

Denis Le Bihan, M.D., Ph.D.



Biographical sketch

Denis Le Bihan has achieved international recognition for his outstanding contributions to the development of new imaging methods allowing, in particular to study human brain function. His work has combined extremely innovative methods, developed for Magnetic Resonance Imaging (MRI) with the application of these methods to questions of the utmost scientific and clinical importance.

Dr. Le Bihan is a full member of the French Academy of Sciences and currently the Founding Director of NeuroSpin, a new Institute aimed at developing and using ultra high field Magnetic Resonance to understand the brain, from mouse to man. Dr. Le Bihan has authored or co-authored over 250 articles, book chapters and review articles in the fields of MRI, imaging, neuroscience and radiology. For his contributions, Dr. Le Bihan was awarded in 2001 the Gold Medal of the International Society for Magnetic Resonance in Medicine. He is also the 2002 recipient of the Lounsbery Award from the National Academy of Sciences (USA) and French Academy of Sciences and a 2003 corecipient (with S. Dehaene) of the prestigious Louis D. Award of the Institut de France. D. Le Bihan is Knight of the French National Order of Merit.

Key-words: medical imaging, neuroimaging, molecular diffusion, functional neuroimaging, cognitive functions, molecular imaging

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Born July 30, 1957 in Nanterre, France
French citizenship

Education and Training

Medicine (University of Paris):

1987: French Board Certification in Radiology.
1984: MD, Doctor in Medicine with Distinction, University of Paris.
1981-87: Residency in Neurosurgery, Nuclear Medicine and Radiology.

Physics (University of Paris):

1987: PhD in Physical Sciences, with High Distinction, Ecole Polytechnique.
1985: Extensive Studies Degree (DEA) in Nuclear and Elementary Particles Physics, with Distinction.
1984: Maitrise ("MA") in Fundamental Physics, with High Distinction.
1983: Licence ("BS") in Fundamental Physics, with High Distinction.

Human Biology (University of Paris):

1979: Higher Studies Degree in Neurophysiology and Central Nervous System Functional Exploration.
1978: Extensive Studies Degree (AEA) in Biomathematics, Data Processing and Statistics, with major in Mathematical Models in Medicine.
1977: Higher Studies Degree in Computer Sciences.

Employment history

- **NeuroSpin**, CEA-Saclay, France **2007-present:** Director
- **Kyoto University**, Kyoto, Japan: **2005-2006, 2008-present:** Invited Professor, Graduate School of Medicine, Human Brain Research Center
- **Federative Research Institute on Functional Neuroimaging (IFR49)**, Paris, France: **2000-present:** Director
- **Service Hospitalier Frédéric Joliot, CEA**, Orsay, France **1999-2006 :** Director, Laboratory of Anatomical and Functional Neuroimaging **1998-1997:** Vice-Head and Research Director **1994-1996:** Chief, Research and Methodology Section
- **Georgetown University Hospital**, Washington, DC, USA **1991-1996:** Clinical Associate Professor of Radiology, Department of Radiology, **1989-1991:** Clinical Assistant Professor of Radiology, Department of Radiology.
- **National Institutes of Health**, Bethesda, MD, USA **1990-1994:** Chief, Diagnostic Radiology Research Section (with Tenure) **1987-1990:** Visiting Associate, Diagnostic Radiology Department, Clinical Center.
- **Consulting**
 - ◆ **2009-:** President of the Board, CERMEP (Economic Interest Group for In Vivo Imaging), Lyon, France
 - ◆ **2007-:** President of the Board, Frederik Bull Institute, Plaisir, France
 - ◆ Member of the Scientific Advisory Board of national and international organizations and research funding agencies.
 - ◆ **1993-1994:** Yokogawa Medical Systems, Tokyo, Japan
 - ◆ **1992-:** Guerbet Group, Aulnay-sous-bois, France.
 - ◆ **1987-88:** Magnetic Resonance Department, Thomson-CGR, Buc, France/General Electric Medical Systems, Milwaukee, USA.

Awards and Honors

2010: Holst Award, University of Eindhoven/Philips Research **2010:** JA Vezina Award, Elected Honorary Member of French Canadian Society of Radiological **2009:** Bécélère Honorary Lecturer, Medal of the 100th Anniversary of the French Society of Radiology **2009:** Fellow of the European Society for Magnetic Resonance in Medicine and Biology **2007:** Knight of the French Order of Merit **2004:** Elected Member, French Academy of Technologies **2004:** Elected Honorary Member, American Society of NeuroRadiology **2003:** Elected Member of the Institut of France, Academy of Sciences **2003:** Louis D. Foundation Award, Institut de France **2002:** Lounsbery Award from the National Academy of Sciences (US) and the French Academy of Sciences **2002:** ECR 04 Honorary Lecturer **2001:** Gold Medal, International Society of Magnetic

Resonance in Medicine **2000**: Fellow of the International Society of Magnetic Resonance in Medicine **1999**: Elected Corresponding Member, French Academy of Sciences **1995**: 'Kodak' Award for Scientific Achievement in Imaging Research (French Academy of Sciences Award) **1994, 1993, 1992, 1990**: Editor's Recognition Award, with Distinction for Outstanding Review in Radiology **1994**: Award of the European Society of Magnetic Resonance in Medicine and Biology **1993**: Cum Laude Award for Scientific Exhibit, American Society of NeuroRadiology **1993**: Magna Cum Laude for Scientific Exhibit, Society of Magnetic Resonance Imaging **1991**: Sylvia Sorkin Greenfield Award in Medical Physics (best publication of the year), American Association of Physicists in Medicine (AAPM) **1991**: Cum Laude Citation for Scientific Exhibit, Society of Magnetic Resonance Imaging **1989**: Foucault Award for Achievements in Applied Physics, French Society of Physics **1989**: Magna Cum Laude for Scientific Exhibit, Radiological Society of North America **1987**: Award of the French College of Evaluation in Magnetic Resonance. **1986**: Rene Djindjian Award, French Society of Neuroradiology **1986**: Cum Laude Award for Scientific Exhibit, Radiological Society of North America **1985**: Michel Katz Award, French Society of Radiology.

Editorial affiliations

Consultant to the Editor for Radiology

Member of the Editorial Board for many international journals (*Journal of Magnetic Resonance Imaging, Journal of Computer Assisted Tomography (1993-1995), Magnetic Resonance in Medicine, International Journal of Neuroradiology, Neuroimage,...*)

Referee for many journals (*Stroke, Science, PNAS, Journal of Magnetic Resonance, American Journal of Roentgenology, Investigative Radiology, NMR in Biomedicine,...*)

Patents issued

- Process for Imaging by Nuclear Magnetic Resonance (US Patent # 4,780,674).
- Process for Imaging by Nuclear Magnetic Resonance (US Patent # RE33,391).
- Method to Measure the Molecular Diffusion and/or Perfusion Parameters of Live Tissue (US Patent # 4,809,701).
- In Vivo Method for Determining and Imaging Temperature of an Object/Subject from Diffusion Coefficients Obtained by Nuclear Magnetic Resonance (US Patent # 4,914,608).
- Method for the imaging of intra-voxel movements by NMR in a body (US Patent # 5,092,335).
- Apparatus for Hyperthermia Treatment of Cancer (US Patent # 5,284,144).
- Method for Diffusion Tensor NMR Imaging (US Patent # 5,539,310).
- Method and system for multidimensional localization and for rapid magnetic resonance spectroscopic imaging (US Patent # 5,657,758).
- Method and system for multidimensional localization and for rapid magnetic resonance spectroscopic imaging (US Patent # 5,709,208).
- Method and system for multidimensional localization and for rapid magnetic resonance spectroscopic imaging (US Patent # 5,879,299).

Publications

h-score: 80, citations > 25000 (Google scholars)

10 patents, 3 books, more than 250 peer-reviewed publications and book chapters

Books

- Imagerie par Résonance Magnétique: Bases Physiques. Masson, Paris, 1984. (*first textbook on MRI physics in French*)
- Magnetic Resonance Imaging of Diffusion and Perfusion: Applications to Functional Imaging. Lippincott-Raven Press, New York, 1995 (*only textbook on Diffusion MRI, first textbook published on fMRI*).
- Water, the forgotten biological molecule (D. Le Bihan, H. Fukuyama coeds). 2011, Pan Stanford Publishing, Singapore
- Le cerveau de cristal, voyage magnétique au centre du cerveau (in preparation, Odile Jacob)

Book chapters (selection)

- Techniques- Encycl. Med. Chir. (Paris, France), Radiodiagnostic VI, 1990.
- Magnetic Resonance Imaging, Bradley and Stark, Eds, Mosby, St-Louis, 1991.
- Magnetic Resonance Angiography, Potchen EJ, Haacke EM, Siebert JE, Gottschalk A, Eds., Mosby, St-Louis, 1992.
- NMR in Physiology and Biomedicine, Gillies R, Ed. Academic Press, Inc., San Diego, California, 1994.
- Advanced Techniques and Clinical Applications in Biomedical Thermology, Mabuchi K, Mizushina S, Harrison B, Eds. Hardwood Academic Publishers, Chur, Switzerland, 1995.
- Non-Invasive thermometry of the Human Body, Miyakawa M & Bolomey J.Ch., Eds., CRC, Boca Raton, Florida 1996.
- Encyclopedia of Nuclear Magnetic Resonance, John Wiley and Sons, Ltd., Chichester, England, 1996.
- Principles and Practice of Thermoradiotherapy and Thermochemotherapy, Seegenschmiedt MH, Fessenden P, Vernon CC, Eds., Springer-Verlag, Berlin, 1996.
- Le cerveau en action, Dehaene S., Ed., PUF, Paris, 1996.
- Cerveaux et Machines, V. Bloch Ed. Institut Frédéric Bull, Hermes Science Publications, Paris, 1999.
- The languages of the brain. A.L. Galaburda, S.M. Kosslyn, Y. Christen, Eds., Harvard University Press, 2002.

Selection of representative articles

- Le Bihan D. and Breton,E.: Imagerie de diffusion *in vivo* par résonance magnétique nucléaire. *C.R.Acad.Sc.Paris* T.301, Série II:1109-1112, 1985.
- Le Bihan D., Breton E., Lallemand D., Grenier P., Cabanis E., Laval-Jeantet M. MR Imaging of Intravoxel Incoherent Motions: Application to Diffusion and Perfusion in Neurologic Disorders, *Radiology*, 161,401-407, 1986. (more than 1400 citations)
- Le Bihan D., Delannoy,J., and Levin,R.: Non-invasive temperature mapping using magnetic resonance imaging of molecular diffusion : application to hyperthermia. *Radiology* 171:853-857, 1989.
- Delannoy J, Le Bihan D, Hoult D, Levin R. Hyperthermia System Combined with a MRI Unit. *Med. Physics*, 17(5):855-860, 1990.
- Turner,R., Le Bihan D., Moonen,C.T.W., Despres,D., and Frank,J.: Echo-planar time course of MRI of cat brain deoxygenation changes. *MRM*. 22:159-166, 1991.
- Douek,P., Turner,R., Pekar,J., Patronas,N.J., and Le Bihan D.: MR Color Mapping of Myelin Fiber Orientation. *J.Comput.Assist.Tomogr*. 15:923-929, 1991.
- Le Bihan D, Turner R, Zeffiro TA, Cuenod,C.A., Jezzard P, Bonnerot V. Activation of Human Primary Visual Cortex During Visual Recall: A Magnetic Resonance Imaging Study. *Proc. Nat.Acad.Sci. (USA)* 90:11802-11807, 1993.
- Basser PJ, Mattiello J, Le Bihan D. MR Diffusion Tensor Spectroscopy and Imaging. *Biophys. J.* 66:259-267, 1994. (more than 1400 citations)
- HertzPannier,L., Gaillard,W.D., Mott,S.H., Cuenod,C.A., Bookheimer,S.Y., Weinstein,S., Conry,J., Papero,P.H., Schiff,S.J., Le Bihan D., and Theodore,W.H.: Noninvasive assessment of language dominance in children and adolescents with functional MRI: A preliminary study. *Neurology* 48:1003-1012, 1997.
- Dehaene S, Naccache L, Leclec'H G, Koechlin E, Mueller M, Dehaene-Lambertz G, Van de Moortele PF, Le Bihan D. Imaging the processing depth of masked visual words and digits. *Nature*, 395 :597-600,1998.
- Dehaene,S., LeClecH,G., Cohen,L., Poline,J.B., Van De Moortele,P.F., and Le Bihan D.: Inferring behavior from functional brain images. *Nature Neuroscience* 1:549-550, 1998.
- Poupon C, Clark CA, Frouin V, Regis J, Bloch I, Le Bihan D, Mangin JF. Regularization of diffusion-based direction maps for the tracking of brain white matter fascicles. *Neuroimage* 12:184-195, 2000.
- Darquie A, Poline JB, Poupon C, Saint-Jalmes H, Le Bihan D. Transient Decrease in Water Diffusion Observed in Human Occipital Cortex During Visual Stimulation. *Proc.Nat.Acad.Sci. (USA)* 98: 9391-9395, 2001.
- S. Dehaene, L. Naccache, L. Cohen, D. LeBihan, J. F. Mangin, J. B. Poline, and D. Riviere, Cerebral mechanisms of word masking and unconscious repetition priming. *Nat. Neurosci.* 4: 752-758, 2001.
- HertzPannier,L., Chiron,C., Jambaque,I., Renaux-Kieffer,V., VanDeMoortele,P.F., Delalande,O., Fohlen,M., Brunelle,F., and Le Bihan D.: Late plasticity for language in a child's non-dominant hemisphere - A pre- and post-surgery fMRI study. *Brain* 125:361-372, 2002.
- Le Bihan D. Looking into the functional architecture of the brain with diffusion MRI. *Nat. Rev. Neurosci.*, 4: 469-480, 2003.

- Le Bihan D., Urayama S-I., Aso T., Hanakawa T., Fukuyama H. Direct and fast detection of neuronal activation in the human brain with diffusion MRI. *Proc.Nat.Acad.Sci. (USA)* 103: 8263-8268, 2006.
- Nakamura K, Dehaene S, Jobert A, Le Bihan D, Kouider S. Task-specific change of unconscious neural priming in the cerebral language network. *Proc Natl Acad Sci U S A.* 2007 Dec 4;104(49):19643-8.
- Le Bihan D. The Wet Mind: Water and Functional Neuroimaging. *Phys. Med. Biol.* 2007 52 : R57-R90.
- Le Bihan D. Intravoxel incoherent motion perfusion MR imaging: a wake-up call. *Radiology.* 2008 Dec;249(3):748-52.
- Kohno S, Sawamoto N, Urayama S, Aso T, Aso K, Seiyama A, Fukuyama H, Le Bihan D. Water-diffusion slowdown in the human visual cortex on visual stimulation precedes vascular responses. *J Cereb Blood Flow Metab.* 2009 Jun;29(6):1197-207.