

Life Sciences

Alan Evans

Citation

EVANS, Alan, Faculty of Medicine, McGill University

Professor Alan Evans is perhaps the leading international scientific force in the development of neuroimaging analytical platforms. Innovations from the Evan's group have enhanced the use and sophistication of brain imaging across the world. His research programs provided substantial contributions to the study of human brain structure and brain development, as well as in the understanding of the anatomical basis multiple brain-based disorders.

Detailed appraisal

We strongly support the election of Alan Evans as a Fellow of Royal Society of Canada. He has had an enormous impact on neuroimaging, as evidenced by his awarding of the 2014 national Margolese Prize in Human Neurological Disorders and the 2014 Vezina Prize for Quebec Neuroradiology. He has long been a leader in his field, with 475 peer-reviewed papers (Google Scholar h-index = 152 with 84,518 citations). In June 2014, he was ranked in the top 1% of Highly Cited Researcher for Neuroscience and Behavior <http://highlycited.com>. He has given 234 invited lectures, including the Purkinje Lecture at the U. of Nottingham, the Feindel Lecture at the U. de Montreal, the Vezina and Margolese Lectures and numerous keynote lectures. He has been PI on grants totaling over \$70M. In 2003 he received a CIHR Senior Scientist Award. After a B.Sc. in Physics and a PhD on 3D protein folding in the UK, Evans spent 5 years working on PET physics at AECL before moving to the MNI in 1984. His interests include PET/MRI neuroimaging, network modeling and large-scale databasing in neurodevelopment and neurodegeneration.

Research Leadership: Evans has held numerous leadership roles, notably as director of the McConnell Brain Imaging Centre (BIC) during the 1990's. His outstanding leadership skills were clearly demonstrated by the growth of the BIC into a top-flight group during that decade. Accordingly, in 1999, the BIC was named a Computerworld Smithsonian Award Laureate and inducted into the Smithsonian's Permanent Research Collection on Information Technology. Evans is a founding member of the International Consortium for Brain Mapping (Mazziotta et al., 1995, 923 citations). He was one of the founders of the Organization for Human Brain Mapping (OHBM), serving in numerous positions on the OHBM Council since 1995 and chairing the 4th OHBM in 1998. He was PI of the Montreal Consortium for Brain Imaging Research, a \$35M CFI initiative to link research at 6 institutions in psychiatry, neurology, development and aging, cognitive neuroscience and addiction. Finally, he is Founder of Biospective Inc., (www.biospective.com), a company that conducts image analysis for pharmaceutical studies. He is on the Scientific Advisory Committee of Brain Canada, CANARIE, Pfizer and Biogen.

Research areas:

1) Methodology: Evans' group has published many methods in imaging processing and statistics, some of which are now classical references (Collins et al., 1994, 2324 citations; Collins et al., 1995, 712 citations; Worsley et al., 2024 citations). He created the MNI152 reference brain; the most frequently employed spatial reference for registering neuroimaging data (Evans et al. 1999, 1000 citations; Fonov et al., 2011, 185 citations). He developed the universally employed N3 algorithm for MRI intensity normalization (Sled et al., 1998, 2320 citations). In 2013, he published the BigBrain dataset in Science (Amunts et al., 2013, 42 citations). In the month after its public release, it was downloaded 14,000 times

(<https://www.youtube.co/watch?v=nJpFvQ0YZLk>). MIT Technology Review ranked it in the top 10 technology breakthroughs of 2014. He developed the first technique for fully-automated extraction of 3D surfaces for grey/white matter from MRI (MacDonald et al., 2000; 606 citations). He subsequently introduced structural network modeling based on correlation of cortical thickness (He et al., 2007, 520 citations). This concept has gained popularity and Dr. Evans was invited to give a Keynote Lecture to the 2012 OHBM conference on networks of anatomical covariance. Many collaborative international projects rely on techniques and ongoing support from Evans' group.

2) Neuroinformatics: Evans developed LORIS, a web-accessible database of neuroanatomical, behavioral and genetic information that is used in dozens of projects worldwide. He heads CBRAIN, a national network of brain imaging centres linked with Compute Canada's high-performance computing (HPC) grid (~200,000 processors) via a web portal. CBRAIN is partnered with HPC facilities in Germany, Korea and India in support of a global brain mapping network. He is the only Canadian participant in the European Human brain Project, contributing CBRAIN technology and the BigBrain 3D brain atlas. By September 2014, CBRAIN had 240 users in 19 countries.

3) Neurodevelopment: Evans publishes extensively on normal and abnormal neurodevelopment, in particular cortical morphology and its relationship to behaviour, e.g. intelligence, aggression, disease severity (e.g. Giedd et al., 1999 ; 3001 citations ; Paus et al., 1999, 1012 citations).. He was PI of the Data Coordinating Centre (DCC) for the NIH MRI Study of Normal Brain Development (NIHPD) from 2000-2012 (Evans et al. (2006, 244 citations). This longitudinal MRI and behaviour database from ~500 normal children has had five releases since 2007. It contains 60+ behavioural instruments and will be mined for years. He performs a similar role for other multi-centre projects (MAVAN, IBIS, NeuroDevNet, GUSTO). In 2014, he PI'd a multicenter award to study brain networks in autism.

4) Neurodegeneration: Evans' group was first to reveal focal cortical thinning in entorhinal cortex (Lerch et al., 2005; 258 citations). He demonstrated abnormal structural brain networks in degenerative disease (e.g. He Y et al. 2008, 333 citations). He heads the DCC for the Canadian Consortium on Neurodegeneration in Aging and is funded by Brain Canada for a CBRAIN-based national platform for research into neurodegenerative disorders. He has numerous international collaborations (e.g. Indian Dementia Network, Korean-ADNI, AddNeuroMed, NeuGrid).

In 2014, the Ludmer Centre For Neuroinformatics and Mental Health was launched, co-directed by Evans and Michael Meaney. This major initiative, using CBRAIN to integrate imaging, behaviour, genetics and epigenetics data, exemplifies the 'big data analytics' revolution that is re-defining neuroscience. In summary, Alan Evans is an outstanding scientist at the highest international level, with a huge international collaborative network. He is one of the few who have made neuroimaging both a scientific strategy for understanding brain structure/function and a clinical research tool. His performance as a lecturer at international conferences is exceptional, due both to his fascinating personality and his convincing talks. He motivates his students with his burning interest in science and has inspired a generation of trainees, many of whom are now established brain researchers. He is one of Canada's brightest scientific lights and absolutely deserves FRSC recognition.