

# Curriculum Vitae

## Arpad Karsai

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### Education

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#### **Ph.D. Biophysics, 2008**

University of Pécs, Faculty of Medicine, Hungary

#### **M.D., 2002**

University of Pécs, Faculty of Medicine, Hungary

### Training

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#### **Postdoctoral Scholar, 2013-Present**

University of California, Davis, Department of Chemistry

Supervisor: Gang-yu Liu

Research topics:

1. Single cell mechanical measurements on human and animal cell lines using atomic force microscope and force spectroscopy.
2. Measurement of the toxicity of nanoparticles on single cells.
3. Nano-scale characterization of peptide based self-assembly amyloid systems.

#### **Postdoctoral Scholar, 2009-2012**

University of California, Davis, Department of Neurology, Physiology and Behavior

Supervisor: Samantha P. Harris

Research topics:

1. Mechanical force induced unfolding of cardiac and skeletal Myosin Binding Protein-C (MyBPc) using atomic force microscope and force spectroscopy.
2. Functional study of MyBPc using in vitro motility and actin binding assays.
3. Calcium induced structural changes in MyBPc using AFM and calcium binding assay.

#### **Ph.D. training 2004-2008**

University of Pécs, Hungary, Faculty of Medicine, Department of Biophysics

Supervisor: Miklos S.Z. Kellermayer

2007-2008 Research and Teaching Assistant

2006-2007 Research Scholar supported by the grant of Richter Gedeon Pharmaceutical

Company

2004-2005 Graduate Student

Research topics:

1. Fibrillogenesis, morphology and nanomechanical properties of Alzheimer`s disease-causing beta amyloid fibrils.
2. Morphology and nanomechanical properties of desmin filaments.
3. Morphology and evolution of oriented, self-assembling networks of beta amyloid fibrils.

**Dissertation:** Atomic force microscopy investigation of the morphology and nanomechanical properties of beta amyloid fibrils.

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### Ph.D. training, Graduate Student 2002-2003

University of Pécs, Hungary, Faculty of Medicine, Department of Laboratory Medicine

Supervisor: Attila Miseta

Research topics:

1. Calcium signaling mechanisms of *Saccharomyces cerevisiae* (yeast),
2. Inhibitory effect of the lithium ion on phosphoglucomutase, in *Saccharomyces cerevisiae* and in animal and human cell models.

### Awards, fellowships

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**2010:** University of California, Davis, Postdoctoral Scholars Association Travel Grant for the annual Biophysical Society Meeting.

**2005-06:** Scholarship of the Centenary Foundation of Richter Gedeon Pharmaceutical Company (Hungary); one year scholarship to study Alzheimer's disease causing beta amyloids.

### Professional memberships

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Biophysical Society - ([www.biophysics.org](http://www.biophysics.org))

### Publications

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- [12] **Karsai, Á.**, S. Z. Miklos, M.S. Kellermayer, and S.P. Harris. 2013. Cross-species Mechanical Fingerprinting of Cardiac Myosin Binding Protein-C. *Biophysical Journal* 104(11) 2465-2475
- [11] Pires RH, **Karsai A**, Saraiva MJ, Damas AM, Kellermayer MSZ. 2012. Distinct Annular Oligomers Captured Along the Assembly and Disassembly Pathways of Transthyretin Amyloid Protofibrils. *PLoS One* 2012;7(9)
- [10] **Karsai, Á.**, S. Z. Miklos, M.S. Kellermayer, and S.P. Harris. 2011. Mechanical Unfolding of Cardiac Myosin Binding Protein-C by Atomic Force Microscopy. *Biophysical Journal* 101(8):1968-1977
- [9] **Karsai, Á.**, U. Murvai, K. Soós, B. Penke, and M.S. Kellermayer. 2008. Oriented epitaxial growth of amyloid fibrils of the N27C mutant beta25-35 peptide. *European Biophysics Journal* 37(7):1133-1137
- [8] Kellermayer, M.S., **Á. Karsai**, M. Benke, K. Soós, and B. Penke. 2008. Stepwise dynamics of epitaxially growing single amyloid fibrils. *Proceedings of the National Academy of Sciences (PNAS)* 105(1):141-144
- [7] **Karsai, Á.**, L. Grama, Ü. Murvai, K. Soós, B. Penke, and M. S. Z. Kellermayer. 2007. Potassium-dependent oriented growth of amyloid  $\beta$ 25–35 fibrils on mica. *Nanotechnology* 18: 345102
- [6] Kellermayer, M.S.Z., **Á. Karsai**, A. Kengyel, A. Nagy, P. Bianco, T. Huber, Á. Kulcsár, C. Niedetzky, R. Proksch, and L. Grama. 2006. Spatially and temporally synchronized atomic force and total internal reflection fluorescence microscopy for imaging and manipulating cells and biomolecules. *Biophysical Journal* 91:2665-2677
- [5] Kiss, B., **Á. Karsai**, and M.S.Z. Kellermayer. 2006. Nanomechanical properties of desmin intermediate filaments. *Journal of Structural Biology* 155:327-339
- [4] **Karsai, Á.**, Z. Mártonfalvi, A. Nagy, L. Grama, B. Penke, and M.S.Z. Kellermayer. 2006. Mechanical manipulation of Alzheimer's amyloid  $\beta$ 1-42 fibrils. *Journal of Structural Biology* 155: 316-326
- [3] **Karsai, Á.**, A. Nagy, A. Kengyel, Z. Mártonfalvi, L. Grama, B. Penke, and M.S.Z. Kellermayer. 2005. Effect of lysine-28 side chain acetylation on the nanomechanical

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- behavior of Alzheimer amyloid  $\beta$ 25-35 fibrils. *Journal of Chemical Information and Modeling* 45 (6):1641-1646
- [2] Kellermayer, M.S.Z., L. Grama, **Á. Karsai**, A. Nagy, A. Kahn, Z. Datki, and B. Penke. 2005. Reversible unzipping of amyloid  $\beta$ -fibrils. *Journal of Biological Chemistry* 280(9):8464-8470
- [1] Csutora, P., **Á. Karsai**, T. Nagy, B. Vas, L.G. Kovács, O. Rideg, and A. Miseta. 2006. Lithium induces phosphoglucomutase activity in various tissues of rats and in bipolar patients. *International Journal of Neuropsychopharmacology*, 9, 613–619

Total impact factor: 51.533

Number of independent citations: 189

### Book chapters:

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- [2] Miklós S.Z. Kellermayer, **Árpád Karsai**, Ünige Murvai, Szilvia Erdélyi-Bótor, József Kardos, Ricardo H. Pires, Single-molecule studies of amyloidogenic proteins Springer Series: Biophysics for the Life Sciences, Vol. 2 Single-molecule Studies of Proteins, Chapter 7: Editor: Oberhauser, Andres F. Springer Science+Business Media New York ( ISBN 978-1-4614-4920-1), 2013
- [1] Kolsofszki, M., **Á. Karsai**, K. Soós, B. Penke, and M.S.Z. Kellermayer. Thermally Induced Effects in Oriented Network of Amyloid  $\beta$ 25–35 fibrils. Vol 135:169-173 Springer Series: Colloids for Nano- and Biotechnology - Progress in Colloid and Polymer Science Vol. 135, Editors: Hórvölgyi, Zoltán; Kiss, Eva (ISBN 978-3-540-85134-9), 2008

### Published conference abstracts

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- [12] **Arpad Karsai**, Miklós S.Z. Kellermayer and Samantha P. Harris. 2012. Common Mechanical Properties of Recombinant and Native Cardiac Myosin Binding Protein-C by Atomic Force Microscope. *Biophysical Journal*, 102(3), 558a,
- [11] **Karsai, Á.**, S. P. Harris, and M. Kellermayer. 2011. The Motif of Myosin Binding Protein-C is Mechanically Weak and Extensible. *Biophysical Journal* 100(3), Supplement 1:453a-454a
- [10] **Karsai, Á.**, R. W. Kensler, M. Kellermayer, and S. P. Harris. 2010. Mechanical Unfolding of Cardiac Myosin Binding Protein-C by Atomic Force Microscopy, *Biophysical Journal* 98(3):593a
- [9] Pires, R.H., **Á. Karsai**, M. J. Saraiva, A. M. Damas, and M. S. Z. Kellermayer. 2010. Structural Transitions Associated with the Assembly Dynamics of Transthyretin Amyloid Protofibrils. *Biophysical Journal* 98(3):456a
- [8] Kolsofszki, M., **Á. Karsai**, and M. S. Kellermayer. 2009. Thermal Stability of Oriented A $\beta$ 25-35 Amyloid Fibril Nanoarray. *Biophysical Journal* 96(3):90a
- [7] Murvai. Ü., **Á. Karsai**, M.S.Z. Kellermayer. 2009. Effect Of Beta-sheet-breaker Peptides On The Assembly, Morphology And Mechanical Stability Of Oriented a $\beta$ 25-35 Amyloid Fibrils *Biophysical Journal* 96(3):90a
- [6] Kellermayer, M.S.Z., **Á. Karsai**, M. Benke, K. Soós, and B. Penke. 2007. Stepwise assembly dynamics of single amyloid fibrils revealed by scanning force kymography. *Biophysical Journal* 92
- [5] **Karsai, Á.**, L. Grama, A. Nagy, and M. Kellermayer. 2006. Oriented, potassium-dependent binding of amyloid beta25-35 fibrils to mica. *Biophysical Journal* 90

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- [4] Kellermayer, M. S. Z., **Á. Karsai**, A. Nagy, A. Kengyel, T. Huber, Z. Mártonfalvi, and L. Grama. 2006. Synchronized atomic force and total internal reflection fluorescence microscopy for imaging cells and biomolecules. *Biophysical Journal* 90
- [3] Kellermayer, M.S.Z., L. Grama, **Á. Karsai**, A. Nagy, A. Kahn, Z. Datki, and B. Penke. 2005. Reversible unzipping of amyloid  $\beta$ -fibrils. *Biophysical Journal* 88:198A-199A
- [2] Kellermayer, M.S., L. Grama, **Á. Karsai**, A. Nagy, A. Kahn, Z. Datki, and B. Penke. 2005. Structural dynamics of amyloid explored by manipulating individual fibrils *FEBS Journal* 272 (s1) F2-016P.
- [1] Kellermayer, M.S.Z., L. Grama, **Á. Karsai**, A. Nagy, A. Kahn, Z. Datki, and B. Penke. 2005. Reversible unzipping of amyloid beta fibrils. *FEBS Journal* 272 (s1): p. F2-016P

### Other conference abstracts:

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- [9] Kellermayer, M.S.Z., **Á. Karsai**, M. Benke, K. Soós, and B. Penke. Stepwise dynamics of epitaxially growing single amyloid fibrils. Regional Biophysics Conference. Linz, Austria, February 10-14, 2009.
- [8] **Karsai, Á.**, L. Grama, Ü. Murvai, M. Kolsovski, K. Soós, B. Penke, and M.S.Z. Kellermayer. Beta-amyloid based nano-networks explored with atomic force microscopy. International Conference on Instrumental Analysis Pécs, Hungary, June 29-July 2, 2008
- [7] Kellermayer, M.S.Z., L. Grama, **Á. Karsai**, A. Kahn, Z. Datki, and B. Penke. Structural dynamics of amyloid explored by manipulating individual fibrils FEBS-IUBMB Conference Budapest, Hungary July2-7, 2007
- [6] Kellermayer, M.S.Z., **Á. Karsai**, M. Benke, K. Soós, and B. Penke. Stepwise assembly dynamics of single amyloid fibrils revealed by scanning force kymography 37. Membrán-transzport Konferencia Sümeg, Hungary May 22-25, 2007
- [5] **Karsai, Á.**, L. Grama, Ü. Murvai, M. Benke, K. Soós, B. Penke, and M.S.Z. Kellermayer. 2007. Structure assembly dynamics and mechanics of oriented amyloid networks 9 th Conference on Colloid Chemistry Siófok Hungary, October 3-5, 2007
- [4] **Karsai, Á.**, L. Grama, Ü. Murvai, K. Soós, B. Penke, and M.S.Z. Kellermayer. 2007. Stepwise Assembly Dynamics of Single Amyloid Fibrils Revealed by Scanning Force Kymography IV. International Conference on Molecular Recognition Pécs Hungary, August 15-18, 2007
- [3] **Karsai, Á.**, L. Grama, Ü. Murvai, K. Soós, B. Penke, and M.S.Z. Kellermayer. 2007. Oriented amyloid 25-35 fibril self assembly on mica explored with atomic force microscopy Joint meeting of Hungarian and German Biophysicists May 17-20 Hünfeld Germany
- [2] Kellermayer, M.S.Z., L. Grama, **Á. Karsai**, A. Kahn, Z. Datki, and B. Penke. 2005. Reversible mechanical unzipping of amyloid beta-fibrils. EMBO/HHMI Central European Scientists Meeting Budapest, Hungary 2005 February 7-9,
- [1] Kellermayer, M.S.Z., **Á. Karsai**, A. Nagy, L. Grama, Z. Kengyel, Z. Mártonfalvi, Z. Datki, and B. Penke. 2005. Mechanical manipulation of amyloid beta fibrils Alpbach Workshop on Coiled Coils Alpbach, Austria September 11-16, 2005

### Technical expertise:

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1. Atomic force microscopy
2. Force spectroscopy on single molecules and protein fibrils
3. Single cell mechanical measurements

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4. Fluorescent microscopy
5. Total internal reflection microscopy
6. Confocal microscopy
7. Molecular biology techniques: designing and cloning proteins in E.coli system
8. Protein expression (E.coli, Sf9 cell/baculovirus expression system)
9. Protein purification techniques (affinity-, ionic exchange chromatography, gel filtration)
10. Protein labeling with fluorophores and antibodies
11. Handling cell cultures (HeLa, Jurkat, N2a, RBL, Sf9 insect cells, *Saccharomyces cerevisiae*, *E. coli*)
12. Protein purification from tissue (myosin, actin, myosin binding protein C)
13. Spectrofluorometry
14. Real-Time PCR