

PROF. MEHMET SARIKAYA, PHD
A SHORT BIOGRAPHICAL SKETCH

Professor of Materials Science & Engineering; Adjunct Professor in Chemical Engineering
Director, Genetically Engineered Materials Science and Engineering Center, an NSF-MRSEC
Box 352120, Univ. of Washington, Seattle, WA 98195:
Ph: (206) 543-0724; Fax: (206) 543-6381;

E-mail: sarikaya@u.washington.edu;

www: i. Sarikaya Research Group: <http://faculty.washington.edu/sarikaya/biomimetics/index.html>;

ii. GEMSEC: <http://www.GEMSEC.washington.edu/>; iii. DURINT: <http://depts.washington.edu/bionano>

Special Strengths:

Technical - Professor Sarikaya has extensive experience in many technical aspects of materials science and engineering, particularly at its transdisciplinary intersections with materials, computation and medicine. Some of his current specific research interests are (e.g.) (i) Molecular Biomimetics – genetically engineered materials utilizing peptides and designer proteins as molecular building blocks towards self-assembled functional nanosystems for technology and medicine; (ii) Nanostructure-property correlations of small-particles, confined systems, and nanostructured materials; (iii) Dental Nanotechnology; (iv) ceramic-metal-polymer composites; (v) High resolution diffraction and spectroscopy (CBED, EXELFS, and low-loss EELS); (vi) Studies of nano- and micro-scale mechanical properties via new methods of EXELFS, AFM/STM, and Nanoindentation techniques. (In these topics, he has organized 20+ workshops and symposia, published 150+ papers, presented 2000+ invited talks, and edited 8 books, conference proceedings, and special journal issues.)

Organizational – Prof Sarikaya has successfully organized, gotten funding for, and directed many complex research programs – the latest is his NSF-funded Materials Science Research Center at UW. Today's research problems are almost universally multidisciplinary and wildly multidimensional. Sarikaya's programs respond to today's and tomorrow's complex research needs – they involve multiple investigators, departments, colleges, disciplines, universities, and both industry and governmental players – to address the evolving intersections and interactions of many fields simultaneously. Because much of the work in his fields is spread around the globe, he maintains extensive close ties with academia and industry around the world.

Education - Prof. Sarikaya is deeply concerned with providing top-notch, innovative technical education to both undergraduates and graduate students, particularly those who are attempting to bridge disciplines. He maintains a heavy schedule of cross-disciplinary teaching in several departments at UW, sits on many dissertation committees, has many PhD and Masters students of his own, and is a major contributor to the UW's very successful program (nanotechnology, dental tissue regeneration, peptide-based practical materials) that develops and provides to K-12 teachers up-to-date curricula and teaching/lab materials for technological subjects such as biomimetics, nanotechnology and bionanotechnology.

EDUCATION:

BS 1977- Middle East Tech. Univ. (Ankara Turkey) - Metallurgical Engineering;

MS 1979, PhD 1982 - U. Cal. Berkeley - Materials Science & Engineering

ACADEMIC POSITIONS:

U. Washington; Prof., MS&E (2003-); Adjunct Prof ChemEngr (2001-); AssocProf MS&E (1990-2002); Asst-Prof MS&E (1984-90);

Visiting: (i) Ecotopia Science Institute, Nagoya, Japan (2006); (ii) MOBGAM- Molecular Biology and Genetics Center, Istanbul Technical University, Istanbul, Turkey (2002-current); (iii) MS&E, Nagoya Univ, Japan (1997); (iv) Princeton Materials Inst. & ChemEng; Princeton Univ. (1993), (v) Max-Planck Institut für Metallforschung, Stuttgart (1980).

OTHER PROFESSIONAL ACTIVITIES: Editorial boards of J. Electron Microscopy (since 1995) and J Biomedical Nanotechnology (since 2004); Key Reader for Metallurgical Transactions-A (since 1990); two NRC Committees (1997-99); NIH Panel member "Nanotechnology in Medicine" (2004-5); site-reviewer for NSF Centers on nanotechnology and materials sciences. He is active in many Societies - Materials Research, American Physical, American Microscopy, American Chemical, American Ceramic, Microanalysis, ASM-International, and others. He has organized and edited the proceedings for ~30 major national and international workshops, symposia, & topical meetings.

RESEARCH SUPPORT, RECENT AND ONGOING: Sarikaya has received ~\$20M research funding over 20 years in areas from nanostructured ceramics, high temperature superconductors, structure-property correlations in biomimetic materials, to, most recently, molecular biomimetics, i.e., genetically engineered polypeptides for materials formation, assembly and function.

1990-1997 - US Air Force (AFOSR) "Bioinspired Materials", \$1M

1998-2004 – NIH (NIDCR) "Enamel Biomimetics," \$0.5M

2003-05 - Murdock Trust (SEM Systems purchase), \$0.5M

2001-06 (US Army DURINT) "Genetically Engineering Proteins for Functional Nanoorganics", \$5M

2002-05 (US Army) "Acquisition of a Molecular Characterization System", \$0.5M

2005-2009 (NIH) "Fibrillation in Huntington Oligomers," \$2M

2005-2011 (NSF) 'Genetically Engineered Materials Science and Engineering Center,' an MRSEC, \$7M

Other past variety of support has come from NSF (e.g., Instrumentation projects; "Electronic properties of Carbon-Nanotubes using Transmission Electron Energy Loss Spectroscopy"); DARPA (Instrumentation projects); US Air Force Office of Research (STTR – Small Business Technology Transfer); Army Research Office (DURIP) - "Molecular characterization engineered polypeptides via spectroscopy and microscopy".

HIGHLIGHT PUBLICATIONS: Sarikaya's work for the last two plus decades spans from design in traditional materials, e.g., steels and ceramics, to local effects in functional solids, synthetic and biological molecular materials, to developing and implementing nanoscale TEM and SPM imaging, diffraction, and spectroscopy measurements in materials and medicine, to computational materials and biology, and finally to molecular biomimetics and genetically engineered materials using peptides as molecular building blocks. Some Highlight Publications include:

1. S. J. Barnard, G. D. W. Smith, M. Sarikaya, and G. Thomas, "Carbon Atom Distribution in Dual Phase Steels: An Atom Probe Study," *Scripta Metallurgica*, **15**, 387-92 (1981); *First paper in direct determination of C-diffusion in retained austenite in low C steels, accomplished using an hitherto unknown technique.*
2. M. Sarikaya, B. G. Steinberg, and G. Thomas, "Optimization of Fe/Cr/C Base Structural Steels for Improved Strength and Toughness," in *Metallurgical Transactions*, **13A**, 2227-2237 (1982); *Work from the PhD thesis, a "hard core" metallurgical study.*
3. J. M. Howe, M. Sarikaya, and R. Gronsky, "Space Group Analysis of Thin Precipitates by Different Convergent Beam Electron Diffraction Procedures," in *Acta Crystallographica.*, **A42**, 368-380 (1986). *First paper in describing space group analysis in an extracted nanometer-scale precipitates.*
4. M. Sarikaya and I. A. Aksay, "Nacre of Abalone Shell: A Natural Multifunctional Nanolaminated Ceramic-Polymer Composite Material," Chapter 1 in: *Results and Problems in Cell Differentiation*, **19**, *Structure, Cellular Synthesis and Assembly of Biopolymers*, Ed. by Steven T. Case (Springer, New York, 1992) 1-25.– *The first comprehensive paper describing microstructure, crystallography, and mechanical properties of nacre, towards quantitative functional biomimetics; This and other early intense studies led to the realization of molecular biomimetics after about a decade (see below, e.g., ref. 16).*
5. M. Sarikaya and E. A. Stern, "Local Structural Variations in $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$," *Phys. Rev. B*, **37** (16) 9373-81 (1988). *The first study revealing the non-uniformity of oxygen in High T_c materials leading to functional effects (see ref 9).*
6. J.-S. Choi, M. Sarikaya, and R. Kikuchi, "Theory of Oxygen Diffusion in the $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$ Superconducting Compound," *Phys. Rev. B*, **42** (7) 4244-4254 (1990); *The model substantiating the findings in 5.*
7. I. A. Aksay, D. M. Dabbs, and M. Sarikaya, "Mullite for Structural, Electronic, and Optical Applications," in *J. Am. Ceram. Soc.*, **74** (10) 2343-2358 (1991); *A comprehensive work about a practical ceramic.*
8. M. Sarikaya, "Evolution of Resolution in Microscopy," *Ultramicroscopy*, **47**[1/3] 1-14(1993); *A paper describing the evolution of imaging for the last 400 years since Gallileo.*
9. High T_C - Science B. Keimer, F. Dogan, I. A. Aksay, R. W. Erwin, J. W. Lynn, and M. Sarikaya, "Inclined Field Structure, Morphology, and Pinning of the Vortex Lattice in Microtwinned $\text{YBa}_2\text{Cu}_3\text{O}_{7-x}$," *Science*, **263**, 83-86 (1993); *An experimental verification of local variations of oxygen leading to superconducting properties of important class of materials.*
10. M. Qian, M. Sarikaya, and E. A. Stern, "Development of EXELFS for high Accuracy Structural Information," *Ultramicroscopy*, **59**, 137 (1995); *Implementation of EXAFS, a major technique used by condensed matter physicist, to the electron microscope environment, a new tool for nanomaterials scientists.*

11. M. Sarikaya, "Biomimetics: fabrication of materials through biology," *Proc. Natl. Acad. Sci. USA*, **96** (25) 14183-14185 (1999); First paper describing the potential utility of engineered peptides.
12. S. Brown, M. Sarikaya, and E. Johnson, "Genetic analysis of crystal growth," *J. Mol. Biol.*, **299** (3) 725-732 (2000); *First paper describing the implementation of genetically engineered peptides (cell-surface selected) in functional materials.*
13. H. Fong, M. Sarikaya, S. White, and M. L., Snead, "Nanomechanical properties profiles across DEJ of human incisor teeth," *J. Mater. Sci. & Eng.-C*, **7**(2) 119-128 (2000); *The first paper providing the submicron data for structural and mechanical integration of mammalian enamel and dentin.*
14. B.W. Reed and M. Sarikaya, "Electronic properties of carbon nanotubes by transmission electron energy loss spectroscopy," *Phys. Rev. B.*, **64**, 1554-1569 (2001); *Development of Aloof-EELS for determining transport properties of nanomaterial.*
15. M. H. Zareie, H. Ma, B. W. Reed, A. Jen, and M. Sarikaya, "Single molecular conductivity of ordered nanowires," *Nano Letters*, **3** (2) 139-142 (2003); *Work describes the transport properties of a synthetic molecular composite using SPM.*
16. M. Sarikaya, C. Tamerler, A. Jen, K. Shulten, & F. Baneyx, "Molecular biomimetics: nanotechnology through biology, *Nature-Mater.*, **2** [9] 577-585 (2003). **Fast Breaking Paper**, by ISI, <http://www.esi-topics.com/fbp/fbp-december2004.htm>; *The first paper describing the concepts of Molecular Biomimetics.*
17. J. L. Wacker, M. H. Zareie, H. Fong, M. Sarikaya, and P. Muchowski, Hsp70 and Hsp40 attenuate formation of spherical and annular polyglutamine oligomers by partitioning monomer, *Nature Structural & Molecular Biology*, **11** (12) 1215-1222 (2004); *One of the first investigations (possibly the second paper) demonstrating the utility of AFM in neurodegenerative diseases.*
18. E. E. Oren, C. Tamerler, and M. Sarikaya, "Metal Recognition of Septapeptides via Polypod Molecular Architecture", *Nano Lett*, **5**(3), 415-419 (2005); *The first paper describing potential recognition of solids by genetically designed peptides.*
19. E. E. Oren, C. Tamerler, D. Sahin, M. Hnilova, U. O. S. Seker, M. Sarikaya, and R. Samudrala, "A novel knowledge-based approach to design inorganic binding peptides", *Bioinformatics*, online published (2007).
20. C. Tamerler and M. Sarikaya, "Molecular Biomimetics: Utilizing Nature's Molecular Ways in Practical Engineering", *Acta Biomaterialia*, **3** 289-299 (2007); *Work describing molecular biomimetic approaches to nanotechnology and medicine.*

HIGHLIGHT INTERNATIONAL PRESENTATIONS: INVITED, KEYNOTE, PLENARY

Sarikaya has presented over 200 invited/keynote/plenary talks over the last 15 years.

An example list from 2007 includes:

1. M. Sarikaya, Molecular Biomimetics Series of Presentations, at Ecotopia Science Institute, Nagoya University, Japan, January 12, 2007. 1. "Hybrid Nanocomposite Design: Lesson from Mother Nature;" 2. "Protein Control of Inorganics;" 3. "Genetic Design of peptides for Materials Fabrication and Assembly."
<http://www.esi.nagoya-u.ac.jp/eng/index.html>
2. M. Sarikaya, "Molecular Biomimetics – Genome-based Materials using Peptides," 7th Ann Workshop of Biomimetic Materials Processing, BMMP-07, Nagoya, Japan, Jan. 23-25, 2007. **Keynote** <http://ecot.esi.nagoya-u.ac.jp/~takai/BMMP7/indexenglish.html>
3. M. Sarikaya, "Molecular Biomimetics – A Tutorial," at Symp. on Biological Materials Science and Engineering, TMS Annual Meeting, Orlando, FL, Feb 25-March 1, 2007. <http://www.tms.org/Meetings/Annual-07/AnnMtg07Home.html>
4. M. Sarikaya, "Molecular Biomimetics and GEMSEC," CNT Seminar Series, Center for Nanotechnology, University of Washington, Seattle, March 13, 2007; <http://www.nano.washington.edu/index.asp>
5. Sarikaya, M., Molecular Biomimetics and Bionanotechnology for Medicine, 2nd International Congress of Molecular Medicine, Istanbul, Turkey, March 22-26, 2007. **Keynote.** <http://www.nano.washington.edu/index.asp>
6. Sarikaya, M. "Genome-based Materials Science," in Exploring and Exploiting Nature with Biomimetics, organized by graduate students, 233rd National meeting of the American Chemical Society, Chicago, IL, March 27, 2007. <http://www.divched.org/DivCHED/2007SpringACSSymposia.pdf>
7. Sarikaya, M., Genetically Engineered Peptides for Technology and Medicine, in *Symp. Peptide-Based Biotechnology, Annual Meeting of the Society of Biomaterials*, Chicago, April 18-21, 2007. **Keynote** <http://www.biomaterials.org/Meetings/07AnnualMeeting/index.cfm>

8. Sarikaya, M. "Genetically Engineered Materials Using Peptides," at *Materials Research Science and Engineering Center, University Wisconsin*, Madison, WI, April 24, 2007. <http://www.mrsec.wisc.edu/index.php>
9. M. Sarikaya, F. Baneyx, A. Jen, J. S. Evans, R. Samudrala and C. Tamerler, "Engineered Proteins for Assembly of Materials, FNANO'06, Foundational Nanoscience and Nanotechnology, Snowbird, Salt Lake City, UTAH, April 16-18, 2007. <http://www.cs.duke.edu/~reif/FNANO/>
10. Sarikaya, M., "Molecular Biomimetics," Materials Days, International Workshop, University of Rostock, Germany, May 3-4, 2007. Keynote <http://wwwswt.informatik.uni-rostock.de/englisch/tycho/highlights/matdays07/matdays07.html>
11. Sarikaya, M., "Genetically Engineered Peptides for Nanotechnology and Medicine," in 2nd International Workshop on Bionanotechnology, Istanbul, Turkey, May 23-25, 2007. Plenary <http://www.mobgam.itu.edu.tr/>
12. Sarikaya, M., "Kinetics and Thermodynamics of Peptide-Solid Interactions," in Modeling and Interactions of Biomolecules with Inorganic Surfaces," CECAM Conf., Lyon, France, July 24-27, 2007. Plenary <http://www.cecam.org/workshop-140.html>
13. Sarikaya, M. "Crystal Morphogenesis using Engineered Peptides," International Conference on Crystal Growth," Salt Lake City, UTAH, Aug. 12-17, 2007. <http://www.crystalgrowth.us/iccg15/index.php>
14. Sarikaya, M., "Genome-Designed Materials," American Chemical Society, 234th Meeting, Boston, MA, Aug. 19-23, 2007. <http://acswebcontent.acs.org/nationalmeeting/boston2007/home.html>
15. GEMSEC workshop, Friday Harbor marine Laboratory, San Juan Island, WA; Sept. 6-8, 2007; <http://depts.washington.edu/gemsec/meetings/FHL2007.html>
16. M. Sarikaya, "Genetically Engineered Peptides as Molecular Blocks in Medical Applications," at Medical Biology and Genetics Conf., Antalya, Turkey, Sept 6-9, 2008. Keynote <http://www.kongre.net/kongre.php?kongre=208>
17. M. Sarikaya, "Molecular Biomimetics," Keck Colloquium, Gulf Coast Consortia, Rice University, Houston, Texas, Oct. 25, 2008. <http://cohesion.rice.edu/CentersAndInst/GCC/>
18. M. Sarikaya, "Molecular Biomimetics for Defense Applications," in Workshop titled "Bionanotechnology for Defense Applications," (sponsored by I-ARPA, Intelligence Advance Research Project Activity), Univ of Maryland/ONR, College Park, U. Maryland, Nov. 13-14, 2007. http://www.nanocenter.umd.edu/nanobiotechnology_conference/2007/speakers.php
19. M. Sarikaya, "Peptide-based Materials Design," Army Research Laboratory, Aberdeen Proven Grounds, Maryland, Nov. 15, 2008. <http://www.arl.army.mil/www/default.htm>
20. M. Sarikaya, "Genetically-Designed Materials for Technology and Medicine," ISET'07, Ecotopia Science Institute, Nagoya, Japan, Nov. 23-25, 2007. <http://www.esi.nagoya-u.ac.jp/h/isets07/>
21. M. Sarikaya et al., "Molecular Biomimetics: Engineered Peptides as Molecular Building Blocks in Technology and Medicine," MRS Fall Meeting, Boston, MA, Nov 27-Dec 3, 2007. <http://www.mrs.org>