Università di Genova

Stefano Di Marco

Associate Professor

EDUCATION AND TRAINING

PhD in Biochemical Sciences and Neuroscience

2008

The environment is fundamental for the development and function of the retina

During this period, I specialized in in vivo retinal electrophysiology techniques using mouse models and learned to perform spontaneous activity recordings from retinal explants using patch-clamp techniques. I also enhanced my skills in immunohistochemistry and confocal microscopy.

University of L'Aquila

Laurea in Scienze Biologiche

2004

Stochastic resonance and visual processing: relationship between oscillatory potentials and visual evoked potentials

During my master's thesis, I gained skills in in vivo electrophysiology of the visual system, conducting research on both patients and mouse models. I helped develop a device used for electroretinographic studies on astronauts during missions on the International Space Station.

University of Genova

PROFESSIONAL HISTORY

2024 – Present

Associate Professor

Research focus: physiology of vision; retinal networks; basic research on retinal degenerations such as retinitis pigmentosa, maculopathies, and diabetic retinopathy; use of technologies or nutraceutical substances to counteract retinal degeneration; development and testing of innovative prosthetic technologies for visual function restoration.

University of Genova

2019 – 2024

Researcher

As an "IIT researcher" at the Center for Synaptic Neuroscience and Technology in Genoa, I led a research team focused on retinal and visual system physiology and on developing new materials for vision restoration in retinal dystrophies. Techniques used include in vivo electrophysiology (ERG, OCT, pupillary reflex, cortical visual evoked potentials, and single units), as well as visually-guided behavioral tests. Ex vivo and in-vitro involve light-evoked response recordings from retinal explants (ganglion cells) using patch-clamp and MEA (traditional or high-density CMOS). We are developing retinal prostheses based on photosensitive polymer nanoparticles and investigating photochromic molecules that integrate into cell membranes and modulate capacitance in response to light.

Italian Institute of Technology

Università di Genova

2015 – 2019

Researcher Type A

I led the retinal physiology lab, developing a setup for in-vitro patch-clamp recordings of light-evoked responses from single ganglion cells in isolated retinas. I also installed an in-vivo ERG system and a confocal microscope for retinal imaging. These tools were used to study changes in the retinal network during photoreceptor degeneration and to evaluate the protective effects of new drugs. The main therapeutic approach involved oral administration of Repron® saffron. I also collaborated with Prof. Campos and Prof. Versura (University of Bologna) to test the neuroprotective effects of eye drops derived from umbilical cord blood serum in experimental models and in retinal pigment epithelial and Müller cell cultures.

University of L'Aquila

2013 – 2015

Postdoctoral Fellow

This postdoc focused on characterizing state-dependent input-output functions in neural circuits in vitro to develop new approaches for understanding and modifying neural coding. The project used high-resolution CMOS multi-electrode arrays to record light-evoked responses from thousands of retinal ganglion cells (SI-CODE project, EU FP7-284553). I also contributed to the RENVISION project (EU FP7-600847), combining ganglion cell recordings with functional imaging of inner retinal cells to identify morpho-functional correlates of visual information processing.

With Dr. A. Maccione, we extended CMOS MEA capabilities to record light-evoked responses from entire retinal explants with millisecond temporal and micrometric spatial resolution.

Italian Institute of Technology

2011 – 2012

Postdoctoral Fellow

Research focus: developing and utilizing a setup for calcium imaging in retinal ganglion cells from whole-mount retinal explants in response to visual stimuli using a multiphoton microscope.

The University of Sydney

2009 – 2011

Postdoctoral Fellow

Research focus: contrast adaptation in retinal ganglion cells from marmosets and mice. During this time, I learned to record light-evoked responses from ganglion cells in retinal explants using patch-clamp techniques.

The University of Sydney

2008 – 2009

Postdoctoral Fellow

Research focus: therapeutic methods for retinal degeneration using cerium dioxide nanoparticles. Advanced training in in vivo retinal electrophysiology with flash-ERG and pattern-ERG.

University of L'Aquila

Università di Genova

ACADEMIC APPOINTMENTS

Member of the PhD Program Committee in Neuroscience (DINOGMI-IIT)
2020 – Present
University of Genoa

EXPERIENCE

SCIENTIFIC RESPONSIBILITY FOR RESEARCH PROJECTS ACCEPTED FOR FUNDING ON THE BASIS OF COMPETITIVE CALLS INVOLVING PEER REVIEW

2023 *"Early Retinal Neurodegeneration as Risk Factor, Biomarker and Pharmacological Target of Diabetic Retinopathy"*
PNRR – Ministry of Health, Mission M6 - Component C2 - Investment 2.1
Italian Institute of Technology

PRIVATE CONTRACTS AS SCIENTIFIC LEAD

2023
"*Efficacy assessment of a new therapeutic agent in retinal degenerations*"
Dompé farmaceutici S.p.A.

2019
"*Study of retinal tissue in various "Alzheimer-like" neurodegeneration models to identify cellular and functional markers for early diagnosis*"
BIO AURUM s.r.l.

2018
"*Evaluation of a new therapeutic agent in retinal degenerations*"
Dompé farmaceutici S.p.A.

2018 PROGETTO G.E.A
"*Efficacy evaluation of saffron-based treatment for retinal degeneration using pharmaceutical-grade saffron from a hydroponic vertical farm*".
Istituto Nazionale Biostrutture e Biosistemi I.N.B.B.

2016
"*Study on the efficacy of Repron® saffron in retinal neurodegeneration*"
Hortus Novus s.r.l.

SELECTED PUBBLICATIONS

2025
Ziraldo G., Cupini S., Sesti V., Delfino E., Lanzani G., Bertarelli C., Benfenati F., Di Marco S.
A membrane-targeted photoswitch restores physiological ON/OFF responses to light in the degenerate retina
Nature Communications, 16 (1), art. no. 600

2025
Cupini S., Di Marco S., Boselli L., Cavalli A., Tarricone G., Mastronardi V., Castagnola V.,
Platinum Nanozymes Counteract Photoreceptor Degeneration and Retina Inflammation in a Light-Damage Model of Age-Related Macular Degeneration

Università di Genova

ACS Nano, 17 (22), pp. 22800 – 22820

2024
Lanzani G., Chiaravalli G., Colombo E., Manfredi G., Di Marco S., Vurro V., Benfenati F.
Nanotechnology for vision restoration
Nature Reviews Bioengineering, 2 (10), art. no. e011504, pp. 829 - 848

2023
Francia S., Di Marco S., DiFrancesco M.L., Ferrari D.V., Shmal D., Cavalli A., Pertile G., Attanasio M., Maya-Vetencourt J.F., Manfredi G., Lanzani G., Benfenati F., Colombo E.
P3ht-Graphene Device for the Restoration of Visual Properties in a Rat Model of Retinitis Pigmentosa
Advanced Materials Technologies, 8 (6), art. no. 2201467

2022
Francia S., Shmal D., Di Marco S., Chiaravalli G., Maya-Vetencourt J.F., Mantero G., Michetti C., Cupini S., Manfredi G., DiFrancesco M.L., Rocchi A., Perotto S., Attanasio M., Sacco R., Bisti S., Mete M., Pertile G., Lanzani G., Colombo E., Benfenati F.
Light-induced charge generation in polymeric nanoparticles restores vision in advanced-stage retinitis pigmentosa rats
Nature Communications, 13 (1), art. no. 3677

2020
Ciavarella C., Buzzi M., Bergantin E., Di Marco S., Giannaccare G., Campos E., Bisti S., Versura P.
Effects of Cord Blood Serum (CBS) on viability of retinal Müller glial cells under in vitro injury
PloS one, 15 (6), pp. e0234145

2018
Nieus T., D'Andrea V., Amin H., Di Marco S., Safaai H., Maccione A., Berdondini L., Panzeri S.
State-dependent representation of stimulus-evoked activity in high-density recordings of neural cultures
Scientific Reports, 8 (1), art. no. 5578

2016
Maccarone R., Rapino C., Zerti D., Di Tommaso M., Battista N., Di Marco S., Bisti S., Maccarrone M.
Modulation of Type-1 and Type-2 cannabinoid receptors by saffron in a rat model of retinal neurodegeneration
PLoS ONE, 11 (11), art. no. e0166827

2014
Protti D.A., Di Marco S., Huang J.Y., Vonhoff C.R., Nguyen V., Solomon S.G.
Inner retinal inhibition shapes the receptive field of retinal ganglion cells in primate
Journal of Physiology, 592 (1), pp. 49 – 65

2015
Fiorani L., Passacantando M., Santucci S., Di Marco S., Bisti S., Maccarone R.
Cerium oxide nanoparticles reduce microglial activation and neurodegenerative events in light damaged retina
PLoS ONE, 10 (10), art. no. e0140387

2013

Di Marco S., Protti D.A., Solomon S.G.
Excitatory and inhibitory contributions to receptive fields of alpha-like retinal ganglion cells in mouse
Journal of Neurophysiology, 110 (6), pp. 1426 – 1440

2009
Di Marco S., Nguyen V.A., Bisti S., Protti D.A.
Permanent functional reorganization of retinal circuits induced by early long-term visual deprivation
Journal of Neuroscience, 29 (43), pp. 13691 – 13701

2008
Maccarone R., Di Marco S., Bisti S.
Saffron supplement maintains morphology and function after exposure to damaging light in mammalian retina
Investigative Ophthalmology and Visual Science, 49 (3), pp. 1254 - 1261