

EFTHIMIOS M. C. SKOULAKIS, PhD

Researcher A' (Research Professor), Division Leader, Neuroscience Division
Biomedical Sciences Research Centre "Alexander Fleming"

EDUCATION/TRAINING

- 1979-1983 The University of Toledo, Ohio USA. BSc Biology/Chemistry minor
- 1984-1990 The Ohio State University, Ohio USA PhD Molecular Genetics
- 1991-1993 Postdoctoral Fellow Molecular Neurobiology Cold Spring Harbor Laboratory, New York USA
- 1993-1994 Postdoctoral Fellow Molecular and Behavioral Neurobiology. Baylor College of Medicine, Texas USA

PERSONAL STATEMENT

The long-term research goal of the Skoulakis laboratory is to define molecular mechanisms employed by neurons to receive and transduce signals essential for acquisition, storage and retrieval of information and how these are altered in cognitive and neurodegenerative diseases. We have established the role of Protein kinase A in associative learning, a role for the ubiquitous 14-3-3 proteins, the adaptor protein Drk/Grb2, the receptor Tyrosine Kinase Alk and the ubiquitin ligase Neur in synaptic transmission and associative learning and memory. We study the molecular mechanisms implicated in cognitive disorders such as Fragile X, Neurofibromatosis and other Rasopathies in *Drosophila* and have identified a significant set of novel genes involved in habituation/attention deficits. Another main research direction we have contributed to is our long term interest in Tauopathies and the role of the Tau protein in neuronal toxicity and dysfunction, as well as its normal function, post-translational regulation, interactome and structure *in vivo* using fly and mouse models and human tissues.

POSITIONS

- 1994-1997 Research Associate, Molecular and Behavioral Neurobiology. Baylor College of Medicine, Texas USA
- 1997-2003 Assistant Professor, Dept. of Biology Texas A&M University, Texas USA
- 2003-2004 Maintained active research lab at Texas A&M in addition to group at BSRC Alexander Fleming
- 2002-2006 Researcher C' Institute of Molecular Biology and Genetics BSRC "Alexander Fleming". Vari, Greece.
- 2007-2009 Researcher B'. Institute of Molecular Biology and Genetics BSRC "Alexander Fleming". Vari, Greece.
- 2009-2012 Researcher B'. Institute of Cellular and Developmental Biology. BSRC "Alexander Fleming". Vari, Greece.
- 2012- Researcher A'. Neuroscience Division. BSRC "Alexander Fleming". Vari, Greece.

POSITIONS OF RESPONSIBILITY

Member, BSRC Fleming Scientific Counsel
Science Officer, Fleming Technology Transfer Office
Chemical and Refuge Safety Supervising Officer
British Biochemical Society Ambassador in Greece.
Academic Editor, PLoS ONE
Review Editor, Frontiers in Neurodegenerative Diseases

SCIENTIFIC SOCIETIES AND BOARDS

Genetics Society of America (GSA).
Society for Neuroscience (SfN)
Federation of European Neuroscience Societies (FENS)
Hellenic Society for Neuroscience (HSN)-*past board member*
Hellenic Society for Biochemistry and Molecular Biology
British Biochemical Society (Ambassador in Greece)

PUBLICATIONS

1. Leicht, B., Skoulakis, E., Sites, C, Lyckegaard, E, Clark A. (1991). Identification of cis-regulatory elements involved in alternative splicing of the MLK-ALK pre-messenger-RNA of *Drosophila*. **Am. J. Human Genetics** 49(4), 430
2. Bolwig, G., Chromey, C., Crittenden, J., Dauwalder B., DeZazzo, J., Han, K.A., Han, P.L., Nighorn, A., Qiu, Y.H., Skoulakis, E., West, R. Davis, R. L. (1993). Gene expression and learning in *Drosophila*. **J. Cell. Biochemistry** 17D, 246
3. Skoulakis, E. M. C. , Kalderon, D. and Davis, R. L. (1993). Preferential Expression in Mushroom Bodies of the Catalytic Subunit of Protein Kinase A and its Role in Learning and Memory. **Neuron** 11, 197-208.
4. Skoulakis, E. M. C. and Davis, R. L. (1996) Olfactory learning deficits in mutants for *leonardo*, a *Drosophila* gene encoding a 14-3-3 protein. **Neuron**, 17, 931-944.
5. Broadie, K., Rushton, E., Skoulakis, E. M. C. and Davis, R. L. (1997) Leonardo, a *Drosophila* 14-3-3 protein involved in Learning regulates presynaptic function. **Neuron**, 19, 391-402.
6. Li, W., Skoulakis, E. M. C. , Davis, R. L. and Perrimon, N. (1997) The *Drosophila* 14-3-3 protein Leonardo enhances Torso signaling through D-Raf in a Ras1-dependent manner. **Development**, 124, 4163-4171.
7. Crittenden, J. R. , Skoulakis, E. M. C., K.-A. Han, Kalderon, D. and Davis, R. L. (1998). Tripartite Mushroom Body architecture revealed by antigenic markers. **Learn. Mem.** 5 (1 and 2), 38-51.
8. Philip, N. Acevedo, S. and Skoulakis, E. M. C. (2001) Conditional rescue of olfactory learning and memory defects in mutants of the 14-3-3 gene *leonardo* . **J. Neuroscience** 21 (21), 8417-8425.

9. Sathyanarayana, P., Barthwal, M. K., Lane, M. E., Acevedo, S. F., Skoulakis, E. M. C., Bergman, A., Rana, A. (2003) *Drosophila* Mixed Lineage Kinase, a missing biochemical Link in *Drosophila* JNK signaling. **Biochem. Biophys. Acta.** 1640, 77-84.
10. Chen, H-K., Fernandez-Funez, P., Lam, Y. C., Kaytor, M. D., Fernandez, M. H., Acevedo, S. F., Aitken, A., Skoulakis, E. M. C., Orr, H. T., Botas, J. and Zoghbi, H.Y. (2003). "Akt phosphorylation-dependent association of ataxin-1 with 14-3-3 mediates neurodegeneration in spinocerebellar ataxia type 1". **Cell** 113, 457-468
11. Merishin, A., Pavlopoulos, E., Fitch, O., Braden, B. C., Nanopoulos, D. V. and Skoulakis, E. M. C. (2004) "Learning and memory deficits upon TAU accumulation in *Drosophila* mushroom body neurons." **Learn. Mem.** 11: 277-287
12. Grammenoudi S., Kosmidis, S. and Skoulakis, E. M. C. "Cell type-specific processing of human Tau proteins in *Drosophila*"(2006). **FEBS Lett.** 580(19): 4602-6. Epub 2006 Jul 21
13. Acevedo, S. F., Froudarakis, E., Tsiorka, A-A., and Skoulakis E. M. C. (2007). "Distinct neuronal circuits mediate experience dependent, non-associative osmotactic responses in *Drosophila*". **Mol. Cell. Neurosci.** 34(3): 378-389
14. Acevedo, S. F., Froudarakis, E. I., Kanellopoulos, A. and Skoulakis, E. M. C. (2007) "Protection from premature habituation requires functional mushroom bodies in *Drosophila*" **Learn. Mem.** 14(5): 376-384
15. Tsiorka, T., Gaentzsch, P., Kosmidis, S., Brown, A. E., Skoulakis, E. M. C., Ligoxygakis, P., and Mosialos, G. (2007) "A *Drosophila* ortholog of the cylindromatosis tumor suppressor regulates triglyceride content and antibacterial defense" **Development** 134(14): 2605-2614
16. Missirlis, F., Kosmidis, S., Brody, T., Mavrikis, M., Holmberg, S., Odenwald, W. F., Skoulakis, E.M.C., and Rouault T. A. (2007) "Multiple homeostatic mechanisms for iron storage revealed by genetic manipulations of *Drosophila* ferritin" **Genetics.** 177 (1): 89-100
17. Acevedo, S. F., Tsigkari, K., Grammenoudi, S. and Skoulakis, E. M. C. (2007) "14-3-3 functional specificity and redundancy of 14-3-3 proteins in *Drosophila melanogaster*". **Genetics.** 177 (1): 239-253
18. Tzortzopoulos, A, and Skoulakis E. M. C. (2007). Paternally and maternally transmitted GAL4 transcripts contribute to UAS transgene expression in early *Drosophila* embryos. **Genesis.** 45: 737-743.
19. Pavlopoulos, E., Anezaki, M. and Skoulakis, E. M. C. (2008) "Neutralized is expressed in the α/β lobes of adult *Drosophila* Mushroom Bodies and facilitates olfactory Long-Term Memory formation". **Proc Natl Acad Sci USA.** 105(38):14674-9.
20. Moressis, A., Friedrich, A. R., Pavlopoulos E., Davis, R. L. and E. M.C. Skoulakis. (2009) "A dual role for the adaptor protein DRK in *Drosophila* olfactory learning and memory." **J. Neurosci.** 29:2611-2625.
21. Messaritou G, Leptourgidou F. Franco, M and Skoulakis EMC. (2009) "A third functional isoform enriched in mushroom body neurons is encoded by the *Drosophila* 14-3-3 ζ gene" **FEBS Lett.** 583: 2934-2938

22. Messaritou G, Grammenoudi, S. and Skoulakis EMC (2010) "Dimerization is essential for *Drosophila* 14-3-3 ζ protein stability and function in vivo". **J. Biol. Chem.** 285(3):1692-700.
23. Kosmidis, S., Grammenoudi, S. Papanikolopoulou, K. and Skoulakis, E. M. C. (2010). "Differential effects of Tau on the integrity and function of neurons essential for learning in *Drosophila*". **J. Neurosci.** 30(2): 464-477
24. Papanikolopoulou K., Kosmidis S., Grammenoudi S., Skoulakis E. M. C. (2010). "Phosphorylation differentiates tau-dependent neuronal toxicity and dysfunction." **Biochem Soc Trans.** 38(4):981-7.
25. Franco MI, Turin L, Mershin A, Skoulakis E.M.C. (2011). "Molecular vibration-sensing component in *Drosophila melanogaster* olfaction." **Proc Natl Acad Sci U S A.** 108(9) :3797-802
26. Kosmidis, S., Botella J. A., Mandilaras, K. Schneuwly, S., Skoulakis, E. M. C., Rouault, T. A. and Missirlis, F. (2011) "Ferritin overexpression in *Drosophila* glia leads to iron deposition in the optic lobes and late onset behavioural effects". **Neurobiol Dis** 43(1): 213-219
27. Shandala, T., Woodcock, J. M., Ng, Y., Biggs, L., Skoulakis, E.M.C., Brooks, D. A., and Lopez, A. F. (2011) "Innate immunity is regulated in *Drosophila* by 14-3-3 ϵ 's function in vesicular assembly and anti-microbial peptide secretion." **J Cell Sci.** 124(Pt 13):2165-74.
28. Memos N, Kataki A, Chatziganni E, Nikolopoulou M, Skoulakis E, Consoulas C, Zografos G, Konstadoulakis M (2011). "Alternations of 14-3-3 θ and β protein levels in brain during experimental sepsis". **J Neurosci Res.** 2011 May 26. doi: 10.1002/jnr.22673
29. Gouzi, J. Y., Moressis, A., Walker, J. A., Apostolopoulou, A. A., Palmer, R. H., Bernards, A. and Skoulakis, E. M. C. (2011) "Drosophila Alk Tyrosine Kinase Controls Neurofibromin dependent Growth and Learning" **PLoS Genet** ,7(9): e1002281
30. Kadas, D., Tzortzopoulos, A., Skoulakis, E. M. C. and Consoulas, C. (2012) "Constitutive activation of Ca²⁺/Calmodulin-dependent Protein Kinase II during development impairs central cholinergic transmission and motor behavior in *Drosophila*." **J. Neurosci.**, 32(1):170-82
31. Tsigkari, K., Acevedo, S. F, and Skoulakis, E. M. C. (2012) "14-3-3 ϵ is required for germline migration in *Drosophila*" **PLoS One** 7(5): e36702. doi:10.1371/journal.pone.0036702
32. Kanellopoulos, K. A., Semelidou, O, Anezaki, M., Kotini, A. G., and Skoulakis, E. M. C. (2012) "Learning and memory deficits consequent to FMRP reduction result from mGluR-mediated inhibition of cAMP signaling in *Drosophila*" 2012, **J. Neurosci.** 32(38):13111-13124.
33. Gane, S., Georganakis, D., Maniati, K., Vamvakias, M., Ragoussis, N., Skoulakis, E.M.C., Turin L. (2013) "Molecular vibration-sensing component in human olfaction." **PLoS One.** 2013;8(1):e55780. doi: 10.1371/journal.pone.0055780.
34. Lalle, M., Leptourgidou, F., Camerini, S., Pozio, E. and Skoulakis, E.M.C (2013) "Interkingdom complementation reveals structural conservation and functional divergence of 14-3-3 proteins." **PLoS One.** 2013;8(10):e78090. doi: 10.1371/journal.pone.0078090.

35. Kosmidis, S., Missirlis, F., Botella, J.A., Schneuwly, S., Rouault, T.A., Skoulakis, E.M.C. (2014). Behavioral decline and premature lethality upon pan-neuronal ferritin overexpression in *Drosophila* infected with a virulent form of *Wolbachia*. **Front Pharmacol.** 4; 5:66.
36. Turin, L., Skoulakis, E.M.C., Horsfield, A.P. (2014) Electron spin changes during general anesthesia in *Drosophila*. **Proc Natl Acad Sci U S A.** 111(34):E3524-33
37. Papanikolopoulou K, Skoulakis EM. (2014) Temporally distinct phosphorylations differentiate Tau-dependent learning deficits and premature mortality in *Drosophila*. **Hum Mol Genet.** 2014 Dec 18. pii: ddu726
38. Drimyli E, Gaitanidis A, Maniati K, Turin L, Skoulakis EMC (2016). "Differential electrophysiological responses to odorant isotopologues in *Drosophilid* antennae", **eNeuro**.0152-15.2016. doi:10.1523/ENEURO.0152-15.2016
39. Mansilla A, Chaves-Sanjuán A, Campillo N E, Semelidou O, Martínez-González L, Infantes L, González-Rubio J M, Gil C, Conde S, Skoulakis EMC, Ferrús A, Martínez A, Sánchez-Barrena M J. (2017) "Phenothiazines regulate synaptic function by interfering the NCS-1/Ric8a complex: a novel approach for Fragile X Syndrome" **Proc Natl Acad Sci U S A.** 114(6):E999-E1008. doi: 10.1073/pnas.1611089114.
40. Sealey MA, Vourkou E, Cowan CM, Bossing T, Quraishe S, Grammenoudi S, Skoulakis EMC, Mudher A.(2017). Distinct phenotypes of three-repeat and four-repeat human tau in a transgenic model of tauopathy. **Neurobiol Dis.** 2017 May 11. pii: S0969-9961(17)30106-7. doi: 10.1016/j.nbd.2017.05.003
41. Paoli, M., Münch, D., Haase, A., Skoulakis, E.M.C., Turin, L. and Galizia, CG. (2017) "Minute impurities contribute significantly to olfactory receptor ligand studies: tales from testing the vibration theory." **eNeuro** Jun 19;4(3). pii: ENEURO.0070-17.2017. doi: 10.1523/ENEURO.0070-17.

Book Chapters, Reviews and editorials

1. Skoulakis, E. M. C. , Han, P.-L. and Davis, R. L. (1993). Learning and memory in *Drosophila*. Novo Nordisk Foundation Symposium #7. Memory concepts. Basic and Clinical aspects. Elsevier Science Publishers. pg 99-111.
2. Davis, R. L., Cherry, J., Dauwalder, B., Han, P.-L. and Skoulakis, E. M. C. (1995). The Cyclic AMP System and *Drosophila* Learning. **Molecular and Cellular Biochemistry.** 149/150:271-278
3. Skoulakis, E. M. C. and Davis, R. L. (1998) 14-3-3 proteins in Neuronal development and Function. **Molecular Neurobiology**, 16, 269-284.
4. Nanopoulos, D. V., Mershin, A. Skoulakis, E. M. C (1999). Quantum Brain? **Proceedings of the Academy of Athens, Greece** 74, 148-179.
5. Skoulakis, E. M. C (2001) "A tool for synthesis" **Trends in Neuroscience**, Vol.24, 122 Printed again in **Trends in Molecular Medicine** (2001) Vol. 7, 139.

6. Mershin, A., Sanabria, H., Miller, J. H., Nawarathna, D., Skoulakis, E. M. C., Mavromatos, N. E., Kolomenskii, A. A. Schuessler, H. A., Luduena, R. F., Nanopoulos, D. V. (2005) "Towards experimental tests of quantum effects in Cytoskeletal proteins." In **"The Emerging Physics of Consciousness"** pp 89-148. Jack Tuszynski, ed. Springer-Verlag
7. Skoulakis E. M. C. and Grammenoudi, S. (2006) "Dunces and DaVincis; The Genetics of Learning and Memory in Drosophila" **Cellular and Molecular Life Sciences**, 63, 975-988.
8. Grammenoudi, S., Anezaki, M. Kosmidis, S. and Skoulakis E. M. C. (2008). "Modeling Cell and Isoform type specificity of Tauopathies in Drosophila". In **Drosophila: A Toolbox for the study of Neurodegenerative Disease**. SEB Exp Biol Ser 60: pp 39-56. A. Mudher and T. Newman eds. Taylor & Francis group.
9. Skoulakis E. M. C., Mudher A. "Two days of tau: a meeting focused on its biology and pathology." **Biochem Soc Trans**. 2010 Aug 1;38(4):953-4.
10. Papanikolopoulou K. and Skoulakis, E. M. C. (2011) "The Power and Richness of modelling Tauopathies in Drosophila" **Molecular Neurobiology** 44(1):122-3318
11. Franco MI, Turin L, Mershin A, Skoulakis E.M.C. (2011). "Olfaction is a physical and a chemical sense in *Drosophila*." **Proc Natl Acad Sci U S A**. 108(31): E350 (www.pnas.org/cgi/doi/10.1073/pnas.1107618108)
12. Morales D, Skoulakis E.M.C. and Acevedo, SF. (2012) "14-3-3s are potential biomarkers for HIV-related neurodegeneration." **J Neurovirol**. 18(5):341-53
13. Skoulakis EM, Mudher "A.Twice is better: highlights of the second meeting focused on tau biology and pathology". **Biochem Soc Trans**. 2012 Aug 1;40(4):641-3.
14. Turin L, Gane S, Georganakis D, Maniati K, Skoulakis EM. "Plausibility of the vibrational theory of olfaction." **Proc Natl Acad Sci U S A**. 2015 Jun 23;112(25):E3154. doi: 10.1073/pnas.1508035112.

News exposure of research achievements

<http://www.nature.com/news/2011/110214/full/news.2011.39.html>,
<http://news.sciencemag.org/sciencenow/2011/02/do-vibrating-molecules-give-us-o.html?ref=hp>, <http://www.newscientist.com/article/dn20130-fly-sniffs-molecules-quantum-vibrations.html>)
<http://www.bbc.co.uk/news/science-environment-21150046>
<http://www.rsc.org/chemistryworld/2013/01/controversial-molecular-vibration-theory-smell-olfaction>
<http://www.scientificamerican.com/article.cfm?id=study-bolsters-quantum-vibration-scent-theory>
<http://phys.org/news/2014-08-electron-mechanism-anesthesia.html>
<http://www.scientificamerican.com/article/electron-theft-not-drug-effects-may-be-how-anesthesia-knocks-people-out/>
<http://www.worldsciencefestival.com/2014/08/anesthetics-electric-effects/>
<http://www.bbc.co.uk/programmes/b04d4tzzp>

F1000 mention

<http://f1000.com/prime/718528143>

MENTORSHIP HISTORY

Alumni:

Postdocs	8
Ph.D.	7
M.Sc.	6
B.Sc Thesis	31

Current:

Postdocs	3
Ph.D.	6
M.Sc.	-
B.Sc Thesis	1