

Curriculum Vitae - Vincenzo De Paola, PhD

WEB LINKS

<http://www.imperial.ac.uk/people/vincenzo.depaola> - www.DePaolaLab.com - https://twitter.com/DePaola_Lab

RESEARCH PROFILE

I received my Ph.D. in molecular and cellular neurobiology from the University of Basel, Switzerland, for work in the laboratory of Dr. Pico Caroni at the Friedrich Miescher Institut, part of the Novartis foundation. I was then awarded an EMBO post-doctoral fellowship to train with Dr. Karel Svoboda at Cold Spring Harbor Laboratory, USA. Since 2008 I am honorary Group Leader at the MRC London Institute of Medical Sciences and a member of the Faculty of Medicine of Imperial College London. I have been invited to join the editorial boards of Science matters, Neural Plasticity, Frontiers in Molecular Neuroscience, Frontiers in Cellular Neuroscience and Frontiers in Cellular Biochemistry and I am an elected Fellow of the Royal Society of Biology. The goal of my research is to understand **the regulation of synaptic connectivity in the adult neocortex**, with the ultimate aim of using this knowledge to promote brain repair.

CURRENT POSITION

2014-present Senior Lecturer (equivalent to Associate Professor), Imperial College London
2008-present Honorary Group Leader, MRC London Institute of Medical Sciences

PREVIOUS ACADEMIC POSITIONS

2008-2016 Group Leader, Neuroplasticity and Disease Laboratory, MRC Clinical Sciences Centre
2008-2013 Lecturer (equivalent to Assistant Professor), Imperial College London
2003-2007 EMBO Postdoctoral fellow - Howard Hughes Medical Institute
(with Karel Svoboda at Cold Spring Harbor Laboratory, USA)
2003-2004 Postdoctoral fellow – Friedrich Miescher Institute for Biomedical Research, Basel
(jointly with Pico Caroni and Karel Svoboda)

EDUCATION

2003 DPhil Friedrich Miescher Institute for Biomedical Research, Basel, Switzerland
(with Pico Caroni); PhD from Basel University, Molecular and Cellular Neurobiology
1997 MSc Bari University, Italy. (With Mariano Rocchi) Genetics, (1st class honours)
1996 BSc Bari University, Italy. Biology and Molecular Biology, (1st class honours)

EDITORIAL BOARDS

2016-present Science matters
2014-present Frontiers in Cellular Neuroscience
2013-present Frontiers in Molecular Neuroscience
2013-present Frontiers in Cellular Biochemistry
2012-present Neural Plasticity

SELECTED HONOURS AND INTERNATIONAL EXTERNAL COMMITTEES

2015 Elected Fellow of the Royal Society of Biology
2013 EPSRC Centre for Doctoral Training in Neurotechnology for Life and Health, Member
2010 DIADEM Challenge, Howard Hughes Medical Institute Scientific Competition, Jury member
2009-present Reviewer of grants for HFSP, 'Fondation pour la Recherche Médicale' and 'L'Agence nationale de la recherche' (EU), Alzheimer's and Related Diseases Research Award Fund (USA) and NC3Rs, BBSRC, MRC (UK).
2008-present Reviewer for *Nature*, *Nature Neuroscience*, *Neuron*, *Nature Communications*, *Cerebral Cortex*, *Neuroinformatics*, *JoVE*, *FEBS journal*, *Genesis*, *Frontiers journals*, *Biological Psychiatry*.

SUMMARY OF RECENT FUNDING HISTORY (LAST 5 YEARS)

2017-20 MRC, Project Grant, Stimulating axon regeneration in adult cortical circuits, £653,000, PI
2016-17 ARUK, A new *in vivo* model to study human axon pathology in AD, £30,000, PI
2008-16 MRC, Programme Grant, Neuroplasticity and Disease group. £2,229,000, PI
2012-17 MRC, Imaging cellular structure and function beyond the diffraction limit. £2,457,731, Co-I

2014-15 EPSRC, Neurotechnology for Life and Health, £31,000, PI
 2012-13 Wellcome Trust, Network of Excellence in Optogenetics, £150,000, Co-PI.

FELLOWSHIPS AND STUDENTSHIPS

2017-20 ARUK PhD studentship (with Prof. MG Spillantini) (£112,000, Maria Tortora, Italy)
 2014-18 FCT-GABBA and Rosetrees Trust PhD studentship (£68,750, Raquel Real, MD, Portugal)
 2014-18 EPSRC funded PhD studentship (£140,000, Cher Bachar, Israel)
 2012-15 MRC Interdisciplinary Cross Campus PhD Studentship (£70,000, Lucien West, UK)
 2012 ERASMUS Studentship, European Union (£5,000, Sara Camporesi, Italy)
 2010 ERASMUS Studentship, European Union (£5,000, Jana Kalz, Germany)
 2009 EU Studentship, 'Interdisciplinary approaches to life sciences' (£4,000, Melanie Strauss, France)
 2004-06 EMBO Long-Term-Fellowship, Post-doctoral Fellowship (£65,000, Vincenzo De Paola)
 1999 Swiss Foundation for Research on Muscle Diseases, PhD Fellowship (£100,000, V. De Paola)

RESEARCH GROUP AND TRAINING

Current group size: 6 (1 postdoctoral fellow, 1 Research Assistant, 3 PhD students, 1 MSc student).
 Training track record: Currently supervising or co-supervising 3 PhD students, two recently graduated (Federico Grillo, now a post-doc with Juan Burrone at King's College London and Peter Bloomfield now a post-doc with Bill Richardson at UCL). Three postdocs (Lieven Huang, Johanna Jackson and Alison Canty) have been trained in the lab, two now hold group leader positions in Australia and at Eli Lilly (Alison Canty and Jo Jackson). Mentored 10 and examined 2 PhD students. Fourteen undergraduate students (6 international, 3 EU funded, 5 medical) visited the lab for periods of 2-6 months in the last 4 years. Of these, 7 accepted PhD positions and 2 started medical studies.

SELECTED INTERNATIONAL PRESENTATIONS

In the past 5 years I've been invited to give 37 talks, including talks at the major conferences on synaptic structural plasticity. Of these, I list below a selection of lectures at international conferences since 2010. Session chairs are indicated in bold.

2017-10 Minisymposium on In Vivo Imaging of CNS Injury and Disease, SFN 2017, DC, USA
 2016-10 CSH Asia meeting, Probing Neural Networks with Light, Suzhou, China
 2016-10 Normal and pathological brain ageing: from systems biology to the clinic, Paris, France
 2016-01 Keystone Symposium, Axons: from cell biology to pathology, Santa Fe, USA
 2015-09 International PhD Course on The Aging Brain, Turin, Italy
 2015-09 12th International Congress of Polish Neuroscience Society, Gdansk, Poland
 2015-03 COSYNE workshop, Functional Stability in a Dynamic Connectome, Snowbird, USA
 2014-04 Imaging Synapse Structure and Function in the Brain, HHMI, Janelia Farm, USA
2014-02 Winter Conference on Neural Plasticity, Symposium Chair, Vieques Island, USA
2013-08 Neural circuit development and plasticity, Workshop Chair, Utrecht, Holland
 2012-10 Nanosymposium on Axon Regeneration, SFN 2012, New Orleans, USA
 2011-07 Computational Neuroscience Meeting, Stockholm, Sweden
 2011-05 Light for Health Meeting, ICFO, Barcelona, Spain
 2010-11 Minisymposium on axon branching, SFN 2010, San Diego, USA
 2010-10 3d Axon Degeneration Meeting, Eibsee, Germany
 2010-08 DIADEM Challenge, HHMI Janelia Farm, USA
2010-03 Structural Plasticity In The Mammalian Brain, Session Chair, HHMI Janelia Farm, USA

AWARDS TO THE GROUP

2015 Biotech Koniku shortlisted for the MassChallenge, Boston, USA (Osh Agabi, co-Founder)
 2015 Best Business Plan and Elevator Pitch Competition, MIT GSW competition (Osh Agabi)
 2014 Best Poster Award, BAP 2014 Summer Meeting, Cambridge, UK (Peter Bloomfield)
 2014 Training bursary, BAP 2014 Summer Meeting, Cambridge, UK (Peter Bloomfield)
 2013 Cooper-Int Award, EU international scheme (Michele Ettore)
 2013 ECNP Young Researcher Workshop travel award, Nice, France (Peter Bloomfield)
 2013 BSF Student travel bursary (Peter Bloomfield)
 2006 Armenise-Harvard Career Development Award, Start-up grant, finalist (V. De Paola)
 2006 Neurotrain Award, Marie Curie Conferences and Training Courses (V. De Paola)
 2005 RIKEN-BSI Summer Course on Mental Disorders, RIKEN-BSI Travel Award (V. De Paola)

PUBLIC ENGAGEMENT

My group participated in 15 activities in the last 5 years, including <http://www.nativescientist.com/> (R. Real and S. Papadopolou), microscopy workshop for school children (P. Bloomfield and S. Papadopolou, 2015), two talks at the University of the 3d age (F. Grillo on synapses and ageing in 2012 and P. Bloomfield on inflammation in schizophrenia in 2013), British Science Festival (P. Bloomfield 2013 and 2015), Strictly Science (L. West, 2013), Ethical Review panel meeting in 2010, Imperial Science Festival (Cher Bachar, 2015) and 'Skeptics in the pub' talk on changes in the brain in schizophrenia (P. Bloomfield, 2015).

INTERNATIONAL COLLABORATIONS (ONGOING)

Graham Knott, Interdisciplinary Centre for Electron Microscopy, EPFL, Lausanne, Switzerland

Ryohei Yasuda, Max Planck Florida Institute (MPFL), Jupiter, USA

Atsushi Miyawaki, RIKEN Brain Science Institute (RIKEN-BSI), Tokyo, Japan

Ali Ertürk, Institute for Stroke and Dementia Research (ISD), München, Germany

Sen Song, Department of Biomedical Engineering, Tsinghua University, Beijing, China

RESEARCH HIGHLIGHTS

- With Pico Caroni developed Thy1-GFP mice, a genetic labelling tool now widely used (**Neuron 2002; Nat Neurosci. 2003**).
- Presynaptic terminals, previously considered stable elements in the adult, can be structurally plastic. We elucidated a pathway controlling their stability in mature hippocampus (**Nat Neurosci. 2003**).
- Axons and presynaptic terminals undergo cell type-specific structural changes in the adult cortex *in vivo* (**Neuron 2006, Nat Protoc. 2009**).
- Synapses are more dynamic in the aged brain than in young adults, highlighting a new principle for long-term memory impairment (**PNAS 2013**).
- Spontaneous axon regeneration in the injured adult cortex; the glia scar is probably not the main player in the inhibition of axon regrowth (**Nat Commun. 2013; PNAS 2013; J Neurosci. 2013**).
- Early involvement of inflammation in schizophrenia, with Oliver Howes (**Am. J. Psych. 2015**).
- Cortical axolemmal degeneration regulated by a NAD⁺-dependent pathway independent of transcription (**Under revision**).
- Experience-dependent structural plasticity of axonal boutons in the adult barrel cortex (**In submission**).
- Functional synaptic rewiring of human stem cell-derived neurons transplanted *in vivo* (**In submission**).
- Neuronal network dysfunction in a new humanised mouse model of Down Syndrome (**In submission**).

In most of these studies we were the first to longitudinally image axons and their synapses in the mammalian brain *in vivo*. Overall, our work highlights the central role of cell-type in regulating structural and functional plasticity in the adult cortex. We are now exploring the molecular and cellular mechanisms of this cell-intrinsic regulation and the implications for enhancing axon regeneration and the recovery from brain damage. In addition, we are extending these studies by using human-derived neurons and humanized mouse models, e.g. to understand the selective vulnerability of specific cell types and projections in neurodegenerative diseases.

SUMMARY OF PUBLICATION RECORD

39 journal papers (<http://orcid.org/0000-0001-9987-8291>) including 5 reviews/book chapters and 9 conference proceedings. Seven papers with > 100 citations ea. H-index = 19, >2150 total citations (Google Scholar). Mean Impact Factor = 13 (first/last author primary research papers excluding reviews). **Since the establishment of my own lab in 2008, I have published 30 papers** (16 primary research, 5 reviews and 9 conference proceedings), **6 of the 16 primary research publications are as lead author**. Four additional papers as lead author are either under revision or in preparation.

SELECTED PUBLICATIONS**My own group**

1. Bloomfield P, Sudhakar S, Veronese V, Rizzo G, Bertoldo A, Owen D, Bloomfield M, Bonoldi I, Kalk N, Turkheimer F, McGuire P, **De Paola V**[§], Howes O[§] (2016). Microglial activity in people at ultra high risk of psychosis and in schizophrenia; an [11C]PBR28 PET brain imaging study. *American Journal of Psychiatry*. Oct 16. **§ Co-Senior authors. (101 citations)**.
2. F. Grillo, L. West and **V. De Paola**. (2015) Removing synaptic breaks on learning. *Nature Neurosci.* 18, 1062–1064.
3. S. Song*, F. Grillo*, Q. Wang, G. Gao, X. Li, V. Ferretti, **V. De Paola**. (2015) EPBscore: a novel method for computer-assisted analysis of axonal structure and dynamics. *Neuroinformatics*. 2015:9274. *The unbiased method to analyse presynaptic live imaging data. (1 citation)*
4. Grillo, F, Song, S, Teles-Grilo Ruivo, LM, Huang, L, Ge, G, Knott, G, Ferretti, V, Thompson, D, Little, G, **De Paola, V**. (2013). Increased axonal bouton dynamics in the ageing mouse cortex. *Proc. National Academy of Sciences Plus*. **(54 citations)**. *This was the first in vivo imaging study in the aged brain at synaptic resolution. We discovered that synapses are more dynamic in the aged brain than in young adults, highlighting a new principle for long-term memory impairment.*
5. Canty, A.J., Huang, L., Jackson, J.S., Little, G., Knott, G., Maco, B., **De Paola, V**. (2013). In-vivo single neuron axotomy triggers axon regeneration to restore synaptic density in specific cortical circuits. *Nature Commun.* 4, 2038. **(36 citations)**. *Evidence for spontaneous cell type-specific axon regeneration associated with the re-establishment of normal synaptic density after laser-mediated axotomy in vivo.*
6. Canty, A.J., Teles-Grilo Ruivo, L., Nesarajah, C., Jackson, J.S., Little, G., Song, S., **De Paola, V**. (2013). Synaptic elimination and protection after minimal injury depend on cell type and their pre-lesion structural dynamics in the adult cerebral cortex. *Journal of Neuroscience* 33:10374-10383. **(10 citations)**. *We found that axons undergo a rapid and lasting process of synaptic elimination, which depends on cell type and their pre-lesion structural dynamics, while synapse formation rates are globally unaffected after laser-axotomy.*
7. L. Allegra-Mascano, P. Cesare, L. Sacconi, G. Grasselli, G. Mandolesi, B. Maco, G. Knott, L. Huang, **V. De Paola**, P. Strata and F.S. Pavone (2013). In vivo single branch axotomy induces GAP-43 dependent sprouting and synaptic remodeling in cerebellar cortex. *Proc. National Academy of Sciences*. **(62 citations)**. *Together with REF. 5 and 6, we provided the first quantitative analysis of axonal regeneration and synaptic reorganization in the cortex and cerebellum of living mice by combining longitudinal in vivo 2-photon imaging with laser microsurgery, viral mediated shRNA manipulation and correlated 2P-FIBSEM.*
8. Holtmaat* A, Bonhoeffer T, Chow D, Chuckowree J, **De Paola* V**, Hofer S, Hübener* M, Keck T, Knott* G, Lee W, Mostany R, Mrsic-Flogel T, Nedivi E, Portera-Cailliau* C, Svoboda K, Trachtenberg* J, Wilbrecht L. (2009). Long-term high resolution imaging in the mouse neocortex through a chronic cranial window. *Nature Prot.* 4:1128-1144. **(Except first author, leading/corresponding* authors are listed in alphabetical order). (419 citations)**.

Before 2008

9. **De Paola, V.**, Holtmaat, A., Knott, G., Song, S., Wilbrecht, L., Caroni, P., and Svoboda, K. (2006). Cell type-specific structural plasticity of axonal branches and boutons in the adult neocortex. *Neuron* 49, 861-875. **(307 citations)**.
10. Portera-Cailliau, C., Weimer, R. M., **De Paola, V.**, Caroni, P., & Svoboda, K. (2005). Diverse modes of axon elaboration in the developing neocortex. *PLoS Biology* 3, e272. **(175 citations)**.
11. **De Paola, V.**, Arber, S., and Caroni, P. (2003). AMPA receptors regulate dynamic equilibrium of presynaptic terminals in mature hippocampal networks. *Nature Neurosci.* 6, 491 **(212 citations)**.
12. Livet, J., Sigrist, M., Stroebel, S., **De Paola, V.**, Price, S. R., Henderson, C. E., Jessell, T. M., and Arber, S. (2002). ETS gene Pea3 controls the central position and terminal arborization of specific motor neuron pools. *Neuron* 35, 877-892. **(210 citations)**.