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## **Curriculum Vitae - Peter Mombaerts, M.D., Ph.D.**

Born: 27 September 1962 in Leuven, Belgium.

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### **Education**

*Medical School:* 1980-1987. Catholic University of Leuven, Leuven, Belgium.

M.D. degree in June 1987 with *summa cum laude and congratulations of the examining board.*

*Graduate School:* 1987-1992. Massachusetts Institute of Technology, Cambridge, MA, USA. Department of Biology

Ph.D. degree in Biology in June 1992 with thesis

*"Studies on Lymphocyte Development and Function with Mutant Mice Created by Gene Targeting."*

Advisor: Dr. Susumu Tonegawa.

*Postdoc:* 1993-1995. Columbia University, New York, NY, USA.

Advisor: Dr. Richard Axel.

### **Faculty Positions**

*The Rockefeller University, New York, NY, USA.*

Head, Laboratory of Developmental Biology and Neurogenetics

Assistant Professor: 1995-2001. Associate Professor: 2001-2003. Professor: 2003-.

*Max Planck Institut für Biophysik, Frankfurt, Germany.*

Direktor, Abteilung Molekulare Neurogenetik: 2006-.

### **Fellowships and Awards**

#### ***As graduate student***

1987-1988: Graduate Fellow of the Belgian American Educational Foundation.

1988-1992: Howard Hughes Medical Institute Predoctoral Fellow in Biological Sciences.

#### ***As assistant professor***

1996-1999: Searle Scholar Award.

1997-1999: Basil O'Connor Starter Scholar Research Award.  
1997-2002: Irma T. Hirschl Trust Career Scientist Award.  
1997-1999: Alfred P. Sloan Research Fellow.  
1997-2000: Klingenstein Fellowship Award in the Neurosciences.  
1997-2000: McKnight Scholar Award in Neuroscience.  
1997-2002: Presidential Early Career Award for Scientists and Engineers  
(from President Clinton).  
1998-1999: Guggenheim Fellow.  
1998-2001: Rita Allen Foundation Scholar Award.

### ***As associate professor***

2001: Takasago Award for Research in Olfaction (Association for Chemoreception Sciences).  
2001: Firmenich Fragrance Award.

### ***As professor***

2004: R. H. Wright Award in Olfactory Research, and Distinguished Visiting Professor, Simon Fraser University, Vancouver, BC, Canada.  
2004-: Honorary Professor, The University of Queensland, Brisbane, Qld, Australia.

### **Reviewing activities**

2002-: Member of the editorial board of *Molecular Cellular Neuroscience*.  
2005-: Associate Editor of *The Journal of Neuroscience*.  
2005-: Member of NIH study section SCS.

### **Advisor of Ph.D. students at The Rockefeller University**

2002: Shirley Xie, *Characterization of the Olf1r7 Odorant Receptor Gene Cluster*  
2002: Karina Del Punta, *The Molecular and Neural Basis of Pheromone Communication in Mammals*

### **Research interests**

Odorant receptor gene choice, olfactory coding, and axon guidance in the mouse olfactory system, using transgenesis, gene targeting, and cloning by nuclear transfer.

### **Publications**

1. Pierre Cambier, Peter Mombaerts, Hilaire De Geest, Désiré Collen, Frans Van de Werf. Treatment of prosthetic tricuspid valve thrombosis with recombinant tissue-type plasminogen activator. *European Heart Journal* (1987) **8**, 906-909.

2. P.J. Declerck, P. Mombaerts, P. Holvoet, M. De Mol, D. Collen. Fibrinolytic response and fibrin fragment D-dimer levels in patients with deep vein thrombosis. *Thrombosis and Haemostasis* (1987) **58**, 1024-1029.
3. V. Ballegeer, P. Mombaerts, P.J. Declerck, B. Spitz, F.A. Van Assche, D. Collen. Fibrinolytic response to venous occlusion and fibrin fragment D-dimer levels in normal and complicated pregnancy. *Thrombosis and Haemostasis* (1987) **58**, 1030-1032.
4. M. Verstraete, G.A.H. Miller, H. Bounameaux, B. Charbonnier, J.P. Colle, G. Lecorf, G.A. Marbet, P. Mombaerts and C.G. Olsson. Intravenous and intrapulmonary recombinant tissue-type plasminogen activator in the treatment of acute massive pulmonary embolism. *Circulation* (1988) **77**, 353-360.
5. Marc Bonneville, Isao Ishida, Peter Mombaerts, Motoya Katsuki, Sjeff Verbeek, Anton Berns and Susumu Tonegawa. Blockage of  $\alpha\beta$  T-cell development by TCR  $\gamma\delta$  transgenes. *Nature* (1989) **342**, 931-934.
6. Marc Bonneville, Shigeyoshi Itohara, Edvins G. Krecko, Peter Mombaerts, Isao Ishida, Motoya Katsuki, Anton Berns, Andrew G. Farr, Charles A. Janeway, Jr. and Susumu Tonegawa. Transgenic mice demonstrate that epithelial homing of  $\gamma\delta$  T cells is determined by cell lineages independent of T cell receptor specificity. *J. Exp. Med.* (1990) **171**, 1015-1026.
7. Peter Mombaerts, Alan R. Clarke, Martin L. Hooper and Susumu Tonegawa. Creation of a large genomic deletion at the T-cell antigen receptor  $\beta$  subunit locus in mouse embryonic stem cells by gene targeting. *Proc. Natl. Acad. Sci. USA* (1991) **88**, 3084-3087.
8. Peter Mombaerts, John Iacomini, Randall S. Johnson, Karl Herrup, Susumu Tonegawa and Virginia E. Papaioannou. RAG-1-deficient mice have no mature B and T lymphocytes. *Cell* (1992) **68**, 869-877.
9. Peter Mombaerts, Alan R. Clarke, Michael A. Rudnicki, John Iacomini, Shigeyoshi Itohara, Juan J. Lafaille, Lili Wang, Yoshiaki Ichikawa, Rudolf Jaenisch, Martin L. Hooper and Susumu Tonegawa. Mutations in T-cell antigen receptor genes  $\alpha$  and  $\beta$  block thymocyte development at different stages. *Nature* (1992) **360**, 225-231.
10. Shigeyoshi Itohara, Peter Mombaerts, John Iacomini, Juan J. Lafaille, Andrew Nelson, Alan R. Clarke, Martin L. Hooper, Andrew Farr and Susumu Tonegawa. T-cell receptor  $\delta$  gene mutant mice: independent generation of  $\alpha\beta$  T cells and programmed rearrangements of  $\gamma\delta$  TCR genes. *Cell* (1993) **72**, 337-348.
11. Peter Mombaerts, Jörg Arnoldi, Friedemann Russ, Susumu Tonegawa and Stefan H.E. Kaufmann. Different roles of  $\alpha\beta$  and  $\gamma\delta$  T cells in immunity against an intracellular bacterial pathogen. *Nature* (1993) **365**, 53-56.

12. Peter Mombaerts, Emiko Mizoguchi, Michael J. Grusby, Laurie H. Glimcher, Atul K. Bhan and Susumu Tonegawa. Spontaneous development of inflammatory bowel disease in T cell receptor mutant mice. *Cell* (1993) **75**, 275-282.
13. Christiaan N. Levelt, Peter Mombaerts, Antonio Iglesias, Susumu Tonegawa and Klaus Eichmann. Restoration of early thymocyte differentiation in T-cell receptor  $\beta$ -chain-deficient mutant mice by transmembrane signaling through CD3 $\epsilon$ . *Proc. Natl. Acad. Sci. USA* (1993) **90**, 11401-11405.
14. Peter Mombaerts. Dismantling the immune system. *Curr. Op. Biotech.* **4** (1993), 690-698.
15. Moriya Tsuji, Peter Mombaerts, Leo Lefrancois, Ruth Nussenzweig, Fidel Zavala and Susumu Tonegawa.  $\gamma\delta$  T cells contribute to immunity against the liver stages of malaria in  $\alpha\beta$  T-cell-deficient mice. *Proc. Natl. Acad. Sci. USA* (1994) **91**, 345-349.
16. Peter Mombaerts and Susumu Tonegawa. Lymphocyte development and function in T cell receptor and RAG-1 mutant mice. In: *Transgenesis and Targeted Mutagenesis in Immunology* (eds. Horst Bluethmann and Pamela Ohashi), Academic Press (1994), 15-34.
17. Dale I. Godfrey, Jacqueline Kennedy, Peter Mombaerts, Susumu Tonegawa and Albert Zlotnik. Onset of TCR- $\beta$  gene rearrangement and role of TCR- $\beta$  expression during CD3<sup>-</sup>CD4<sup>-</sup>CD8<sup>-</sup> thymocyte differentiation. *J. Immunol.* (1994) **152**, 4783-4792.
18. Peter Mombaerts, Emiko Mizoguchi, Hans-Gustaf Ljunggren, John Iacomini, Hiromichi Ishikawa, Lili Wang, Michael J. Grusby, Laurie H. Glimcher, Henry J. Winn, Atul K. Bhan and Susumu Tonegawa. Peripheral lymphoid development and function in TCR mutant mice. *Int. Immunol.* (1994) **6**, 1061-1070.
19. Peter Mombaerts, Steven Anderson, Roger M. Perlmutter, Tak W. Mak and Susumu Tonegawa. An activated *lck* transgene promotes thymocyte development in RAG-1 mutant mice. *Immunity* (1994) **1**, 261-267.
20. Maryna Eichelberger, Anthony McMickle, Marcia Blackman, Peter Mombaerts, Susumu Tonegawa and Peter C. Doherty. Functional characteristics of the TCR  $\alpha^{-}\beta^{+}$  cells that accumulate in the pneumonic lung of influenza virus-infected TCR  $\alpha^{-/-}$  mice. *J. Immunol.* (1995) **154**, 1569-1576.
21. Christoph H. Ladel, Jürgen Hess, Sabine Daugelat, Peter Mombaerts, Susumu Tonegawa and Stefan H.E. Kaufmann. Contribution of  $\alpha\beta$  and  $\gamma\delta$  T lymphocytes to immunity against *Mycobacterium bovis* Bacillus Calmette Guérin: studies with T cell receptor-deficient mutant mice. *Eur. J. Immunol.* (1995) **25**, 838-846.

22. Peter Mombaerts. Lymphocyte development and function in T-cell receptor and RAG-1 mutant mice. *International Reviews of Immunology* (1995) **13**, 43-63.
23. Jean Langhorne, Peter Mombaerts and Susumu Tonegawa.  $\alpha\beta$  and  $\gamma\delta$  T cells in the immune response to the erythrocytic stages of malaria in mice. *Int. Immunol.* (1995) **7**, 1005-1011.
24. Hajime Komano, Yasuyoshi Fujiura, Mariko Kawaguchi, Satoshi Matsumoto, Yasuhiro Hashimoto, Satoshi Obana, Peter Mombaerts, Susumu Tonegawa, Hiroshi Yamamoto, Shigeyoshi Itohara, Masanobu Nanno and Hiromichi Ishikawa. Homeostatic regulation of intestinal epithelia by intraepithelial  $\gamma\delta$  T cells. *Proc. Natl. Acad. Sci. USA* (1995) **92**, 6147-6151.
25. Peter Mombaerts, Cox Terhorst, Tyler Jacks, Susumu Tonegawa and Jaime Sancho. Characterization of immature thymocyte lines derived from T-cell receptor or recombination activating gene 1 mutant and p53 double-mutant mice. *Proc. Natl. Acad. Sci. USA* (1995) **92**, 7420-7424.
26. Christiaan N. Levelt, Peter Mombaerts, Wang Baoping, Heinz Kohler, Susumu Tonegawa, Klaus Eichmann and Cox Terhorst. Regulation of thymocyte development through CD3: functional dissociation between p56lck and CD3 $\zeta$  in early thymic selection. *Immunity* (1995) **3**, 215-222.
27. Peter Mombaerts. Targeting olfaction. *Curr. Op. Neurob.* (1996) **6**, 481-486.
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30. Peter Mombaerts. Molecular biology of odorant receptors in vertebrates. *Annu. Rev. Neurosci.* (1999) **22**, 487-509.
31. Ivan Rodriguez, Paul Feinstein and Peter Mombaerts. Variable patterns of axonal projections of sensory neurons in the mouse vomeronasal system. *Cell* (1999) **97**, 199-208.
32. Peter Mombaerts. Odorant receptor genes in humans. *Curr. Op. Genet. Dev.* (1999) **9**, 315-320.
33. Peter Mombaerts. Digging for gold in the human genome. *Nature Neurosci.* (1999) **2**, 686-687.

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35. Peter Mombaerts. Seven-transmembrane proteins as odorant and chemosensory receptors. *Science* (1999) **286**, 707-711.
36. Teruhiko Wakayama, Ivan Rodriguez, Anthony C. F. Perry, Ryuzo Yanagimachi and Peter Mombaerts. Mice cloned from embryonic stem cells. *Proc. Natl. Acad. Sci. USA* (1999) **96**, 14984-14989.
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38. Chen Zheng, Paul Feinstein, Thomas Bozza, Ivan Rodriguez and Peter Mombaerts. Peripheral olfactory projections are differentially affected in mice deficient in a cyclic nucleotide-gated channel subunit. *Neuron* (2000) **26**, 81-91.
39. Peter Mombaerts. Better taste through chemistry. *Nature Genetics* (2000) **25**, 130-132.
40. Ivan Rodriguez, Charles A. Greer, Mai Y. Mok and Peter Mombaerts. A putative pheromone receptor gene expressed in human olfactory mucosa. *Nature Genetics* (2000) **26**, 18-19.
41. Teruhiko Wakayama, Yoichi Shinkai, Kellie L.K. Tamashiro, Hiroyuki Niida, D. Caroline Blanchard, Robert J. Blanchard, Atsuo Ogura, Kentaro Tanemura, Makoto Tachibana, Anthony C.F. Perry, Diana F. Colgan, Peter Mombaerts and Ryuzo Yanagimachi. Cloning of mice to six generations. *Nature* (2000) **407**, 318-319.
42. Joerg Strotmann, Sidonie Conzelmann, Anja Beck, Paul Feinstein, Heinz Breer and Peter Mombaerts. Local permutations in the glomerular array of the olfactory bulb. *J. Neurosci.* (2000) **20**, 6927-6938.
43. Shirley Y. Xie, Paul Feinstein and Peter Mombaerts. Characterization of a cluster comprising ~100 odorant receptor genes in mouse. *Mamm. Genome* (2000) **11**, 1070-1078.
44. Karina Del Punta, Andrea Rothman, Ivan Rodriguez and Peter Mombaerts. Sequence diversity and genomic organization of vomeronasal receptor genes in the mouse. *Genome Research* (2000) **10**, 1958-1967.
45. Kawai J, Shinagawa A, Shibata K, Yoshino M, Itoh M, Ishii Y, Arakawa T, Hara A, Fukunishi Y, Konno H, Adachi J, Fukuda S, Aizawa K, Izawa M, Nishi K, Kiyosawa H, Kondo S, Yamanaka I, Saito T, Okazaki Y, Gojobori T, Bono H, Kasukawa T, Saito R, Kadota K, Matsuda HA, Ashburner M, Batalov S, Casavant T, Fleischmann W, Gaasterland T, Gissi C, King B,

Kochiwa H, Kuehl P, Lewis S, Matsuo Y, Nikaido I, Pesole G, Quackenbush J, Schriml LM, Staubli F, Suzuki R, Tomita M, Wagner L, Washio T, Sakai K, Okido T, Furuno M, Aono H, Baldarelli R, Barsh G, Blake J, Boffelli D, Bojunga N, Carninci P, de Bonaldo MF, Brownstein MJ, Bult C, Fletcher C, Fujita M, Gariboldi M, Gustincich S, Hill D, Hofmann M, Hume DA, Kamiya M, Lee NH, Lyons P, Marchionni L, Mashima J, Mazzarelli J, Mombaerts P, Nordone P, Ring B, Ringwald M, Rodriguez I, Sakamoto N, Sasaki H, Sato K, Schonbach C, Seya T, Shibata Y, Storch KF, Suzuki H, Toyo-oka K, Wang KH, Weitz C, Whittaker C, Wilming L, Wynshaw-Boris A, Yoshida K, Hasegawa Y, Kawaji H, Kohtsuki S, Hayashizaki Y. Functional annotation of a full-length mouse cDNA collection. *Nature* (2001) **409**, 685-690.

46. Teruhiko Wakayama, Viviane Tabar, Ivan Rodriguez, Anthony C. F. Perry, Lorenz Studer and Peter Mombaerts. Differentiation of embryonic stem cell lines generated from adult somatic cells by nuclear transfer. *Science* (2001) **292**, 740-743.

47. Peter Mombaerts. The human repertoire of odorant receptor genes and pseudogenes. *Ann. Rev. Genomics Hum. Genet.* (2001) **2**, 493-510.

48. Thomas C. Bozza and Peter Mombaerts. Revealing intrinsic representations of odors. *Curr. Biol.* (2001) **11**, R687-R690.

50. Leonard Feiner, Andrea L. Webber, Christopher B. Brown, Min Min Lu, Li Jia, Paul Feinstein, Peter Mombaerts, Jonathan A. Epstein and Jonathan A. Raper. Targeted disruption of semaphorin 3C leads to persistent truncus arteriosus and aortic arch interruption. *Development* (2001) **128**, 3061-3070.

51. Paul Cohen, Connie Zhao, Xiaoli Cai, Jason M. Montez, S. Christy Rohani, Paul Feinstein, Peter Mombaerts and Jeffrey M. Friedman. Selective deletion of leptin receptor in neurons leads to obesity. *J. Clin. Invest.* (2001) **108**, 1113-1121.

52. Anthony C. F. Perry, Andrea Rothman, Jose I. de las Heras, Paul Feinstein, Peter Mombaerts, Howard J. Cooke and Teruhiko Wakayama. Efficient metaphase II transgenesis with different transgene archetypes. *Nature Biotech.* (2001) **19**, 1071-1073.

53. Peter Mombaerts. How smell develops. *Nature Neurosci.* (2001) **4** Suppl, 1192-1198.

54. Steve M. Potter, Chen Zheng, David S. Koos, Paul Feinstein, Scott E. Fraser and Peter Mombaerts. Structure and emergence of specific olfactory glomeruli in the mouse. *J. Neurosci.* (2001) **21**, 9713-9723.

55. Ivan Rodriguez, Karina Del Punta, Andrea Rothman, Tomohiro Ishii and Peter Mombaerts. Multiple new and isolated families within the mouse superfamily of V1r vomeronasal receptors. *Nature Neurosci.* (2002) **5**, 134-139.

56. Helen B. Treloar, Paul Feinstein, Peter Mombaerts and Charles A. Greer. Specificity of glomerular targeting by olfactory sensory axons. *J. Neurosci.* (2002) **22**, 2469-2477.
57. Thomas Bozza, Paul Feinstein, Chen Zheng and Peter Mombaerts. Odorant receptor expression defines functional units in the mouse olfactory system. *J. Neurosci.* (2002) **22**, 3033-3043.
58. Andreas Walz, Ivan Rodriguez and Peter Mombaerts. Aberrant sensory innervation of the olfactory bulb in neuropilin-2 mutant mice. *J. Neurosci.* (2002) **22**, 4025-4035.
59. Ivan Rodriguez and Peter Mombaerts. Novel human vomeronasal receptor-like genes reveal species-specific families. *Curr. Biol.* (2002) **12**, R409-R411.
60. Anne Vassalli, Andrea Rothman, Paul Feinstein, Martin Zapotocky and Peter Mombaerts. Minigenes impart odorant receptor-specific axon guidance in the olfactory bulb. *Neuron* (2002) **35**, 681-696.
61. Karina Del Punta, Adam Puche, Niels C. Adams, Ivan Rodriguez and Peter Mombaerts. A divergent pattern of sensory axonal projections is rendered convergent by second-order neurons in the accessory olfactory bulb. *Neuron* (2002) **35**, 1057-1066.
62. Karina Del Punta, Trese Leinders-Zufall, Ivan Rodriguez, David Jukam, Charles J. Wysocki, Sonoko Ogawa, Frank Zufall and Peter Mombaerts. Deficient pheromone responses in mice lacking a cluster of vomeronasal receptor genes. *Nature* (2002) **419**, 70-74.
63. Leonardo Belluscio, Claudia Lodovichi, Paul Feinstein, Peter Mombaerts and Lawrence C. Katz. Odorant receptors instruct functional circuitry in the mouse olfactory bulb. *Nature* (2002) **419**, 296-300.
64. Tomohiro Ishii, Junji Hirota and Peter Mombaerts. Combinatorial coexpression of neural and immune multigene families in mouse vomeronasal sensory neurons. *Curr. Biol.* (2003) **13**, 394-400.
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66. Peter Mombaerts. Therapeutic cloning in the mouse. *Proc. Natl. Acad. Sci. USA* (2003) **100**, 11924-11925.



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69. Peter Mombaerts. Genes and ligands for odorant, vomeronasal and taste receptors. *Nat. Rev. Neurosci.* (2004) **5**, 263-278.
70. Jinsong Li, Tomohiro Ishii, Paul Feinstein and Peter Mombaerts. Odorant receptor gene choice is reset by nuclear transfer from mouse olfactory sensory neurons. *Nature* (2004) **428**, 393-399.
71. Thomas Bozza, John P. McGann, Peter Mombaerts and Matt Wachowiak. In vivo imaging of neuronal activity by targeted expression of a genetically encoded probe in the mouse. *Neuron* (2004) **42**, 9-21.
72. Xinmin Zhang, Ivan Rodriguez, Peter Mombaerts and Stuart Firestein. Odorant and vomeronasal receptor genes in two mouse genome assemblies. *Genomics* (2004) **83**, 802-811.
73. Junji Hirota and Peter Mombaerts. The LIM-homeodomain protein *Lhx2* is required for complete development of mouse olfactory sensory neurons. *Proc. Natl. Acad. Sci. USA* (2004) **101**, 8751-8755.
74. Paul Feinstein and Peter Mombaerts. A contextual model for axonal sorting into glomeruli in the olfactory system. *Cell* (2004) **117**, 817-831.
75. Paul Feinstein, Thomas Bozza, Ivan Rodriguez, Anne Vassalli and Peter Mombaerts. Axon guidance to glomeruli by odorant receptors and the  $\beta 2$  adrenergic receptor. *Cell* (2004) **117**, 833-846.
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77. Peter Mombaerts. Love at first smell – The 2004 Nobel Prize in Physiology or Medicine. *N. Engl. J. Med.* (2004) **351**, 2579-2580.
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80. Tomohiro Ishii, Masayo Omura and Peter Mombaerts. Protocols for two- and three-color fluorescent RNA *in situ* hybridization of the main and accessory olfactory epithelia in mouse.

*J. Neurocyt.* (2005) **33**, 657-669.

81. Stefan H. Fuss, Masayo Omura and Peter Mombaerts. The Grueneberg ganglion of the mouse projects axons to glomeruli in the olfactory bulb. *Eur. J. Neurosci.* (2005) **22**, 2649-2654.

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