# Ivan Božović, PhD, FAPS, FSPIE, FSNAS

## **CURRICULUM VITAE**

Brookhaven National Laboratory MA 480 Upton NY 11947-9000

phone: (631) 344-4973 fax: (631) 344-4071 e-mail: bozovic@bnl.gov

Applied Physics Department Yale University New Haven CT 06520

e-mail: ivan.bozovic@yale.edu



**Summary.** Worked at university (9 years as a regular faculty and 4 as a visiting scientist), industrial research centers (13 years) and National Laboratory (11). Chaired a large university physics department (100 faculty and staff serving over 1000 students), was the CTO of a start-up company, and is currently a Group Leader at BNL. Published over 240 refereed research papers, edited 10 monographs, and presented over 200 invited conference talks and colloquia. Chaired 21 international conferences or symposia.

#### **RESEARCH INTERESTS**

(1) Basic physics of condensed states of matter; (2) novel electronic properties including unconventional metallic conductivity, superconductivity and colossal magneto-resistance, (3) innovative methods of thin film synthesis and characterization; (4) mesoscopic (nano-scale) physics.

### RESEARCH EXPERIENCE

Experimental techniques: ultra-high vacuum; cryogenics; thin film synthesis (by molecular beam epitaxy, laser ablation, electron-beam evaporation and sputtering); X-ray diffraction; optical spectroscopy (far-IR to UV, Raman, spectro-ellipsometry); ion scattering spectroscopy; transport measurements; device design and testing. Theory: group theory, electron band structure, optical spectra, phonon spectra, vibronic coupling; numerical simulations of RHEED and XRD patterns and surface structure; cohesion and structure of ionic crystals. Materials studied so far: conducting polymers (polyacetylene, poly-p-phenylene, polypyrolle); carbon nanotubes; cuprates, bismuthates, titanates, manganites, cobaltates, nickelates, tungstates, vanadates and rhutenates.

## **DISTINCTION**

#### **AWARDS AND HONORS**

2014	Member, Academia Europea (The Academy of Europe)
2013	Max Planck Lecture and gold medal from Max Planck Institutes, Stuttgart, Germany
2012	Berndt T. Matthias Prize for Materials Aspects of Superconductivity (shared with J. Eckstein and D.
	Johrendt)
2011	"New York State Leader in Superconductivity" by NYS Superconductor Technology Summit
2011	"Dr. Ivan Bozovic Award" for best paper in the area of superconductivity area established by <i>Physics</i>
	Express journal

2009	Foreign (Honorary) Member, National Academy of Sciences and Arts of Serbia
2008	BNL Science and Technology Award
2004	SPIE Technology Achievement Award
1999	M. Jaric Memorial Prize (The first recipient)
1998	Fellow, The American Physical Society
1997	Fellow, The International Society for Optical Engineering
1989	Polaroid International Prize for Microphotography (shared with D. Schlom, J. Harris, and J. Eckstein)
1985	Institute of Physics (Belgrade) Prize
1982	Fulbright Fellowship
CONFER	ENCE CHAIRING
2014	Co-chair, 10th International Conference on New Theories, Discoveries, and Applications of Super-
2014	conductors and Related Materials (New3SC-10), Chongking, China
2013	Co-chair, Solid state physics Workshop (SSP13), Beograd, Serbia
2013	Co-chair, Search for New Superconductors Focus Topic, APS March Meeting
2011	Chair, SFKM11, Beograd, Serbia
2009	Co-chair, Conference on Complex Oxide Heterostructures, St. Thomas, US Virgin Islands.
2009	Symposium Chair, The Materials Research Society Symposium on Novel Functional Properties at
	Oxide-Oxide Interfaces, San Francisco, California.
2007	Chair, HTS Thin Films Workshop, Tsukuba, Japan.
2006	Chair, Materials Panel, DOE BES Workshop on Basic Research Needs for Superconductivity, Arling-
	ton, Virginia
2005	Conference Chair, International Society for Optical Engineering (SPIE) Conference on Strongly Corre-
	lated Electron Materials: Physics and Nanoengineering, San Diego, California.
2004	Symposium co-chair, 11th Int. Conf. on Composites/Nano-engineering (ICCE-11) Hilton Head, S.
	Carolina
2003	Contact co-chair, IUMRS-ICAM2003 (Fabrication of Oxide Thin Films and Compo-sites), Yokohama,
	Japan
2002	Conference Chair, SPIE Conference on Superconducting and Related Oxides: Physics and
	Nanoengineering V, Seattle, Washington.
2000	Conference Chair, SPIE Conference on Superconducting and Related Oxides: Physics and Nano-
	engineering IV, Orlando, Florida.
1998	Conference Chair, SPIE Conference on Superconducting Superlattices II: Natural and Artificial, San
	Diego, California.
1998	Conference Chair, SPIE Conference on Oxide Superconductor Physics and Applications III, San Diego,
	California.
1997	Symposium Chair, Mini-symposium on Novel Materials, 3rd European Conference on Applied Su-
	perconductivity, Koningshof, Holland.
1996	Symposium Chair, The Materials Research Society Symposium on High-Temperature Superconduc-
	tors, Boston, Massachusetts.
1996	Conference Chair, SPIE Conference on Spectroscopic Studies of Superconductors, San Jose, Califor-
	nia.
1996	Conference Chair, SPIE Conference on Oxide Superconductor Physics and Applications II, San Jose,
	California.

## **ADVISORY BOARDS**

1994

1994

## Journal and institution boards

les, California.

2014-	International Advisory Board, Advanced Electronic Materials.
2011-	Associate Editor, J. Superconductivity and Novel Magnetism

Conference Chair, SPIE Conference on Superconducting Superlattices and Multilayers, Los Angeles,

Conference Co-chair, SPIE Conference on Oxide Superconductor Physics and Applications, Los Ange-

- 2011- Editorial Board, ISRN Condensed Matter Physics.
- 2010- Editorial Board, Journal of Nanoscience Letters.
- 1998- Editorial Board, The International Journal of Superconductivity.
- 2006 Guest Editor, J. Superconductivity, special issue honoring V. L. Ginzburg.
- 2006 Co-editor, Proceedings of Applied Superconductivity Conference
- 2015 Prize Committee, Berndt T. Matthias Prize for Materials Aspects of Superconductivity
- 2012- International Advisory Board, Center of Excellence for Superconductivity Research (CESUR), Ankara, Turkey
- 2012- Advisory Committee, MBE group, Institute of Physics, Academia Sinica, Taipei, Taiwan
- 2005- International Advisory Committee, Institute for Complex Matter, Federal Institute of Technology, Lausanne, Switzerland.
- 2005- International Advisory Board, Yugoslav Materials Research Society.

## **Conferences**

- 67. International Organizing Committee, EMN Istanbul Meeting, Turkey, 1-4 July 2015.
- 66. International Advisory Board, International Conference on Energy, Materials, and Nanotechnology, Qingdao, China, 14-17 June 2015.
- 65. International Advisory Board, the International Conference on the Materials and Mechanisms of Superconductivity (M<sup>2</sup>S 2012), Geneve, Switzerland, 2015.
- 64. International Advisory Board, 12<sup>th</sup> Condensed Matter Physics Conference, Belgrade, Serbia, 2015.
- 63. International Advisory Board, Oxide-based Materials and Devices International Conference, SPIE OPTO, San Francisco, CA, USA, 2015.
- 62. International Advisory Board, 16th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2015.
- 61. International Organizing Committee, International Conference on Small Science (ICSS 2014), Hong Kong, China, Dec. 8-11, 2014
- 60. International Organizing Committee, EMN Conference, Chengdu, China, Sept. 22-5, 2014.
- 59. International Advisory Board, Oxide Thin Films, Nanocomposites and Heterostructures, IUMRS-ICEM-14 Taipei, Taiwan, 2014.
- 58. International Advisory Board, EMN (Energy, Materials, Nanotechnology) Conference, Cancun, Mexico, 2014
- 57. International Advisory Board, 4<sup>th</sup> International Conference *Fundamental Problems of HTS,* Zvenigorod, Russia, 2014.
- 56. International Advisory Board, 7<sup>th</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2014.
- 55. International Advisory Board, 15th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2014.
- 54. International Advisory Board, 4th International Conference on Superconductivity and Magnetism (ICSM2014), Istanbul, Turkey, 2014.
- 53. International Advisory Board, 7th International Conference "Science and Engineering of Novel Superconductors", Montecatini Terme, Tuscany, Italy, June 2014.
- 52. International Advisory Board, Oxide-based Materials and Devices V, SPIE International Symposium SPIE OPTO, San Francisco, CA, 2014.
- 51. International Advisory Board, V Euro-Asian Symposium "Trends in Magnetism: Nano-magnetism" EASTMAG-2013, Vladivostok, Russia, 2013.
- 50. International Advisory Board, EMN (Energy, Materials, Nanotechnology) Conference, Houston, TX, 2013.
- 49. International Program Committee, Oxide-based Materials and Devices IV (OE109), San Francisco, CA, 2013.
- 48. International Advisory Board, 14th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2013.
- 47. International Advisory Board, Conference on Electronic States and Phases Induced by Electric or Optical Impacts (IMPACT 2012), Paris, France, 2012.
- 46. International Advisory Board, 9th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-9), Frascati, Italy, 2012.

- 45. International Advisory Committee, the International Conference on the Materials and Mechanisms of Superconductivity (M<sup>2</sup>S 2012), Washington, DC, 2012.
- 44. International Advisory Board, The International Ginzburg Conference on Physics, Moscow, Russia, 2012.
- 43. International Advisory Board, Energy Materials Nanotechnology (EMN) Meeting, Orlando FL, US, 2012.
- 42. International Advisory Board, 6<sup>th</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2012.
- 41. International Advisory Board, 3rd International Conference on Superconductivity and Magnetism (ICSM2012), Istanbul, Turkey, 2012.
- 40. International Program Committee, Oxide-based Materials and Devices III, SPIE Photonics West, San Francisco CA, USA, 2012.
- 39. International Advisory Board, 13th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2012.
- 38. *Chair,* The International Advisory Board, 8th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-8), Chongking, China, 2011.
- 37. International Advisory Board, Villa Conference on Complex Oxide Heterostructures, Las Vegas, Nevada, US, 2011.
- 36. International Advisory Committee, Oxide Nanocomposites Symposium, ICCE-18 (18th International Conference on Composites and Nano-engineering), Shanghai, China, 2011.
- 35. International Advisory Board, 12th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2011.
- 34. *Chair,* The International Advisory Committee, International Conference on Complex Oxide Heterostructures, Santorini, Greece, 2010.
- 33. International Advisory Board, 5<sup>th</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2010.
- 32. International Advisory Board, the Twelfth Annual Conference YUCOMAT 2010, Herceg Novi, Montenegro, 2010.
- 31. *Chair,* The International Advisory Committee, International Conference on Complex Oxide Heterostructures, St. Thomas, US Virgin Islands, 2009.
- 30. International Advisory Board, 7th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-7), Beijing, China, 2009.
- 29. International Advisory Board, 11th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2009.
- 28. International Advisory Board, 6th International Conference on Stripes and High-T<sub>c</sub> Superconductivity, Erice, Sicily, Italy, 2008.
- 27. International Advisory Board, 10th Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2008.
- 26. International Advisory Committee, Oxide Nanocomposites Symposium, ICCE-16 (16th International Conference on Composites and Nano-engineering), Kunming, China, 2008.
- 25. International Advisory Board, 4<sup>th</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2008.
- 24. International Advisory Board, The 8<sup>th</sup> International Conference on Spectroscopies in Novel Superconductors (SNS2007), Sendai, Japan, 2007.
- 23. International Advisory Board, XVII Symposium on Condensed Matter Physics, Vrsac, Serbia, 2007.
- 22. International Advisory Board, Ninth Annual Conference of the Yugoslav Materials Research Society, Herceg Novi, Montenegro, 2007.
- 21. International Advisory Board, DELFS Conference, Port Jefferson, NY USA, 2007.
- 20. International Advisory Board, 6th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-6), Sydney, Australia, 2007.
- 19. International Advisory Board, Eight Annual Conference of the Yugoslav Materials Research Society, 2006.
- 18. International Advisory Board, 3<sup>rd</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2006.
- 17. International Advisory Committee, Oxide Nanocomposites Symposium, ICCE-14 (14th International Conference on Composites and Nano-engineering), Boulder, Colorado, 2006.
- International Advisory Board, Seventh Annual Conference of the Yugoslav Materials Research Society, 2005.
- 15. Program Committee, Oxide Nanocomposites Symposium, Tenerife, Spain, 2005.

- 14. Program Committee, Applied Superconductivity Conference, Jacksonville, Florida, 2004.
- 13. International Advisory Board, 7th International Conference on Spectroscopies in Novel Superconductors (SNS2004) Sitges, Spain, 2004.
- 12. International Advisory Board, 2<sup>nd</sup> International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2004.
- 11. International Advisory Board, 5th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-4), Chunking, China, 2004.
- 10. International Advisory Board, NATO Advanced Research Workshop on New Challenges in Superconductivity, Coral Gables, Florida, 2004.
- 9. International Advisory Board, 4th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-4), San Diego, California, 2003.
- 8. International Advisory Board, International Conference *From Solid State to Biophysics*, Dubrovnik, Croatia, 2002.
- 7. International Advisory Board, 3rd International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-3), Honolulu, Hawaii, 2001.
- 6. International Advisory Board, 3rd International Conference on Stripes and High-T<sub>c</sub> Superconductivity, Rome, Italy, 2000.
- 5. Advisory Board, 2nd International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials (New3SC-2), Las Vegas, Nevada, 1999.
- 4. Advisory Board, International Symposium on Irradiation Induced Phenomena in Organic Thin Films, Sophia, Bulgaria, 1999.
- 3. International Advisory Board, Symposium on Condensed Matter Physics, Kladovo, Yugoslavia, 1997.
- 2. International Advisory Board, The Fifth World Congress on Superconductivity, Budapest, Hungary, 1995.
- 1. International Advisory Board, The 2nd International Symposium on High-T<sub>c</sub> Superconductivity and Tunneling Phenomena, Slavyanogorsk, Ukraine, 1994.

#### **VISITING POSITIONS**

2007	Visiting Professor, EPFL, Lausanne, Switzerland
2003	Visiting Professor, ESPCI (Ecole Superieure de Physique et Chimie Industrielle) Paris, France
2003	Visiting Scientist, Los Alamos National Laboratory
2002-3	Visiting Scientist, Laboratory for Advanced Materials, Stanford University
2002	Visiting Scholar, Applied Physics Department, Yale University.
1987-88	Visiting Professor, Applied Physics Department, Stanford University.
1985-86	Visiting Scholar, Department of Physics, University of Pennsylvania, Philadelphia.
1982, 85	Visiting Professor, University Notre-Dame, Namur (Belgium).
1982-83	Visiting Scholar, Physics Department, University of California, Berkeley.

### **EMPLOYMENT HISTORY AND ACHIEVEMENTS**

2014-	Applied Physics Department, Yale University, Adjunct Professor

2003- Brookhaven National Laboratory, *Group Leader and Senior Scientist* 

Established a new group at BNL for Molecular Beam Epitaxy (MBE) of complex oxides. Designed and built a set of 7 laboratories and assembled a world-class team. The laboratory is fully functional at the peak performance, producing daily the highest-quality HTS films, heterostructures and superlattices, patterning them into a range of devices, and studying their physical properties. Apart from in-house experiments, the MBE group provides unique samples to few dozen collaborating groups - at BNL, other national laboratories (ANL, LANL, LBL, NHMFL,

ORNL), leading US universities (Harvard, MIT, Stanford, Caltech, Urbana, Cornel, Johns Hopkins, Houston, etc.) and numerous other groups in Canada, Europe and Asia.

## Principal achievements:

- Combinatorial study of doping (in)dependence of interface superconductivity, covering over 800 compositions, and showing that underdoped HTS cuprates do not behave as Fermi liquids. [The paper #241 in the List of Publications]
- Field effect in HTS, study of S-I quantum phase transition: established existence of local pairs in cuprates. [the paper #212 in the List of Publications]
- Delta-doping in complex oxide hetero-structures; the proof that HTS occurs in a single CuO<sub>2</sub> plane. [204]
- Discovery of high-T<sub>c</sub> interface superconductivity. [197 and patent]
- Discovery of photo-induced colossal expansion in La<sub>2</sub>CuO<sub>4</sub> (in collaboration with Nobel Laureate A. Zewail at Caltech) [186]; proof of strong electron-lattice coupling in cuprates. [194]
- Experimental proof of the "Giant Proximity Effect". [174, 216]
- Discovery of coherent excitation of longitudinal acoustic phonons by light. [167, 168, 175]
- Synthesis of novel artificial (metastable) compounds such as Ba<sub>2</sub>LaBi<sub>3</sub>O<sub>9</sub>.

## 1998-2002 Oxxel GmbH, Bremen, Germany, *Chief Technical Officer and Principal Scientist*

Designed and built a unique, next-generation oxide-MBE system, with many innovations: modularity, combinatorial search capability, integration of MBE with state-of-the-art *in-situ*, real-time surface science tools (TOF-ISARS, LEEM). Integrated the system, automated it completely (with 1,000 protective interlocks), and computerized all the controls. Starting from an empty hall, within one year put together a completely self-sufficient laboratory for device fabrication and testing that included electron-beam nano-lithography, AFM/STM nano-microscopy, high-resolution XRD, ultra-high-frequency microwaves, low-noise low-temperature transport measurements, etc., with a complex supporting infrastructure. Assembled and led a world-class team of scientists which promptly assumed the leading position in the field.

## Principal achievements:

- LCO and LSCO films of unmatched quality, with rms surface roughness of 0.2 nm. [166]
- $T_c = 51.5 \text{ K}$  (the highest ever observed) in LSCO bilayer film. [166]
- $T_c = 40 \text{ K in LCO film on SrTiO}_3$  under *tensile* stress. [166] (This result shattered widespread misconceptions about the effect of epitaxial stress on HTS.)
- Heterostructures with one-unit-cell thick LCO barriers without pinholes. [173]
- Josephson Junctions (JJs) with HTS interconnects in arbitrary circuit topology; SQUIDs and arrays with up to 2,600 JJs. [This was never achieved before with this type of JJs.]
- Experimental proof that HTS and antiferromagnetism separate on a scale of 1 Å. [173]
- Discovered colossal expansion (>2%) in ultrathin LCO films on STO upon exposure to ozone. [166, 176]
- The first direct structural probe of the spatial homogeneity of the HTS condensate [165]

.....

#### 1989-1998 Varian Research Center, Palo Alto, CA: Senior Research Scientist

Synthesized and characterized thin films, multilayers and heterostructures using atomic layer-by-layer molecular beam epitaxy. The compounds included cuprate superconductors, manganites that show colossal magneto-resistance, and titanate ferroelectrics. Synthesized large-area superconducting and ferroelectric thin films by pulsed laser ablation, and metal films by electron-beam evaporation. Conducted experimental and theoretical studies of transmittance, reflectance, ellipsometric, and Raman spectra of thin films and single crystals of cuprates and other metallic oxides.

## Principal achievements:

- In-situ synthesis of untwinned single-crystal thin films of various BiSrCaCuO phases, with record transport properties, atomically flat surfaces, and no secondary-phase defects. [66, 67]
- One-unit-cell thick BiSrCaCuO films and dilute superconducting superlattices, with T<sub>c</sub> equal to that of bulk samples. [82, 108] (This provided the first direct evidence for quasi-two-dimensional nature of the HTS state.)
- A novel family, BiSr<sub>2</sub>Ca<sub>n-1</sub>Cu<sub>n</sub>O<sub>2n+2</sub>, of metastable superconducting compounds. (The first demonstration of material engineering at atomic-monolayer level in complex oxides.) [92]
- Trilayer structures that provided the first hysteretic high-T<sub>c</sub> Josephson Junction devices, and demonstration of barrier engineering (via chemical doping) over four orders of magnitude in I<sub>c</sub> and R<sub>n</sub>. [84, 85, 112], with I<sub>c</sub>R<sub>n</sub> = 10 mV order-of-magnitude better than in any other junction reported before. [95, 96] (The first demonstration of modulation doping in complex oxides.)
- The first HTS tunnel (SIS) Josephson junctions, with sharp quasiparticle gap features. [106, 148]
- Single-crystal thin films of (La,Sr)MnO<sub>3</sub> and (La,Ca)MnO<sub>3</sub> that show colossal magneto-resistance (CMR). [138, 140, 144]
- Heterostructures involving various phases of (La,Sr)MnO<sub>3</sub> and (La,Ca)MnO<sub>3</sub>, including the first lateral superlattices. (The first nanowires fabricated using oxides.) These superlattices showed 5-fold increase in low-field sensitivity. [138]
- Spectroscopic evidence for similarity of electronic excitations in cuprates and other metallic oxides [113]. Developed a model which quantitatively describes these spectra and predicts existence of novel low-energy excitations [96].

1986-8 Applied Physics Department, Stanford University: *Visiting Scholar* (1986) *Senior Research ciate* (1987), *Visiting Professor* (1988)

- Conducted extensive experimental and theoretical studies of transmittance, reflectance, ellipsometric, and Raman spectra of thin films and single crystals of cuprates.
- Studied photoresponse of cuprates to femtosecond free-electron laser radiation.

## Principal achievements:

- Invented a novel, accurate method of determining the spectral function of metals, by combining reflectance and spectro-ellipsometry. [63] (The method has been adopted subsequently by several leading research institutions, including University of Illinois at Urbana-Champaign and Naval Research Laboratory.)
- Reported the first transmittance spectra of HTS thin films, discovered the electronic Raman continuum in cuprates [42].
- Reported the first polarized reflectance spectra of HTS single crystals [46, 68] which provided an early proof of quasi-2D nature of HTS in cuprates.

1984-86 Institute of Physics, Belgrade, Yugoslavia: Senior Research Scientist,

1975-84 Faculty of Science, University of Belgrade, Yugoslavia: *Lecturer* (1975-8) *Docent* (1978-83), *Head, Department of Physics* (1979-81)

Investigated structure, symmetry, electron and vibration spectra, instabilities, transport properties and photoresponse of conducting polymers and quasi-one-dimensional metals. Studied behavior of metals at ultra-high pressures.

#### **PUBLICATIONS AND PATENTS**

Published 11 research monographs and over 200 research papers, including 18 in *Science* and *Nature* journals. These results were cited over 6,500 times (h = 41) and highlighted by editorials in *Physics Today, Scientific American, The APS News in Physics, Science, Nature* journals, *Physics World, MRS Bulletin, Materials Today, Superconductor Week, Superconductivity News*, DOE Office of Science publications, *Innovations, Washington Post, Reuters*, and hundreds of web journals worldwide. Awarded six patents.

#### **PROFESSIONAL SERVICE**

Gave over 200 invited talks, keynote and plenary addresses, colloquia, seminars, etc. Served on numerous panels and committees; (co)chaired 21 conferences or symposia. Refereed papers for *Nature, Nature Physics, Nature Materials, Nature Nanotechnology, Nature Communications, Science, Physical Review Letters, Physical Review,* and other leading journals. Reviewed project proposals for the US National Science Foundation (9), US Department of Energy (14), US National Science Foundation (4); the International Science Foundation (9), the Foundation for Fundamental Research on Matter of the Netherlands (5), Swiss National Science Foundation (2), Italian Foundation for Research (2), U.S.-Israel Binational Science Foundation (1), Natural Sciences and Engineering Research Council of Canada - NSERC (3), Engineering and Physical Sciences Research Council of United Kingdom (2), CNRS - France (1), European Union Research Foundation (3) and German-Israeli Foundation for Scientific Research and Development (1). Served on Advisory board for EPIQS program at Gordon and Betty Moore Foundation. Served internationally on prize awards, faculty election, and Ph.D. thesis committees.

#### **EDUCATION**

Doctor of Physical Sciences (1975), M.Sc. in Physics (1972); B.Sc. in Physics (1970; valedictorian), University of Belgrade, Yugoslavia.

#### **PERSONAL**

Born in Belgrade, Yugoslavia; US citizen. Married to Natasha Bozovic, Professor of Mathematics at California State University. Have two daughters, Dolores (US Presidential Scholar, Stanford B.Sc, Harvard Ph.D., Associate Professor at UCLA Physics Dept, Laureate of DeGennes Prize for Biophysics) and Marijeta (Harvard B.A., Columbia Univ. PhD, Fulbright Fellow, Assistant Professor at Yale University).