

Curriculum Vitae - Vincenzo De Paola, PhD**WEB LINKS**

<https://orcid.org/0000-0001-9987-8291> - [F1000 - www.DePaolaLab.com](https://www.DePaolaLab.com) - https://twitter.com/DePaola_Lab

RESEARCH PROFILE

The goal of my scientific research is to understand the regulation of neural network connectivity and function in the neocortex, a brain region affected in numerous developmental and degenerative diseases, which are incurable to date. My ultimate aim is to use this knowledge to promote brain repair. Recently, my team developed a new approach to study the dynamics of human cortical networks using transplanted patient derived cells and intravital longitudinal imaging (Real et al., Science 2018). We are now using this new experimental system, at the interface between neuroscience, genetics, human stem cell and tissue biology and high-resolution optical imaging, to uncover human-specific principles of cortical circuit function and for disease modelling.

I received a 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 permanent member of the Faculty of Medicine of Imperial College London.

CURRENT POSITION

2019-present Reader (equiv. to US Professor, tenured) of Translational Neuroscience and Director of Synaptic Plasticity and Repair Laboratory, Imperial College London
2008-present Honorary Group Leader, MRC London Institute of Medical Sciences (MRC LMS)

PREVIOUS ACADEMIC POSITIONS

2014-2018 Senior Lecturer (equiv. to Associate Professor, tenured) of Translational Neuroscience and Director of Synaptic Plasticity and Repair Laboratory, Imperial College London
2008-2013 Lecturer (equiv. to US 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. Genetics (with Mariano Rocchi), (1st class honours)
1996 BSc Bari University, Italy. Biology and Molecular Biology, (1st class honours)

EDITORIAL BOARDS

2020-present Brain Disorders
2018-present F1000 (Faculty member - Neurobiology of Disease and Regeneration section)
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

2019 Chair, Syn2Psy (European Commission ITN) Doctoral Studies Committee
2019 Supervisory Board Syn2Psy (with Sandi, Choquet, Osterweil, Carvalho and Betancur)
2019 Principal Investigator, Marie Curie Actions, Innovative Training Network ‘Syn2Psy’
2015 Royal Society of Biology, Elected Fellow
2013 EPSRC Centre for Doctoral Training in Neurotechnology for Life and Health, Member
2012 Wellcome Trust Network-of-Excellence Optogenetic Control of Injured Neural Tissue, Member
2010 Howard Hughes Medical Institute Scientific Competition, DIADEM Challenge, Jury Member

2009-present Reviewer of grants for ERC, HFSP, SNF (CH), Helmholtz Foundation (DE), Fondation pour la Recherche Médicale and L'Agence nationale de la recherche (Fr), Alzheimer's and Related Diseases Research Award Fund (USA) and NC3Rs, BBSRC, MRC (UK).

2008-present Reviewer for *Acta Neuropathologica*, *Brain*, *Cerebral Cortex*, *FEBS journal*, *Frontiers journals*, *Genesis*, *JCI*, *JoVE*, *Molecular Psychiatry*, *Nature*, *Nature Methods*, *Nature Neuroscience*, *Nature Communications*, *Neuroinformatics*, *Neuron*, *PLoS Biology*, *Trends in Neurosciences*

2008 MRC Programme Grant, Neuroplasticity and Disease group

SUMMARY OF RECENT FUNDING HISTORY (LAST 5 YEARS)

2019-23 EU, H2020-ITN, Synaptic dysfunction in neuropsychiatric disorders, £452K, PI
 2017-20 MRC, Project Grant, Stimulating axon regeneration in adult cortical circuits, £653K, PI
 2017-20 ARUK, PhD studentship (with Prof. MG Spillantini), £112K to Maria Tortora
 2014-19 EPSRC, PhD studentship, £140K to Cher Bachar
 2014-18 FCT-GABBA and Rosetrees Trust, PhD studentship, £69K to Raquel Real, MD
 2016-17 ARUK, A new *in vivo* model to study human axon pathology in AD, £30K, PI
 2012-17 MRC, Imaging cellular structure and function beyond the diffraction limit, £2.5M, Co-I
 2008-16 MRC, Core Support from LMS, Neuroplasticity and Disease group, £3.5M, PI
 2014-15 EPSRC, Neurotechnology for Life and Health, £31K, PI
 2012-15 MRC, Interdisciplinary Cross Campus PhD Studentship, £70K to Lucien West

RESEARCH GROUP AND TRAINING

Group size in the last 5 years: 5-8 (1-3 postdoctoral fellows, 3-4 PhD students, 1-2 MSc students).

Training track record: Graduated five PhD students. Currently supervising 3 PhD students, two recently graduated (Raquel Real, MD, now Clinical Research Fellow at UCL and Cher Bass, now a post-doc at King's). Five postdocs (Alison Canty, Lieven Huang, Johanna Jackson, Smaragda Papadopoulou and Antonio Trabalza) have been trained in the lab, two now hold group leader positions in Australia and at Eli Lilly/Imperial College London (Alison Canty and Jo Jackson). A former student, Osh Agabi, has started an award-winning biotech company www.Koniku.com. Mentored 16 and examined 6 PhD students. Seventeen undergraduate students (6 international, 6 EU funded, 5 medical) visited the lab for periods of 2-6 months in the last 4 years. Of these, 9 accepted PhD positions and 2 started medical studies.

SELECTED INTERNATIONAL PRESENTATIONS

I list below a selection of lectures at international conferences since 2010.

Session chairs or Keynote talks are indicated in bold.

2021-02 **Winter Conference on Neural Plasticity, Symposium Chair, Fiji, Pacific Islands**
 2021-02 Neuroscience Institute - National Research Council, Italy, Webinar
 2020-11 World Wide Neuro talk, hosted by IST, Vienna, Virtual meeting
 2020-11 University of Utrecht, Holland, Virtual meeting
 2020-11 CHU Ste-Justine Research Center, Université de Montréal, Canada, Virtual meeting
 2020-10 Building and Repairing the Brain, Abcam, Virtual meeting
 2019-12 CSHL Development and 3D Modeling of the Human Brain, CSH, NY, USA
 2019-12 **Australasian Neuro meeting, Deconstructing the synapse, Keynote speaker, Adelaide, AUS**
 2019-09 3d Axon meeting, Alicante, Spain
 2019-06 3^d T21 Research Society meeting, Barcelona, Spain
 2018-11 CSH Asia meeting, Advances in Optical Imaging: Focus on the Brain, Suzhou, China
 2017-11 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, Paris, France (declined)
 2016-01 Keystone Symposium, Axons: form 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 GROUP MEMBERS

2018 Proteintech FENS travel grant, (Raquel Real, MD)
 2017 Best Poster prize, 6th Cambridge Neuroscience Symposium, Cambridge, UK (Raquel Real, MD)
 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 Ettorre)
 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)
 2003 European Molecular Biology Organization (EMBO) Long-Term Fellowship (V. De Paola)
 1999 Swiss Foundation for Research on Muscle Diseases, PhD Fellowship (V. De Paola)

PUBLIC ENGAGEMENT

My group participated in several 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). Pint of Science 'Beautiful Mind' talk at the 2018 UK Brain Festival on the neuroscience of & changing perception of brain disorders (S. Khan, 2017). SciArt collaboration as a neuroscientist towards London Brain Project's Art and Science exhibition at Menier Gallery working with various artists and young people to raise public understanding of the brain in health and disorders (S. Khan, 2018).

INTERNATIONAL COLLABORATIONS (ONGOING)

Graham Knott, Interdisciplinary Centre for Electron Microscopy, EPFL, Lausanne, Switzerland
Boaz Levi, Allen Institute for Brain Science, Seattle, USA
Dean Nizetic, Nanyang Technological University, Singapore
Subhojit Roy, UCSD, San Diego, USA

RESEARCH HIGHLIGHTS

- Human axon pruning, synaptogenesis and network activity can be modelled *in vivo*, combining patient-specific genetic background with live imaging in cortical tissue grafts, with R. Livesey (*Science* 2018).
- Early involvement of inflammation in schizophrenia, with O. Howes (*Am. J. Psych.* 2015).
- Spontaneous axon regeneration in the injured adult brain; the glia scar is likely not a main player in the inhibition of cortical axon regeneration (*Nat Commun.* 2013; *PNAS* 2013a; *J Neurosci.* 2013).
- Synapses are more dynamic in the aged brain than in young adults, highlighting a new principle for long-term memory impairment (*PNAS* 2013b).
- Axons and presynaptic terminals undergo cell type-specific structural changes in the adult cortex *in Vivo*, with K. Svoboda (*Neuron* 2006, *Nat Protoc.* 2009).
- Developed Thy1-GFP mice, a genetic labelling tool now widely used, with P. Caroni (*Neuron* 2002; *Nat Neurosci.* 2003).
- Presynaptic terminals, previously considered stable elements in the adult, can be structurally plastic. We elucidated a pathway controlling their instability in mature hippocampus, with P. Caroni (*Nat Neurosci.* 2003).

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 synaptic connectivity

and repair in the brain. We are now studying the mechanisms regulating synaptic connectivity in patient-derived cortical tissue systems, to discover their relevance for human brain physiology and pathogenesis.

SUMMARY OF PUBLICATION RECORD

47 journal papers (<http://orcid.org/0000-0001-9987-8291>) including 6 reviews/book chapters and 11 conference proceedings. **Since the establishment of my own lab in 2008, I have published 38 papers** (21 primary research, 6 reviews and 11 conference proceedings), **11 of the 21 primary research papers are as lead author.**

SELECTED PUBLICATIONS

My own group

1. Canty, A.J.*, Jackson, J.S.*, Huang, L., Trabalza, A, Little, G., Tortora, M., Khan, S., **De Paola, V.** (2020) In vivo imaging of injured cortical axons reveals a rapid onset form of Wallerian degeneration *BMC Biology*. *A new cortical axon degeneration assay reveals a rapid-onset form of Wallerian degeneration regulated by a NAD⁺-dependent pathway after laser microsurgery.*
2. Raquel Real*, Antonio Trabalza*, Manuel Peter*, Shabana Khan, Mark A. Smith, Joana Dopp, Samuel J. Barnes, Ayiba Momoh, Alessio Strano, Emanuela Volpi, Graham Knott, Frederick J. Livesey[^] and **Vincenzo De Paola[^]** (2018). *In vivo* modeling of human neuron dynamics and Down syndrome. *Science*. *Equal Contribution, [^]Corresponding authors. **(26 citations)**. *First in vivo imaging study of donor-derived human iPSC cortical grafts. We found reduced oscillatory activity and increased synaptic stability in Down syndrome.*
3. Bloomfield P S, Bonsall D, Wells L, Doorman D, Howes* O D, **De Paola* V** (2018) Clinically relevant haloperidol exposure has no effect on microglial morphology and [3H]PBR28 binding. *J. Psychopharmacology*. *Equal Contribution. **(10 citations)**. *This study suggests that changes in microglia seen in patients are likely not the consequence of antipsychotic treatment, but rather a phenotype of schizophrenia.*
4. 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. (292 citations)**. *We report the discovery of an early involvement of inflammation in schizophrenia. Importantly, the level of microglial activity correlated with the severity of symptoms in the patient group.*
5. Ilse S. Pienaar, Sarah E. Gartside, Puneet Sharma, **Vincenzo De Paola**, Sabine Gretenkord, Dominic Withers, Joanna L. Elson and David T. Dexter. (2015) Pharmacogenetic stimulation of cholinergic pedunculopontine neurons reverses motor deficits in a rat model of Parkinson's disease. *Molecular Neurodegeneration*, 10:47. **(38 citations)**. *Here my team has set up opto-pharmacogenetics and applied them to an animal model of PD.*
6. 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*. [^]Corresponding authors. **(102 citations)**. *Increased cell type specific axonal bouton dynamics in the aged brain, highlighting a new principle for long-term memory impairment.*
7. 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. **(61 citations)**. *Spontaneous cell type-specific axon regeneration associated with the re-establishment of normal synaptic density after laser microsurgery in vivo.*
8. 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. *J. Neuroscience* 33:10374-10383. **(20 citations)**. *Axons undergo a rapid and lasting process of synaptic elimination, which depends on cell type, while synapse formation rates are globally unaffected after laser microsurgery.*
9. L. Allegra-Mascaro, 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*. **(94 citations)**. *First quantitative analysis of axonal regeneration and synaptic reorganization in the cerebellum of living mice.*
10. 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). **(704 citations)**. *Leading international laboratories working on synaptic plasticity established and validated the main in vivo optical imaging method of all our future studies.*

Before 2008

11. **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. **(402 citations)**.
12. 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. **(212 citations)**.
13. **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 **(246 citations)**.
14. 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. **(245 citations)**.