Section b: Curriculum vitae

PERSONAL INFORMATION

Family name, First name: **Tachtsidis, Ilias**

ORCID: **https://orcid.org/0000-0002-8125-0313**

Date of birth: **31/08/1978**

Nationality: **Greece**

URL for web site: https://www.ucl.ac.uk/medical-physics-biomedical-engineering/multimodal-spectroscopy-mms

- **EDUCATION**

Sep 2001-May 2005	PhD in Medical Physics and Biomedical Optics, University College London, University of London, UK (funded by EPSRC/MRC IRC Studentship)
Sep 2000-Sep 2001	MSc in Medical Electronic and Physics (merit), Queen Mary, UK
Sep 1997-Jun 2000	BEng (Hons) in Medical Electronics and Computing, Bournemouth University, UK

CURRENT POSITION(S)

June 2020 - present	Professor in Biomedical Engineering, Department of Medical Physics and Biomedical Engineering, University College London, London, UK
Sep 2019 – present	Visiting Associate Professor, Birkbeck, University of London, London, UK

- **PREVIOUS POSITIONS**

Oct 2016-June 2020	Reader in Biomedical Engineering, Department of Medical Physics and Biomedical Engineering, University College London, London, UK
Jan 2015-Dec 2019	Senior Wellcome Trust Research Fellow, Department of Medical Physics & Bioengineering, University College London (funded by The Wellcome)
Jan 2010-Dec 2014	Wellcome Trust Career Development Research Fellow, Department of Medical Physics & Bioengineering, University College London, (funded by The Wellcome)
Oct 2006-Dec 2009	Research Associate, Department of Medical Physics & Bioengineering, University College London, (funded by EPSRC)
Oct 2004-Sep 2006	Research Associate, Department of Medical Physics & Bioengineering, University College London, (funded by Clinical Research & Development Committee of RF&UCMS/UCLH)

- **FELLOWSHIPS**

Jan 2015-Dec 2019	Senior Wellcome Trust Research Fellow, "Early bedside biomarkers of cognitive function following neonatal brain injury." funded by The Wellcome Trust, Total: 1,198,478£ Department of Medical Physics & Bioengineering, University College London, London, UK
Jan 2010-Dec 2014	Wellcome Trust Career Development Research Fellow, "The fusion of optical and magnetic resonance spectroscopy technologies to deliver novel multimodal methods to investigate brain injury in adults and neonates." funded by The Wellcome Trust 528,536£ Department of Medical Physics & Bioengineering, University College London, London, UK

- **AWARDS**

Oct 2019	UCL Provost Major Prizes Reception, in recognition of my success leading my team in the MetaboLight science exhibit at the 2019 Royal Society Summer Science Exhibition.
May 2018	Provost's Engineering Engagement Awards. Recognising my team MetaboLight for outstanding contribution to engineering engagement with young people.
Feb 2013	Poster Prize, Wellcome Trust Brain Biomarkers Meeting in Cambridge UK. (acknowledging my paper with title Non-Invasive In-Vivo Brain Biomarkers in Perinatal Hypoxia-Ischaemia)
Aug 2007	Melvin H. Knisely award from the International Society of Oxygen Transport to Tissue, (acknowledging a young investigator for outstanding achievements in research related to oxygen transport to tissue)
Sep 2007	Bellman Prize in Mathematical Biosciences,

	(acknowledging the best paper in 'Mathematical Biosciences' over a two-year period)
Aug 2004	Duane F. Bruley award from International Society of Oxygen Transport to Tissue, (acknowledging student work in research related to oxygen transport to tissue)

- **SUPERVISION OF GRADUATE STUDENTS AND POSTDOCTORAL FELLOWS**

Oct 2009-Aug 2020	PhD, University College London: As 1st supervisor -Completed, **total of 9 PhD students** in the field of biomedical optics, medical physics, biomedical engineering and mathematical modelling. -Current active 1 PhD student due to complete October 2023.
Oct 2013-Aug 2020	Staff/Postdocs, University College London: In recent years I had **a total of 13 Postdoctoral/Clinical/Technician/Marie Curie researchers** joining my research group.
2014-2020	Visiting Researchers, University College London: I had **a total of 15 visiting researchers** (3 months to 1 year) joining my research group mostly from Europe Hospital Zurich University of Zurich, Zurich, Switzerland; Radboud Universiteit Nijmegen, Netherlands; "G. D'Annunzio" University School of Advanced Studies, Chieti, Italy; L'Ecole Centrale Marseille in France; University of Leipzig, Germany; University of Leuven – KU Leuven, Belgium but also from the National Institute for Astrophysics, Optics and Electronics (INAOE) in Mexico; and Hitachi Advanced Research Laboratory, Japan.
2002-ongoing	Student supervision, in total I have **supervised near to 70 students** for 3rd year BSc students, MSc and MRes students. Every year I supervise 4 to 5 students.

- **TEACHING ACTIVITIES**

Period	Role	Module Name	Course
2011 – 2019	Module Organiser	MPHYGB97 MPHY0034/35 – MSc Research Projects	MSc in Physics and Engineering Medicine
2008 – present	Lecturer	MPHY3012 – Physiological Monitoring MPBE-Research Skills Course CoMPLEX ITPL Labs	BSc Physics with Medical Phys. (3rd Year); Intercalated BSc in Medical Phys. & Bioeng.; Electronic Engineering (3rd Year)

- **ORGANISATION OF SCIENTIFIC MEETINGS**

I have been Member of Scientific and Local Organising Committee for several conferences including OSA/SPIE ECBO Meeting, International conference in Functional Near-Infrared Spectroscopy (fNIRS) and International Society of Oxygen Transport to Tissue. I have also chaired several meetings including the Photonex Roadshow (2013, 2016, 2018), Workshop/Conference in UK-JAPAN Multimodal Brain Imaging, Royal Society Kavli Center, UK (2012) and recently Institute of Physics, Optics in Clinical Practice Meeting for December 2020.

- **INSTITUTIONAL RESPONSIBILITIES**

In 2019 I was promoted to director of all postgraduate taught studies including the MRes program in the department and the Chair for Medical Physics Postgraduate Teaching Committee. In total I am directing fours MSc programmes in Physics and Engineering in Medicine (Radiation Physics, Biomedical Engineering, Medical Imaging and Distance Learning).

- **REVIEWING ACTIVITIES**

I am currently the associate editor for the Frontiers Published Journal Brain Imaging and Stimulation and Guest Editor for the MDPI Applied Sciences Special Issue "Advances in Hyperspectral and Multispectral Optical Spectroscopy and Imaging of Tissue". I have been an active review for all major journals in my research field such as Biomedical Optics Express, Journal of Biomedical Optics; Applied Optics etc but also journals including Neuroimage; Journal of Cerebral Blood Flow and Metabolism etc. Finally I am a reviewer for various research councils including Action Medical Research; Medical Research Council; Swiss National Science Foundation and many more.

- **MEMBERSHIPS OF SCIENTIFIC SOCIETIES**

(1)Since 2002-International Society of Oxygen Transport to Tissue. (2)Since 2018 -Member of the Executive Committee of the International Society of Functional NIRS. (3)Since 2004-Member of the Optical Society of America. (4)Since 2002-Member of the International Society of Cerebral Blood Flow and Metabolism. (5)Since 2002-Associate Member of the Institute of Physics.

Appendix: All on-going grants and submitted grants applications of the PI (Funding ID)

Mandatory information (not counted towards page limits)

On-going Grants (Please indicate "No funding" when applicable):

Project Title	*Funding source*	*Amount (Euros)*	*Period*	*Role of the PI*	*Relation to current ERC proposal*[2]
Development of a cot-side optical biomarker of brain tissue health following neonatal hypoxic-ischaemic brain injury.	Medical Research Council (MRC) – Standard Research Grant	1,096,646Euros	Nov 2018 – Nov 2021	PI	None. This project focuses on developing an optical instrument to monitor the brain of newborns within the first days of life and up to 1-week old.
LightNIRS functional Near-InfraRed Spectroscopy (fNIRS) wearable, head-mounted scanning devices x 2.	EPSRC Capital Award for Core Equipment	239,940Euro	Nov 2019	Co-PI	None. Equipment funding to purchase two fNIRS equipment.
Toddlerlab CAVE Neuroimaging Facilities	Wellcome Trust - Multi-user equipment	1,117,662Euro	Sep 2019 – Sep 2024	Co-PI	None. Development of the Toddler lab facility at Birkbeck University.
What Does the Human Face Tell the Human Brain?	4 Years PhD Studentship, UCL Yale Collaboration Initiative	122,636Euro	Oct 2019 – Oct 2023	PI	None. fNIRS project and collaboration with Prof. Joy Hirsch at Yale University
Understanding neural and physiological signatures of human communication	4 Years PhD Studentship UBEL ESRC-Case PhD	122,636Euro	Oct 2019 – Oct 2023	Co-PI	None. fNIRS project and collaboration with Prof. Antonia Hamilton at the Institute of Cognitive Neuroscience at UCL

[2] Describe clearly any scientific overlap between your ERC application and the current research grant or any grant application.

Grant applications (Please indicate "No funding" when applicable):

Project Title	*Funding source*	*Amount (Euros)*	*Period*	*Role of the PI*	*Relation to current ERC proposal*[2]
Understanding ATP1A3 related disease - a deep phenotypig - genotyping study	National Grant Outline Application - UCL Great Ormond Street Institute of Child Health	239,940 Euros	May 2021 - October 2022	Co-PI	None.
Quantum Sensors for multiscale Imaging of Alzheimer's Disease pathogenesis	Horizon 2020 Call: H2020-ICT-2018-20 (Information and Communication Technologies) Topic: ICT-36-2020 Type of action: RIA	5,873,196Euros	May 2021-May 2024	Co-PI	None.
Understanding the role of tissue hypoxia in multiple sclerosis, and achieving the new therapeutic opportunity	Wellcome Trust Collaborative Award	3,531,425(Euro)	July 2021 – July 2026	Co-PI	None.

Section c: Ten years track-record

Ground-breaking Research and Technological Innovations

I have an established research international reputation within the field of near-infrared spectroscopy (NIRS) developments and application, both through (1) my novel observations in understanding the confounding factors of NIRS in neuroscience, proposing signal processing methods to overcome them and standards for analysis [Pinti P. et al Front.Hum.Neurosci. 2019; Caldwell M. et al Neuroimage 2016; Tachtsidis and Scholkmann Neurophotonics. 2016; Kirilina E. et al Neuroimage 2012]; and (2) my pioneering work on the development of instrumentation and algorithms for monitoring non-invasively brain tissue changes in oxygenation and metabolism (the oxidation state of cytochrome-c-oxidase or oxCCO) through the development of multi-wavelength and broadband NIRS [Lange F. et al IEEE J.Sel.Top.Quantum.Electron 2018; Bale et al Biomed.Opt.Express. 2014; Bainbridge A. et al Neuroimage 2014]. Over the last 10-years I have: (1) developed a novel optical brain monitoring technology broadband near-infrared spectroscopy (or bNIRS) that additional to the measurements of brain oxygenation can quantify metabolism by measuring in-vivo the oxidation state of cytochrome-c-oxidase (or oxCCO); (2) demonstrated in the neonatal preclinical animal model that the unique optical measurement with bNIRS of the brain tissue oxCCO is a biomarker of hypoxic-ischaemic injury severity and outcome; (3) establish a neonatal bNIRS bedside system to monitor oxCCO in the neonatal intensive care unit (NICU) in the University College London Hospitals (UCLH); (4) demonstrated that bNIRS measurement of brain tissue oxCCO measured as early as the first day of life in neonates with hypoxic-ischaemic encephalopathy (HIE) can prognosticate neurodevelopment; (5) developed computational models of the brain tissue physiology and biochemistry for multimodal data integration and interpretation [Russell-Buckland J. et al PLOS Comput Biology 2019] (6) developed the instrumentation (hardware) foundations based on state-of-the-art photonic components for brain imaging of oxCCO and demonstrated its operation in the adult brain during frontal lobe and visual cortex activation; and (7) demonstrate in 4-to-6-month-old infants significant changes in brain tissue oxCCO in response to stimulus-evoked activation. In two recent publications, I have demonstrated in neonates with HIE in the NICU that only in infants with severe injury, the brain tissue mitochondrial metabolism (oxCCO) as measured with bNIRS (1) is highly dependent in brain tissue oxygenation; and (2) is highly associated with spontaneous blood pressure changes [Mitra S. et al. J Cereb Blood Flow Metab. 2019; Bale G. et al J Cereb Blood Flow Metab. 2018]. Hence, providing evidence of our brain tissue measurements of oxCCO with bNIRS being able to prognosticate neonates with hypoxic-ischaemic encephalopathy within the first day of life. I have further demonstrated the importance of measuring brain tissue mitochondrial metabolism with my bNIRS neuromonitoring instrument in (1) neonatal seizures [Mitra S. et al. Front Pediatr. 2016]; (2) neonatal stroke [Mitra S. et al Adv Exp Med Biol. 2016]; and (3) during rewarming following hypothermia treatment [Mitra S. et al Adv Exp Med Biol. 2016].

Publications

1. Kaynezhad P, Mitra S, Bale G, Bauer C, Lingam I, Meehan C, Avdic-Belltheus A, Martinello KA, Bainbridge A, Robertson NJ, **Tachtsidis I.** Quantification of the severity of hypoxic-ischemic brain injury in a neonatal preclinical model using measurements of cytochrome-c-oxidase from a miniature broadband-near-infrared spectroscopy system. Neurophotonics. 2019 Oct;6(4):045009.
2. Russell-Buckland J, Barnes CP, **Tachtsidis I.** A Bayesian framework for the analysis of systems biology models of the brain. PLoS Comput Biol. 2019 Apr 26;15(4):e1006631.
3. Bale G, Mitra S, de Roever I, Sokolska M, Price D, Bainbridge A, Gunny R, Uria-Avellanal C, Kendall GS, Meek J, Robertson NJ, **Tachtsidis I.** Oxygen dependency of mitochondrial metabolism indicates outcome of newborn brain injury. J Cereb Blood Flow Metab. 2019 Oct;39(10):2035-2047.
4. Lange F, Dunne L, Hale L, **Tachtsidis I.** MAESTROS: A Multiwavelength Time-Domain NIRS System to Monitor Changes in Oxygenation and Oxidation State of Cytochrome-C-Oxidase. IEEE J Sel Top Quantum Electron. 2018 May 9;25(1):7100312.
5. Pinti P, Merla A, Aichelburg C, Lind F, Power S, Swingler E, Hamilton A, Gilbert S, Burgess PW, **Tachtsidis I.** A novel GLM-based method for the Automatic IDentification of functional Events (AIDE) in fNIRS data recorded in naturalistic environments. Neuroimage. 2017 Jul 15;155:291-304.
6. Phan P, Highton D, Lai J, Smith M, Elwell C, **Tachtsidis I.** Multi-channel multi-distance broadband near-infrared spectroscopy system to measure the spatial response of cellular oxygen metabolism and tissue oxygenation. Biomed Opt Express. 2016 Oct 5;7(11):4424-4440.

7. **Tachtsidis I**, Scholkmann F. False positives and false negatives in functional near-infrared spectroscopy: issues, challenges, and the way forward. Neurophotonics. 2016 Jul;3(3):031405.
8. Caldwell M, Moroz T, Hapuarachchi T, Bainbridge A, Robertson NJ, Cooper CE, **Tachtsidis I.** Modelling Blood Flow and Metabolism in the Preclinical Neonatal Brain during and Following Hypoxic-Ischaemia. PLoS One. 2015 Oct 7;10(10):e0140171
9. Bale G, Mitra S, Meek J, Robertson N, **Tachtsidis I.** A new broadband near-infrared spectroscopy system for in-vivo measurements of cerebral cytochrome-c-oxidase changes in neonatal brain injury. Biomed Opt Express. 2014 Sep 5;5(10):3450-66.
10. Kirilina E, Jelzow A, Heine A, Niessing M, Wabnitz H, Brühl R, Ittermann B, Jacobs AM, **Tachtsidis I.** The physiological origin of task-evoked systemic artefacts in functional near infrared spectroscopy. Neuroimage. 2012 May 15;61(1):70-81.

Evidence for International Reputation and Research Output

- I am a regular keynote speaker at international conferences since 2009 a total of 26 including both technology innovation conferences such as the Biophotonics Congress of the Optical Society of America (OSA); and application/clinical relevant such as the International meeting of the Society of Oxygen Transport to Tissue (ISOTT).
- I have 122 journal publications (UCL Pubmed). My publications focus on (i) technical journals such as IEEE Journal of Selected Topics in Quantum Electronics (IF:4.7), Biomedical Optics Express (IF:3.3), PLOS Computational Biology (IF:4.4); (ii) neuroscience\neuroimaging journals such as NeuroImage (IF:5.4), Neurophotonics (IF:4.1); and (iii) clinical journals such as Journal of Cerebral Blood Flow and Metabolism (IF:6.0), Current Biology (IF:9.2) and Journal of Neuroscience (IF:6.0).
- I have patents within the field of biomedical optics and nanoparticles detection and recently I have submitted a patent with co-inventor Nilli Lavie (UCL, Psychology) PCT/EP2018 (pending approval) for using broadband NIRS for determining the perceptual load and the level of stimulus perception of a human adult brain.
- To date I have secured a total of £7,464,741 in research funding from a range of research councils (EPSRC, MRC, EU), charitable (Wellcome Trust, Rosetree Trust) and industrial sources (Hamamatsu, Hitachi, Shimadzu).
- I have an excellent track record of working with industry and most recently I have recently established a collaboration with Shimadzu Japan, a leading manufacturer of fNIRS instruments.
- Demonstrating the highly regarded international reputation of my technology and measurements, I had the following hospitals and departments purchasing from me broadband NIRS equipment: (1) the Paediatric University Hospital Sydney, Australia, for monitoring in cardiac surgery; (2) the Psychiatric University Hospital Zurich, Switzerland for dementia research; and (3) the Department of Psychiatry, Columbia University, USA for research in psychosis including substance abuse.

Evidence of Outreach and Impact

- I am leading a highly active public engagement activity when I obtained in 2016 £160,000 from the Wellcome to create MetaboLight, the public engagement alias of my research team. This funding allowed me (i) to connect with Design Science a company that specialised in communicating research to the public and (ii) establish a very active public engagement program spanning from schools to science festivals (Big Bang Fair, British Science Festival) to development of educational resources for teachers and pupils (see www.metabolight.org)
- In 2019 I led the Royal Society Summer Science exhibition “Lighting the Brain After Birth” which attracted over 12,000 visitors over seven days. As part of that I managed a team of over 50 people and produced a unique interactive exhibit.
- My work received extensive media attention including exposure in BBC, BBC World Radio and Evening Standard.

Evidence of Mentorship

My PhD students following their graduation went to work to industry (including GOOGLE), some joined other academic groups (including Institute of Cognitive Neuroscience) and some stayed within my research group. It worth mentioning Dr Gemma Bale (physicists by training), she joint my group as a PhD student and she is currently a lecturer at University of Cambridge, UK. In addition, Dr Subhrabata Mitra (clinical neonatologist by training), he joint my research team as a PhD student and he has currently a Wellcome trust clinical fellowship. Finally Dr Paola Pinti (engineer by training) she joined my team as a postdoctoral researcher and she is now the senior laboratory manager at the new Toddler Laboratory at Birkbeck, University of London, UK.