Fabio Benfenati

Full professor

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Education and training

1979
Laurea in Medicina e Chirurgia
110/110 e lode
Alma Mater Università di Bologna - Bologna - IT

1983
Specialista in Neurologia
60/60 e lode
Alma Mater Università di Bologna - Bologna - IT

Academic experience

1983 - 1992
Ricercatore Universitario
Università di Modena - Modena - IT

1992 - 2000
Professore associato
Università di Roma Tor Vergata - Roma - IT

2000 - ONGOING
Professore ordinario
Università di Genova - Genova - IT

Work experience

2006 - ONGOING
Research Director
Istituto Italiano di Tecnologia - Genova - IT

1990 - ONGOING
Member of the Adjunct Faculty
The Rockefeller University - New York - US

Language skills

English
Proficient

TOEFL

Teaching activity

1992-1999:   Titolare dei Corsi di Fisiologia Umana I e II e di Neurofisiologia presso la Facoltà di Medicina e Chirurgia dell'Università di Roma Tor Vergata.
2000-:   Titolare dei Corsi di Fisiologia Umana I e II e di Neurofisiologia presso la Facoltà di Medicina e Chirurgia dell'Università di Genova.
2000-:   Titolare del Corso di Fisiologia Umana per il Corso di Laurea in Biotecnologie presso la Facoltà di Medicina e Chirurgia dell'Università di Genova.
2004-2007:   Titolare del modulo di Neurofisiopatologia nell'ambito del Corso di Neurologia presso la Facoltà di Medicina e Chirurgia dell'Università di Genova.
2004-2008:   Coordinatore del Dottorato di Ricerca in Neuroscienze Sperimentali dell'Università di Genova.
2008-:   Coordinatore del Dottorato di Ricerca poi Curriculum in Neuroscienze e Neurotecnologie dell'Università di Genova/Istituto Italiano di Tecnologia.

Postgraduate research and teaching activity

Supervision of PhD students, residents and post-doctoral fellows

Supervised > 90 students for Bachelor/Master Thesis in the Courses of Medicine, Biological Sciences, Bioengineering and Biotechnologies and over 25 PhD students and Committee Member in several PhD thesis Committees in Universities in France, Belgium, Norway, Sweden and UK.

Research interests

The main subjects of investigation of Dr. Benfenati in the last 30 years have been the molecular mechanisms of information transfer among neurons. He has begun working in the field of synaptic transmission in Paul Greengard's laboratory in 1986. Since then, he has addressed the mechanisms of neural and synaptic communication using a variety of experimental models of human diseases by using a combination of experimental techniques ranging from cell biology, biochemistry, biophysics, live imaging, electrophysiology and molecular biology, providing the following main contributions: (i) Elucidation of the mechanisms of neurotransmitter release, synaptic vesicle trafficking and synaptic plasticity and identification of the proteins involved. A long array of papers has, for the first time, put forward the functional role of synaptic vesicle proteins in the regulation of the multi-step process of neurotransmitter release; (ii) Composition of the molecular machine that promotes membrane fusion during exocytosis and identification of the intracellular targets of tetanus/botulinum neurotoxins; (iii) Pathogenic mechanisms of synaptopathies in genetically altered mice lacking synaptic vesicle proteins as models of human neurological

disorders such as epilepsy and autism; (iv) Generation of engineered neuronal networks, neuro-electronic and opto-neural interfaces by exploiting optogenetics and photovoltaic interfaces.

The two main lines of research that are currently ongoing are: (i) investigation of disease gene function in epilepsy and ASD using mouse and human neuronal models; (ii) The double background of neurologist and cellular neurophysiologist allowed dr. Benfenati to get in depth into the cellular mechanisms that underlie normal brain function and whose dysfunction leads to the pathogenesis of neurological diseases.

In 2006 he started the big challenge to build the *Department of Neuroscience and Brain Technologies* at the newborn *Italian Institute of Technology* (IIT) in Genova with the mission to approach interdisciplinary research in Neuroscience by interacting with Nanochemistry, Nanophysiscs and Nanostructure Departments developed within the same Institute.

Currently I am directing the IIT Center of Synaptic Neuroscience and Technology (NSYN) that IIT developed together wit the University of Genova Medical School within the University Hospital San Martino in Genova with the aim to boost the application of new technologies to central nervous system diseases. My research group in NSYN consists of 40 people including researchers, postdocs and PhD students working in laboratories equipped with a large electrophysiology unit with the most sophisticated patch-clamp, multielectrode arrays and optogenetics setups, a molecular and cellular neurobiology units with a large cell culture facility and state-of-the art live neuroimaging facilities.

Grants

Synaptic Pathophysiology
Pricipal investigator
- Ministero della Salute, Ricerca Finalizzata Call 2013. Project: '*Development and implant of the photovoltaic artificial retina in the pig with photoreceptor degeneration: towards the human Phase-1 experimentation*' (RF-2013-02358313). Role: PI (2016-2018); ranked first project in Italy
- S. Paolo Foundation, Project *"PRRT2, a novel synaptic gene causing epilepsy, dyskinesia and migraine: functional studies in mutant mice and reprogrammed neurons from patients' fibroblasts"*. Role: PI (2016/18)
- Multiple Sclerosis Foundation (FISM). Multicentric project '*Therapeutic targeting of REST activity and expression to reduce neurodegeneration and synaptic deficits in chronic EAE*'. Role PI (2016/18)
- EU Horizon 2020 - Flagship Graphene Core 1 Project: '*WP4: Health and Safety of graphene-based materials*'. Role: PI (2016/18)
- EU Horizon 2020 - Flagship Graphene Core 1 Project: '*WP5: Bioapplications*'. Role: PI (2016/18)
- EU Horizon 2020. Call: H2020-MSCA-ITN-2014. Project: *"The Extracellular Matrix in Epileptogenesis"*. Role: PI (2015-2018)
- Ministero della Salute, Ricerca Finalizzata Call 2012. Project: '*Role of the novel presynaptic protein PRRT2 in neuronal physiology and in the pathogenesis of paroxysmal neurological disorders*' Role: PI (2014-2016)

- Cariplo Foundation 2012 Technology Call. PROJECT: '*UMANA: Ultrasensitive Magnetic Array for recording of Neuronal Activity*'. Role: PI (2014-16)
- Cariplo Foundation 2012 Health Call. Project: '*Role of the presynaptic protein PRRT2 in the pathogenesis of neurological paroxysmal disorders*'. Role: PI (2014-16)
- Fas Par Tecnobionet grant. Project: '*Realizzazione di microchips per l'identificazione e la validazione di cellule staminali riprogrammate in tessuti specifici per studi funzionali*'. Role: PI (2014/15)
- Call FP7-NMP-2013-EU-China. - Project: '*Neuroscaffolds: Rapid prototyping scaffolds for the nervous system*'. Role: PI (2013/16)
- The Michael Stern Parkinson's Research Foundation Foreign Research Award - Project: '*Role of synaptic vesicle trafficking and presynaptic dysfunction in the pathogenesis of Parkinson disease*'. Role: PI (2013)
- EU Horizon 2020 - Flagship Graphene Rump-up Project: '*WP2: Health and Safety of graphene-based materials*'. Role: PI (2014/15)
- CURE Epilepsy Innovator Grant - Project: '*Optogenetic Regulation of the Transcription of Epilepsy Genes: an Innovative Strategy to Cure Drug-Resistant Epilepsy*' (2013/14): Role: PI
- Telethon Foundation, Italy. Multicentre Project GGP

Editorial activity

Associate Editor
Frontiers in Neuroscience, *The Scientific World Journal*, *The Journal for Modeling in Ophthalmology*, *Archives Italiennes de Biologie*, *Rendiconti Lincei, Scienze Fisiche e Naturali, Semin. Cell Dev. Biol.*
Reviewer:
Scientific Journals
Nature, Nature Protocols, *J. Cell Biol., Proc. Natl. Acad. Sci. USA, eLife, J. Neurosci., J. Physiol., J. Neurochem., Neuroscience, J. Cell Sci., Cell Death and Differentiation, Eur. J. Neurosci., FEBS Lett., Brain Res., Exp. Brain Res., Naturwissenschaften, Eur. J. Biochem., Neurosci. Lett., Learning & Memory, Eur. J. Pharmacol., DNA Sequence, BMC Neuroscience Electrophoresis.*
Research Agencies
Human Frontier Science Program (HFSP), National Science Foundation (USA), Yale University Evaluation Program, Biotechnology & Biological Sciences Research Council (UK), Agricultural and Food Research Council (UK), Ireland Health Research Board, Norway Research Council, Singapore Biomedical Research Council, The Israel Science Foundation, Health Research Council of New Zealand (HRC), INSERM-ANR (France); CNRS-PIME Career Project (France); Telethon-France; Telethon Foundation – Italy; Italian Research Council (CNR), National Institute of Health (ISS), Italian Ministry of University and Research (MIUR).

Assigments abroad

1983-1984: **Post-doctoral fellow** at the Dept. of Histology and Neurobiology at the Karolinska Institutet, Stockholm (Sweden) in Kjell Fuxe's and Thomas Hokfelt's laboratories
1986-1989: **Fogarty Fellow & Research Associate**, Laboratory of Molecular

and Cellular Neuroscience, The Rockefeller University, New York (USA) directed by Prof. Paul Greengard (Nobel Laureate in 2000)
1990-present: **Member of the Adjunct Faculty,** The Rockefeller University, New York (USA)

Other professional activities

1992-1996: Board Member of the *Italian Society for Neuroscience*

2008-2011: Chairman, International Program Committee, *8th IBRO World Congress, Florence* (Italy)

2009-2011: President, *The Italian Physiological Society*

2009-2012: Member, *CNRS Conseil Scientifique du Dept. Sciences du Vivant*, Paris (France)

2012-present: President, Advisory Board of the *Clinical Res. Institute of Neurological Sciences*, Bologna (Italy)

2015: Member of the Program Committee, Federation of the European Neuroscience Societies Forum, Copenhagen (Denmark), 2016