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### Education

Bachelor of Engineering (Honours Electrical) with distinction, McGill University, Montreal, Canada, 1971

M.D., C.M., McGill University, Montreal, 1975

Straight Internship and Resident II, Medicine, Royal Victoria Hospital, McGill University, Montreal, 1975-77

Resident and Fellow in Neurology, McGill University Program, 1977-80; and Chief Resident, Neurology, Montreal Neurological Hospital, July-Sept, 1979

### Clinical and Academic Appointments

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| 1981-1982 | Lecturer, Dept of Neurology and Neurosurgery, McGill University, Montreal, Canada, and Assistant Neurologist, Montreal Neurological Hospital (on leave of absence)                          |
| 1981-1986 | Assistant Neurologist, Barnes Hospital, St. Louis, MO   |
| 1981-1983 | Research Instructor and Instructor in Neurology, Dept of Neurology and Neurosurgery, Washington University School of Medicine, St. Louis  |
| 1983      | Instructor, Division of Radiation Sciences, Dept of Radiology, Washington University School of Medicine, St. Louis  |
| 1983-1986 | Assistant Professor of Neurology, Dept of Neurology and Neurosurgery, and Assistant Professor of Radiation Sciences, Dept of Radiology, Washington University School of Medicine, St. Louis |
| 1983-1986 | Instructor, Program in Occupational Therapy, Washington University School of Medicine, St. Louis  |
| 1984-1986 | Consulting Neurologist, Jewish Hospital of St. Louis  |

1987-present Chief, Positron Emission Tomography Imaging Section, Nuclear Medicine Department / PET Department, National Institutes of Health, Bethesda, MD  
Senior Attending Physician, National Institutes of Health Clinical Center

1989-1991 Acting Chief, Radiochemistry/Cyclotron Section,  
Department of Nuclear Medicine, NIH

2003-2005 Acting Director, PET Department, NIH Clinical Center

2005-present Director, PET Department, NIH Clinical Center

### Medical Licenses and Certification

Licentiate, Medical Council of Canada (LMCC), July 1976

Diplomate, National Board of Medical Examiners, USA, April 1977

#### Medical Licenses:

Province of Quebec (76-326), June 1976

State of Missouri (R2B13), February 1981

#### Board Certification, Neurology:

Royal College of Physicians and Surgeons, Canada, November, 1980

Professional Corporation of Physicians, Quebec, December, 1980

NIH Authorized User of Radioactive Materials in Human Subjects, 1988

### Awards

McGill University Entrance Scholarship, 1966-67; McGill University Scholarships, 1967-68, 1971-72, 1972-73, 1973-74, 1974-75; Frederick Smith Memorial Scholar, Faculty of Medicine, McGill University 1973-74

Member, McGill University delegation, Voyage d'observation et d'information, France, May-June, 1970

Scarlet Key Honour Society, McGill University

Hackbusch Award, for the best paper submitted from student branches, Institute of Electrical and Electronic Engineers, Canada, 1971

Research Fellowship, Medical Research Council of Canada, 1981, 1982

Listed in Best Doctors in America (Nuclear Medicine) 1992-93, 1994-95, 1998, 2011-12, 2013; Best Doctors in America - Southeast Region (Nuclear Medicine), 1996-97

Fellow, American College of Physicians (FACP)

Fellow, Royal College of Physicians, Canada (FRCPC)

Fellow, Society of Nuclear Medicine and Molecular Imaging (FSNMMI)

Kuhl-Lassen Brain Imaging Award and Lecturer, Society of Nuclear Medicine, June 2000

NIH Clinical Center Director's Award, 2005

NIH Office of the Director Honor Award, 2012

NIAID Merit Award, 2015

Society of Nuclear Medicine and Molecular Imaging, Presidential Distinguished Service Award, 2013 and 2016

Organization for Human Brain Mapping 2013 Editors' Choice Award to K Simonyan, P Herscovitch, B Horowitz

### Professional Associations

International Society for Cerebral Blood Flow and Metabolism:

President, 2015-2017

Immediate Past President, 2017-19

President-elect, 2013-2015

Treasurer, 2008-2013

Chair, Finance Committee, 2001-2003

Web Page Committee, 1997-2003

Membership Committee, 1995-97; Chair, 1997-1999

Board of Directors, 1995-99

Society of Nuclear Medicine and Molecular Imaging:

President 2014-15

Immediate Past President, 2015-16

President-elect 2013-14, Vice President-elect, 2012-13

Board of Directors, 2007-2010

Brain Imaging Council:

President 2006-2007

Vice-president/President-elect 2004-06

Board of Directors 1997-99, 2003-05

Molecular Imaging Center of Excellence:

Editorial Board, 2007-2012

Board of Directors, 2010-2013

PET Center of Excellence Board of Directors, 2012-15

Committee on Councils, 2005-07

Education Committee 2009-2013

Ethics Committee, 2009-2012  
Committee on Outreach; Chair, Brain Working Group, 2011-2013  
Patient Advocacy Advisory Board, 2011-2015  
Grants and Awards Committee Chair, 2016-7; member 2017-2019  
Nominating Committee Chair 2016-17; member 2006-07

American Academy of Neurology  
American College of Physicians  
Institute of Electrical and Electronic Engineers  
Radiologic Society of North America  
Chair, GE/Scanditronix PET Users' Group, 1991-92

#### Organization of Scientific Meetings

Society of Nuclear Medicine, Annual Meeting Scientific Program Committee  
Scientific Program Committee Chair, 2009-13  
Associate Chair, 2005-08  
Vice-Chair, Neurosciences, 2002-06  
Sub-Chair: PET Instrumentation & Data Analysis, 1990; Neurology, 2001;  
Neurosciences Young Investigator Award, 2007, 2008

International Society for Cerebral Blood Flow and Metabolism  
Program Committee member, Biennial Meeting Taipei, 1999-2001  
Program Committee member, Biennial Meeting Amsterdam, 2003-2005  
Program Committee member, Biennial Meeting Berlin, 2015-2017

Co-organizer, 3<sup>rd</sup> International Symposium on Quantification of Brain Function "Brain PET"97, Bethesda MD, June 1997

Program Committee, Third Theranostics World Congress on Ga-68 and Peptide Receptor Radionuclide Therapy, Baltimore, March 12-14, 2015

#### Reviewer, Other Scientific Meetings:

Scientific Advisory Board, Biennial International Symposium on CBF and Metabolism, 1993, 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017  
Scientific Advisory Board, BrainPET'93, Akita Japan 1993  
Scientific Advisory Board, Human Brain Mapping meeting HBM2007, Chicago  
Society of Nuclear Medicine, Annual Meeting (Neurology): 1985, 1989-92, 1995-2000  
American Acad of Neurology, Farber Award for Brain Tumor Research Review Cttee, 1993  
International Scientific Program Cttee, International Symposium on Functional NeuroReceptor Mapping of the Living Brain: Copenhagen 2006; Pittsburgh 2008; Glasgow 2010; Baltimore 2012; Amsterdam 2014; Boston 2016; London 2018  
World Molecular Imaging Congress, 2009; 2011-17  
Radiologic Society of North America (RSNA) Molecular Imaging Subcommittee/Scientific Program Committee, and Education Exhibits Committee, 2011-17

## Editorial Boards

Associate Editor, Journal of Cerebral Blood Flow and Metabolism, 2017 – present  
Editorial Board, Journal of Cerebral Blood Flow and Metabolism, 1992-2000  
Editorial Board, Clinical Nuclear Medicine, 2009-2010  
Editorial Board, Clinical & Translational Imaging: Reviews in Nuclear Medicine and Molecular Imaging, 2012-18  
Editorial Board, American Journal of Nuclear Medicine and Molecular Imaging, 2013-  
Editorial Board, Nuclear Medicine and Molecular Imaging (Korea), 2015-2018  
*Ad hoc* journal reviewer (2014 - present): Ann Neurol, Neurobiol Disease, Biol Psychiat, Alzheimer's & Dementia, J Nuc Med, Europ J Nuc Med Mol Imag, Mol Imag & Biol

## Scientific Review Committees

### NIH Review Committees:

NINDS Special Review Committee, Massachusetts General Hospital, Sept 1987, Jan 1989  
NIMH Research Scientist Development Review Committee, 1987,1988,1989,1990  
NINCDS Special Review Committee, Brookhaven National Laboratories, Dec 1988  
NCI Special Review Committee, University of Washington, April 1989  
NIH Pathology A Study Section ad hoc member, 1989  
NINDS Special Review Committee, University of Pennsylvania, March 1991, Dec 1991  
NIMH Functional Imaging Centers Special Review Committee, May 1991  
NIMH Special Review Committee, University of Michigan, July 1991  
NIH DRG Radiation ad hoc Study Section, June 1992  
NIH DRG Special Study Section X, Multidisciplinary Special Emphasis Panel, June 1993  
NIA Special Review Committee, University of Southern California, Feb 1994  
Human Brain Project P20 Special Review Committee, March 1994  
NIA ad hoc Review Committee - CERAD Review, April 1994  
NIH DRG Special Study Section 1, Multidisciplinary Special Emphasis Panel, July 1994  
NIMH Special Emphasis Panel, Yale University review, March 1996.  
NIA Neurosciences Aging Review Committee, March 1997  
NINDS Special Emphasis Panel - Parkinson's Disease Centers, July 1998  
NINDS Neurological Sciences and Disorders B, ad hoc member, Feb 25, 2000  
NINDS Neurological Sciences and Disorders B, ad hoc member, Oct 19, 2000  
NIA Special Emphasis Panel – Early Markers of Alzheimer's Disease, Aug 9, 2004  
NCI In Vivo Cellular and Molecular Imaging Centers (ICMICS) Study Section, Nov 2005  
NIDDK Toward Imaging the Pancreatic Beta Cell Special Emphasis Panel Aug 8 2006  
NIMH Conte Center for Mood/Schizophrenia Review Panel, Feb 2007

### Other Review Committees

Medical Research Council of Canada *ad hoc* reviewer, 1988, 1989, 1992, 1993, 1997  
Dept of Veterans Affairs Medical Research Service, Research Advisory Group, 1991  
Medical Research Council of Canada Review Cttee, Clarke Institute of Psychiatry, Toronto, January 1996  
Medical Research Council of Canada Neurosciences B Cttee, ad hoc member, Dec 1997  
Ontario Mental Health Foundation, 1993  
Montreal Neurological Institute Brain Imaging Centre Review Committee, Chair, July 1994  
Human Frontier Science Program, 1997

McGill University MNI Tenure and Promotions Cttee, *ad hoc* member, 2002  
The Charles R. Dana Foundation: Advisory Cttee for Clinical Hypotheses in Neuroscience Research Program in Imaging, 1999-2003; Advisory Cttee for Immuno-imaging Program, 2001-2002  
Cancer Research UK, 2003  
Dept of Energy, Office of Biological and Environmental Research, Sept 2004  
Scientific Review Committee, Montreal Neurological Institute, McGill University, Aug 27-28 2008  
Canada Foundation for Innovation Review Committee (Neuroimaging), November 25 2008  
The Alzheimer's Association, 2004, 2005, 2007, 2009  
Dept of Veterans Affairs Merit Review Panel, Cellular and Molecular Medicine, November 2011

### NIH Intramural Committees

PET Scientific Review Committee, NIH Intramural Research Program, 1987-1995  
PET Advisory Committee, Intramural Research Program, NIDA, NIH, 1995-97  
CC *ad hoc* Committee for Medical Record Design, 1995  
Head, NIH Inter-Institute PET Interest Group, 1996-present  
Animal Care and Use Committee, NIH Clinical Center, 1993-present;  
Chair 1996-1998, 2003-2005, 2010-2012  
NIH Animal Research Advisory Committee, 1996-1998, 2003-2005, 2010-12  
NIH Clinical Center Scientific Advisory Committee, 2004-2005  
NIH Imaging Probe Development Center (IPDC) Steering Committee, 2007- present  
NIH PET Steering Committee, 2005 – present  
NINDS Protocol Implementation (Scientific) Review Committee, 2014 – present  
NIBIB Search Committee for PI, PET Radiochemistry Research Laboratory, 2007-08  
Chair, Search Committee for Director of Imaging Probe Development Center, NIH IRP, 2013  
Chair, Search Committee for Director of Radiology Dept., NIH Clinical Center, 2017

### DHHS Committees

FDA CDER Medical Imaging Drugs Advisory Committee, Guest Expert, June 28-29, 1999  
FDA Peripheral and Central Nervous System Drugs Advisory Committee, *ad hoc* member, Oct 23 2008, to consider radionuclide imaging products for the detection of amyloid to assist in the diagnosis of Alzheimer's Disease  
FDA Peripheral and Central Nervous System Drugs Advisory Committee, *ad hoc* member, August 11, 2009, to consider an NDA for I-123 Ioflupane to detect loss of functional nigrostriatal dopaminergic neurons by SPECT imaging  
FDA Peripheral and Central Nervous System Drugs Advisory Committee, *ad hoc* member, January 20, 2011, to consider an NDA for Florbetapir F 18 injection for use in PET imaging of beta-amyloid in the brain  
CMS Medicare Evidence Development & Coverage Advisory Committee, *ad hoc* member, Jan 30, 2013  
FDA Medical Imaging Drugs Advisory Committee, Member, 2015-19

## DoD Committees

Joint Human Imaging/Image Processing Steering Committee, Center for Neuroscience & Regenerative Medicine, USUHS, DoD 2009 - present  
Translational Imaging Facility Steering Committee, Center for Neuroscience & Regenerative Medicine, USUHS, DoD 2009 - present  
Neuroimaging Steering Committee for The National Intrepid Center of Excellence (NICoE), Bethesda, MD, Dept of Defense, 2010-2011

## Consultant and Other Activities

Neurology Consultant, Missouri Patient Care Review Foundation, 1985-86  
West Virginia University Center for Nuclear Medicine Research, External Advisory Committee, 1991-93  
Consultant, Brain Imaging Center, Nathan Kline Institute, Rockland Psychiatric Center, Orangeburg NY, 1992  
External Advisory Committee, Clinical Pathophysiology of Acute Brain Injury Program Project, Washington University School of Medicine, St. Louis, MO, 1997-2005  
External Advisory Committee and DSMB, Pilot Collaborative PET Imaging Trial in Frontotemporal Dementia, University of Michigan, 2003-2006

## Teaching

Program in Occupational Therapy, Washington University School of Medicine: Medical Neurology 319C, 1983-86  
Foundation for Advanced Education in the Sciences (FAES) Graduate School at the NIH: Course Director, Imaging 505 "PET Principles and Applications", 1998-2004

## PUBLICATIONS

### Papers

1. Sniderman AD, Herscovitch P, Marpole D, Fallen EL. Restoration of regional wall motion by nitroglycerin therapy in patients with left ventricular asynergy. *Chest* 1974; 66: 545-548.
2. Herscovitch P, Markham J, Raichle ME. Brain blood flow measured with intravenous H<sub>2</sub><sup>15</sup>O. I. Theory and error analysis. *J Nucl Med* 1983; 24:782-789.
3. Raichle ME, Martin WRW, Herscovitch P, Mintun MA, Markham J. Brain blood flow measured with intravenous H<sub>2</sub><sup>15</sup>O. II. Implementation and validation. *J Nucl Med* 1983; 24:790-798.
4. Herscovitch P, Raichle ME. Effect of tissue heterogeneity on the measurement of cerebral blood flow with the equilibrium C<sup>15</sup>O<sub>2</sub> inhalation technique. *J Cereb Blood Flow Metab* 1983; 3:407-415.
5. Mintun MA, Raichle ME, Martin WRW, Herscovitch P. Brain oxygen utilization measured with O-15 radiotracers and positron emission tomography. *J Nucl Med* 1984; 25:177-187.
6. Volpe JJ, Herscovitch P, Perlman JM, Raichle ME. Positron emission tomography in the newborn: Extensive impairment of regional cerebral blood flow with intraventricular hemorrhage and hemorrhagic intracerebral involvement. *Pediatrics* 1983; 72:589-601.
7. Powers WJ, Martin WRW, Herscovitch P, Raichle ME, Grubb RL, Jr. Extracranial-intracranial bypass surgery: hemodynamic and metabolic effects. *Neurology* 1984; 34:1168-1174.
8. Reiman EM, Raichle ME, Butler FK, Herscovitch P, Robins E. A focal brain abnormality in panic disorder, a form of severe anxiety. *Nature* 1984; 310:683-685.
9. Fox PT, Mintun PA, Raichle ME, Herscovitch P: A noninvasive approach to quantitative functional brain mapping with H<sub>2</sub><sup>15</sup>O and positron emission tomography. *J Cereb Blood Flow Metab* 1985; 4:329-333.
10. Perlman JKM, Herscovitch P, Kreusser KL, Raichle ME, Volpe JJ. Positron emission tomography in the newborn: effect of seizure on regional cerebral flow in an infant. *Neurology* 1985; 35:244-247.
11. Herscovitch P, Raichle ME. What is the correct value for the brain:blood partition coefficient for water? *J Cereb Blood Flow Metab* 1985; 5:65-69.
12. Volpe JJ, Herscovitch P, Perlman JM, Kreusser KL, Raichle ME. Positron emission tomography in the asphyxiated newborn: parasagittal impairment of cerebral blood flow. *Ann Neurol* 1985; 17:287-296.
13. Herscovitch P, Mintun MA, Raichle ME. Brain oxygen utilization measured with O-15 radiotracers and positron emission tomography: generation of metabolic images. *J Nucl Med* 1985; 26:416-417.



14. Perlmutter JS, Herscovitch P, Powers WJ, Fox PT, Raichle ME. Standardized mean regional method for calculating global positron emission tomography measurements. *J Cereb Blood Flow Metab* 1985; 5:476-480.
15. Lauter JL, Herscovitch P, Formby C, Raichle ME. Tonotopic organization in human auditory cortex revealed by positron emission tomography. *Hearing Research* 1985; 20:199-205.
16. Ter-Pogossian MM, Herscovitch P. Radioactive oxygen-15 in the study of cerebral blood flow, blood volume, and oxygen metabolism. *Sem In Nucl Med* 1985; 15:377-394.
17. Herscovitch P, Auchus PA, Gado M, Chi D, Raichle ME. Correction of positron emission tomography data for cerebral atrophy. *J Cereb Blood Flow Metab* 1986; 6:120-124.
18. Reiman EM, Raichle ME, Robins E, Butler FK, Herscovitch P, Fox P, Perlmutter J. The application of positron emission tomography to the study of panic disorder. *Am J Psychiatry* 1986; 143:469-477.
19. Perlmutter JS, Powers WJ, Herscovitch P, Fox PT, Raichle ME. Regional asymmetries of cerebral blood flow, blood volume, oxygen utilization and extraction in normal subjects. *J Cereb Blood Flow Metab* 1987; 7:64-67.
20. Herscovitch P, Raichle ME, Kilbourn MR, Welch MJ. Positron emission tomographic measurement of cerebral blood flow and permeability-surface area product of water using <sup>15</sup>O-water and <sup>11</sup>C-butanol. *J Cereb Blood Flow Metab* 1987; 7:527-542.
21. Videen TO, Perlmutter JS, Herscovitch P, Raichle ME. Brain blood volume, flow, and oxygen utilization measured with O-15 radiotracers and positron emission tomography: revised metabolic computations. *J Cereb Blood Flow Metab* 1987; 7:513-516.
22. Altman DI, Powers WJ, Perlman JW, Herscovitch P, Volpe SL, Volpe JJ. Cerebral blood flow requirement for brain viability in newborn infants is lower than in adults. *Ann Neurol* 1988; 24:218-226.
23. Powers WJ, Stabin M, Howse D, Eichling JO, Herscovitch P. Radiation absorbed dose estimates for oxygen-15 radiopharmaceuticals in newborn infants. *J Nucl Med* 1988; 29:1961-1970.
24. Herscovitch P: Cerebral blood flow and metabolism measured with oxygen-15 radiotracers. *J Neuropsychiatry Clin Neurosci* 1989; 1:19-29.
25. Schapiro MB, Grady CL, Kumar A, Herscovitch P, Haxby JV, Moore AM, White B, Friedland RP, Rapoport SI. Regional cerebral glucose metabolism is normal in young adults with Down syndrome. *J Cereb Blood Flow Metab* 1990; 10:199-206.
26. Goldstein DG, Smith CB, Herscovitch P, Austin SM, Eisenhofer G, Chang PC, Kopin IJ. Dosimetric estimates for clinical positron emission tomographic scanning after injection of [<sup>18</sup>F]-6-fluorodopamine. *J Nucl Med* 1991; 32:102-110.

27. Haxby JV, Grady CL, Horwitz B, Ungerleider LG, Mishkin M, Carson RE, Herscovitch P, Schapiro MB, Rapoport SI. Dissociation of spatial and object visual processing pathways in human extrastriate cortex. *Proc Nat Acad Sci* 1991; 88:1621-1625.
28. Saris SC, Blasberg RG, Carson RE, DeVroom HL, Lutz RJ, Dedrick RL, Pettigrew K, Chang R, Doppman J, Wright DC, Herscovitch P, Oldfield EH: Intravascular streaming during carotid artery infusions: demonstration in humans and reduction using diastole-phased, pulsatile administration. *J Neurosurg* 1991; 74:763-772.
29. Powers WJ, Perlmutter JS, Videen TO, Herscovitch P, Griffeth LK, Royal HD, Siegel BA, Morris JC, Berg L. Blinded clinical evaluation of positron emission tomography for diagnosis of Alzheimer's disease. *Neurology* 1992; 42:765-770.
30. Grady C, Haxby J, Horwitz B, Schapiro M, Rapoport SI, Ungerleider L, Mishkin M, Carson R, Herscovitch P. Dissociation of object and spatial vision in human extrastriate cortex: Age-related changes in activation of regional cerebral blood flow measured with [<sup>15</sup>O]water and positron emission tomography. *J Cog Neurosci* 1992; 4:23-34.
31. Theodore WH, Carson RE, Andreason P, Zametkin A, Blasberg R, Liederman DB, Rice K, Newman A, Channing M, Dunn B, Simpson N, Herscovitch P. PET imaging of opiate receptor binding in human epilepsy using [<sup>18</sup>F]cyclofoxy. *Epilepsy Research* 1992; 13:129-139.
32. Kumar A, Braun A, Schapiro M, Grady C, Carson R, Herscovitch P. Cerebral glucose metabolic rates after 30 and 45 minute acquisitions: A comparative study. *J Nucl Med* 1992; 33:2103-2105.
33. Carson RE, Channing MA, Blasberg RG, Dunn BB, Cohen RM, Rice KC, Herscovitch P. Comparison of bolus and infusion methods for receptor quantitation: application to [<sup>18</sup>F]-cyclofoxy and positron emission tomography. *J Cereb Blood Flow Metab* 1993; 13:24-42.
34. Grady CL, Haxby JV, Horwitz B, Gillette J, Salerno JA, Gonzales-Aviles A, Carson RE, Herscovitch P, Schapiro MB, Rapoport SI. Activation of regional cerebral blood flow during a face perception task in patients with dementia of the Alzheimer type. *Neurobiol Aging* 1993; 14:35-44.
35. Zametkin AJ, Liebenauer LL, Fitzgerald GA, King AC, Minkunas DV, Herscovitch P, Yamada EM, Cohen RM. Brain metabolism in teenagers with attention deficit hyperactivity disorder. *Arch Gen Psychiatry* 1993; 50:333-340.
36. Matthew E, Andreason P, Carson RE, Herscovitch P, Pettigrew K, Cohen R, King C, Johanson CE, Paul S. Reproducibility of resting cerebral blood flow measurements with H<sub>2</sub><sup>15</sup>O positron emission tomography in humans. *J Cereb Blood Flow Metab* 1993; 13:748-754.
37. Carson RE, Yan Y, Daube-Witherspoon ME, Freedman N, Bacharach SL, Herscovitch P. An approximation formula for the variance of PET region-of-interest values. *IEEE Trans Med Imag* 1993; 12:240-250.

38. Braun AR, Stoetter B, Randolph C, Hsiao J, Vldar K, Gernert J, Carson RE, Herscovitch P, Chase TN. The functional neuroanatomy of Tourette's syndrome: An FDG PET study. I. Regional changes in cerebral glucose metabolism differentiating patients and controls. *Neuropsychopharm* 1993; 9: 277-291.
39. Goldstein DS, Eisenhofer G, Dunn BB, Armando I, Lenders J, Grossman E, Holmes C, Kirk KL, Bacharach S, Adams R, Herscovitch P, Kopin IJ. Positron emission tomographic imaging of cardiac sympathetic innervation using 6-[<sup>18</sup>F]fluorodopamine: Initial findings in humans. *J Amer Coll Cardiol* 1993; 22:1961-1971.
40. George MS, Ketter TA, Gill DS, Haxby JV, Ungerleider LG, Herscovitch P, Post RM. Brain regions involved in recognizing facial emotion or identity: an oxygen-15 PET study. *J Neuropsychiat Clin Neurosci* 1993; 5:384-394.
41. George MS, Ketter TA, Parekh PI, Rosinsky N, Ring H, Casey BJ, Trimble MR, Horwitz B, Herscovitch P, Post RM. Regional brain activity when selecting a response despite interference: An H<sub>2</sub><sup>15</sup>O PET study of the Stroop and an emotional Stroop. *Human Brain Mapping* 1994; 1:194-209.
42. Braun AR, Carson RE, Adams HR, Finn RD, Francis BE, Herscovitch P. A kinetic comparison of [<sup>18</sup>F]2-fluoro-2-deoxyglucose and [<sup>18</sup>F]2-fluoro-2-deoxymannose using positron emission tomography. *Nucl Med Biol* 1994; 21:857-863.
43. Molchan SE, Sunderland T, McIntosh AR, Herscovitch P, Schreurs BG. A functional anatomical study of associative learning in humans. *Proceed Nat Acad Sci* 1994; 91:8122-8126.
44. Parekh P, Spencer JW, George MS, Gill DS, Ketter TA, Andreason P, Herscovitch P, Post RM. Procaine-induced increases in limbic rCBF correlate positively with increases in occipital and temporal fast EEG activity. *Brain Topogr* 1995; 7:209-216.
45. Matthew E, Andreason P, Pettigrew K, Carson RE, Herscovitch P, Cohen R, King C, Johanson C, Greenblatt D, Paul SM. Benzodiazepine receptors mediate regional blood flow changes in the living human brain. *Proc Nat Acad Sci* 1995; 92:2775-2779.
46. Berman KF, Ostrem J, Randolph C, Gold J, Goldberg TE, Coppola R, Carson RE, Herscovitch P, Weinberger DR. Physiological activation of a cortical network during performance of the Wisconsin Card Sort Test: a positron emission tomographic study. *Neuropsychologia* 1995; 33:1027-1046.
47. Gaillard WD, Fazilat S, White S, Malow B, Sato S, Reeves P, Herscovitch P, Theodore WH. Interictal metabolism and blood flow are uncoupled in temporal lobe cortex of patients with complex partial epilepsy. *Neurology* 1995; 45:1841-1847.
48. George MS, Ketter TA, Parekh PI, Horwitz B, Herscovitch P, Post RM. Brain activity during transient sadness and happiness in healthy women. *Am J Psychiatry* 1995; 152:341-351.

49. Braun AR, Randolph C, Stoetter B, Mohr E, Cox C, Vladar K, Sexton R, Carson RE, Herscovitch P, Chase TN. The functional neuroanatomy of Tourette's syndrome: An FDG PET study. II. Relationships between regional cerebral metabolism and associated behavioral and cognitive features of the illness. *Neuropsychopharm* 1995; 13:151-168.
50. Arai T, Wakabayashi S, Channing MA, Dunn BB, Der MG, Bell JM, Herscovitch P, Eckelman WC, Rapoport SI, Chang MCJ. Incorporation of [ $^{11}\text{C}$ ] palmitate in monkey brain using PET. *J Nucl Med* 1995; 36:2261-2267.
51. VanMeter JW, Maisog JM, Zeffiro TA, Hallett M, Herscovitch P, Rapoport SI. Parametric analysis of positron emission tomography images: a variable-rate motor task. *NeuroImage* 1995; 2:273-283.
52. Ketter TA, Andreason PJ, George MS, Lee C, Gill DS, Parekh P, Herscovitch P, Post RM. Anterior paralimbic mediation of procaine-induced emotional and psychosensory experiences. *Arch Gen Psychiatry* 1996; 53:59-69.
53. George MS, Parekh PI, Rosinsky N, Ketter TA, Kimbrell TA, Heilman K, Herscovitch P, Post RM. Understanding emotional prosody activates right hemisphere regions: an O15-water PET study in healthy volunteers. *Arch Neurol* 1996; 53:665-670.
54. Zünkeler B, Carson RE, Olson J, Blasberg RG, Girton M, Bacher J, Herscovitch P, Oldfield EH. Hyperosmolar blood-barrier disruption in primates: an *in vivo* study using positron emission tomography and  $^{82}\text{Rb}$ . *J Neurosurg* 1996; 84:494-502.
55. Theodore W, Balish M, Leiderman D, Bromfield E, Sato S, Herscovitch P. The effect of seizures on cerebral blood flow measured with  $^{15}\text{O}$ -H $_2$ O and positron emission tomography. *Epilepsia* 1996; 37:796-802.
56. George MS, Ketter TA, Parekh PI, Herscovitch P, Post RM. Gender differences in regional cerebral blood flow during transient self-induced sadness or happiness. *Biol Psychiatry* 1996; 40:859-871.
57. Zünkeler B, Carson RE, Olson J, Blasberg R, DeVroom H, Lutz R, Saris S, Wright D, Kammerer W, Patronas N, Dedrick RL, Herscovitch P, Oldfield E. Quantitation of human blood-brain barrier disruption. *J Neurosurg* 1996; 85:1056-1065.
58. Marangell LB, Ketter TA, George MS, Pazzaglia PJ, Callahan AM, Parekh P, Andreason PJ, Horwitz B, Herscovitch P, Post RM. Inverse relationship of peripheral thyrotropin-stimulating hormone levels to brain activity in mood disorders. *Am J Psychiatry* 1997; 154:224-230.
59. Schreurs BG, McIntosh AR, Bahro M, Herscovitch P, Sunderland T, Molchan SE. Lateralization and behavioral correlation of changes in regional cerebral blood flow with classical conditioning of the human eyeblink response. *J Neurophysiol* 1997; 77:2153-2163.
60. Aloj L, Carson RE, Lang L, Herscovitch P, Eckelman WC. Measurement of transferrin receptor kinetics in the baboon liver using dynamic positron emission tomography imaging and [ $^{18}\text{F}$ ]holo-transferrin. *Hepatology* 1997; 25:986-990.

61. Sadato N, Carson RE, Daube-Witherspoon ME, Campbell G, Hallett M, Herscovitch P. Optimization of non-invasive activation studies with O-15 water and 3D PET. *J Cereb Blood Flow Metab* 1997; 17:732-739.
62. Braun AR, Balkin TJ, Wessenstein NJ, Carson RE, Varga M, Baldwin P, Belenky G, Herscovitch P. Regional cerebral blood flow during sleep and wakefulness: an H<sub>2</sub><sup>15</sup>O positron emission tomography study. *Brain* 1997; 120:1173-1197.
63. Chang MCJ, Arai T, Freed LM, Wakabayashi S, Channing MA, Dunn BB, Der MG, Bell JM, Herscovitch P, Eckelman WC, Rapoport SI. Brain incorporation of [1-<sup>11</sup>C]arachidonate in normocapnic and hypercapnic monkeys: a PET study. *Brain Res* 1997; 755:74-83.
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## Book Chapters, Review Articles

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#### Professional Guidelines

AD Waxman, K Herholz, DH Lewis, P Herscovitch, S Minoshima, M Ichise, AE Drzezga, MD Devous, JM Mountz: Society of Nuclear Medicine Procedure Guideline for FDG PET Brain Imaging, Version 1.0, February 2009. [http://interactive.snm.org/docs/Society of Nuclear Medicine Procedure Guideline for FDG PET Brain Imaging.pdf](http://interactive.snm.org/docs/Society%20of%20Nuclear%20Medicine%20Procedure%20Guideline%20for%20FDG%20PET%20Brain%20Imaging.pdf)

Member, Alzheimer's Association / Society of Nuclear Medicine Amyloid Imaging Taskforce, to develop appropriate use criteria for amyloid PET imaging in cognitive impairment and dementia, 2012-2013

Member, American College of Radiology Collaborative Committee to revise the *ACR-ACNM-ASNR-SNMMI Practice Parameter for Brain PET-CT Imaging in Dementia*, 2019

#### Letters

1. Herscovitch P, Mintun MA, Raichle ME: Brain blood flow measurement with bolus intravenous H<sub>2</sub><sup>15</sup>O. *J Nucl Med* 25:730-732, 1984.
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4. Shoaf SE, Hommer D, Williams W, Higley JD, Carson RE, Herscovitch P, Eckelman WC: Reply, The validity of the PET/ $\alpha$ -[ $^{11}\text{C}$ ]methyl-L-tryptophan method for measuring rates of serotonin synthesis in the human brain. *Neuropsychopharm* 21:156-157, 1999.
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## Invited Lectures

Canadian Anaesthetists' Society Annual Meeting, Quebec City, Canada, May, 1982. "Regional vs global cerebral metabolism"

Department of Neurosciences, University of Calgary Medical School, Calgary, Canada, November, 1982. "Positron emission tomography: from image to applications"

Devices and Technology Branch Contractors Meeting, NHLBI, NIH, Washington D.C, December 1982. "Measurement of cerebral blood flow with positron emission tomography"

Stroke Centers Directors' Workshop, San Diego CA, February, 1983. "Cerebral blood flow: Introduction to the radioisotopic methods and a discussion of the effects of tissue inhomogeneity"

National Alliance for the Mentally Ill, Annual Conference, St. Louis, MO, August, 1983. "Positron emission tomography - current applications in psychiatry and neurology"

National Conference on Biological Imaging II. Clinical Aspect, National Academy of Sciences, Washington D.C., October, 1983. "Positron emission tomography - physiological and clinical application"

Alberta Heritage Foundation for Medical Research Lecturer, University of Alberta, Edmonton, Canada, September, 1984. "Positron emission tomography - technical aspects" and "Positron emission tomography - applications"

Brain Agent Symposium, Mallinckrodt Inc., St. Louis, MO, May 1985. "Tracer techniques for tomographic measurement of cerebral blood flow"

Symposium on Perfusion Imaging, Society of Nuclear Medicine Midwinter meeting, San Antonio, February, 1987. "First pass techniques for measuring CBF with O-15 Water"

Imaging Living Brain Chemistry: Principles and Practice, Johns Hopkins Medical Institutions, Baltimore, MD, March 1988. "Cerebral blood flow and metabolism measured with oxygen-15 radiotracers"

Division of Nuclear Medicine, Johns Hopkins Medical Institutions, Baltimore, MD, February, 1990. "Recent PET studies with O-15 labelled water"

Dept of Neurology, University of Iowa, Iowa City, IA, April 1990. "PET cerebral blood flow studies with oxygen-15 water"

Case Western Reserve University Hospitals PET Program, Cleveland, OH, October, 1991. "PET cerebral blood flow studies"

American Society of Hospital Pharmacists, New Orleans, December 1991. "Application of positron emission tomography in psychopharmacology research"

PET and SPECT Imaging of Living Brain Chemistry in Health and Disease. John Hopkins University, Baltimore, MD, March 1992. "Task-related patterns of cerebral activation"

PET & Modeling Symposium, Biomedical Engineering Society Meeting, Salt Lake City, Oct 18 1992. "PET and modeling: blood flow and metabolism"

Visiting lecturer, University of Minnesota PET Program, Minneapolis, November 1992. "PET studies of the brain"

Research Frontiers in Brain Imaging, 4th Annual ASHA Conference, New Orleans, Nov 16 1994. "PET - basic principles and applications to the study of auditory and language processing"

NIMH Workshop on Psychotropic Medications and the Developing Brain, Bethesda, MD, July 16 1997. "Applications of PET to the study of CNS effects of psychotropics"

Kuhl-Lassen Lecture, Society of Nuclear Medicine, St. Louis MO, June 2000. "Challenges for clinical functional brain imaging"

Society for Nuclear Imaging in Drug Development meeting, Bethesda MD, Oct 23 2000. "Can O-15 Water Be Used to Evaluate Drugs?"

Uniformed Services University of the Health Sciences, Dept of Psychiatry Seminar Series, Bethesda MD, Feb 1 2001. "Positron emission tomography"

American Pharmacists Association, San Francisco CA, March 19 2001, "PET in the Evaluation of Drug Effects"

First International Workshop on Endocrine Hypertension, Bethesda, MD, Nov 16 2001. "Use of PET scanning in clinical cancer research"

NIAID 2<sup>nd</sup> Annual Workshop on Experimental Imaging of Infectious Disease, Bethesda MD, September 18 2007. "PET imaging of nonhuman primates"

3rd Annual Kim Paterson Lang Lecture, Chester-Crozer Medical Center, Philadelphia, Nov 16 2007. "Molecular Imaging with PET"

Division of Medical Imaging and Hematology Products, CDER, U.S. Food and Drug Administration, Rockville, MD, January 8 2008. "Molecular Imaging with PET"

Neuroimaging in Obesity Research Workshop, NIDDK, NIH, Bethesda MD, Oct 27 2008. "PET Methods for Functional Neuroimaging and PET Data Analysis"

Radiologic Society of North America (RSNA) annual meeting, Chicago, Dec 1 2009. "Neurologic Imaging in the Era of Molecular Medicine"

American Pharmacists Association Annual Meeting, Washington DC, March 14 2010. "PET Imaging in Drug Development: Focus on Clinical Trials"



University of Maryland Radiology Department Grand Rounds, Baltimore, March 17 2010. “Molecular Imaging of Neuropsychiatric Disorders with PET: Three Decades of Clinical Research”

American Academy of Neurology annual meeting, Toronto, April 16 2010. AAN Future of Neuroscience Conference, “The New PET: Imaging Molecular Targets in Neurological Disease”

International Tuberculosis Research Center, Masan Korea, October 27 2010. “PET Imaging in Drug Development and Clinical Trials: Relevance to Tuberculosis”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Dec 2 2010. Refresher Course: “PET Imaging of Neuropsychiatric Disorders”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Dec 1 2011. Refresher Course: “PET Imaging of Neuropsychiatric Disorders”

Western Region Annual Meeting, Society of Nuclear Medicine, Monterey, CA, Oct 26 2012. “National Issues in Nuclear Medicine”

Medical Imaging Technology Alliance PET Endpoints Workshop, Baltimore, Nov 13 2012. “Appropriate Use Criteria for beta-Amyloid PET Imaging”

American Association for Geriatric Psychiatry annual meeting, Los Angeles, March 16 2013. “Emerging Concepts in Appropriate Use Criteria for  $\beta$ -Amyloid PET Imaging”

MidEastern Chapter, Society of Nuclear Medicine and Molecular Imaging, Ocean City MD, April 12 2013. “Molecular Imaging of Dementia”

The Ottawa Hospital, Ottawa, Canada, May 9 2013, City-wide Nuclear Medicine Grand Rounds, “Amyloid Imaging in Dementia”; May 10 2013, Neurology Grand Rounds. “Molecular Imaging of the Brain with PET”

Society of Nuclear Medicine and Molecular Imaging Annual Meeting, Vancouver BC, June 11 2013. “Clinical Diagnosis of Alzheimer’s Disease and Approval for Amyloid PET”

European Association of Nuclear Medicine Annual Meeting, Lyon France, Oct 21 2013. “Dementia Imaging with Amyloid Agents”

Missouri Valley Region, Society of Nuclear Medicine and Molecular Imaging, Omaha NE, Oct 2013. “Molecular Imaging of Dementia”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Dec 2013. “Making Molecular Brain Imaging Available in the Clinic: FDA and CMS”

Johns Hopkins University School of Medicine, Baltimore, March 2014. Nuclear Molecular Imaging and Therapy: Focus on Value symposium, “Appropriate Use of Amyloid Imaging”

Association of University Radiologists annual meeting, Baltimore MD, April 4 2014. Invited speaker, “Nuclear Medicine and Molecular Imaging of the Future”

Canadian Association of Nuclear Medicine annual meeting, Calgary, Alberta, April 12 2014. "Molecular Imaging in Neuropsychiatry"

American Psychiatric Association annual meeting, New York, May 4 2014. "PET Amyloid Imaging: Appropriate Use Criteria Development and CMS Consideration"

International Symposium for Translational Theranostics, Tsinghua University Graduate School, Shenzhen China, May 26 2014. "Amyloid Imaging in the Development of Anti-Alzheimer Disease Therapeutics"

International Symposium on Molecular Imaging and Translational Medicine, Peking Union Medical College, Beijing, Sept 14 2014. "PET in Drug Development and Translation"

European Association of Nuclear Medicine, Gothenburg Sweden, Oct 21 2014. "Regulatory Approval – The Final Step in Translational Molecular Imaging"

Japanese Society of Nuclear Medicine 54<sup>th</sup> Annual Scientific Meeting, Osaka, Nov 6 2014, "PET in Neuroscience"

Korean Society of Nuclear Medicine Annual Meeting, Seoul, Nov 8 2014. "Molecular Imaging of the Brain with PET"

EE Kim Distinguished Lectureship, Department of Nuclear Medicine, Seoul National University College of Medicine, Seoul, Nov 10 2014, "PET in Drug Development and Translation"

Radiologic Society of North America (RSNA) annual meeting, Chicago, Dec 2014. "Making Molecular Brain Imaging Available in the Clinic: FDA and CMS"

Canadian Association of Nuclear Medicine annual meeting, Montreal, Jan 30 2015. "PET Imaging and Dementia in 2015 and Beyond"

Southwest Chapter, Society of Nuclear Medicine and Molecular Imaging, Austin TX, April 12 2015. "Contributions of PET to Clinical Neuroscience"

Australia New Zealand Society of Nuclear Medicine annual meeting, Brisbane, April 19 2015. "Contributions of PET to Clinical Neuroscience"

Sydney Medical School, Westmead Hospital, Nuclear Medicine Rounds, Sydney Australia, April 21 2015. "PET in Drug Development and Translation"

American College of Radiology (ACR) annual meeting, Washington DC, May 18 2015. "Translation to the Clinic: FDA Approval and CMS Coverage for Amyloid Radiopharmaceuticals"

Northeast Region Annual Meeting, Society of Nuclear Medicine and Molecular Imaging, Newport RI, Nov 6 2015. "PET Imaging in Dementia"

Radiologic Society of North America (RSNA) annual meeting, Chicago, Nov 30 2015. "Making Molecular Brain Imaging Available in the Clinic: FDA, CMS, and the IDEAS Study"

Chinese Society for Cerebral Blood Flow & Metabolism and Chinese Stroke Association, Shijiazhuang China, February 27 2016. “Contributions of PET to Clinical Neuroscience”

Montreal Neurological Institute, McGill University, May 30 2016, William Feindel Brain Imaging Lecture series, “Contributions of PET to Basic and Clinical Neuroscience”

Society of Nuclear Medicine and Molecular Imaging annual meeting, San Diego, June 11, 2016. “Update on Amyloid Brain Imaging”

Society of Nuclear Medicine and Molecular Imaging annual meeting, San Diego, June 12, 2016. “IDEAS: Imaging Dementia – Evidence for Amyloid Scanning Study”

Georgetown University Medical Center, Radiology Grand Rounds, Washington DC, September 23 2016. “Molecular Imaging in Dementia”

Peterson Memorial Lecture in Nuclear Medicine, University of Iowa School of Medicine, Iowa City IA, November 14, 2016. “Contributions of PET to Basic and Clinical Neuroscience”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Nov 28 2016. “Clinical Translation in Molecular Brain Imaging”

Society of Nuclear Medicine and Molecular Imaging midwinter meeting, Phoenix AZ, January 22 2017. “How to Lead a Clinical Molecular Imaging Program”

Chinese Society for Cerebral Blood Flow & Metabolism, Guangzhou China, March 4 2017. “Molecular Imaging of Alzheimer’s Disease and Related Disorders”

Society of Nuclear Medicine and Molecular Imaging annual meeting, Denver CO, June 13 2017. “Molecular Imaging Programs for Clinical Research”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Nov 27 2017. “Making Molecular Brain Imaging Available in the Clinic: FDA, CMS and the IDEAS Study”

Society of Nuclear Medicine and Molecular Imaging Mideast Chapter meeting, April 13, 2018. “Molecular Imaging of Dementia”

World Federation of Nuclear Medicine and Biology meeting, Melbourne Australia, April 22 2018. “Tracer kinetic modeling in brain PET”

Radiologic Society of North America (RSNA) annual meeting, Chicago, Nov 26 2018. “Clinical Trials and Approval Process for New Brain MI Radiopharmaceuticals”

#### Invited Participant/Discussant, Workshops and Symposia

NIMH Human Brain Project Clinical Neuroscience Workshop, Rockville, MD, discussant, Feb 28 1992.

NINDS Workshop on Positron Emission Tomography, Bethesda, MD, invited speaker Nov 9-10 1992.

NIMH Mentored Awardees meeting, Brain Imaging in Depression, Discussant, Rockville, MD, June 23, 1994.

Perfusion Imaging Workshop, Discussant, NIMH, Bethesda, MD, Oct 20, 1997.

3<sup>rd</sup> Cologne PET Symposium, Invited participant, Dec 8-10 1999.

4<sup>th</sup> International Scientific Symposium on Tourette Syndrome, “Neuroimaging and Neurophysiology”, discussant, Cleveland OH, June 2004.

Infectious Disease Imaging Workshop, Invited participant, NIAID, San Antonio TX, Feb 2-3, 2009.

Positron Emission Tomography Evidence Workshop, Center for the Evaluation of Value and Risk in Health, Invited participant, Arlington VA, Feb 24, 2015

Brain Scanning to Assess for Traumatic Injury and Encephalopathy (SAFTIE) Symposium, Dallas TX, May 6-7, 2017.

Pathways for Successful Translation of New Imaging Agents and Modalities: Phase III Studies workshop, NCI, Rockville, MD, May 15 2017.