

# Curriculum Vitae et Studiorum

## Filippo Recrosi

### General Informations

### Position

- Sept 2021 - present: PostDoc researcher (ICAR/08) at Università La Sapienza, Dipartimento di Ingegneria Strutturale e Geotecnica (DISG), Roma.  
Research Project: “Mechanics and diffusion in intelligent actively-remodeling bio polymer gels”.  
Tutor: Prof. Paola Nardinocchi
- Sept 2020 - Aug 2021: PostDoc researcher (ICAR/08) at Università La Sapienza, Dipartimento di Ingegneria Strutturale e Geotecnica (DISG), Roma.  
Research Project: “Modelli meccanici per la crescita tumorale”.  
Tutor: Prof. Antonino Favata
- Giu 2019 - May 2020: PostDoc researcher (ICAR/08) at Università degli Studi Roma Tre, Dipartimento di Ingegneria, Roma.  
Research Project: “Processi di accrescimento e rimodellazione nella meccanica dei materiali soffici”.  
Tutor: Prof. Giuseppe Tomassetti
- Nov 2018 - Feb 2019: visiting student at Gran Sasso Science Institute (GSSI), L’Aquila.
- Nov 2015 - Oct 2018: PhD student in Mathematics of Natural, Social and Life Sciences, Gran Sasso Science Institute (GSSI), L’Aquila.
- Fall 2017: visiting at Department of Bioengineering, Imperial College, London.

## Scientific society memberships

- From 2021: Associazione Italiana di Meccanica Teorica e Applicata (AIMETA), Biomeccanica (GBMA) & Meccanica dei Materiali (GMA).
- From July 2018: European Society of Mechanics (Euromech).
- From Sept 2017: European Society of Biomechanics, Italian Chapter (ESB-ITA).
- From 2017: Istituto Nazionale di Alta Matematica (INDAM), Gruppo Nazionale di Fisica Matematica (GNFM).

## Coordination of research projects

- Progetto Giovani 2020 GNFM, granted by INdAM, project funded 3.150,00 €, participating as coordinator.  
Title: “*Cellular diffusion via Phase Field Methods: Blebbing & Plastic Remodeling of ECM*”, prot. numb. U-UFMBA2-2021-000074.

## Awards

- Meccanica dei Materiali–GMA Award for the best PhD Thesis 2020.

## Education

- **PhD in Mathematics in Natural, Social and Life Sciences**, *summa cum laude*, on November 28<sup>th</sup>, 2019, at GSSI & SISSA.  
Title of the Thesis: “*Modeling of biological tissue: diffusion, growth & remodeling, active behaviour*”.  
Advisor: Prof. Rodolfo Repetto (DICCA–University of Genova).  
Co-Advisor: Prof. Amabile Tatone (DISIM–University of L’Aquila).
- **Master’s degree in Mathematics** on December 14<sup>th</sup>, 2015, at Facoltà di Scienze Matematiche, Fisiche e Naturali - Università Cattolica del Sacro Cuore; degree mark: 110/110.  
Title of the Thesis: “*Interplay of Different Environments in Open Quantum Systems*”.  
Advisor: Dr. Giulio Giuseppe Giusteri.  
The Thesis deals with the quantum transport in an ideal chlorophyll aggregate, modeled by a ring of two levels systems connected to a central one-dimensional lead, acting as a sink. The aim is to determine the range of validity, in the presence of different

kinds of disorder on the sites of the ring, of a non-Hermitian effective model, which is derived on phenomenological basis, with respect to the Haken-Strobl model, which considers, instead, the trace over the lead degrees of freedom of the full Hamiltonian. In addition to what can be found in literature, the study of dynamical disorder is discussed.

- **Master's degree in Physics** on April 28<sup>th</sup>, 2014, at Facoltà di Scienze Matematiche, Fisiche e Naturali - Università Cattolica del Sacro Cuore; degree mark: 110 cum laude/110.

Title of the Thesis: *“Dynamics of Slender Filaments in Viscous Fluids”*.

Advisor: Prof. Alfredo Marzocchi.

The Thesis deals with the free fall of a body with a small aspect ratio within a viscous fluid at very low Reynolds number. An Iterative Procedural Scheme is presented to simulate the body motion as a quasi-static evolution process. This iterative method uses a set of material/geometric constraints to determine the body shape, and the Singularity Method to determine the related surrounding flow by means of the superposition of fundamental solutions of the Stokes equation and their derivatives. In addition to what can be found in literature, the effects due to the twist of the body are modeled.

- **Bachelor's degree in Physics** on January 12<sup>th</sup>, 2012, at Facoltà di Scienze Matematiche, Fisiche e Naturali - Università Cattolica del Sacro Cuore; degree mark: 110 cum laude/110.

Title of the Thesis: *“Magnetohydrodynamics equations and Turbulent Dynamics in Plasma”*.

Advisor: Dr. Giulio Giuseppe Giusteri.

## Teaching

AA 2021–2022:

- **Matematica e Informatica** (MAT/07; ING-INF/05), Corso di Laurea in Scienze dell’Alimentazione e della Nutrizione Umana; Facoltà Dip. Scienze e Tecnologie per l’Uomo e l’Ambiente, UCBM-Roma;

AA 2020–2021:

- **Matematica e Informatica** (MAT/07; ING-INF/05), Corso di Laurea in Scienze dell’Alimentazione e della Nutrizione Umana; Facoltà Dip. Scienze e Tecnologie per l’Uomo e l’Ambiente, UCBM-Roma;
- **Meccanica e Termodinamica** (FIS/03), Corso di Laurea in Ingegneria Industriale; Facoltà Dip. di Ingegneria, UCBM-Roma.

AA 2019–2020:

- **Laboratorio Didattico di Dinamica delle Strutture** (ICAR/08), Corso di Laurea Magistrale in Ingegneria Civile Per La Protezione Dai Rischi Naturali, Curriculum: Strutture; Università Degli Studi Roma Tre.
- **Meccanica e Termodinamica** (FIS/03), Corso di Laurea in Ingegneria Industriale; Facoltà Dip. di Ingegneria, UCBM-Roma.

## Publications

- A. Favata, R. Paroni, F. Recrosi, G. Tomassetti “*Young modulus of healthy and cancerous epithelial tissues from indirect measurements*”, Mechanics Research Communications, 103952 (2022), DOI:10.1016/j.mechrescom.2022.103952.
- R. Abeyaratne, E. Puntel, F. Recrosi, G. Tomassetti “*Surface accretion of a pre-stretched half-space: Biot’s problem revisited*” Journal of the Mechanics and Physics of Solids, 167, 104958 (2022), DOI:10.1016/j.jmps.2022.104958.
- A. Favata, R. Paroni, F. Recrosi, G. Tomassetti “*Competition between epithelial tissue elasticity and surface tension in cancer morphogenesis*”, International Journal of Engineering Science, 176, 103677 (2022), DOI: 10.1016/j.ijengsci.2022.103677.
- F. Recrosi, R. Repetto, A. Tatone, G. Tomassetti “*Mechanical Model of Fiber Morphogenesis in the Liver*”, Proceedings of XXIV AIMETA Conference 2019. AIMETA 2019. Lecture Notes in Mechanical Engineering. Springer, Cham. ISBN: 978-3-030-41057-5, DOI: 10.1007/978-3-030-41057-5\_55.
- A. Tatone, F. Recrosi, R. Repetto, G. Guidoboni “*From species diffusion to poroelasticity and the modeling of lamina cribrosa*”, Journal of the Mechanics and Physics of Solids, 124, 849–870 (2019), DOI: 10.1016/j.jmps.2018.11.017.
- F. Recrosi, A. Tatone, R. Repetto, G. Guidoboni “*Thermodynamical derivation of a nonlinear poroelastic model describing hemodynamics-mechanics interplay in the Lamina Cribrosa*”, JMO: Journal of Modeling in Ophtalmology, vol 2, No 2 (2018) 80-85, ISSN: 2468-3930.
- A. Tatone, F. Recrosi, R. Repetto “*From species diffusion to poroelasticity in modelling the Lamina Cribrosa*”, Proceedings of the XXIII Conference of Italian Association of Theoretical and Applied Mechanics, vol 4, 1893-1912 (2017) ISBN: 978-889-42484-7-0.
- G. G. Giusteri, F. Recrosi, G. Schaller, G. L. Celardo, “*Interplay of different environments in open quantum systems: Breakdown of the additive approximation*”, Phys. Rev. E 96, 012113 (2017), DOI: 10.1103/PhysRevE.96.012113.

## Scientific Communications

- Sept 19<sup>th</sup>-25<sup>th</sup>, 2021. “*Poromechanical model for the IOP-induced Lamina Cribrosa cupping*” **Active materials: from Mechanobiology to Smart Devices**, INdAM Meeting, Cortona.
- Jun 07<sup>th</sup> - 08<sup>nd</sup>, 2021. “*Modeling of biological tissue: diffusion, growth & remodeling, active behaviour*”, **Giovani alla Ricerca - GBMA, GIMC e GMA si incontrano on-line**.
- Sept 10<sup>th</sup> - 22<sup>nd</sup>, 2018. “*Blood perfusion in a mathematical model of fibrotic liver tissue*”, **XLIII Summer School on Mathematical Physics**, Ravello.
- Jul 02<sup>th</sup> - 06<sup>th</sup>, 2018. “*Blood perfusion in a mathematical model of fibrotic liver tissue*”, during the minisymposium: “*Mechanics of Biological Soft Tissue*”, **10<sup>th</sup> European Solid Mechanics Conference (ESMC10)**, Bologna.
- Jun 11<sup>th</sup> - 15<sup>th</sup>, 2018. “*Hemodynamics-mechanics coupling in studying large deformations of Lamina Cribrosa*”, during the minisymposium: “*Biomechanics of the Eye*”, **6<sup>th</sup> European Conference on Computational Mechanics (ECCM6) - 7<sup>th</sup> European Conference on Computational Fluid Dynamics (ECDF7)**, Glasgow.
- Sept 28<sup>th</sup> - 29<sup>th</sup>, 2018. “*Thermodynamical derivation of a nonlinear poroelastic model describing hemodynamics-mechanics interplay in the Lamina Cribrosa*”, during thematic symposium: “*Ocular Biomechanics*”, **VII annual meeting, Italian Chapter of the European Society of Biomechanics (ESB-ITA 2017)**, Roma.
- Sept 04<sup>th</sup> - 16<sup>th</sup>, 2017. “*Simple exemples of configurational forces and hemodynamics-mechanics Interplay in the Lamina Cribrosa*”, **XLII Summer School on Mathematical Physics**, Ravello.
- Jan 07<sup>th</sup> - 08<sup>th</sup>, 2016. “*Traffic flow on a road network using the Aw-Rasclé Model*”, **GSSI Students PDEs Seminar**, GSSI, L’Aquila.

## Schools

- Jun 27<sup>th</sup> - Jul 01<sup>st</sup>, 2022. **C2206-CISM-AIMETA Advanced School on Exploiting the Use of Strong Nonlinearity in Dynamics and Acoustics**, many speakers (CISM, Udine).
- Jun 12<sup>th</sup> - 17<sup>th</sup>, 2022. **25<sup>th</sup> CISM-IUTAM International Summer School on Instability and bifurcation of Solids Including Coupled Field Phenomena**, many speakers (CISM, Udine).

- Feb 24<sup>th</sup> - 28<sup>th</sup>, 2020. **Advanced International School on Imaging, Modeling and Simulation in Biomechanics and Mechanobiology**, many speakers (UCBM & Università degli Studi di Roma Tor Vergata, Roma).
- Gen 30<sup>th</sup>, 2019. “*Meccanica macroscopica con prescrizioni costitutive microscopiche*”, Prof. Antonio Di Carlo (Università La Sapienza, Facoltà di Ingegneria Civile e Industriale, Roma).
- Gen 15<sup>th</sup>, 2019. “*Come costruire campi di sforzo associati a moti molecolari*”, Prof. Paolo Podio Guidugli (Università La Sapienza, Facoltà di Ingegneria Civile e Industriale, Roma).
- Dec 05<sup>th</sup>, 2018. “*Il potere multiscala del concetto di potenza spesa*”, Prof. Paolo Podio Guidugli (Università La Sapienza, Facoltà di Ingegneria Civile e Industriale, Roma).
- Aug 27<sup>th</sup> - 31<sup>th</sup>, 2018. **CIME-EMS Summer School in Applied Mathematics: “The Mathematics of Mechanobiology”**, many speakers (Cetraro).
- June 12<sup>th</sup> - 16<sup>th</sup>, 2017. **23rd CISM-IUTAM International Summer School: “Growth And Remodeling In Soft Biological Tissue”**, many speakers (CISM, Udine).
- January 23<sup>th</sup> - 25<sup>th</sup>, 2017. “*Non-linear Propagation and Non-equilibrium Thermodynamics*”, Prof. Tommaso Ruggeri (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).
- November 14<sup>th</sup> - November 18<sup>th</sup>, 2016. **Life2Math: “A Mathematical Shuttle From Molecules To Neurons To Functions And Back”**, many speakers (Politecnico di Milano, Dipartimento di Matematica).
- February 3<sup>rd</sup> - 5<sup>th</sup>, 2014. “*Thin Elastic Structures, New and Old Models via Variational Convergence*”, Prof. Roberto Paroni (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).
- April 17<sup>th</sup> - 18<sup>th</sup>, 2013. “*Cell Migration*”, Prof. Luigi Preziosi (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).
- February 6<sup>th</sup> - 8<sup>th</sup>, 2012. “*Smart Elasticity, soft- and pseudo-elasticity, memory effects, and other contraptions*”, Prof. Paolo Biscari (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).

## Workshops

- Sept 30<sup>th</sup> - Oct 1<sup>st</sup>, 2021. **RAM3: Recent Advances in Mechanics and Mathematics of Materials** (DISG, Università La Sapienza, Roma).

- Nov 19<sup>th</sup> - 21<sup>th</sup>, 2019. **RAM3: Recent Advances in Mechanics and Mathematics of Materials** (DISG, Università La Sapienza, Roma).
- Giu 06<sup>th</sup> - 08<sup>th</sup>, 2019. **Math From The Body II** (Venezia).
- Oct 08<sup>th</sup> - 11<sup>th</sup>, 2018. **Mathematics for BioMedicine** (Accademia Nazionale dei Lincei - CNR, Roma).
- May 14<sup>th</sup> - 18<sup>th</sup>, 2018. **ESGI: 136<sup>th</sup> European Study Group with industry** (GSSI, L'Aquila).
- Gen 15<sup>th</sup> - 19<sup>th</sup>, 2018. **Modelling Camp** (DICCA, Università degli Studi di Genova, Genova).
- Nov 22<sup>nd</sup> - 24<sup>th</sup>, 2017. **RAM3: Recent Advances in Mechanics and Mathematics of Materials** (DISG, Università La Sapienza, Roma).
- May 29<sup>th</sup> - 31<sup>th</sup>, 2017. **Math From The Body** (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).
- Jan 20<sup>th</sup> - 22<sup>nd</sup>, 2016. **MM16 PG75 Physics and Mathematics of Materials: current insights**, (on the occasion of the 75th birthday of Paolo Podio Guidugli) (GSSI, L'Aquila).
- Sept 30<sup>th</sup> - Oct 1<sup>st</sup>, 2013. **International Workshop: "From carbon nanotubes to graphene: the key materials of the future?"** (Università Cattolica del Sacro Cuore, Dipartimento di Scienze Matematiche, Fisiche e Naturali, Brescia).

## Languages

- **Italian:** Native Speaker.
- **English:** Good reading and listening comprehension, speaking fluently.

## Computer skills

LaTeX for scientific typing. FORTRAN, FEAP, Wolfram *Mathematica* and COMSOL MULTIPHYSICS for numerical simulations.