***Curriculum vitae***

Mart Saarma

***Current position***: Professor of Biotechnology, director of the Laboratory of Molecular Neuroscience, Institute of Biotechnology, University of Helsinki, Finland

**Education and Training**

* Tartu University, Estonia, MSc, biochemistry and molecular biology 1972
* Tartu University, Estonia, PhD, biochemistry and molecular biology 1975
* Friedrich Miescher Institute, Basel, Switzerland, postdoctoral fellow 1982
* Institute of Molecular Biology, Russian Academy of Sci., Dr. habil. 1986

**Positions and Employment**

* *Research assistant & junior researcher,* Department of Biochemistry,

Medical Faculty, Tartu University 1971-1977

* *Head of the Laboratory of Molecular Genetics*, Institute of Physics,

 Estonian Academy of Sciences, Tartu 1977-1980

* *Head of the Department of Molecular Genetics,* Institute of

 CPB, Estonian Academy of Sciences, Tartu, Tallinn 1980-1990

* *Professor,*  Tallinn Technical University (part time) 1986-2015
* *Director, Professor,* Institute of Biotechnology, Univ. of Helsinki 1990-2008
* *Director,* Biocenter Finland2008-2009
* *Director,* Centre of Excellence in Molecular and

Integrated Neuroscience Research 2008-2013

* *Academy Professor*, Institute of Biotechnology 2009-2013
* *Professor of Biotechnology,* Institute of Biotechnology 2014-

**Other Experience and Professional Memberships**

* Estonian Prime Minister’s Council for Science and Technology, *member* 2001-
* Scientific Board (SAB) of the Heidelberg Neuroscience Center, *chairman* 2002-
* SAB of the Göttingen Neuroscience Center, *member of the board* 2003-
* Journal Experimental Neurology, m*ember of the editorial board* 2003-
* SAB of the Helsinki Institute of Information Technology, *member* 2003-
* SAB of National Institute of Chemical Physics & Biophysics, *member* 2006-
* Frontiers in the Autonomic Nervous System, *Review Editor* 2010
* Tanner Academy, *President* 2007-
* HermoPharma Ltd., Finland, *founder and member of the SAB* 2008-
* EMBO Council, *member of the Council* 2011-
* ERC Scientific Council, *member of the Scientific Council* 2011-
* European Research Councl, *Vice President* 2015-
* DANDRITE, the Danish Nordic-EMBL partnership, Chairman of SAB 2013
* Journal of Biological Chemistry, m*ember of the editorial board*  2014-

**Honors**

* Academician*,* Estonian Academy of Sciences 1990
* First order decoration of the Finnish White Rose Knighthood 1999
* Foreign Member of the Finnish Academy of Science 2000
* Member of the Tanner Academy 2001
* Second order decoration of the Estonian White Star 2001
* Helsinki Gold medal 2002
* Member of the Finnish Technical Academy of Sciences 2003
* European Molecular Biology organization (EMBO), member 2005
* Foreign Member of the Finnish Society of Sciences and Letters 2007
* Visiting Professor, Wuhan University, China 2011-2014
* Member of the Academia Europea 2015
* Commander of the Order of the Lion of Finland 2015
* DANA Alliance for Brain Initiatives, member 2015

**Awards**

* Russian Academy of Sciences, prize for the young scientist 1974
* Estonian State prize for science and technology 1980
* Fellow of the Biocentrum Helsinki 1994, 2001, 2006, 2011, 2013
* Academy of Finland Centre of Excellence in molecular neurobiology 1999-2005
* Finnish Innovation Prize 2000
* Finnish Cultural Foundation Science Prize 2000
* Väinö Tanner Prize 2001
* Runeberg Medical Science Prize 2003
* Karl Schlossmann Science Prize 2004
* Nordic Science Prize, Lundbeck Foundation 2009
* Tartu University Medical Faculty, Honorary Medal 2010
* Alfred Kordelin Foundation Science Prize 2013

**Ongoing Research Support**

1. Biocentrum Helsinki grant, University of Helsinki, 2013-2016 (45,000 €/year).

2. Sigrid Jusélius Medical Research Foundation grant, “Novel NTFs”, 2014-2016, 115,000 €/year.

3. MFJJ for Parkinson's Research grant, “CDNF and α-synuclein model of PD”, 2014-2016, 75,000 €/year.

4. Academy of Finland grant “Novel neurotrophic factors”. 2012-2016, 150,000 €/year).

5. European Union FP7 grant, “New drugs for pain”, 2013-2017, 120,000 €/year,

6. European Union Marie Curie IAAP grant, “GDNF mimetics”, 2013-2017, 140,000 €/year.

7. Juvenile Diabetes Research Foundation grant, USA,“MANF & diabetes, 2013-2016,140,000 €/year.

8. Herantis Pharma Ltd. collaboration, “CDNF for Parkinson’s”, 2013-2016, 50,000€/year.

9. Parkinson’s UK grant, “GDNF mimetics for PD”, 2014-2015, 45,000€ total.

10. Jane and Aatos Erkko Foundation grant, “CDNF for Parkinson’s disease”, 2014-2016, 1.600,000 € total

**Supervision of PhD Students and Postdocs**

Founding member and Board member of the Helsinki Graduate Program in Molecular Biology and Biotechnology. Since 1978 supervised 31 PhD students, who have defended their PhD thesis.

Altogether 14 of Dr. Saarma’s former PhD students or post-docs have become professors in Finland, Estonia, China, Canada and USA.

**Scientific and Societal Impact of Research**

Dr. Saarma investigates neurotrophic factors, their structure, receptors, biology and therapeutic potential, and cross-talk of neurotrophic factors with ion transporter proteins. Recent highlight is the discovery of the novel neurotrophic factor CDNF that is a potential drug for the treatment of Parkinson’s disease. CDNF has unique structure and a completely novel mode of action. Another groundbreaking discovery was the finding that tyrosine kinase Ret is the signaling receptor for GDNF family ligands. He has also discovered that GFRα2 is the co-receptor for neurturin, which is another GDNF family ligand. He has identified N-syndecan as a novel receptor for GDNF. Recently he and his team found that MANF is protecting pancreatic beta-cells in animal models of diabetes and stimulates beta-cell maintenance and proliferation *in vivo*. Most of his significant findings have been well cited (14,200 times, H-index 54) and raised interest with pharmaceutical and biotechnological companies. He has a series of patents, patent families, and has several research contracts or licensing agreements with international and domestic pharmaceutical and biotechnology companies. To develop CDNF and MANF technology he started with Prof. Castrén, Prof. Rauvala, and Dr. Huttunen in 2009 Herantis Pharma Ltd. He is also a co-founder of the biotechnology company MobiDiag, Ltd. and partner of GeneCode Ltd.

**Selected Peer-Review Publications in Chronological Order**

1. Pirvola, U., Palgi, J., Ylikoski, J., Lehtonen, E. Arumäe, U. & Saarma, M. (1992) Brain-derived neurotrophic factor and neurotrophin 3 in the peripheral target fields of developing inner ear ganglia. **Proc. Natl. Acad. Sci**., USA, *89,* 9915-9919.

2. Trupp, M., Arenas, E., Fainzilber, M., Nilsson, A.-S., Sieber, B.-A., Grigoriou, M., Kilkenny, C., Salaxar-Grueso, E., Pachnis, V., Arumäe, U., Sariola, H., Saarma, M. & Ibañéz, C.F. (1996) Functional receptor for GDNF encoded by the c-*ret* proto-oncogene. **Nature**, *381*, 785-789.

3. Rivera, C., Voipio, J., Payne, J.A., Ruusuvuori, E., Lahtinen, H., Lamsa, K., Pirvola, U., Saarma, M. & Kaila, K. (1999) A K+/Cl- co-transporter KCC2 renders GABA hyperpolarizing during neuronal maturation. **Nature 397,** 251-255.

4. Rossi, J., Luukko, K., Poteriaev, D., Laurikainen, A., Sun, Y.F., Laakso, T., Eerikäinen, S., Tuominen, R., Lakso, M., Rauvala, H., Arumäe, U., Pasternack, M., Saarma, M. & Airaksinen, M.S. (1999) Retarded growth and deficits in the enteric and parasympathetic nervous system in mice lacking GFRa2, a functional neurturin receptor. **Neuron** **22**, 243-252.

5. Meng, X., Lindahl, M., Hyvönen, M. E., Parvinen, M., de Rooij, D. G., Hess, M. W., Raatikainen-Ahokas, A., Sainio, K., Rauvala, H., Lakso, M., Pichel, J. G. , Westphal, H., Saarma, M. & Sariola, H. (2000) Regulation of cell fate decision of undifferentiated spermatogonia by GDNF. **Science**, 287, 1489-1493.

6. Airaksinen, M. S. & Saarma, M. (2002) GDNF family neurotrophic factors: receptor mechanisms, biological functions and therapeutic utility. **Nature Rev. Neurosci**., 3, 383-394.

7. Rivera, C., Hong Li, Thomas-Crusells, J., Lahtinen, H., Viitanen, T., Nanobashvili, A., Kokaia, Z., Airaksinen, M. S., Voipio, J., Kaila, K. & Saarma, M. (2002). BDNF-induced TrkB activation down-regulates the K+–Cl- cotransporter KCC2 and impairs neuronal Cl- extrusion**. J. Cell Biol.,** 159: 747-752.

8. Lindholm, P., Voutilainen, M .H., Laurén, J., Peränen, J., Leppänen, V-M., Andressoo,J-O., Lindahl, M., Janhunen, S., Kalkkinen, N., Timmusk, T., Tuominen, RK. and Saarma, M. (2007) Novel neurotrophic factor CDNF protects and rescues midbrain dopaminergic neurons *in vivo*. **Nature**, 448, 73-77.

9. **Parkash, V., Leppänen****, V-M., Virtanen, H., Jurvansuu, J. M., Bespalov, M. M., Sidorova, Y. A., Runeberg-Roos, P., Saarma, M. and Goldman, A. (2008) The** Structure of the glial cell line-derived neurotrophic factor-coreceptor complex. Insights into RET signalling and heparin binding. **J. Biol. Chem**., 283, (50), 35164-35172.

10 .Mijatovic J, Airavaara M, Planken A, Auvinen P, Raasmaja A, Piepponen TP, Costantini F, Ahtee L, Saarma M (2007) Constitutive Ret activity in knock-in multiple endocrine neoplasia type B mice induces profound elevation of brain dopamine concentration via enhanced synthesis and increases the number of TH-positive cells in the substantia nigra. **J Neurosci** 27: 4799-4809.

11. Li H, Khirug S, Cai C, Ludwig A, Blaesse P, Kolikova J, Afzalov R, Coleman S K, Lauri S, Airaksinen M S, Keinänen K, Khiroug L, Saarma M, Kaila K and Rivera C. (2007) KCC2 interacts with the dendritic cytoskeleton to promote spine development**.** **Neuron** 56(6), 1019-1033.

12. Parkash V, Leppanen VM, Virtanen H, Jurvansuu JM, Bespalov MM, Sidorova YA, Runeberg-Roos P, Saarma M, Goldman A (2008) The structure of the glial cell line-derived neurotrophic factor-coreceptor complex: insights into RET signaling and heparin binding. **J Biol Chem** 283: 35164-35172.

13. Palgi M, Lindström R, Peränen J, Piepponen TP, Saarma M, Heino TI. (2009) [Evidence that DmMANF is an invertebrate neurotrophic factor supporting dopaminergic neurons.](http://www.ncbi.nlm.nih.gov/pubmed/19164766?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DefaultReportPanel.Pubmed_RVDocSum) **Proc. Natl. Acad. Sci. U S A**.,106 (7): 2429-2434.

14. Voutilainen, M.H., Bäck, S., Pörsti, E., Toppinen, L., Lindgren, L., Lindholm, P., Peränen, J., Saarma, M\*. and Tuominen, R. K. (2009) Neurotrophic factor MANF is neurorestorative in rat model of Parkinson’s disease **. J. Neurosci,** 29(30):9651-9659.\*Corresponding author.

15. Lonka-Nevalaita L, Lume M, Leppänen S, Jokitalo E, Peränen J and Saarma M. (2010) Characterization of the intracellular localization, processing and secretion of two GDNF splice isoforms. **J. Neurosci.** , 30(34):11403-11413.

16. Bespalov MM, Sidorova Y A, Tumova S, Ahonen-Bishopp A, Magalhães AC, Kulesskiy E, Paveliev M, Rivera C, Rauvala H,and Saarma M. . (2011) Heparan sulfate proteoglycan syndecan-3 is a novel receptor for GDNF, neurturin and artemin **J. Cell Biol.,** 192(1), 153-169.

17. Hellman M, Arumäe U, Yu LY, Lindholm P, Peränen J, Saarma M\*, Permi P\* (2011) Mesencephalic Astrocyte-derived Neurotrophic Factor (MANF) Has a Unique Mechanism to Rescue Apoptotic Neurons. J Biol Chem 286: 2675-2680. \*Equal contribution.

18. Glerup S, Lume M, Olsen D, Nyengaard JR, Vaegter, CB, Gustafsen C, Christensen EI, Kjolby M, Hay-Schmidt A, Lande AD, Madsen P, Saarma M, Nykjaer A and Petersen CM. (2013) SorLA controls neurotrophic activity through sorting of GDNF and its receptors GFRα1 and RET. **Cell Reports** 3(1):186-199.

19. Lindahl M, Danilova T, Palm E, Pulkkila P, Voikar V, Hakonen E, Ustinov J, Andressoo J-O, Harvery B, Otonkoski T, Rossi J and Saarma M. (2014). MANF is indispensable for the proliferation and survival of pancreatic β-cells. **Cell Reports**, 7(2):366-75. doi: 10.1016/j.celrep.2014.03.023. Epub 2014 Apr 13

20. Kopra J, Vilenius C, Grealish S, Härma A-M, Varendi K, Lindholm J, Castrén E, Võikar V, Björklund A, Piepponen TP, Saarma M\*, Andressoo J-O\* (2015) GDNF is not required for catecholaminergic neuron survival in vivo. **Nature Neurosci**. 18(3):319-22. doi: 10.1038/nn.3941. \*Equal contribution.

21. [Galli E](http://www.ncbi.nlm.nih.gov/pubmed/?term=Galli%20E%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Härkönen T](http://www.ncbi.nlm.nih.gov/pubmed/?term=H%C3%A4rk%C3%B6nen%20T%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Sainio MT](http://www.ncbi.nlm.nih.gov/pubmed/?term=Sainio%20MT%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Ustav M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Ustav%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Toots U](http://www.ncbi.nlm.nih.gov/pubmed/?term=Toots%20U%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Urtti A](http://www.ncbi.nlm.nih.gov/pubmed/?term=Urtti%20A%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Yliperttula M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Yliperttula%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Lindahl M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lindahl%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Knip M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Knip%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27356471), [Saarma M](http://www.ncbi.nlm.nih.gov/pubmed/?term=Saarma%20M%5BAuthor%5D&cauthor=true&cauthor_uid=27356471)\*, [Lindholm P](http://www.ncbi.nlm.nih.gov/pubmed/?term=Lindholm%20P%5BAuthor%5D&cauthor=true&cauthor_uid=27356471)\*. (2016) Increased circulating concentrations of mesencephalic astrocyte-derived neurotrophic factor in children with type 1 diabetes. [**Sci Rep**.](http://www.ncbi.nlm.nih.gov/pubmed/27356471) 30;6:29058. doi: 10.1038/srep29058.\* Equal contribution.

22. Kumar A, Kopra J, Varendi K, et al. Piepponen TP, Saarma M\*, Andressoo JO\*. (2016) [GDNF Overexpression from the Native Locus Reveals its Role in the Nigrostriatal Dopaminergic System Function.](http://www.ncbi.nlm.nih.gov/pubmed/26752407) **PLoS Genet**. 12(1):e1005808. doi: 10.1371/journal.pgen.1005808. eCollection 2016 Jan. PMID:26752407\* Equal contribution