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April 27, 2012

Re: Position of Assistant Professor in Computational Neuroscience

Dear Search Committee,

I wish to apply for the position of Assistant Professor in Computational Neuroscience and have attached a copy of my curriculum vitae, my research and teaching statements, and three representative publications.

The attached documentation shows that, broadly speaking, I have been working over the last few years on a quantitative modeling approach to the analysis of sensory neurophysiology in humans. As such, it was with great interest that I saw the advertisement for the position at Brown. The possibility of working as part of the Department of Neuroscience in conjunction with the Brown Institute for Brain Sciences is something that interests me greatly. I believe that my previous research on vision and audition fits extremely well with both the job spec and with the general questions forming the framework of the BIBS.

In particular, my model-based approach to human visual neurophysiology has led to interesting, ongoing work in schizophrenia and in children with autism spectrum disorder. It has also been looked at in multiple sclerosis - all of which seems to be very much in line with the job specification. One of the attached representative publications describes the first of my ongoing studies on visual responses in schizophrenia.

My research on vision also appears to align very well with the BIBS research question: How do we see? The possibility of regularly interacting with other researchers who are interested in the computational principles underpinning vision in natural environments is extremely exciting to me. I firmly believe that the flexibility provided by some of the methods that I have developed has an important role to play in this research area.

My research on audition, particularly my recent project examining neural responses to natural speech appears to align well with the theme: How do we communicate? I am interested in this research area both in terms of how adults process natural speech, but also in terms of the acquisition of language (NIH - R21 grant in prep as Co-Investigator with Prof John Foxe). I have attached a manuscript on how attention affects the processing of natural language as a representative publication.

Finally, I have conducted some research on the computational modeling of retinal ganglion cell population responses in collaboration with Professor Liam Paninski. This work relates very much to the theme of cracking the neural code and I have attached our paper as my third representative publication.

With regards to teaching, my teaching statement is somewhat philosophical in nature, so it is worth adding some more concrete points. First and foremost, I enjoy teaching both at undergraduate and postgraduate level. As can be seen from my CV, I have taught a variety of courses over the last few years ranging from courses on neural signals to courses on analog electronics and on how technology impacts upon society. While I have enjoyed all of these teaching assignments, I would be particularly interested to teach on a topics that relate a little more closely to my own research, e.g., neuroscience,

signal processing, sensory processing, etc.

While my CV contains a fuller account of my career to date, I have included here a brief summary of my experience:

- Publishing in both neuroscience and bioengineering - **20 peer-reviewed journal publications** (15 as first, last or corresponding author), 1 invited book chapter, > 30 conference proceedings/abstracts, 1 patent application.
- **3 prestigious fellowship awards** (Marie-Curie Intra-European Fellowship, IRCSET Government of Ireland postdoctoral fellowship, University of Southern California's Powell Merit Fellowship).
- Experience in developing and teaching courses at **undergraduate** and **postgraduate** level - including postgraduate modules in neuroscience.
- Undergraduate (4) and postgraduate (12) supervision including the organization of regular seminars/journal clubs.
- Co-investigator on 4 grants totaling over **$1.6 million**.

I have requested references from:

- Professor John Foxe (Albert Einstein College of Medicine) who was my first post-doc adviser,
- Professor Barak Pearlmutter (Brain and Computation Lab, Hamilton Institute, NUI Maynooth, Ireland) who I worked with during my PhD.
- Professor Liam Paninski with whom I collaborated on a project on the modeling of neuronal populations.

I am hopeful that these will be forthcoming in the next couple of days.

Other potential referees include:

- Professor Matteo Carandini (UCL) who very briefly supervised me as a postdoc.
- Professor Charles Schroeder (NKI) with whom I collaborate and for whom I regularly review papers (J Neurosci).

I would be delighted to get the opportunity to speak to you in more detail about my research and teaching interests and about how I might contribute to both the Department of Neuroscience at Brown University and BIBS.

Yours sincerely,

Edmund C Lalor, Ph.D.

Edmund C Lalor, PhD

20 Killakee Walk
Firhouse, Dublin 24,
Ireland

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Education

- **PhD, Biomedical (Neural) Engineering** — 2007
  University College Dublin — Dublin, Ireland
  Supervisor: Professor Richard Reilly
- **MSc, Electrical Engineering** — 1999
  University of Southern California — Los Angeles, CA
- **BE, Electronic Engineering** - 1^{st} class honours — 1998
  University College Dublin — Dublin, Ireland

Academic Positions

- **Assistant Professor** — 2011 - Present
  School of Engineering, — Dublin, Ireland
  Trinity College Dublin
- **Principal Investigator** — 2011 - Present
  Trinity College Institute of Neuroscience and, — Dublin, Ireland
  Trinity Centre for Bioengineering
  Trinity College Dublin
- **Research Associate** — 2010 - 2011
  Department of Visual Neuroscience, Institute of Ophthalmology, — London, UK
  University College London
  Mentor: Professor Matteo Carandini
- **Postdoctoral Research Fellow** — 2008 - 2010
  Institute of Neuroscience and Centre for Bioengineering, — Dublin, Ireland
  Trinity College Dublin
  Mentors: Professor Ian H. Robertson and Professor John J. Foxe
- **Postdoctoral Research Fellow** — 2006 - 2008
  Cognitive Neurophysiology Laboratory, — Orangeburg, NY
  Nathan Kline Institute for Psychiatric Research
  Mentor: Professor John J. Foxe

Other Experience

- **Adjunct Lecturer** — 2009 - 2010
  School of Engineering, Trinity College Dublin — Dublin, Ireland
- **Adjunct Assistant Professor** — 2006 - 2008
  Cognitive Neuroscience Program, The City College of New York — New York, NY
- **Research Associate** — 2002 - 2005
  MIT Media Lab Europe — Dublin, Ireland

Primary School Resource Teacher 2002 - 2003

- Good Shepherd National School Dublin, Ireland
  St. Colmcille's Primary School Dublin, Ireland

- **DSP Development Engineer** 2000 - 2001
  Massana Design Limited Dublin, Ireland

Teaching

- **School of Engineering** Trinity College Dublin
  - *Undergraduate:*
    4E1 (2009-2010) - Senior course on Technology and Society
    3C3 (2011-2012) - Junior course on Analogue Circuits
  - *Postgraduate:*
    EE7B11 (2011-2012) - Neural Signal Analysis.
    ME7B08 (2010-2012) - MSc in Bioengineering.
    Neural Signal Analysis, Neural Recording Techniques, EEG and Schizophrenia.
    EE7900 (2010-2012) - MSc in Neuroscience.
    Neural Signal Analysis, EEG and Schizophrenia.

- **Cognitive Neuroscience Program** City College of New York
  - *Undergraduate:*
    Lectures (2006-2008) on cognitive neuroscience and experimental research methods.
  - *Postgraduate:*
    PSYC 80103 (2007-2008) - PhD Course on Signal Processing for Neuroscientists.

- **School of Engineering** University College Dublin
  - Supervision and tutoring of various undergraduate engineering laboratories (2004-2006).

- **St. Colmcille's Primary and Good Shepherd National Schools** Dublin, Ireland
  - Teacher for children with learning difficulties (2002-2003).

Funding

Co-Investigator - PI: Foxe, Albert Einstein College of Medicine US NIH

- Exploratory/Developmental Research Grant (R21DC012447) 2012 - 2014
  Neurophysiology of receptive speech in Rett Syndrome $ 275,000

Marie Curie Intra-European Fellowship European Commission (FP7)

- BEMVMMS - Mentor: Carandini 2010
  (Note: Declined in order to accept academic post) €279,180

Co-Investigator - PI: Reilly, TCD Science Foundation Ireland

- Research Frontiers Programme 2009 - 2012
  Multisensory integration: vision/audition, vision/vestibular €238,000

Co-Investigator - PI: Dockree, TCD — IRCHSS

- Reseach Development Initiative — 2009 - 2010

  Attention and distraction in clients with acquired brain injury — €42,256

Fellowship - Mentor: Robertson, TCD — IRCSET

- 2-year Postdoctoral Fellowship — 2008 - 2010

  New methods for EEG research using natural stimuli — €83,100

Co-Investigator - PI: Foxe, NKI — US National Science Foundation

- Biological Sciences Grant (BCS0642584) — 2007 - 2010

  Anticipatory attentional deployment and early selection — $ 632,000

Co-Investigator - PI: Reilly, UCD — Irish Higher Education Authority

- Fund for Digital Research — 2004 - 2007

  Attention-based brain-computer interfacing — €483,500

Awards and Honours

- *Provost's Teaching Award (Nominated)*, Trinity College Dublin, 2011.
- *Marie Curie Intra-European Fellowship*, European Commission (FP7), 2010.
  (Declined in order to accept academic post.)
- *Government of Ireland Postdoctoral Research Fellowship*, IRCSET, 2008.
- *Excellence in Neural Engineering*, IEEE Engineering in Medicine and Biology Society, US National Science Foundation and US Office of Naval Research, 2005.
- *Best Presentation*, UCD Faculty of Engineering and Architecture, 2005.
- *Certificate of Research Excellence*, MIT Media Lab, 2004.
- *Powell Merit Fellowship*, School of Engineering, University of Southern California, 1998.
  Awarded to 2 outstanding postgraduate students each year. $36,600 per annum.
- *Maximum Scores*, GRE quantitative section and analytical section, 1997. Placed in the top 1% of all students entering US graduate study in mathematical aptitude and logical reasoning.

Memberships

- Society for Neuroscience (SFN).
- Institute of Electronic and Electrical Engineers (IEEE).
- IEEE Engineering in Medicine and Biology Society (EMBS).
- Physiology Society.

Reviewing Experience

- Registered Expert - Seventh Research Framework Programme (FP7).
- Reviewing Editor - Frontiers in Integrative Neuroscience.
- Reviewer:

  - Journal of Neuroscience.
  - Journal of Neurophysiology.
  - European Journal of Neuroscience.
  - Biological Psychiatry.
  - Brain Research.
  - Brain Topography.
  - Psychophysiology.
  - IEEE Transactions on Biomedical Circuits and Systems.
  - IEEE Engineering in Medicine and Biology Society.
  - Medical & Biological Engineering & Computing.
  - Hearing Research.
  - Medical Engineering & Physics.
  - Computer Methods and Programs in Biomedicine.
- Grant Reviewer - Israel Science Foundation.

Invited Talks & International Presentations

- *Invited Talk* - Department of Neuroscience, Albert Einstein College of Medicine, 2012
- *Invited Talk* - Department of Biomedical Engineering, City College of New York, 2011
- *Podium Presentation* - Annual Meeting of the Society for Neuroscience, 2010
- *Podium Presentation* - Annual Meeting of the Society for Neuroscience, 2009
- *Invited Talk* - Institute of Molecular Medicine, TCD, 2009
- *Invited Talk* - Department of Psychology, City College of New York, 2007
- *Invited Talk* - University of Bristol, 2006
- *Invited Talk* - Hamilton Institute, NUI Maynooth 2006
- *Podium Presentation* - Engineering in Medicine and Biology Conference, 2006

Other Professional Activities

- Represented TCD in nationally-televised documentary (MND: The Inside Track), 2012.
- Local organising committee, Irish Signals and Systems Conference (ISSC), 2011.
- Participant in IEEE EMBS Forum on Grand Challenges in Neural Engineering, 2010.
- STEPS to Engineering program, 2006–2008.
- Lab in the Gallery at Dublin's Science Gallery, 2008.
- Committee member for the Neural Engineering stream of the 16th Annual Bioengineering in Ireland Conference, 2009.
- Summer school supervisor - UCD Electronic & Electrical Engineering, 2006.

Theses Examined

PhD

- *Temporal Discrimination Thresholds as an Endophenotype in Adult-Onset Primary Torsion Dystonia* — Dr. David Bradley (TCD; 2012)

MSc

- *System Identification of the Hippocampus* — Mayke Van Dort. (TCD; 2011)
- *EEG During Ambulation* — Glenn Browett. (TCD; 2010)

Student Supervision

PhD

- *Supervisor (2011–Present)* — Michael Crosse.
- *Supervisor (2011–Present)* — James O'Sullivan.
- *Supervisor (2011–Present)* — Gerard Loughnane.
- *Co-Supervisor (2011–Present)* — Dr. Parameswaran Iyer.
- *Temporary Supervisor (2011)* — Andrew Hines.
- *Co-Supervisor (2008–2011)* — Alan Power.

MSc

- *MSc in Neuroscience: Project Supervisor (2012)* — Áine Ní Choisdealbha.
- *MSc in Neuroscience: Project Co-Supervisor (2012)* — John Shanley.
- *MSc in Bioengineering: Project Supervisor (2011–2012)* — Nuno Gonçalves.
- *MSc in Bioengineering: Project Supervisor (2012)* — Rory Farrell.
- *MSc in Bioengineering: Project Supervisor (2012)* — Catriona Egan.
- *MSc in Bioengineering: Project Supervisor (2011)* — Michael Crosse.

Undergraduate

- *Final Year Project (Elec Eng) Supervisor (2012)* — James Clifford.
- *Final Year Project (Elec Eng) Supervisor (2012)* — Alex Peña.
- *Final Year Project (Elec Eng) Supervisor (2012)* — Fionan Keenan.
- *Final Year Project (Physiology) Supervisor (2010)* — James Barrett.

Interns

- *2011* — Karen Mooney-Kelleher.

Selected Publications

Book Chapters

- **Lalor, E.C.**, Pearlmutter, B.A., Foxe, J.J. (2009). *Reverse Correlation and the VESPA Method*, In Handy, T.C. (Ed.) *Brain Signal Analysis: Advances in Neuroelectric and Neuromagnetic Methods*. MIT Press: Cambridge.

Peer Reviewed Journal Articles

- Kelly, S.P., Schroeder, C.E., **Lalor, E.C.** (2012) What does polarity inversion of extrastriate activity tell us about striate contributions to the early VEP? A comment on Ales et al (2010). *NeuroImage*, doi: 10.1016/j.neuroimage.2012.03.081.
- Whelan, R., Conrod, P.J., Poline, J.B., Lourdusamy, A., Banaschewski, T., Barker, G.J., Bellgrove, M.A., Büchel, C., Byrne, M., Cummins, T.D.R., Fauth-Bühler, M., Flor, H., Gallinat, J., Heinz, A., Ittermann, B., Mann, K., Martinot, J.L., **Lalor, E.C.**, Lathrop, M., Loth, E., Paus, T., Rietschel, M., Smolka, M.N., Spanagel, R., Stephens, D., Struve, M., Thyreau, B., Vollstaedt-Klein, S., Robbins, T.W., Schumann, G., Garavan, H., and the IMAGEN consortium (2012). Adolescent impulsivity phenotypes characterized by distinct brain networks. *Nature Neuroscience*, in press.
- Power, A.J., Foxe, J.J., Forde, E.J., Reilly, R.B., **Lalor, E.C.** (2012) At what time is the cocktail party? A late locus of selective attention to natural speech. *European Journal of Neuroscience*, doi: 10.1111/j.1460-9568.2012.08060.x.
- Power, A.J., **Lalor, E.C.**, Reilly, R.B. (2011) Endogenous auditory spatial attention modulates obligatory sensory activity in auditory cortex. *Cerebral Cortex*, 21(6): 1223-1230.
- Frey, H.P., Kelly, S.P., **Lalor, E.C.**, Foxe, J.J. (2010). Early spatial attentional modulation of inputs to the fovea. *Journal of Neuroscience*, 30(13): 4547-4551.
- **Lalor, E.C.**, Foxe, J.J. (2010). On interpreting responses to low contrast stimuli in terms of magnocellular activity–a few remarks. *Vision Research*, 50(2010): 991-994.
- **Lalor, E.C.**, Foxe, J.J. (2010). Neural responses to uninterrupted natural speech can be extracted with precise temporal resolution. *European Journal of Neuroscience*, 31(1):189-193.
- **Lalor, E.C.**, Ahmadian, Y., Paninski, L. (2009). The relationship between optimal and biologically plausible decoding of stimulus velocity in the retina. *Journal of the Optical Society of America A*, 26(11):B25–B42.
- **Lalor, E.C.**, Foxe, J.J. (2009). Visual evoked spread spectrum analysis (VESPA) responses to stimuli biased towards magnocellular and parvocellular pathways. *Vision Research*, 49(1):127–133.
- **Lalor, E.C.**, Power, A.J., Reilly, R.B., Foxe, J.J. (2009). Resolving precise temporal processing properties of the auditory system using continuous stimuli. *Journal of Neurophysiology*, 102(1):349-359.
- **Lalor, E.C.**, Yeap, S., Reilly, R.B., Pearlmutter, B.A., Foxe, J.J. (2008). Dissecting the cellular contributions to early visual sensory processing deficits in schizophrenia using the VESPA evoked response. *Schizophrenia Research*, 98(2008):256–264.
- **Lalor, E.C.**, Kelly, S.P., Pearlmutter, B.A., Reilly, R.B., Foxe, J.J. (2007). Isolating endogenous visuo-spatial attentional effects using the novel Visual Evoked Spread Spectrum Analysis (VESPA) technique. *European Journal of Neuroscience*, 26(12):3536–3542.
- Kelly, S.P., **Lalor, E.C.**, Reilly, R.B., Foxe, J.J. (2006). Increases in alpha oscillatory power reflect an active retinotopic mechanism for distracter suppression during sustained visuo-spatial attention. *Journal of Neurophysiology*, 95:3844–3851.
- **Lalor, E.C.**, Pearlmutter, B.A., Reilly, R.B., McDarby, G., Foxe, J.J. (2006). The VESPA: a method for the rapid estimation of a visual evoked potential. *NeuroImage*, 32:1549–1561.
- Kelly, S.P., **Lalor, E.**, Finucane, C., McDarby, G., Reilly, R.B. (2005). Visual spatial attention control in an independent brain-computer interface. *IEEE Transactions on Biomedical Engineering*, 52(9):1588–1596.

- Kelly, S.P., **Lalor, E.C.**, Reilly, R.B., Foxe, J.J. (2005). Visual spatial attention tracking using high-density SSVEP data for independent brain-computer communication. *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 13(2):172–178.
- **Lalor, E.C.**, Kelly, S.P., Finucane, C., Burke, R. Smith, R., Reilly, R.B., McDarby, G.(2005). Steady-state VEP-based brain-computer interface control in an immersive 3-D gaming environment. *EURASIP Journal on Applied Signal Processing*, 2005(19):3156–3164.

Journal Articles In Review

- **Lalor, E.C.**, Kelly, S.P., Foxe, J.J. Generation of the VESPA response to rapid contrast fluctuations is dominated by striate cortex: evidence from retinotopic mapping. *Neuroscience.*
- Murphy, J.M., Kelly, S.P., Foxe, J.J. **Lalor, E.C.** Isolating early cortical generators of visual evoked activity: A systems identification approach. *Experimental Brain Research.*
- **Lalor, E.C.**, De Sanctis, P., Krakowski, M.W., Foxe, J.J. Visual sensory deficits in schizophrenia: Is there anything to the magnocellular account? *Schizophrenia Research.*

Journal Articles In Preparation

- Gonçalves, N., Whelan, R., **Lalor, E.C.** Isolating dorsal visual stream processing in humans with high temporal resolution.
- Frey, H.P., Molholm, S., **Lalor, E.C.**, Russo, N., Foxe, J.J. Altered electrophysiological responses to peripheral visual stimuli in children with autism spectrum disorder: a high-density electrical mapping study.
- Frey, H.P., **Lalor, E.C.**, Murphy, J.M., Schmid, A., Foxe, J.J. The precise timing of the divided attentional spotlight.

Patent Applications

- **Lalor, E.C.**, Reilly, R.B., Foxe, J.J., Pearlmutter, B.A. (2007). *Method and apparatus for evoking a response from a subject.* Internation Application No., PCT/IB2007/001431.

Selected Conference Publications

- **Lalor, E.C.** (2010). *The timing of coherent motion processing in human visual cortex.* 40th Annual Meeting of the Society for Neuroscience.
- **Lalor, E.C.**, Ahmadian, Y., Pillow, J., Simoncelli, E., Paninski, L. (2009). *Decoding of stimulus velocity using a model of ganglion cells in primate retina.* Frontiers in Systems Neuroscience - CoSyNe.
- **Lalor, E.C.** (2009). *Modeling the human visual system using the white-noise approach.* IEEE EMBS Conference on Neural Engineering.
- **Lalor, E.C.**, De Sanctis, P., Krakowski, M., Foxe, J.J. (2009). *The search for evidence of magnocellular dysfunction in schizophrenia using the VESPA*. 39th Annual Meeting of the Society for Neuroscience.
- **Lalor, E.C.**, Connolly, C.G., Bell, R.P., Nestor, L., Foxe, J.J., Garavan, H. (2009). *Differing activation of ventral striatum in abstinent cocaine users in response to cues signaling non-drug incentives.* 15th Annual Meeting of the Organization for Human Brain Mapping.
- **Lalor, E.C.**, Pearlmutter, B.A., Reilly, R.B., and Foxe, J.J. (2006). *Spread spectrum stimulation for the study of multisensory integration.* Proceedings of the 7th Annual Meeting of the International Multisensory Research Forum.

Broadly speaking, the research that I have undertaken over the last few years can be described as a quantitative modelling approach to the analysis of sensory neurophysiology in humans. More specifically, my research can be divided into two interdependent streams (***fundamental*** and ***translational***), which are investigated using two distinct research modalities (***electrophysiology*** and ***computational modelling***).

The first of these research streams seeks to exploit powerful mathematical approaches to the analysis of sensory physiology in order to gain a greater fundamental understanding of visual, auditory and multisensory processing in human and non-human subjects. To date our understanding of the workings of these sensory systems in humans has been hampered by less rigorous analysis methodologies. Novel electrophysiological methods that I have developed and published have sought to redress this and these have garnered significant attention in the international research community as evidenced by the recent publication of an invited book chapter by MIT press. In addition, through advanced computational modelling approaches, in collaboration with researchers at Columbia University in New York, I have sought to gain a greater understanding of how the brain encodes and decodes information in populations of neurons. The burgeoning field of neural prosthetics, in which damaged portions of the sensory or motor system are replaced by active, implantable human-engineered systems, will require substantial improvements in our ability to design signalling interfaces between artificial devices and real neural tissue. Understanding encoding and decoding in populations of neurons - and developing models that allow us to predict the effects of experimental perturbations to their behaviour - is key to this endeavour.

The second stream of my research has a sharp translational focus. It is directed at the identification of biological markers of mental disorder, which has been highlighted as a key goal in the Wellcome Trust's recently published strategic plan (2010-2020) and in the strategic plan of the US National Institute of Mental Health (2007), among others. Through advances on the electrophysiological methodologies that I have published over the last 6 years, I aim to greatly increase the specificity and clinical tractability of immediately translatable biomarkers and thus to help accelerate the progress towards badly-needed combinatorial treatments for mental illness. Recently, I have had positive discussions relating to this work both with funding agencies and industry. In terms of funding for the work, I have 1 grant proposal in review as a Co-PI with the NIH and a second grant in final preparation for submission as PI. In terms of industrial interest, I have had preliminary discussions with two companies interested in exploring licensing arrangements with some of the technology that I have developed.

Specific research areas that I have been and continue to be involved in include the following:

- **Processing of electrophysiological signals reflecting activity of human sensory systems.** Specifically, I am interested in using systems identification methods to answer fundamental questions on the processing of stimuli by the brain. To that end, I have developed a novel method known as the VESPA (Visual Evoked Spread Spectrum Analysis) which uses scalp EEG and has resulted in a number of publications. One of my long term aims is to build on this work to create methods that allow for great flexibility and specificity in the experimental interrogation of human neurophysiology. I have recently extended the VESPA to the auditory domain wherein it is known as the AESPA and have shown that it is possible to obtain useful electrophysiological indices in response to natural speech. I believe this will be extremely useful in the design of cognitive neuroscience experiments that have been difficult to implement to date for methodological reasons. I also expect it to have a major impact in our understanding of the adult processing of speech and in the development of language in children.

- **Effects of selective attention on sensory and perceptual processing.** In human electrophysiological experiments stimuli typically take the form of simple, isolated, discrete events such as flashes and beeps. Such stimulation is not always ideal for examining cognitive processes. We have utilized novel methods of continuous stimulation to address several important outstanding questions involving visual spatial attention in humans using electrophysiology. We have also recently made significant contributions to the field of auditory attention and, in particular, to the 'cocktail party problem'.
- **Sensory deficits in schizophrenia.** Patients with schizophrenia and their clinically unaffected first degree relatives have been shown to have deficits in electrophysiological markers of early sensory processing. The VESPA method has recently been shown to behave quite differently to standard event-related potential methods in this regard. This suggests a high degree of specificity in the underpinnings of these deficits. I am in the process of further investigating the electrophysiological origins of these deficits using EEG and have recently developed an entirely new VESPA method that seeks to dramatically increase the clinical sensitivity of our measures. In the future, I hope to combine this research with genetic information in an effort to isolate candidate endophenotypic markers of this disorder.
- **Multisensory integration.** Sensory events often do not occur in isolation and the complex integration of inputs from multiple senses is still poorly understood. I believe the "ESPA" method to be an extremely appropriate tool for answering questions in this research field that have been difficult or impossible to address thus far with standard, discrete stimulus methods. This project was awarded a prestigious Research Frontiers Programme grant by Science Foundation Ireland in 2009 and a number of innovative studies are under way.
- **Computational modelling of the visual system at various hierarchical levels.** As well as modelling the visual system in a somewhat holistic manner using EEG, I have also recently become interested in the workings of the visual system at a lower level. My work in this area to date has involved a collaboration with Professor Liam Paninski of Columbia University on computational modelling of ganglion cells in the retina. The global aim of this work is to contribute to the understanding of the neural code. More specifically, I have been looking at how the retina encodes real world information such as stimulus velocity.
- **Brain-computer interfacing.** A number of laboratories around the world are working towards a brain-computer interface that will enable people who cannot communicate to do so. I, along with my colleagues, have developed a novel brain-computer interface known as the visual-spatial attention control (V-SAC) BCI. This BCI has received considerable attention in the field and the work has been much cited.
- **Methods and computational modelling in functional brain imaging.** Computational model-based fMRI for research on decision making and machine learning methods in fMRI analysis. I have collaborated on a number of fMRI projects in recent months.
- **Sensory processing in autism spectrum disorder.** Recent work with my US-based collaborators has shown unusual responses to peripheral visual stimuli in children with autism spectrum disorder using my aforementioned visual stimulus paradigm. A paper is in preparation.

Edmund C Lalor, PhD - April 27, 2012

I am grateful every day for having been fortunate enough to have been born in one of the world's wealthiest countries and at a time when it is possible to live a life that previous generations could not have possibly imagined. My birthplace and time have allowed me to avail of tremendous opportunities to study, travel around and learn about many aspects of our wonderful world (and to learn a little bit about the universe beyond!). These opportunities have enriched my life and my enjoyment of life in innumerable diverse ways. I am firmly of the opinion that education, the spreading of knowledge and the instilment of a love of learning, are the most fundamentally important building blocks for the future happiness of the human race. In my teaching career to date, I have endeavoured to transmit my enthusiasm for learning to the students that I have dealt with. More than simply transmitting knowledge however, if I could teach nothing else, I would teach that a love of learning can open your eyes to a richer, more satisfying life. This is not just because of the financial riches that gained be gained through the medium of education, but because the process of learning is a glorious end in itself.

My desire to instil a love of learning has met with a number of tough challenges. Foremost among these was my role as a primary school teacher for children with mild general learning disabilities. These children struggled with virtually all aspects of the primary school curriculum and accordingly had become resistant to the idea that education was a good thing. Furthermore, many of these children came from families with very limited education and so, to convince them that school and learning were important was a very difficult task. After 18 months of effort, I am sorry to say that their ability to do their "times tables" had not improved a great deal, but I at least knew that they saw some value in reading, nature, inquiry and discussion.

In recent years, as I have become increasing involved in research, I have become quite alarmed at the unquestioning attitude of a lot of my own contemporaries at the "new" stories and advertisements that purport to inform us about the progress of (pseudo-)science and technological advances. While this is mostly limited to those contemporaries of mine who have no formal education in engineering or science, a number of friends of mine with Master's degrees in technical disciplines still seem prepared to believe anything they read. I feel that it is of the utmost importance that a person who graduates with a technical degree from one of the best universities in the world be able to think critically about the many (pseudo-)science sound bites with which we are bombarded every day. The role that rigorous, peer-reviewed, fully-disclosed research has in underpinning the teaching of the next generation is of the utmost importance in this regard. Without an understanding of how real research leads to real, practical knowledge, the graduates of the future will be at the mercy of the many marketing managers, fakirs and gurus who seek to prey on them. I don't think it is an exaggeration to say that the fabric of future society depends on university graduates commanding a good understanding of how knowledge is acquired.

On a somewhat less philosophical note, the ability to teach students based on cutting edge research is of paramount importance for future economic development. The lead time between important, new research discoveries and commercial development is ever decreasing - in some cases it is, unfortunately, less than zero! Providing students with an education that is richly informed by the most recent developments in science and engineering research will empower them to innovate and develop enterprises that would otherwise not be born.

From a practical point of view, I have two guidelines that I like to keep in mind when teaching. The first, which I believe is a particularly difficult, but vital challenge, is to try to imagine myself in the place of the student during one of my courses or lectures. Trying to remember what it was like to hear a complex concept for the first time, particularly when it may be something about which I have thought a lot about since, is a difficult, but important exercise. I feel that the better the job that one can do in this regard, then the better the lesson will be.

The second guideline, which I believe applies especially to technical courses, is the notion of contextualization. Because it is crucial for science students to have a deep understanding of the finer details of technical issues, it is sometimes difficult to keep in mind how those details map on to the bigger picture. I have always found that students will care more about the finer details if they have a strong sense of why those details are important in a larger context.

In summary, I feel extremely fortunate to have received a high quality education and to have discovered a life-long love of learning that immeasurably enriches my life. I am fully committed to and excited about transmitting this love of learning to as many other people as possible throughout my career, using the guidelines of empathy and contextualization.

Edmund C Lalor, PhD - April 27, 2012