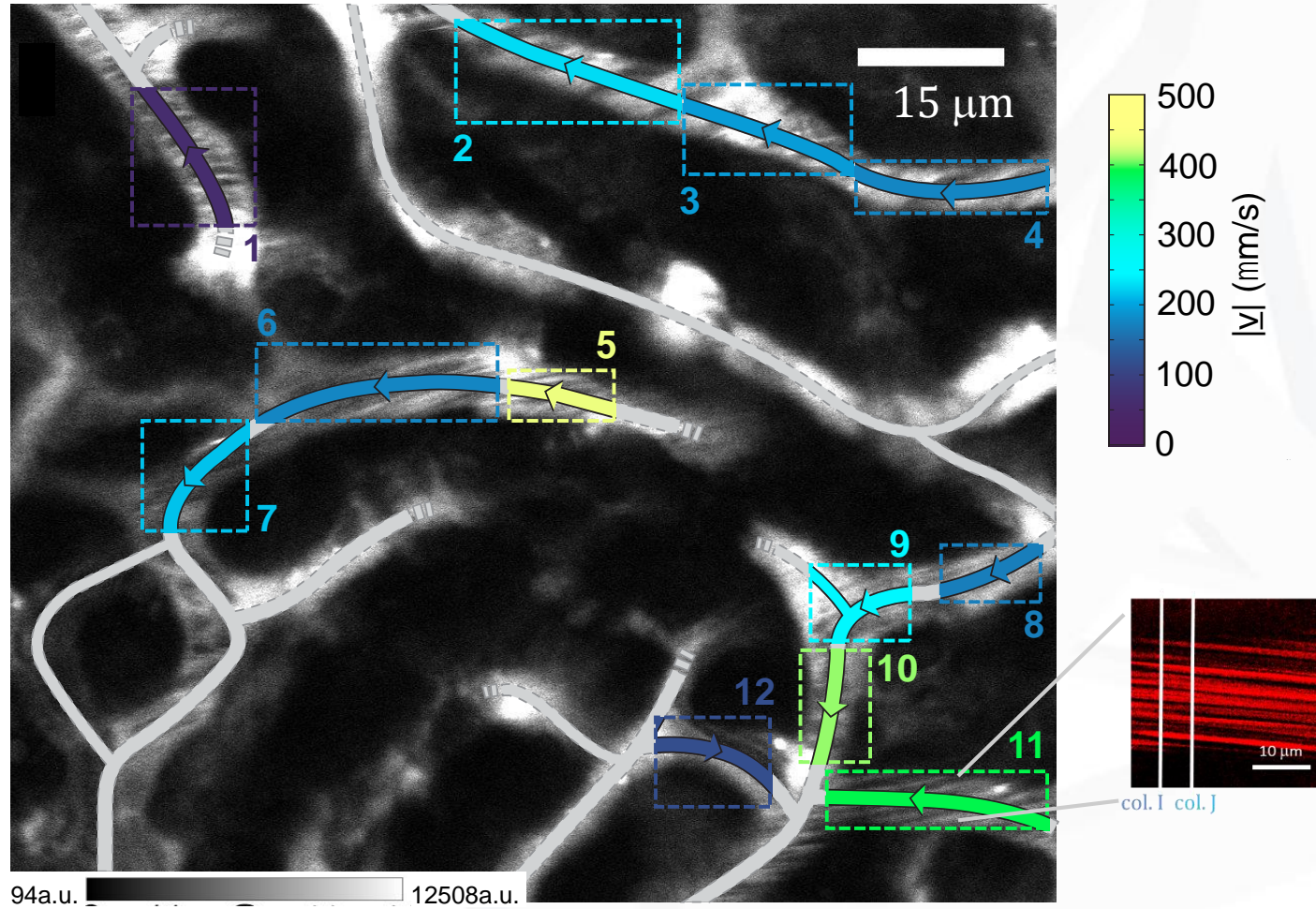
Laura Sironi^{1*}, Margaux Bouzin^{1*}, Donato Inverso^{2,4}, Laura D'Alfonso¹, Paolo Pozzi¹, Franco Cotelli³, Luca G. Guidotti², Matteo Iannacone^{2,4}, Maddalena Collini¹ & Giuseppe Chirico¹

SCIENTIFIC REPORTS | 4 : 7341 | DOI: 10.1038/srep07341

ANALISI DI EMODINAMICA IN VIVO



Typical sinusoid
diameter $\approx 5-10 \mu\text{m}$



5-nm quantum dots; $\lambda_{\text{exc}}=900$ nm

Spatiotemporal Image Correlation Analysis for 3D Flow Field Mapping in Microfluidic Devices

2018

Nicolo' G. Ceffa,[§] Margaux Bouzin,^{§,†} Laura D'Alfonso,[§] Laura Sironi,^{*,§} Cassia A. Marquezin,[¶] Ferdinando Auricchio,[§] Stefania Marconi,[§] Giuseppe Chirico,^{§,#} and Maddalena Collini^{*,§,#,Ⓜ}

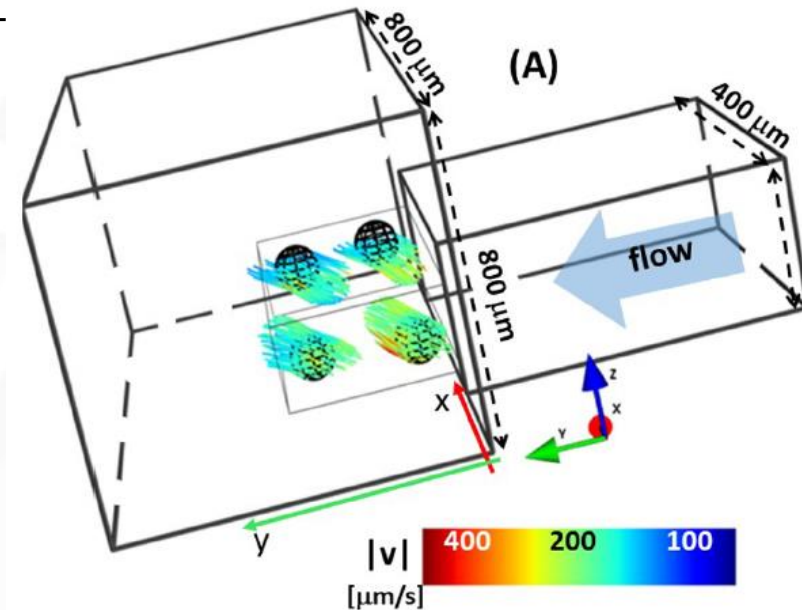
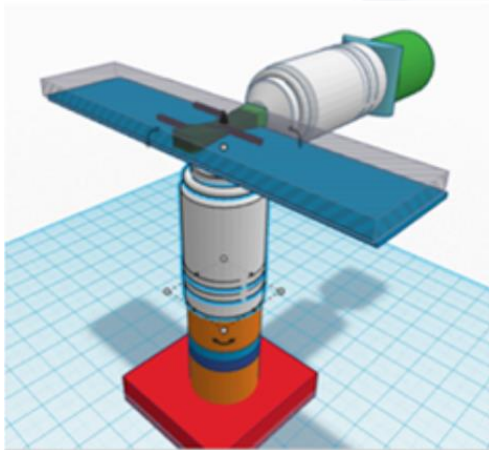
[§]Dipartimento di Fisica, Centro di Nanomedicina, Università degli Studi di Milano-Bicocca, Piazza della Scienza 3, 20126, Milano, Italy

[#]CNR-ISASI, Institute of Applied Sciences and Intelligent Systems, Via Campi Flegrei 34, 80078 Pozzuoli, Italy

[§]Dipartimento di Ingegneria Civile e Architettura, Università degli Studi di Pavia, 27100 Pavia, Italy

[¶]Instituto de Física, Universidade Federal de Goiás, Goiânia, Goiás 74.690-900, Brazil

$$C(\xi, \eta, \tau) = \frac{\langle \delta I(x, y, t) \delta I(x + \xi, y + \eta, t + \tau) \rangle_{x,y,t}}{\langle I(x, y, t) \rangle_{x,y,t}^2}$$



Article

An Intermittent Model for Intracellular Motions of Gold Nanostars by k-Space Scattering Image Correlation

Margaux Bouzin,¹ Laura Sironi,¹ Giuseppe Chirico,¹ Laura D'Alfonso,¹ Donato Inverso,² Piersandro Pallavicini,³ and Maddalena Collini^{1,*}

¹Physics Department, Università degli Studi di Milano-Bicocca, Milan, Italy; ²Division of Immunology, Transplantation and Infectious Diseases, IRCCS, San Raffaele Scientific Institute, Milan, Italy; and ³Chemistry Department, Università degli Studi di Pavia, Pavia, Italy

Biophysical Journal Volume 109 December 2015 2246–2258

Out of the Randomness: Correlating Noise in Biological Systems

Biophysical *Journal*

Biophysical Perspective

Maddalena Collini,^{1,2} Margaux Bouzin,¹ and Giuseppe Chirico^{1,2,*}

¹Dipartimento di Fisica e Centro di Nanomedicina, Università degli Studi di Milano-Bicocca, Milan, Italy and ²CNR-ISASI, Center for Complex Systems, Pozzuoli, Italy

Biophysical Journal 114, 2298–2307, May 22, 2018

Premio giovani talenti 2018

Margaux Bouzin:

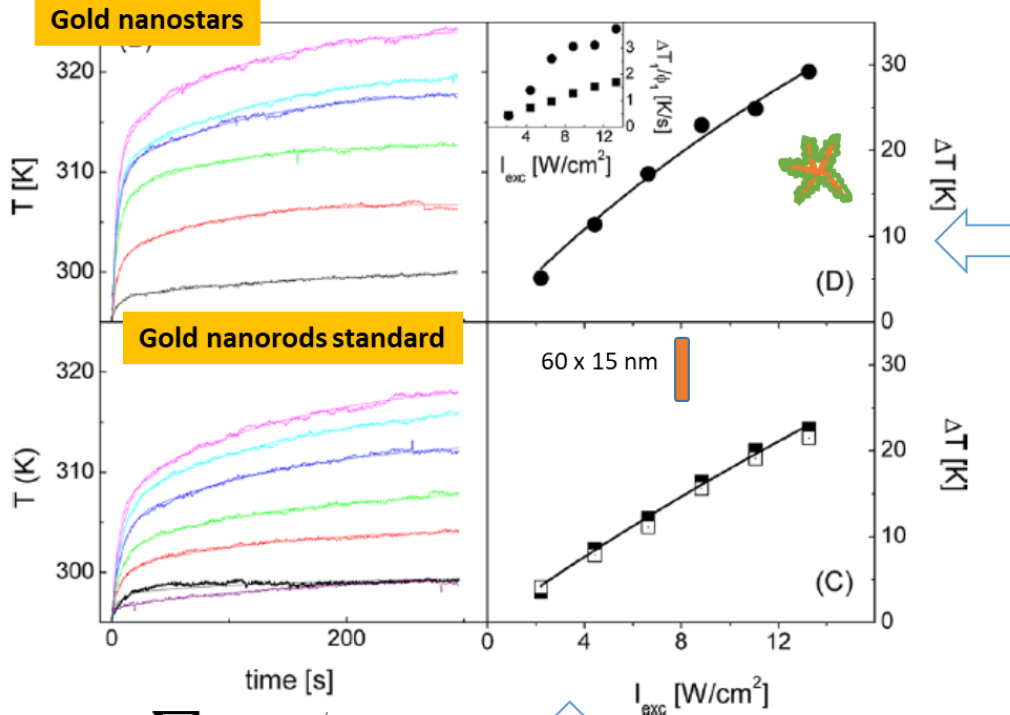
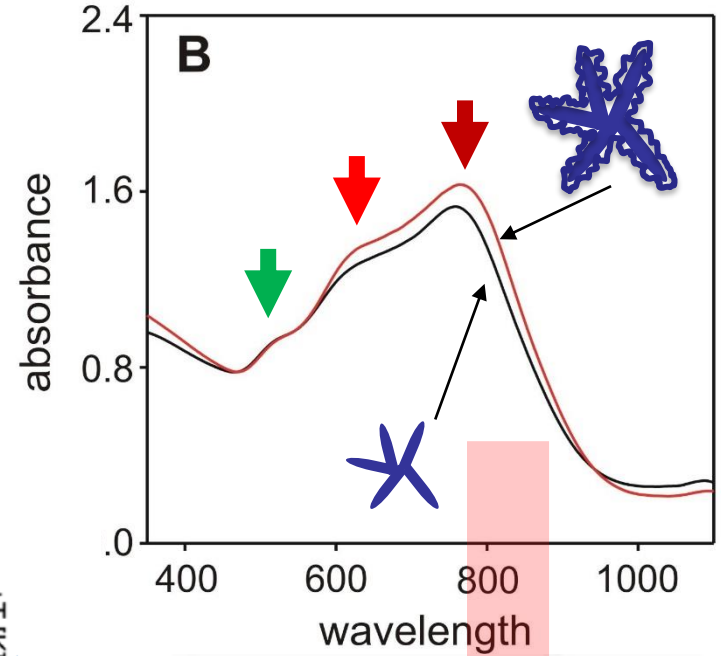
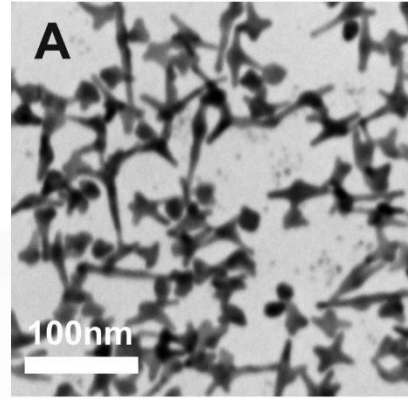
Per i suoi rilevanti contributi a studi di processi diffusivi, in sistemi biologici complessi, basati sulla innovativa tecnica di spettroscopia a correlazione di immagini



Ambiti di ricerca

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Plasmonic Resonances Engineering



$$\Delta T \approx \sum_i \delta T_i e^{-t/\phi_i}$$

- Hyperthermal therapy
- Cancer eradication
- Neuron cells differentiation
- Superresolution thermal imaging

Fabrication of Inkjet-Printed Gold Nanostar Patterns with Photothermal Properties on Paper Substrate

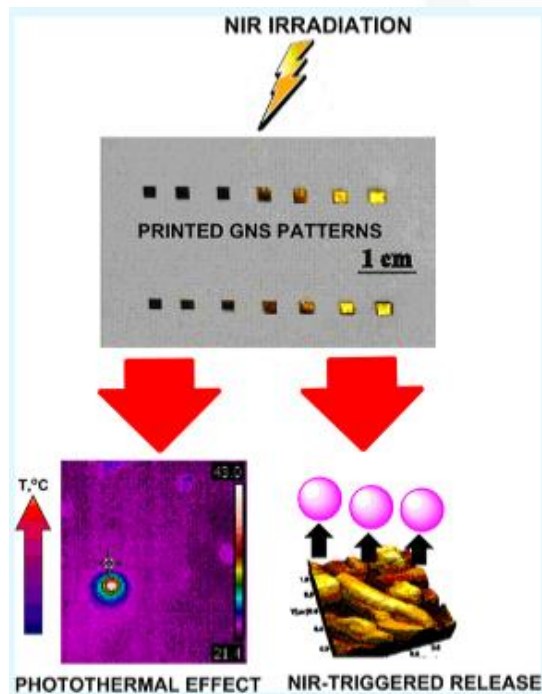
Mykola Borzenkov,^{*,†} Anni Määttänen,^{*,‡} Petri Ihalainen,[‡] Maddalena Collini,[†] Elisa Cabrini,[§] Giacomo Dacarro,[§] Piersandro Pallavicini,[§] and Giuseppe Chirico[†]

[†]Department of Physics "G. Occhialini", Nanomedicine Center, University of Milano-Bicocca, piazza della Scienza 3, 20126 Milan, Italy

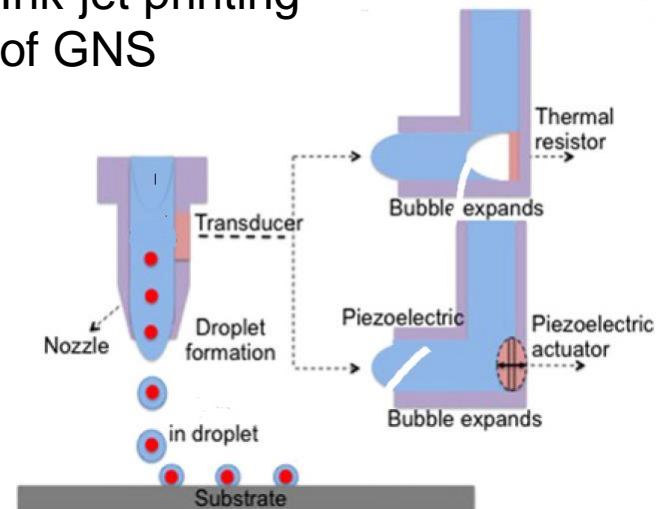
[‡]Laboratory of Physical Chemistry, Center for Functional Materials, Åbo Akademi University, Porthaninkatu 3-5, 20500 Turku, Finland

[§]Department of Chemistry, University of Pavia, viale Taramelli 12, 27100 Pavia, Italy

ACS **APPLIED MATERIALS**
& INTERFACES



Ink-jet printing of GNS

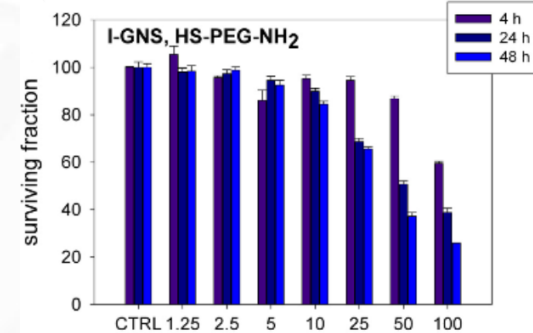
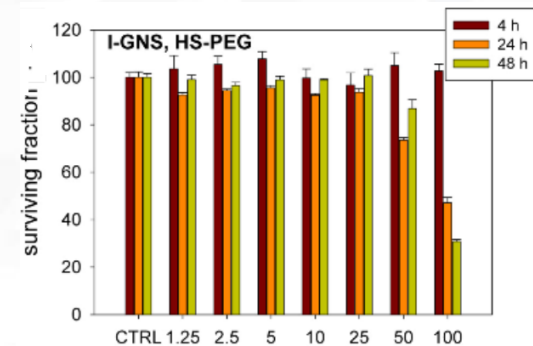
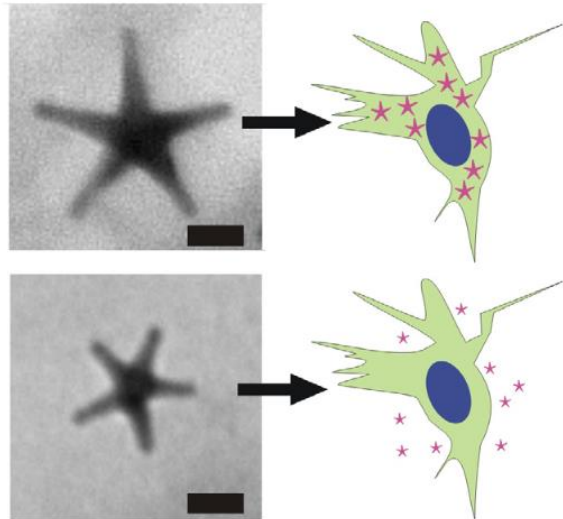
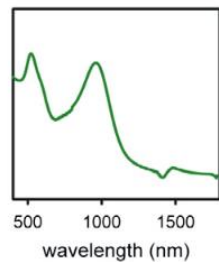
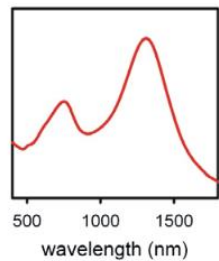


Synthesis of reduced-size gold nanostars and internalization in SH-SY5Y cells

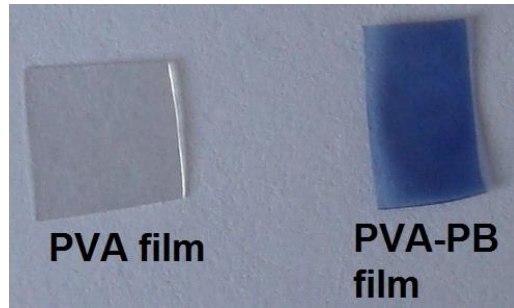


Giacomo Dacarro ^{a,*}, Piersandro Pallavicini ^{a,*}, Serena Maria Bertani ^a, Giuseppe Chirico ^b, Laura D'Alfonso ^b, Andrea Falqui ^c, Nicoletta Marchesi ^d, Alessia Pascale ^d, Laura Sironi ^b, Angelo Taglietti ^a, Efisio Zuddas ^c

Journal of Colloid and Interface Science 505 (2017) 1055–1064



unimib
unimi
unipv

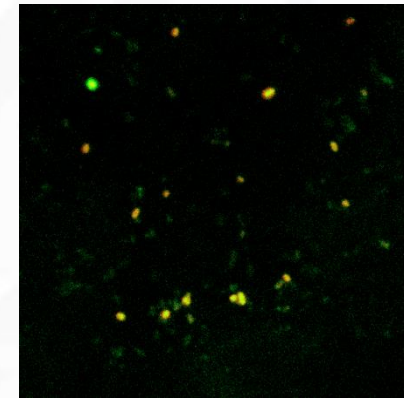


effetto antibatterico
su *Pseudomonas*
Aeruginosa

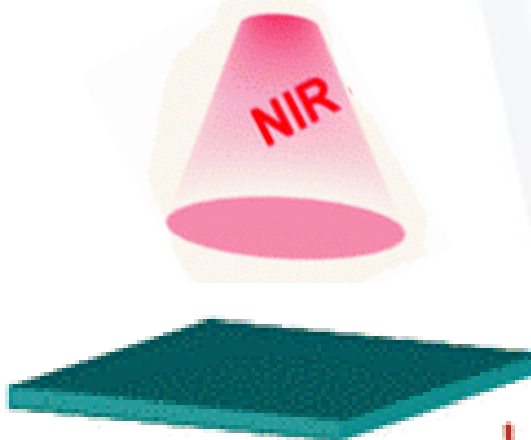


effetto antibatterico
del solo gel
(Prussian Blue NP)

DEAD/ALIVE= 0.6 ± 0.05

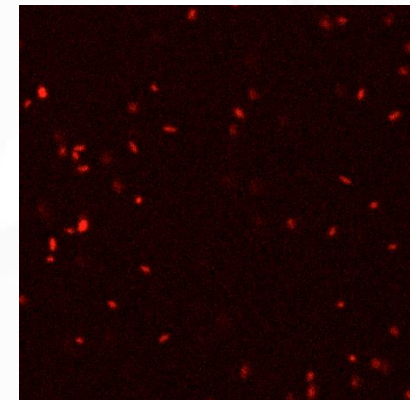


700 nm

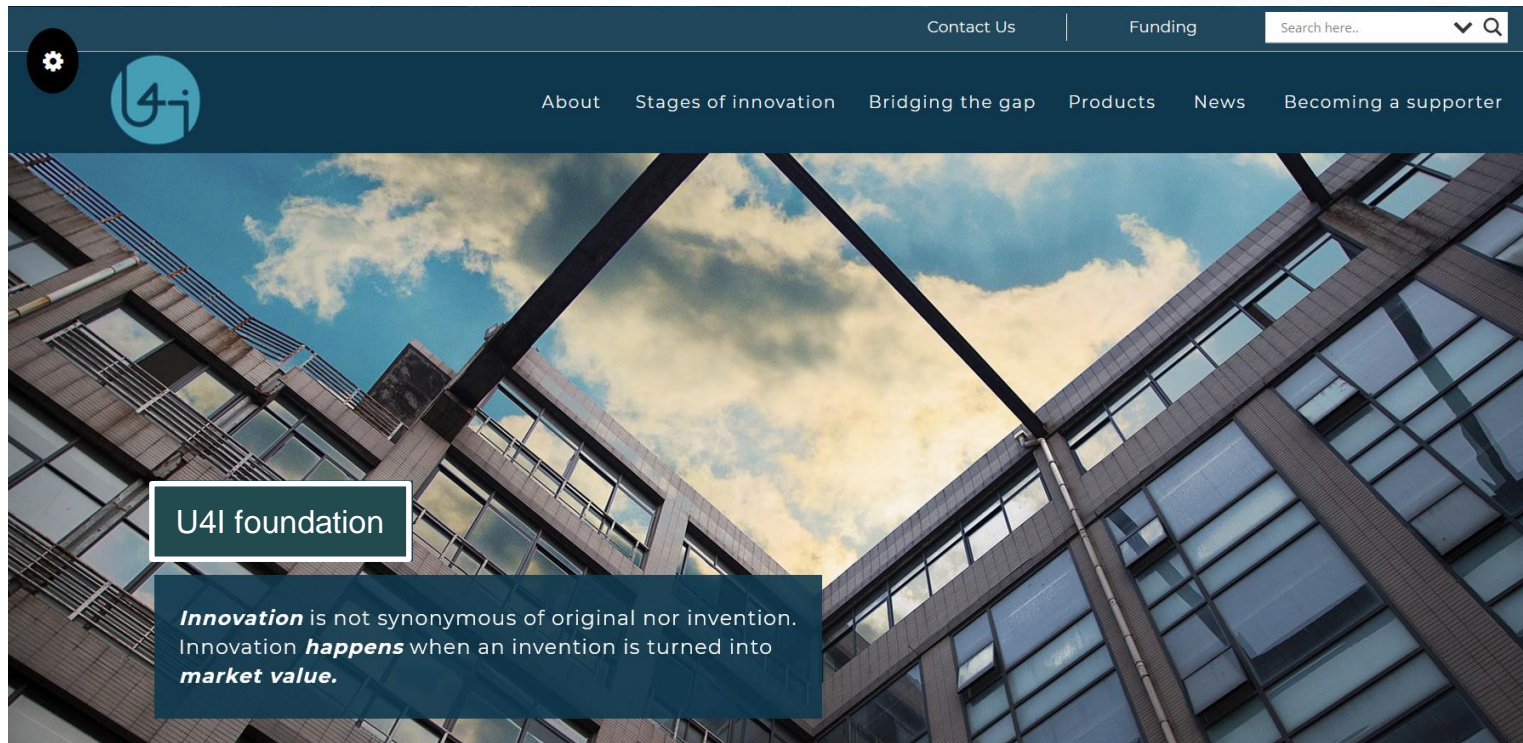


effetto antibatterico
irraggiamento @700nm

DEAD/ALIVE= 2.3 ± 0.2



Antibacterial surfaces



PI: Mykola Borzenkov

G. Chirico, M. Collini, P. Pallavicini

Department of Physics, Nanomedicine Center

**NanoThemoPatch: Novel Patches Capable to
Convert Light into Heat for Medical Application**

BREVETTO IT DEPOSITATO, in estensione

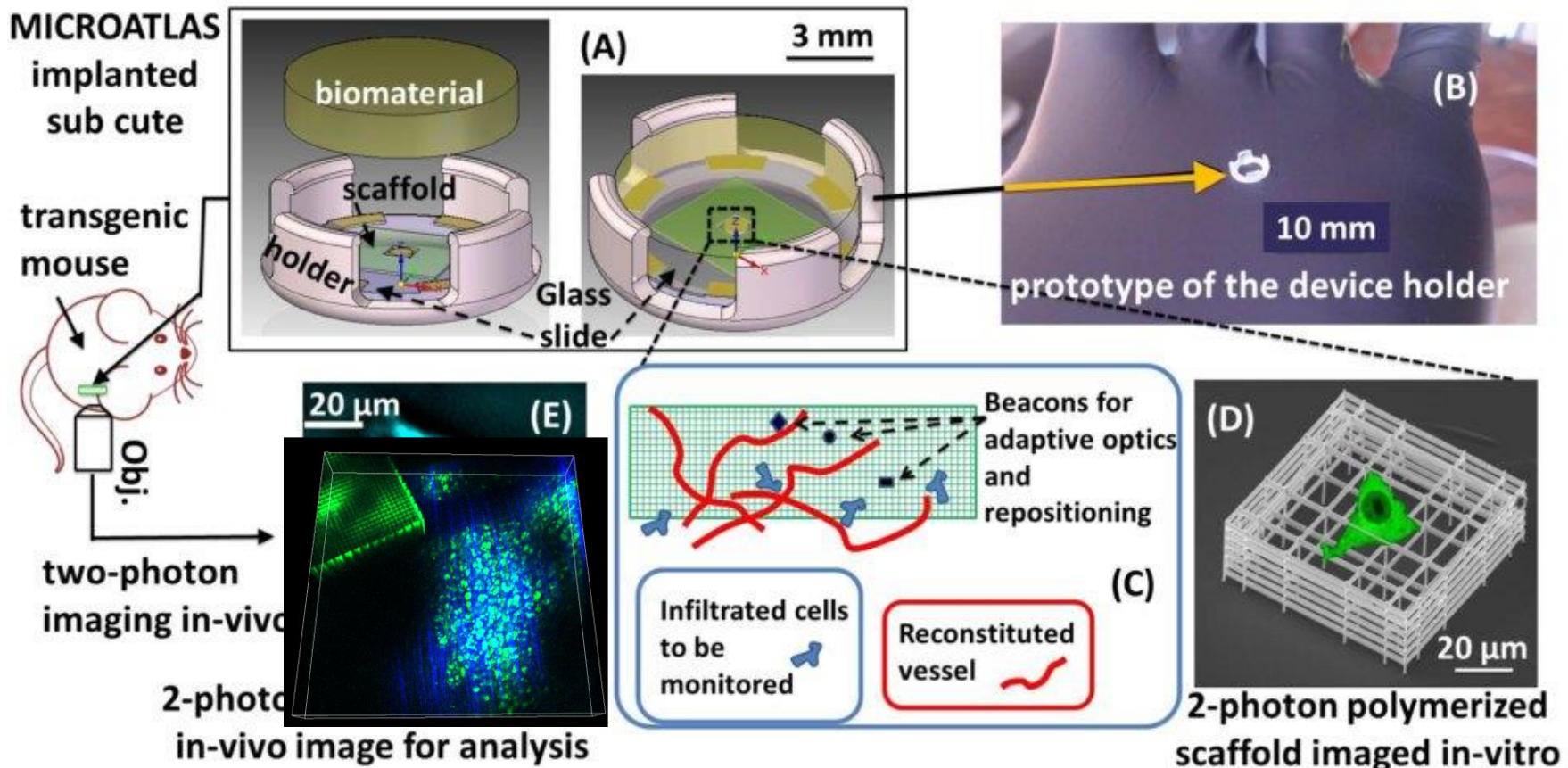
Terza missione

G. Pessina – P. Carniti unimib

Microatlas: un dispositivo per impianti controllati in «modelli animali»

Brevetto approvato polimi+unimib+cnr in estensione EU

unimib
polimi
CNR
Crete



People

Strutturati

- Giberto Chirico
- Maddalena Collini
- Laura D'Alfonso
- Laura Sironi

Post-doc

- Mykola Borzenkov
- Margaux Bouzin

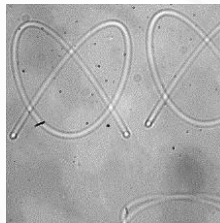
dottorandi

- Bahador Zeynali
- Mario Marini

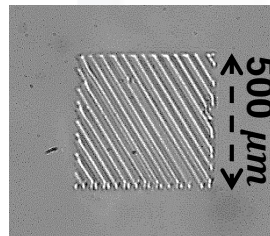
I giovani...

Bahador Zeynali

- Nanoscribing
Proteinaceous Microstructures
Induced via Near Infrared Laser
Two-Photon Excitation



- Non-linear absorption
Z-scan to probe high-order
non-linearities in biomaterials



Mario Marini

- Photo-activated thermal imaging

