

CURRICULUM VITAE



Name: Katsuhiko Mikoshiba

Present Address: Senior Team Leader, Laboratory for Developmental Neurobiology
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Education: 1969 M.D. Keio University School of Medicine
1973 Ph.D. (Dr. of Medical Science), Keio University

Professional Training and Employment:

1973-1974	Instructor, Department of Physiology, Keio University School of Medicine
1974-1982	Assistant Professor, Department of Physiology, Keio University School of Medicine
1976-1977	Research Associate Pasteur Institute, Paris, France (c/o Dr. Jean-Pierre Changeux)
1982-1985	Associate Professor, Department of Physiology, Keio University School of Medicine
1985-1992	Professor, Division of Regulation of Macromolecular Function, Institute for Protein Research, Osaka University
1986-1991	Professor, Division of Behavior and Neurobiology, National Institute for Basic Biology (Adjunct position)
1992-1997	Chief Scientist, Molecular Neurobiology Laboratory, The Institute of Physical and Chemical Research (RIKEN), Tsukuba Life Science Center (Adjunct position)
1992-2007	Professor, Department of Molecular Neurobiology, The Institute of Medical Science, The University of Tokyo
1995-2000	Project Leader, Mikoshiba Calciosignal Net Project, Exploratory Research for Advanced Technology (ERATO), Japan Science and Technology Corporation (JST)
1998-Present	Team Leader, The Laboratory for Developmental Neurobiology, Group Director, Neuro-Development Disorder Research Group, The Brain Science Institute, RIKEN
2001-2005	Research Director, The International Cooperative Research Project (calcium oscillation project) Japan Science and Technology Agency (JST)
2003-Present	Foreign Professor (Adjunct Professor) at Karolinska Institute
2004-Present	Adjunct Professor at Jikeikai Medical School, Yamagata University
2005-Present	Member of Science Council of Japan
2006-Present	Research Director, Solution Oriented Research for Science and Technology (calcium oscillation project) Japan Science and Technology Agency (JST)
2007-Present	Professor Emeritus at University of Tokyo
2008-Present	Foreign Professor of Seoul National University (Korea)

2009-present Senior Team Leader, RIKEN BSI

Honors:

- 1974 Erwin von Bälz Preis
- 1980 Kitazato Prize
- 1987 The 3rd Inoue Scientific Prize
- 1987 The 1st Memorial Prize for Tsukahara Nakaakira (with Prof. Nobutaka Hirokawa)
- 1991 The 9th Osaka Prize for Science
- 1996 Medical Award of the Japan Medical Association
- 1996 Human Frontier Science Program Grant Award (1996-98)
- 1997 Uehara Prize (with Prof. Shigekazu Nagata)
- 1998 The Keio Medical Science Prize (International Prize) with Dr. M.J. Folkman
- 1999 Human Frontier Science Program Grant Award (1999-01)
- 1999 The Fritz-Lipmann Lecture Award (Germany)
- 2000 College de France Medal (France)
- 2002 Medal of Honor in Japan (Medal with Purple Ribbon-Emperor's Prize)
- 2003 Klaus Joachim Zülch -Preis (Germany • Max-Planck Institute, Gertrud Reemtsma Foundation) with Professor Fred H. Gage (Salk Institute)
- 2003- Foreign Professor at Karolinska Institute (Adjunct Professor), (Sweden)
- 2004 Takeda Medical Science Prize (Takeda Foundation, Japan)
- 2005 Meister Prize (Endocrinology Society for Japan)
- 2006 Nobel Forum Lecture (Karolinska Institute, Sweden)
- 2007 Hagiwara Lecture (The Physiological Society of Japan)
- 2008 Sherrington Lecture (Liverpool, UK)
- 2009 The Naito Foundation Research Prize
- 2009 Japan Academy Prize
- 2011 Honorary doctorate at Karolinska Institutet

Editorial Board Membership:

1. Science {Science's STKE (Signal Transduction Knowledge Environment) Perspective (Web publication) (American Association for the advancement of Science) (1999 - 2008) Science Signaling (from 2008 Sept.-)}
2. Molecular Neurobiology (Humana Press) (1999 -)
3. Fundamental & Clinical Pharmacology (Elsevier) (1999 -)
4. Journal of General Physiology (American Physiological Society) (1996 -)
5. Methods: A Companion to Methods in Enzymology (Academic Press) (1995 - 1999)
6. Glia (Academic Press) (1994 - 1999)
7. Molecular and Cellular Neuroscience (MCN) (Academic Press) (1994 -)
8. Protein Profile (Academic Press) (1994 - 1998)
9. Neuron (Cell Press) (1993 - 1994)
10. Journal of Neurochemistry (Raven Press) (1993 -2003)
11. Receptors and Channels (Chief Editor of Asia & Australia Region (Harwood Academic Publishers GMBH) (1992 -)
12. NeuroProtocols (Academic Press) (1992 - 1996)
13. Journal of Neuroscience Research (Wiley-Liss) (1992 -)
14. Brain Dysfunction (S.Karger, Medical and Scientific Publishers) (1991- 1999)

15. Neuroscience Research (Elsevier) (Section Editor, Molecular Neuroscience) (1990 -)
16. Cell Structure and Function (Japan Society for Cell Biology)
17. Cellular and Molecular Neurobiology (Plenum Publishing Corporation) (1989-)
18. Development, Growth and Differentiation (Academic Press) (1984-)
19. Developmental Neuroscience (S.Karger, Medical and Scientific Publishers) (1983 - 1989)
20. Neuro signals (Karger) (1999-)
21. Cell Calcium (Elsevier) (2006-)

Academic Activities:

1. Council Member, International Society for Neurochemistry (1998-2004)
2. Council Member, International Committee on Second Messengers and Phosphoproteins (1997-)
3. Council Member, International Symposium on Calcium Binding Proteins and Calcium Function in Health and Disease (1997-)
4. Chairman, International Symposium on Calcium Binding Proteins and Calcium Function in Health and Disease (1999)
5. Council Member of Asia Pacific Region of IBRO (International Brain Research Organization) (1999-2001)
6. Council Member of Asian Pacific Society for Neuroscience (2000-2006)
7. Full Member, International Society of Developmental Biologists
8. Full Member, Society for Neuroscience
9. Full Member, International Brain Research Organization
10. Full Member, Society for Developmental Neuroscience
11. Board of Director, International Society of Differentiation (1999-) Japanese Society
12. Council Member, Japanese Neuroscience Society(1987-1989, 1992-1995, 1995-1998, 1998-)
13. Council Member, Japanese Society of Cell Biology (1993-1994, 1996-1998, 1998-2000)
14. Council Member, Physiological Society of Japan (1999-2004)
15. • President, Japanese Society for Neurochemistry (2000-2002, 2002-2004) Council Member, Japanese Society for Neurochemistry (1986-1989, 1992-1995, 1996-1998,2001-2004)
 - Chairman of the Selection Committee for the research grant candidate, Japanese Society for Neurochemistry (1997-1999)
 - Chairman of the Committee for the International Affairs, Japanese Society for Neurochemistry (1999-2000, 2001-2005)
 - President, The 41st Annual Meeting of the Japanese Society for Neurochemistry (1998)
16. Council Member, Molecular Biology Society of Japan (2000-2005)
17. Council Member, Japan Intractable Diseases Research Foundation (1996-)
18. Council Member, Japanese Society for Regenerative Medicine (2001-2005)
19. Executive Council Member, Japanese Biochemical Society (1994-1996) (2002-2004)
20. Council Member, Center for Academic Societies Japan (1999-2004)
21. Council Member, Center for Academic Journals in Japan (1997-2004)

22. Full Member, Japanese Society of Developmental Biologists
23. Full Member, Japanese Association of Anatomists
24. Full Member, Japanese Association for Neuroethology
25. Full Member, Research Group of Information Biology
26. Council Member, Japan Foundation for Neuroscience and Mental Health (2007-)
27. Council Member, Japan Foundation for Applied Enzymology (1989-)

Foundation member for selection of the Prize:

28. Committee Member, Selection Committee of Uehara Memorial Foundation (1998-)
29. Committee Member, Selection Committee of “International Prize for Biology,” Japan Society for the Promotion of Science (1989)
30. Committee Member, Selection Committee of “Kyoto Prize,” Inamori Foundation (1986), (1996), (2000)
31. Committee Member, Selection Committee of “Japan Prize,” Science and Technology Foundation of Japan (1992),(1996)

REVIEW COMMITTEE:

1. Review Committee Member, Mitsubishi Biochemical Institute of Life Sciences
2. Review Committee Member, Niigata University
3. Review Committee Member, Kumamoto University
4. Review Committee Member, Hamamatsu Medical School

Remarks:

Appeared in the ‘Who’s Who in the World,’ MARQUIS WHO’S WHO Vol.15 (1997-)

Appeared in the ‘Who’s Who in the 21st Century’ 1st Edition (International Biographical Centre, Cambridge, England)

Man of the Year 2000 (American Biographical Institute, USA)

Intellectuals of 20th Century (in the field of Neuroscience) (International Biographical Centre Cambridge, UK)

Major publication list

1. Mikoshiba, K., Huchet, M. & Changeux, J.-P.: Biochemical and immunological studies on the P400 protein, a protein characteristic of the Purkinje cell from mouse and rat cerebellum. *Developmental Neuroscience* 2: 254-275 1979
2. Mikoshiba, K., Yokoyama, M., Inoue, Y., Takamatsu, K., Tsukada, Y. & Nomura, T. Oligodendrocyte abnormalities in shiverer mouse mutant are determined in primary chimaeras. *Nature* 299: 357-359, 1982
3. Okano, H., Tamura, T., Miura, M., Aoyama, A., Ikenaka, K., Oshimura, M. & Mikoshiba, K. Gene organization and transcription of duplicated MBP genes of myelin deficient (shi^{mld}) mutant mouse. *EMBO J.* 7:77-83, 1988
4. Ikenaka, K., Furuichi, T., Iwasaki, Y., Moriguchi, A., Okano, H. & Mikoshiba, K. Myelin proteolipid protein gene structure and its regulation of expression in normal and jimpy mutant mice. *J. Mol. Biol.* 199: 587-596, 1988
5. Okano, H., Ikenaka, K. & Mikoshiba, K. Recombination within the upstream gene of duplicated myelin basic protein genes of myelin deficient (shi^{mld}) mouse results in the production of antisense RNA. *EMBO J.* 7: 3407-12, 1988
6. Furuichi, T., Yoshikawa, S., Miyawaki, A., Wada, K., Maeda, N. & Mikoshiba, K. Primary structure and functional expression of the inositol 1,4,5-trisphosphate-binding protein P400. *Nature* 342: 32-38, 1989
7. Maeda, N., Niinobe, M. & Mikoshiba, K. A cerebellar Purkinje cell marker P400 protein is an inositol 1,4,5-trisphosphate (InsP₃) receptor protein. Purification and characterization of InsP₃ receptor complex. *EMBO J.* 9: 61-67, 1990
8. Miyawaki, A., Furuichi, T., Maeda, N. & Mikoshiba, K. Expressed cerebellar-type inositol 1,4,5-trisphosphate receptor, P400 has calcium release activity in a fibroblast L cell line. *Neuron* 5: 11-18, 1990
9. Maeda, N., Kawasaki, T., Nakade, S., Yokota, N., Taguchi, T., Kasai, M. & Mikoshiba, K. Structural and functional characterization of inositol 1,4,5-trisphosphate receptor channel from mouse cerebellum. *J. Biol. Chem.* 266: 1109-16, 1991
10. Miyawaki, A., Furuichi, T., Ryo, Y., Yoshikawa, S., Nakagawa, T., Saitoh, T. & Mikoshiba, K. Structure-function relationships of the mouse inositol 1,4,5-trisphosphate receptor. *Proc. Natl. Acad. Sci. USA* 88: 4911-15, 1991
11. Mori, Y., Friedrich, T., Kim, M.S., Mikami, A., Nakai, J., Ruth, P., Bosse, E., Hofman, F., Flockerzi, V., Furuichi, T., Mikoshiba, K., Imoto, K., Tanabe, T. & Numa, S. Primary structure and functional expression from complementary DNA of a brain calcium channel. *Nature* 350: 398-402, 1991
12. Nakanishi, S., Maeda, N. & Mikoshiba, K. Immunohistochemical localization of an inositol 1,4,5-trisphosphate receptor, P400 in neural tissue: Studies in developing and adult mouse brain. *J. Neurosci.* 11: 2075-86, 1991
13. Nakagawa, T., Okano, H., Furuichi, T., Aruga, J. & Mikoshiba, K. The subtypes of the mouse inositol 1,4,5-trisphosphate receptor are expressed in a tissue-specific and developmentally specific manner. *Proc. Natl. Acad. Sci. USA* 88: 6244-48, 1991
14. Turnley, A.M., Morahan, G., Okano, H., Bernard, O., Mikoshiba, K., Allison, J., Bartlett, P.F. & Miller, J.F.A.P. Dysmyelination in transgenic mice resulting from expression of class I histocompatibility molecules in oligodendrocytes. *Nature* 353: 566-69, 1991
15. Mikoshiba, K., Okano, H., Tamura, T. & Ikenaka, K. Structure and function of myelin protein genes. *Annual Rev. of Neurosci.* 14: 201-217, 1991
16. Miyazaki, S., Yuzaki, M., Nakada, K., Shirakawa, H., Nakanishi, S., Nakade, S. &

- Mikoshiha, K.
Block of Ca^{2+} wave and Ca^{2+} oscillation by antibody to the inositol 1,4,5-trisphosphate receptor in fertilized hamster eggs. *Science* 257: 251-255, 1992
17. Kuwajima, G., Futatsugi, A., Niinobe, M., Nakanishi, S. & Mikoshiha, K.
Two types of ryanodine receptors in mouse brain: Skeletal muscle type exclusively in Purkinje cells and cardiac muscle type in various neurons. *Neuron* 9: 1133-42, 1992
 18. Fujita, Y., Mynlieff, M., Dirksen, R.T, Kim, M.S., Niidome, T., Nakai, J., Friedrich, T., Iwabe, N., Miyata, T., Furuichi, T., Furutama, D., Mikoshiha, K., Mori, Y. & Beam, K.G.
Primary structure and functional expression of the ω -conotoxin-sensitive N-type calcium channel from rabbit brain. *Neuron* 10: 585-598, 1993
 19. Kume, S., Muto, A., Aruga, J., Nakagawa, T., Michikawa, T., Furuichi, T., Nakade, S., Okano, H. & Mikoshiha, K.
The Xenopus IP_3 receptor : structure, function, and localization in oocytes and eggs. *Cell* 73: 555-570, 1993
 20. Mikoshiha, K.
Inositol 1,4,5-trisphosphate receptor. *Trends in Pharmacol. Sci.* 14: 86-89, 1993
 21. Furuichi, T., Kohda, K., Miyawaki, A. & Mikoshiha, K.
Intracellular channels. *Current Opinion in Neurobiology.* 4: 294-303, 1994
 22. Yamamoto-Hino, M., Sugiyama, T., Hikichi, K., Mattei, M.G., Hasegawa, K., Sekine, S., Sakurada, K., Miyawaki, A., Furuichi, T., Hasegawa, M. & Mikoshiha, K.
Cloning and characterization of human type 2 and type 3 inositol 1,4,5-trisphosphate receptors. *Receptors and Channels.* 2: 9-22, 1994
 23. Kagawa, T., Ikenaka, K., Inoue, Y., Kuriyama, S., Tsujii, T., Nakao, J., Nakajima, K., Aruga, J., Okano, H. & Mikoshiha, K.
Glial cell degeneration and hypomyelination caused by overexpression of myelin proteolipid protein gene. *Neuron* 13: 427-442, 1994
 24. Llinás, R., Sugimori, M., Lang, E.J., Morita, M., Fukuda, M., Niinobe, M. & Mikoshiha, K.
The inositol high-polyphosphate series blocks synaptic transmission by preventing vesicular fusion: A squid giant synapse study. *Proc. Natl. Acad. Sci. USA* 91: 12990-93, 1994
 25. Miyawaki, A., Matsushita, F., Ryo, Y. & Mikoshiha, K.
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 27. Mikoshiha, K., Fukuda, M., Moreira, J.E., Lewis, F.M.T., Sugimori, M., Niinobe, M. & Llinás, R.
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 28. Matsumoto, M., Nakagawa, T., Inoue, T., Nagata, E., Tanaka, K., Takano, H., Minowa, O., Kuno, J., Sakakibara, S., Yamada, M., Yoneshima, H., Miyawaki, A., Fukuuchi, Y., Furuichi, T., Okano, H., Mikoshiha, K. & Noda, T.
Ataxia and epileptic seizures in mice lacking type 1 inositol 1,4,5-trisphosphate receptor. *Nature* 379: 168-171, 1996
 29. Hashimoto, M., Aruga, J., Hosoya, Y., Kanegae, Y., Saito, I. & Mikoshiha, K.
A neural cell-type-specific expression system using recombinant adenovirus vectors. *Human Gene Therapy* 7: 149-158, 1996
 30. Aruga, J., Nagai, T., Tokuyama, T., Hayashizaki, Y., Okazaki, Y., Chapman, V.M. & Mikoshiha, K.
The mouse *Zic* gene family -homologues of the Drosophila pair-rule gene odd paired-
J. Biol.Chem. 271: 1043-47, 1996
 31. Miyawaki, A., Homma, H., Tamura, H., Matsui, M. & Mikoshiha, K.

- Zonal distribution of sulfotransferase for phenol in olfactory sustentacular cells. *EMBO J.* 15: 2050-55, 1996
32. Katayama, E., Funahashi, H., Michikawa, T., Shiraishi, T., Ikemoto, T., Iino, M., & Mikoshiba, K.
Native structure and arrangement of inositol-1,4,5-trisphosphate receptor molecules in bovine cerebellar Purkinje cells as studied by quick-freeze deep-etch electron microscopy. *EMBO J.* 15: 4844-51, 1996
 33. Muto, A., Kume, S., Inoue, T., Okano, H. & Mikoshiba, K.
Calcium waves along the cleavage furrows in cleavage-stage xenopus Embryos and its inhibition by heparin. *J. Cell Biol.* 135: 181-190, 1996
 34. Mikoshiba, K.
InsP3 receptor and intracellular Ca²⁺ signalling. *Current Opinion in Neurobiology.* 7: 339-345, 1997
 35. Del Rio, J.A., Heimrich, B., Borrell, V., Forster, E., Drakew, A., Alcantara, S., Nakajima, K., Miyata, T., Ogawa, M., Mikoshiba, K., Derer, P., Frotscher, M. & Soriano, E.
A role for Cajal-Retzius cells and reelin in the development of hippocampal connections. *Nature* 385: 70-74, 1997
 36. D'Arcangelo, G., Nakajima, K., Miyata, T., Ogawa, M., Mikoshiba, K. & Curran, T.
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 37. Miyata, T., Nakajima, K., Mikoshiba, K. & Ogawa, M.
Regulation of Purkinje cell alignment by reelin as revealed with CR-50 antibody. *J. Neurosci.* 17: 3599-609, 1997
 38. Umemori, H., Inoue, T., Kume, S., Sekiyama, N., Nagao, M., Itoh, H., Nakanishi, S., Mikoshiba, K. & Yamamoto, T.
Activation of the G protein Gq/11 through tyrosine phosphorylation of the α subunit. *Science* 276: 1878-1882, 1997
 39. Nakajima, K., Mikoshiba, K., Miyata, T., Kudo, C. & Ogawa, M.
Disruption of hippocampal development in vivo by CR-50 mAb against reelin. *Proc. Natl. Acad. Sci. USA* 94: 8196-201, 1997
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Scrambler and yotari disrupt the disabled gene and produce a reeler-like phenotype in mice. *Nature* 389: 730-733, 1997
 42. Kume, S., Muto, A., Inoue, T., Suga, K., Okano, H. & Mikoshiba, K.
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 43. Aruga, J., Minowa, O., Yaginuma, H., Kuno, J., Nagai, T., Noda, T. & Mikoshiba, K.
Mouse *Zic1* is involved in cerebellar development. *J. Neurosci.* 18: 284-293, 1998
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Apical vesicles bearing inositol 1,4,5-trisphosphate receptors in the Ca²⁺ initiation site of ductal epithelium of submandibular gland. *J. Cell Biol.* 141: 135-142, 1998
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- 316-327, 1999
49. Michikawa, T., Hirota, J., Kawano, S., Hiraoka, M., Yamada, M., Furuichi, T. & Mikoshiba, K.
Calmodulin mediates calcium-dependent inactivation of the cerebellar type 1 inositol 1,4,5-trisphosphate receptor. *Neuron* 23: 799-808, 1999
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 51. Futatsugi, A., Kato, K., Ogura, H., Li, S-T., Nagata, E., Kuwajima, G., Tanaka, T., Itohara, S. & Mikoshiba, K.
Facilitation of NMDA receptor-independent LTP and spatial learning in mutant mice lacking Ryanodine receptor type 3. *Neuron* 24: 701-713, 1999
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Inositol 1,4,5-trisphosphate receptors are strongly expressed in the nervous system, pharynx, intestine, gonad and excretory cell of *Caenorhabditis elegans* and are encoded by a single gene (*itr-1*). *J.Mol.Biol.* 294: 467-476, 1999
 53. Miyawaki, A., Matheson, J.M., Sayers, L.G., Muto, A., Michikawa, T., Furuichi, T., & Mikoshiba, K.
Expression of green fluorescent protein and inositol 1,4,5-trisphosphate receptor in *Xenopus laevis* oocytes. *Methods in Enzymology.* 302: 225-233, 1999
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 57. Utsunomiya-Tate, N., Kubo, K., Tate, S., Kainosho, M., Katayama, E., Nakajima, K. & Mikoshiba, K.
Reelin molecules assemble together to form a large protein complex, which is inhibited by the function-blocking CR-50 antibody. *Proc. Natl. Acad. Sci. USA* 97: 9729-9734, 2000
 58. Mikoshiba, K. & Hattori, M.
IP₃Receptor-operated calcium Entry. *Science* {Science's stke (Signal Transduction Knowledge Environment) Perspective (Web publication)}: 1-4, 2000
 59. Fukuda, M., Moreira, J. E., Liu, V., Sugimori, M. & Mikoshiba, K.
Role of the conserved WHXL motif in the C terminus of synaptotagmin in synaptic vesicle docking. *Proc.Natl.Acad.Sci. USA* 97: 14715-14719, 2000
 60. Nishiyama, M., Hong, K., Mikoshiba, K., Poo, M. & Kato, K.
Calcium stores regulate the polarity and input specificity of synaptic modification. *Nature* 408: 584-588, 2000
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Synergistic contributions of cyclin-deendant kinse 5/p35 and Reelin/Dab1 to the positioning of cortical neurons in the developing mouse brain. *Proc. Natl. Acad. Sci.* 98: 2764-2769, 2001
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 63. Nagai, T., Ibata, K., Park, ES., Kubota, M., Mikoshiba, K. & Miyawaki, A.

- A variant of yellow fluorescent protein with fast and efficient maturation for cell-biological applications. *Nature Biotechnol.* 20: 87-90, 2002
64. Uchiyama, T., Yoshikawa, F., Hishida, A., Furuichi, T. & Mikoshiba, K.
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 66. Saneyoshi, T., Kume, S., Amasaki, Y. & Mikoshiba, K.
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Structure of the inositol 1, 4, 5-trisphosphate receptor binding core in complex with IP₃. *Nature* 420: 696-700, 2002
 68. Zhang, S., Mizutani, A., Hisatsune, C., Higo, T., Bannai, H., Nakayama, T., Hattori, M. & Mikoshiba, K.
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IRBIT, a novel inositol 1,4,5-trisphosphate (IP₃) receptor binding protein, is released from the IP₃ receptor upon IP₃ binding to the receptor. *J. Biol. Chem.* 278: 10602-10612, (2003)
 70. Fukami, K., Yoshida, M., Inoue, T., Kurosawa, M., Rafael A.F., Yoshida, N., Mikoshiba, K. & Takenawa, T.
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