

Anne Elisabeth Morel (1947-2016)

Anne Morel was a prominent neuroscientist who in her early career contributed greatly to our present understanding of the organization of the auditory, visual, and motor systems in cats and non-human primates. The majority of her later career was devoted to clinical research with the aim of improving therapeutic neurosurgical approaches to alleviating chronic human suffering due to disorders of brain functions like Parkinson's disease or neurogenic pain. She began her career as a neurophysiologist, but soon also became an expert neuroanatomist. Her career began in the University of Lausanne, Switzerland with following periods at the University of Kansas Medical Center in Kansas City, Kansas, INSERM in Bron, France, Vanderbilt University in Nashville, Tennessee, University of Fribourg in Fribourg, Switzerland, and University Hospital in Zurich, Switzerland where she spent the majority of her career.

Her colleagues, students, and friends remember Anne as an intelligent, dedicated, gregarious, generous, kind, respectful and helpful person fond of travel, her cat, and organizing social events often centered around interesting conversation, good food and fine wine. She was loved by all who knew her and will be fondly remembered.

Anne was born on January 26, 1947 in Lausanne, Switzerland, the daughter of Elisabeth Marguerite Morel (Berthoud) and Jean Albert Morel. She passed away in Zurich, Switzerland on August 22, 2016 after suffering a three month battle with cancer. She is survived by two brothers, Jacques Morel and François Morel and their families. The chronology of her scientific career follows:

1971 or 1972 Licence (approximately equivalent to bachelor's and master's degrees) in Biology, University of Lausanne, Switzerland.

1980 Ph.D. Codage des sons dans le corps genouille median du chat: évaluation de l'organisation tonotopique de ses différents noyaux. PhD dissertation. Juris, Zurich. "Coding of sounds in the medial geniculate body of the cat: evaluation of the tonotopic organization of its different nuclei", Institute of Physiology in the Medical School of the University of Lausanne, under the direction of

Prof. François de Ribaupierre. She was a member of a research team that included Yves de Ribaupierre and Eric M. Rouiller.

1981-1986 Research Associate, Research Assistant Professor, Department of Physiology, University of Kansas Medical Center, Kansas City, Laboratory of Tom Imig. Studies of the tonotopic organization of the medial geniculate body of the cat and its connections with auditory cortex.

1986-1988 Researcher at INSERM in Bron, France (Lyon region), laboratory of Jean Bullier. Studies of cortical connections of the visual system in macaque monkeys in collaboration with Henry Kennedy and Christine Baleydier.

1988-1991 Research Associate Professor, Dept. of Psychology, Vanderbilt University. Laboratory of Jon Kaas, Investigation of the functional and anatomical organization of the auditory system in owl and macaque monkeys. With Jean Bullier and Jeff Schall she also described the topography of connectivity of extrastriate visual areas in the frontal lobe.

1991 - 2013 Neuroanatomist, Dept. of Functional Neurosurgery, Neurosurgical Clinic, University Hospital Zürich. In research with Daniel Jeanmonod, Michel Magnin, Gabor Szekely, and other neurosurgeons, Anne used her neuroanatomical expertise to develop a human neuroanatomical atlas of the thalamus and basal ganglia that guided neurosurgical treatments of chronic therapy-resistant functional brain disorders. She applied different staining techniques thus allowing cyto-architectonic determination of thalamic and pallidal subnuclei to analyze inter-individual variability based on a large number of human brain specimens. The culmination of this work was the publication of a book, "Stereotactic Atlas of the Human Thalamus and Basal Ganglia" in 2007. Besides the printed form of the atlas, she joined a team of ETH Zürich to create a 3-dimensional digital representation of the thalamic nuclei, also covering the inter-individual variability of the anatomy. The resulting digital atlas has become an indispensable tool both in neuroscience and in clinical care and has been licensed by over 100 research centers all over the world in the meantime. In addition, she applied the tract-tracing Nauta technique to the brain of a deceased patient who suffered from

dystonia. This study allowed her to analyze in detail the presence of axonal projections from the external pallidum to the thalamic reticular and relay cells, a demonstration highly relevant in the pathophysiological mechanism of dystonia. Following that she published a study devoted to the human insula with Marc Gallay and other collaborators.

2000 While living in Zurich Anne reactivated a regular and intense scientific collaboration with Eric Rouiller, a fellow PhD student with her at the University of Lausanne, and colleagues at the University of Fribourg (Switzerland), to investigate in non-human primates the connections between the motor thalamus and motor cortex. Anne was an expert in the delineation of the multiple nuclei comprised in the motor thalamus and she supervised with talent and great enthusiasm several Ph.D. students.

2013 Anne retired with plans for travel and enjoyment of her remaining years. Nevertheless, she also remained true to neuroscience research and participated in a new venture investigating the geometric relation of thalamic nuclei with thalamo-cortical connections as can be determined in vivo by MR diffusion tensor imaging. Just a few days before her death she was still very much looking forward to finish this work which was interrupted by her illness. Unfortunately all these great plans were prematurely terminated.

Her research publications have been highly cited and have provided the foundation for important developments in basic and translational research as well as neurosurgical care. Her scientific legacy is assured.

Bibliography

Morel A, Gallay MN, Baechler A, Wyss M, Gallay DS. The human insula: Architectonic organization and postmortem MRI registration. Neuroscience. 2013 Apr 16;236:117-35.

Gallay DS, Gallay MN, Jeanmonod D, Rouiller EM, Morel A. [The insula of Reil revisited: multiarchitectonic organization in macaque monkeys.](#) Cereb Cortex. 2012 Jan;22(1):175-90.

Martin E, Jeanmonod D, Morel A, Zadicario E, Werner B. [High-intensity focused ultrasound for noninvasive functional neurosurgery.](#)

Ann Neurol. 2009 Dec;66(6):858-61

Krauth A, Blanc R, Poveda A, Jeanmonod D, Morel A, Székely G. [A mean three-dimensional atlas of the human thalamus: generation from multiple histological data.](#) Neuroimage. 2010 Feb 1;49(3):2053-62. doi: 10.1016/

Jetzer AK, Morel A, Magnin M, Jeanmonod D. [Cross-modal plasticity in the human thalamus: evidence from intraoperative macrostimulations.](#) Neuroscience. 2009 Dec 29;164(4):1867-75. doi: 10.1016/j

Cappe C, Morel A, Barone P, Rouiller EM. [The thalamocortical projection systems in primate: an anatomical support for multisensory and sensorimotor interplay.](#) Cereb Cortex. 2009 Sep;19(9):2025-37.

Germann M, Morel A, Beckmann F, Andronache A, Jeanmonod D, Müller B. Strain fields in histological slices of brain tissue determined by synchrotron radiation-based micro computed tomography. J Neurosci Methods. 2008 May 15;170(1):149-55.

Gallay MN, Jeanmonod D, Liu J, Morel A. [Human pallidothalamic and cerebellothalamic tracts: anatomical basis for functional stereotactic neurosurgery.](#) Brain Struct Funct. 2008 Aug;212(6):443-63.

Morel A. [The thalamus and behavior: effects of anatomically distinct strokes.](#) Neurology. 2007 May 8;68(19):1640; author reply 1640-1.

Cappe C, Morel A, Rouiller EM. [Thalamocortical and the dual pattern of corticothalamic projections of the posterior parietal cortex in macaque monkeys.](#) Neuroscience. 2007 May 25;146(3):1371-87.

Morel A, Stereotactic Atlas of the Human Thalamus and Basal Ganglia 2007 CRC Press 160 Pages - 10 Color & 183 B/W Illustrations ISBN 9780824728946

Magnin M, Morel A, Jeanmonod D. [\[Toward a unified theory of positive symptoms\]](#). Neurophysiol Clin. 2005 Nov-Dec;35(5-6):154-61.

Sarnthein J, Morel A, von Stein A, Jeanmonod D. [Thalamocortical theta coherence in neurological patients at rest and during a working memory task](#). Int J Psychophysiol. 2005 Aug;57(2):87-96

Morel A, Liu J, Wannier T, Jeanmonod D, Rouiller EM. [Divergence and convergence of thalamocortical projections to premotor and supplementary motor cortex: a multiple tracing study in the macaque monkey](#). Eur J Neurosci. 2005 Feb;21(4):1007-29.

Jeanmonod D, Schulman J, Ramirez R, Cancro R, Lanz M, Morel A, Magnin M, Siegemund M, Kronberg E, Ribary U, Llinas R. [Neuropsychiatric thalamocortical dysrhythmia: surgical implications](#). Neurosurg Clin N Am. 2003 Apr;14(2):251-65.

Wannier T, Liu J, Morel A, Jouffrais C, Rouiller EM. [Neuronal activity in primate striatum and pallidum related to bimanual motor actions](#). Neuroreport. 2002 Jan 21;13(1):143-7.

Morel A, Loup F, Magnin M, Jeanmonod D. [Neurochemical organization of the human basal ganglia: anatomofunctional territories defined by the distributions of calcium-binding proteins and SMI-32](#). J Comp Neurol. 2002 Jan 28;443(1):86-103.

Liu J, Morel A, Wannier T, Rouiller EM. [Origins of callosal projections to the supplementary motor area \(SMA\): a direct comparison between pre-SMA and SMA-proper in macaque monkeys](#). J Comp Neurol. 2002 Jan 28;443(1):71-85.

Morel et al.: Efferent connections of the human striatum and pallidum : a Nauta degeneration study. In: Basal Ganglia and Thalamus in Health and Movement Disorders, eds.: Kultas-Ilinsky and Ilinsky, Kluwer Academic/Plenum, New York, pp. 61-65, 2001

Magnin M, Jetzer U, Morel A, Jeanmonod D. [Microelectrode recording and macrostimulation in thalamic and subthalamic MRI](#)

guided stereotactic surgery. Neurophysiol Clin. 2001 Aug;31(4):230-8.

Niemann K, Mennicken VR, Jeanmonod D, Morel A. [The Morel stereotactic atlas of the human thalamus: atlas-to-MR registration of internally consistent canonical model.](#) Neuroimage. 2000 Dec;12(6):601-16.

Roth C, Jeanmonod D, Magnin M, Morel A, Achermann P. [Effects of medial thalamotomy and pallido-thalamic tractotomy on sleep and waking EEG in pain and Parkinsonian patients.](#) Clin Neurophysiol. 2000 Jul;111(7):1266-75.

Magnin M, Morel A, Jeanmonod D. [Single-unit analysis of the pallidum, thalamus and subthalamic nucleus in parkinsonian patients.](#) Neuroscience. 2000;96(3):549-64.

Bourgeois G, Magnin M, Morel A, Sartoretti S, Huisman T, Tuncdogan E, Meier D, Jeanmonod D. [Accuracy of MRI-guided stereotactic thalamic functional neurosurgery.](#) Neuroradiology. 1999 Sep;41(9):636-45.

Morel A, Magnin M, Jeanmonod D. [Multiarchitectonic and stereotactic atlas of the human thalamus.](#) J Comp Neurol. 1997 Nov 3;387(4):588-630. Erratum in: J Comp Neurol 1998 Feb 22;391(4):545.

Bullier J, Schall JD, Morel A. [Functional streams in occipito-frontal connections in the monkey.](#) Behav Brain Res. 1996 Apr;76(1-2):89-97.

Schall JD, Morel A, King DJ, Bullier J. [Topography of visual cortex connections with frontal eye field in macaque: convergence and segregation of processing streams.](#) J Neurosci. 1995 Jun;15(6):4464-87.

Jeanmonod D, Magnin M, Morel A. [Chronic neurogenic pain and the medial thalamotomy.](#) Schweiz Rundsch Med Prax. 1994 Jun 7;83(23):702-7.

Morel A, Garraghty PE, Kaas JH. [Tonotopic organization, architectonic fields, and connections of auditory cortex in macaque monkeys.](#) J Comp Neurol. 1993 Sep 15;335(3):437-59.

Jeanmonod D, Magnin M, Morel A. [Thalamus and neurogenic pain: physiological, anatomical and clinical data.](#) Neuroreport. 1993 May;4(5):475-8. Erratum in: Neuroreport 1993 Aug;4(8):1066.

Schall JD, Morel A, Kaas JH. [Topography of supplementary eye field afferents to frontal eye field in macaque: implications for mapping between saccade coordinate systems.](#) Vis Neurosci. 1993 Mar-Apr;10(2):385-93.

Kaas JH, Morel A. [Connections of visual areas of the upper temporal lobe of owl monkeys: the MT crescent and dorsal and ventral subdivisions of FST.](#) J Neurosci. 1993 Feb;13(2):534-46.

Baleydier C, Morel A. [Segregated thalamocortical pathways to inferior parietal and inferotemporal cortex in macaque monkey.](#) Vis Neurosci. 1992 May;8(5):391-405.

Morel A, Kaas JH. [Subdivisions and connections of auditory cortex in owl monkeys.](#) J Comp Neurol. 1992 Apr 1;318(1):27-63.

Morel A, Bullier J. [Anatomical segregation of two cortical visual pathways in the macaque monkey.](#) Vis Neurosci. 1990 Jun;4(6):555-78.

Morel A, Imig TJ. [Thalamic projections to fields A, AI, P, and VP in the cat auditory cortex.](#) J Comp Neurol. 1987 Nov 1;265(1):119-44.

Morel A, Rouiller E, de Ribaupierre Y, de Ribaupierre F. [Tonotopic organization in the medial geniculate body \(MGB\) of lightly anesthetized cats.](#) Exp Brain Res. 1987;69(1):24-42.

Imig TJ, Morel A. [Tonotopic organization in lateral part of posterior group of thalamic nuclei in the cat.](#) J Neurophysiol. 1985 Mar;53(3):836-51.

Imig TJ, Morel A. [Tonotopic organization in ventral nucleus of medial geniculate body in the cat.](#) J Neurophysiol. 1985 Jan;53(1):309-40.

Imig TJ, Morel A. [Topographic and cytoarchitectonic organization of thalamic neurons related to their targets in low-, middle-, and high-frequency representations in cat auditory cortex.](#) J Comp Neurol. 1984 Aug 20;227(4):511-39.

Rouiller E, de Ribaupierre Y, Morel A, de Ribaupierre F. [Intensity functions of single unit responses to tone in the medial geniculate body of cat.](#) Hear Res. 1983 Aug;11(2):235-47.

Imig TJ, Morel A. [Organization of the thalamocortical auditory system in the cat.](#) Annu Rev Neurosci. 1983;6:95-120.

Imig TJ, Morel A, Kauer CD. Covariation of distributions of callosal cell bodies and callosal axon terminals in layer III of cat primary auditory cortex. Brain Res. 1982 Nov 11;251(1):157-9.