Sergei V. Kalinin

PROFESSIONAL EXPERIENCE

June 2014 – 2019 Director, Institute for Functional Imaging of Materials, ORNL

Oct. 2007 – Oct. 2016 co-theme leader for Electronic and Ionic Functionality (previously Functional Imaging on the Nanoscale), Center for Nanophase Materials Sciences, ORNL

Jan 2013 – Dec. 2017 adjunct professor, Sung Kyun Kwan University, South Korea

Dec 2010 – present joint faculty, Center for Interdisciplinary Research and Graduate Education, University of Tennessee, Knoxville

Dec 2009 – present adjunct faculty, Department of Materials Science and Engineering, Pennsylvania State University

Fall 06 – present Adjunct Associate Professor, Department of Materials Science and Engineering, University of Tennessee, Knoxville

Fall 05 – present Adjunct Assistant Professor, Department of Materials Science and Engineering, North Carolina State University

Oct. 04 – present Research Staff Member, Oak Ridge National Laboratory

Oct. 02 – Oct. 2004 Eugene P. Wigner Fellow, Oak Ridge National Laboratory

Sept. 02 Ph.D., Department of Materials Science and Engineering, University of Pennsylvania, Thesis: *Nanoscale Electric Phenomena in Oxide Materials by Scanning Probe Microscopy*, Advisor: Prof. Dawn A. Bonnell, **GPA** 4.0/4.0

Jan. 1998 M.S. summa cum laude, Department of Materials Science, Moscow State University, RUSSIA, Thesis: *Cryosol synthesis of nanocomposite materials*, Advisor: Prof. Alexey A. Vertegel, **GPA** 5.0/5.0, ranked first in class for the whole period of education

RESEARCH INTERESTS

Atom by atom fabrication via electron beams. Applications of machine learning and artificial intelligence for physics extraction from the atomically-resolved and mesoscopic imaging data. Coupling between electromechanical, electrical, and transport phenomena on the nanoscale. Developing novel SPM techniques, mathematical analysis of SPM data, quantitative measurements of local properties by SPM.

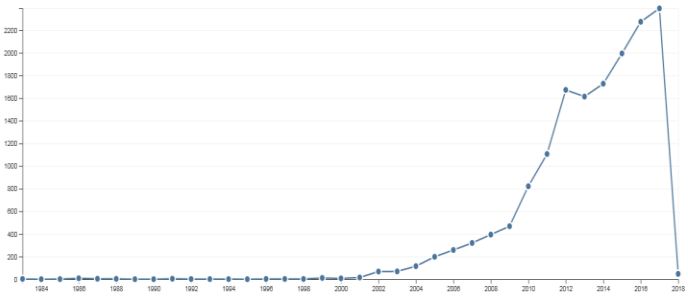
HONORS AND AWARDS

- Pollak lecture, Technion, **2019**
- MRS Symposium X Lecture, Fall **2018**
- RD100 Award for “Atomic Forge”, **2018**
- ORNL Significant Event award, **2018**

- Highly cited researcher, Clarivate Analytics, **2018**
- Laureate of Blavatnik National Award for Young Scientists in Physics, **2018**
- CNMS Distinguished patent award, **2018**
- Fellow, Foresight Institute, **2018**
- Zernicke lecture, U. Groeningen, **2018**
- Fellow, IoP, **2017**
- Fellow, IEEE, **2017**
- Fellow, Materials Research Society, **2017**
- One of the top 100 most cited Russian physicists, **2017**
- RD100 Award for "G-Mode Scanning Probe Microscopy and Spectroscopy", **2016**
- Finalist, Blavatnik National Award for Young Scientists, Physics, **2016, 2017, 2018**
- Microscopy Today Innovation Award for "General Mode (G-mode) Microscopy & Spectroscopy", **2016**
- Fellow, American Physical Society, **2015**
- Fellow, AVS, **2015**
- IEEE Senior member, **2015**
- Medal for Scanning Probe Microscopy, Royal Microscopical Society, **2015**
- ORNL Distinguished Scientist Award, **2013**
- ORNL Team Award in Science and Technology (led the team), **2011**
- Microscopy Today Innovation Award for "Electrochemical Strain Microscopy", **2011**
- Roland B. Snow Award, American Ceramics Society, **2010**
- Presidential Early Career Award for Scientists and Engineers (PECASE), **2009**
- R&D 100 Award for "Ztherm Modulated Thermal Analysis" (with M. Nikiforov and S. Jesse, ORNL, and A. Gannepali and R. Proksch, Asylum Research), **2010**
- Microscopy Today Innovation Award for "Adaptive Band Excitation Method in Scanning Probe Microscopy", **2010**
- Significant Event Award, ORNL **2010**
- 2010 IEEE-UFFC Ferroelectrics Young Investigator Award, **2010**
- Burton medal for Young Investigator, Microscopy Society of America, **2010**
- ISIF Young Investigator Award, **2009**
- Robert L. Coble Award for Young Scholars, American Ceramic Society, **2009**
- Southeast FLC Excellence in Technology Transfer Award for "Adaptive Band Excitation Method and Controller in Scanning Probe Microscopy", **2008**
- R&D 100 Award for "Adaptive Band Excitation Method and Controller in Scanning Probe Microscopy" (with S. Jesse, ORNL, and R. Proksch, Asylum Research), **2008**
- Peter Mark Memorial Award for Young Scientists, AVS: Science and Technology Society, **2008**

- Cosslett Award for Best Invited Paper of Microbeam Analysis Society (principal S. Jesse). **2008**
- CNMS Division Director Award, **2007** and **2009**
- ORNL Director Award for Outstanding Team Accomplishment in Science and Technology (led the team), **2006**
- Team Scientific Research Award from ORNL (led the team), **2006**
- ORNL Early Career Accomplishment Award for Science and Technology, **2005**
- Ross Coffin Purdy Award of American Ceramic Society, **2003**
- Wigner Fellowship of Oak Ridge National Laboratory, **2002**
- MRS best poster award (**Fall 2009**, **Spring 2005**, **Fall 2003**)
- AVS Graduate Student Award, **2002**
- MRS Gold Graduate Student Award - **Fall 2001** Meeting
- MRS Silver Graduate Student Award - **Fall 1999** Meeting, **Fall 2000** Meeting
- Ceramographics Contest at 2000 ACerS meeting (2nd and 3d award in Problem Solving and 3d award in Scanning Probe Microscopy sections)
- Bochvar Prize for excellence in studies (Moscow State University) **1998**
- Novoselova prize for best student research work in Inorganic Chemistry, MSU, **1997**
- Soros undergraduate student fellowship **1994/1995**, **1995/1996** and **1996/1997**
- Moscow State University Lomonosov Scholarship for Excellency in Studies, **1996/1997**
- State Scholarship for Young Scientists from Russian Academy of Sciences, **1994-1996**

PUBLICATIONS



In total, >560 peer-reviewed papers (4 *Science*, 1 *Science Advances*, 2 *Nature*, 9 *Nature Mat.*, 4 *Nature Nanotech.*, 1 *Nature Chem.*, 4 *Nature Phys.*, 24 *Nature Comm.*, 13 *Sci. Rep.*, 17 *Phys. Rev. Lett.*, 42 *Adv. (Func., Electronic, Energy) Mat.*, 2 *PNAS*, 27 *Nano Lett*, 45 *ACS Nano*, 2 *Small*), 20 reviewed papers in conference proceedings, 11 book chapters, 2 books [+2 in Russian], citations >14500, *h* = 60 by ISI (75 by *Google Scholar*), 15 patents, 7 disclosures, ~200 invited and plenary talks and workshops

PROFESSIONAL SERVICES

- Co-founder, APS topical group on data science
- MRS Board of directors, 2018
- Conference organizer, IMRS Cancun, Mexico, 2017
- Chair-elect, Nanoscale Science and Technology Division, AVS, 2016
- Editor, NPJ *Computational Materials*, since 2015

- Member, Program Development Subcommittee MRS, since **2014**, Award Diversity Subcommittee, since **2017**
- Editorial board, *Advances in Chemical and Structural Imaging*, since 2014
- Editorial advisory board, *ACS Nano*, since 2014
- Co-Technical program chair, ISAF-PFM, Penn State, 2014
- Co-Technical program chair, IEEE-ISAF-PFM, Prague, Czech Republic, 2013
- Member of editorial board, Applied Physics Letters/Journal of Applied Physics (since 2012)
- Member of editorial board, Scientific Reports (Nature Publishing group)
- Member of editorial board, Frontiers
- Conference organizer, MRS 2014 Spring Meeting
- Organizer, PFM School and 12th PFM workshop (ORNL March 2013)
- Co-organizer, 3d International Workshop of Imaging Energy Materials, ORNL 2012
- Co-Organizer, 11th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Aveiro, Portugal 2012 (as a part of ISAF-ECAPD-PFM conference)
- Co-Technical program chair, ISAF-PFM, Vancouver, Canada 2011
- Co-Organizer, 10th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Vancouver, Canada 2011
- IEEE Ferroelectric Committee member, since November 2010
- Organizer, Workshop on Scanning Probe Microscopy for Energy Materials, ORNL, September 2010
- Co-Organizer, 9th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Prague, Czech Republic, September 2010
- Co-Organizer, 8th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Beijing, China 2010
- Volume editor, *MRS Bulletin* 2012.
- Editorial board member, *Nanotechnology*, 2010 – present (2010-2013 – Section editor for patterning and nanofabrication)
- (since 2009 – present) Associate Editor, *J. Appl. Phys*. special volume on Piezoresponse Force Microscopy and Nanoscale Ferroelectrics (Proceedings of PFM Workshop series, 3 published and 1 planned for 2013))
- Organizer, 6th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2009
- Co-Organizer, 5th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, NIMS, Japan, 2009
- Organizer, 4th Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Aveiro, Portugal, 2009
- DOE DMSE Panel on Scanning Probe Microscopy, Annapolis, MD, October 2009

- Organizer, 3rd Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2008
- Member of program committee, Non-contact AFM 2008, Madrid, Spain
- Organizer, 2nd Workshop on Piezoresponse Force Microscopy, EPFL, Switzerland, May 2008
- DOE DMSE Panel on Long-Range Interactions, Annapolis, MD, October 2007
- Organizer, Workshop on Nanoscale Electromechanics by Piezoresponse Force Microscopy, Oak Ridge, TN, 2007
- Member of Editorial Board, *Journal of Nanoelectronics and Optoelectronics*, 2005-present
- Member of publications committee, American Vacuum Society, 2006 - 2013
- Member at large, Nanoscale Science and Technology Division, American Vacuum Society, 2004-2006
- Session chair, "Seeing on the Nanoscale-III", Veeco Instruments (2005), "Seeing on the Nanoscale-IV" (2006).
- Instructor for Lehigh microscopy course in SPM (2005, 2006)
- MRS Symposium Organizer (Spring 2018, Spring 2017, Spring 2011, Spring 2009, Fall 2007, Fall 2004 Meeting)
- Member of NSF MRI panel (2004)
- Reviewed manuscripts for Physical Review Letters, Physical Review B, Applied Physics Letters, Journal of Applied Physics, Journal of the American Ceramic Society, Journal of Physical Chemistry, Journal of Electronic Materials, Nanotechnology, Nano Letters, Applied Physics A, Journal of Materials Research and MRS Symposia Proceedings.
- AVS session chair (2006 Meeting, 2005 Meeting, 2004 Meeting, 2001 Meeting); MRS session chair (Fall 2006 Meeting, Fall 2004 Meeting, Fall 2002 Meeting)

TEACHING EXPERIENCE

Ph.D. Thesis committee, A. Maksov, UT Knoxville, 2018
Ph.D. Thesis committee, O. Ovchinnikov, Vanderbilt, 2018
Ph.D. Thesis committee, P. Gupta, Lehigh University
Supervising graduate student, 2 visiting students, and 6 postdocs at ORNL
Development and teaching 2 week course in SPM techniques, UPenn, Spring 2002
Teaching assistant, General Chemistry recitations, UPenn, Spring 2002
Participated in design of laboratory course in SPM in materials science, Spring 2001
Supervised research of 3 undergraduate students at MSU; co-advisor in senior design projects
Developed and taught Intermediate level English language course (Fall 1996, 1997).

MEMBER

AAAS, IEEE, Materials Research Society, American Vacuum Society, American Ceramic Society, American Physical Society, Electrochemical Society

LIST OF PUBLICATIONS

Video lectures

1. (7 lecture series) PFM Lectures: available on YouTube via search for "Sergei V. Kalinin"
2. Blavatnik award: https://www.youtube.com/watch?v=hHnvEUk2Dq8
3. IFIM, https://www.youtube.com/watch?v=0hwZTUvFzko&feature=youtu.be
4. 30 years of SPM, https://www.brighttalk.com/webcast/8013/229945/celebrating-30-years-of-afm-and-stm
5. SERGEI V. KALININ, *Atomic Forge*,

   https://www.youtube.com/watch?v=mZMhRPAJRsw&feature=youtu.be

Books

6. (editor, 2 book collection) SERGEI V. KALININ and IAN FOSTER, *Big, Deep, and Smart Data in Physical Scinces*, World Scientific, in progress
7. (editor) E. STACH, J. SETHIAN, O. OVCHINNIKOVA, and S.V. KALININ, *Big, Deep, and Smart Data in Physical Imaging: Scanning and Electron Microscopy and Chemical Imaging*, World Scientific, in progress
8. (editor) DAWN A. BONNELL and SERGEI V. KALININ, *Scanning Probe Microscopy for Energy Research*, World Scientific, 2013
9. **(editor)** SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Functional Imaging of Advanced Materials by Scanning Probe Microscopy*, Springer 2010
10. **(editor)** SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, II, Springer (2006).
11. **(author)** S.V. KALININ and V.V. ZAGORSKY, *Handbook on chemistry for secondary school students*, Moscow, Mezdynarodnaya programma obrazovania, 1 ed. –1996, 2ed. –1997 (in Russian)
12. **(author)** S.V. KALININ, *Concise handbook on chemistry for secondary school students*, Moscow, Kultura i traditsii, 1 ed. - 1993, 2 ed. - 1995. (in Russian)

Journal Special Issues

13. **(editors)** SERGEI V. KALININ and S. PENNYCOOK, *Building matter atom by atom by scanning probes and electron beams*, MRS Bulletin 2017
14. **(editors)** N. BASSIRI-GHARB, SERGEI V. KALININ, and N. VALANOOR, *Selected Papers from the Piezoresponse Force Microscopy Workshop Series: Part of the Joint ISAF-ECAPD-PFM 2013 Conference*, special issue of J. Appl. Phys. **116** (2014).
15. **(editors)** J. LI, SERGEI V. KALININ, and A. KHOLKIN, *Selected Papers from the Piezoresponse Force Microscopy Workshop Series: Part of the Joint ISAF-ECAPD-PFM 2012 Conference*, special issue of J. Appl. Phys. **113** (2013).

16. **(organizer)** *Scanning Probe Microscopy in Nanoscale Science Research Centers (NSRC) of the US Department of Energy (DOE),* special issue of Advanced Functional Materials (2013)

17. **(editors)** S.V. KALININ, Z.G. YE, and A.L. KHOLKIN, *Piezoresponse Force Microscopy and Nanoscale Phenomena in Polar Materials*, special issue of J. Appl. Phys. **112** (2012).

18. **(editors)** S.V. KALININ and A.L. KHOLKIN, *Piezoresponse force microscopy and nanoscale phenomena in polar materials*, special issue of J. Appl. Phys. **110** (2011).

19. **(editor)** SERGEI V. KALININ, J. JOSHUA YANG and ANNA DEMMING, *Non-volatile memory based on nanostructures*, Nanotechnology 25, 24 June 2011

20. **(editors)** S.V. KALININ, N. SETTER, and A.L. KHOLKIN, *Invited Papers from the International Symposium on Piezoresponse Force Microscopy and Nanoscale Phenomena in Polar Materials, Aveiro, Portugal*, 2009, special issue of J. Appl. Phys. **108** (2010).

21. **(editor)** SERGEI V. KALININ, NAVA SETTER and ANDREI KHOLKIN (Eds.), *NanoScale Electromechanics: Principles, Devices, and Applications*, MRS Bulletin, September 2009

22. **(editor)** SERGEI V. KALININ and HIROSHI FUNAKUBO, *Materials*, special issue on "Advances in Ferroelectric & Piezoelectric Materials".

23. **(editor)** S.V. KALININ, B. GOLDBERG, B. HUEY, AND L.M. ENG (Eds.), *Scanning Probe and Other Novel Microscopies of Local Phenomena in Nanostructured Materials*, Mat. Res. Soc. Proceedings Vol. 838E (electronic) (2005).

Book chapters

24. MAXIM ZIATDINOV, ARTEM MAKSOV, and SERGEI V. KALININ, *Deep data analytics in structural and functional imaging of nanoscale materials,* in Ed. By T. Lookman

25. S. JESSE, L. COLLINS, S. NEUMAYER, S. SOMNATH, and SERGEI V. KALININ, *Dynamic Modes in Kelvin Probe Force Microscopy: Band Excitation and G-Mode*, in *Kelvin Probe Force Microscopy* Ed. By Thilo Glaetsel and Sacha Sadewasser, Springer 2017

26. E. STRELCOV, M. AHMADI, and SERGEI V. KALININ, *Nanoscale Transport Imaging of Active Lateral Devices: Static and Frequency Dependent Modes*, in *Kelvin Probe Force Microscopy* Ed. By Thilo Glaetsel and Sacha Sadewasser, Springer 2017

27. A. KUMAR, S.V. KALININ, and Y. KIM, *Exploring Electro-Chemo-Mechanical Phenomena on the Nanoscale Using Scanning Probe Microscopy*, in *Electro-Chemo-Mechanics of Solids*, Springer, 2017

28. ANNA N. MOROZOVSKA, EUGENE A. ELISEEV and SERGEI V. KALININ, *Topological Defects in Ferroic Materials,* in *Topological Structures in Ferroic Materials*, Springer 2016

29. A.N. MOROZOVSKA, O.V. VARENYK, and S.V. KALININ, *Impact of Flexoelectric Effect on Electro-mechanics of Moderate Conductors*, in *Flexoelectricity in Solids*, Ed. by A.K. Tagantsev and P.V. Yudin, World Scientific 2016

30. A.N. MOROZOVSKA, S.V. KALININ, and E.A. ELISEEV, *Flexoelectricity Impact on the Domain Wall Structure and Polar Properties*, in *Flexoelectricity in Solids*, Ed. by A.K. Tagantsev and P.V. Yudin, World Scientific 2016

31. S.V. KALININ AND D.A. BONNELL, *The Role of Local Probes in the Next Decade of Energy Research and Development*, in "*Scanning Probe Microscopy for Energy Research*," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013

32. A. KUMAR, F. CUICCI, A. MOROZOVSKA, S. JESSE, S. KALININ, *Electrochemical Strain Microscopy of Oxygen Ion Conductors: Fuel Cells and Oxide Electronics*, in "*Scanning Probe Microscopy for Energy Research*," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013

33. T. ARRUDA, N. BALKE, S. JESSE, S. KALININ, *Electrochemical Strain Microscopy of Li-Ion and Li Air Battery Materials*, in "*Scanning Probe Microscopy for Energy Research*," edited by D.A. Bonnell and S.V. Kalinin, World Scientific, 2013

34. BRIAN J. RODRIGUEZ, ROGER PROKSCH, PETER MAKSYMOVYCH, and SERGEI V. KALININ, *Scanning Probe Microscopy – Forces and Currents in the Nanoscale World*, in "Handbook of Nanoscopy Vol.1", edited by G. Van Tendeloo, D. van Dyck, and S. Pennycook, Wiley-VCH; 1 edition (May 21, 2012)

35. SERGEI V. KALININ, BRIAN J. RODRIGUEZ, AND A. KHOLKIN, *Piezoresponse Force Microscopy and Spectroscopy*, Springer NanoEncyclopedia,

36. BRIAN J. RODRIGUEZ and SERGEI V. KALININ, *KPFM and PFM of Biological Systems*, in *Kelvin Probe Force Microscopy: Measuring and Compensating Electrostatic Forces* (Springer Series in Surface Sciences), Sascha Sadewasser (Editor), Thilo Glatzel (Editor)

37. R. O'HAYRE, M. LEE, F. PRINZ, and S.V. KALININ, *Scanning Impedance Microscopy and Nanoimpedance Microscopy*, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).

38. A. KHOLKIN, A. ROELOFS, S.V. KALININ, and A. GRUVERMAN, Review of Ferroelectric Domain Imaging by Piezoelectric Force Microscopy, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).

39. A. GRUVERMAN, and S.V. KALININ, *Bioelectromechanical Imaging by Scanning Probe Microscopy: The Galvani Experiment on the Nanoscale*, in SERGEI V. KALININ and ALEXEI GRUVERMAN (Eds.), *Scanning Probe Microscopy: Electrical and Electromechanical Phenomena on the Nanoscale*, Vol. I, Springer (2006).

40. SERGEI V. KALININ and DAWN A. BONNELL, *Scanning Probe Microscopy Of Piezoelectric And Transport Phenomena In Electroceramic Materials*, in NATO ASI Series, P. Vilarinho (Ed.), Kluwer Academic Publishers (2004).

41. SERGEI V. KALININ and DAWN A. BONNELL, *Polarization and Charge Dynamics in Ferroelectric Materials with Scanning Probe Microscopy*, in *Nanoscale Phenomena in Ferroelectric Thin Films*, Ed. S. Hong, Kluwer (2004)

42. SERGEI V. KALININ and DAWN A. BONNELL, *Imaging mechanism and Quantification of Scanning Force Microscopy of Ferroelectric Surfaces*, in *Nanoscale Characterization of Ferroelectric Materials*, Eds. M. Alexe and A. Gruverman, Springer (2004), cond-mat/0301535

43. SERGEI V. KALININ and DAWN A. BONNELL, *Electrostatic and Magnetic Force Microscopy, in Scanning Probe Microscopy: Theory, Techniques and Applications,* Ed. D.A. Bonnell, Wiley VCH, 2000

Papers: Published

44. X. LI, O. DYCK, M. OXLEY, A. LUPINI, S. JESSE and S.V. KALININ, *Structure retrieval from* 4D-STEM: *statistical analysis of potential pitfalls in high-dimensional data,* submitted

45. (Jupyter paper) M. ZIATDINOV, C. NELSON, R.K. VASUDEVAN, D.Y. CHEN, and S.V. KALININ, *Building ferroelectric from the bottom up: the machine learning analysis of the atomic-scale ferroelectric distortions,* submitted

46. R.K. VASUDEVAN, K. CHOUDHARY, A. MEHTA, R. SMITH, G. KUSNE, F. TAVAZZA, L. VLCEK, M. ZIATDINOV, S.V. KALININ, and J. HATTRICK-SIMPERS, *Materials Science in the AI age: high-throughput library generation, machine learning and a pathway from correlations to the underpinning physics,* MRS Bull., submitted

47. (opinion) O. DYCK, S. JESSE, and S.V. KALININ, *A Self-driving Microscope and the Atomic Forge: Opportunities for the Future of Electron Microscopy,* MRS Bull., submitted

48. O. DYCK, S. JESSE, N. DELBY, S.V. KALININ, and A. LUPINI, *Variable Voltage Electron Microscopy: towards Chemistry-Selective Atom-by-Atom Quantum Structure Fabrication in* 2D *Materials,* submitted

49. S.V. KALININ, O. DYCK, N. BALKE, S. NEUMAYER, W.Y. TSAI, R.K. VASUDEVAN, D. LINGERFELT, M. AHMADI, M. ZIATDINOV, M.T. MCDOWELL, and E. STRELCOV, *Towards electrochemical studies on nanometer and atomic scales: progress, challenges and opportunities,* ACS Nano, submitted

50. O. DYCK, M. ZIATDINOV, D. LINGERFELT, R.R. UNOCIC, B.M. HUDAK, A.R. LUPINI, S. JESSE, and SERGEI V. KALININ, *Atom-by-atom Fabrication via Electron Beams,* Nat. Mat. Rev., accepted

51. S. SOMNATH, C.R SMITH, N. LAANAIT, R.K VASUDEVAN, A. IEVLEV, A. BELIANINOV, A.R. LUPINI, M. SHANKAR, SERGEI V. KALININ, and S. JESSE, *USID and Pycroscopy – Open frameworks for storing and analyzing spectroscopic and imaging data,* ASCI, submitted

52. N. BORODINOV, N. BILKEY, M. FOSTON, A. IEVLEV, A. BELIANINOV, S. JESSE, R.K. VASUDEVAN, S.V. KALININ, and O. OVCHINNIKOVA, *Application of pan-sharpening algorithm for correlative multimodal imaging using* AFM-IR, NPJ Comp Mat, accepted

53. A.N. MOROZOVSKA, E.A. ELISEEV, C.T. NELSON, and SERGEI V. KALININ, *Building Free Energy Functional from Atomically-Resolved Imaging: Atomic Scale Phenomena in* La-*doped* $BiFeO_3$, arXiv preprint arXiv:1903.03656

54. N. BORODINOV, S. NEUMAYER, S.V. KALININ, O.S. OVCHINNIKOVA, R.K. VASUDEVAN, and S. JESSE, *Deep neural networks for understanding noisy data applied to physical property extraction in scanning probe microscopy,* npj Computational Materials 5, 25 (2019)

55. R. GIRIDHARAGOPAL, J.T. PRECHT, S. JARIWALA, L. COLLINS, S. JESSE, S.V. KALININ, and D.S. GINGER, *Time-Resolved Electrical Scanning Probe Microscopy of Layered Perovskites Reveals Spatial Variations in Photoinduced Ionic and Electronic Carrier Motion,* ACS Nano, in print

56. J.M. RICKMAN, T. LOOKMAN, and S.V. KALININ, *Materials Informatics: From the Atomic-Level to the Continuum,* Acta Materialia, in print
57. M. ZIATDINOV, O. DYCK, S. JESSE, and S.V. KALININ, *Atomic mechanisms for the Si atom dynamics in graphene: chemical transformations at the edge and in the bulk,* arXiv preprint arXiv:1901.09322
58. E.A. ELISEEV, A.N. MOROZOVSKA, C.T. NELSON, and S.V. KALININ, *Intrinsic structural instabilities of domain walls driven by gradient coupling: Meandering antiferrodistortive-ferroelectric domain walls in* $BiFeO_3$, Phys. Rev. **B 99**, 014112 (2019).
59. D.V. KARPINSKY, O.M. FESENKO, M.V. SILIBIN, S.V. DUBKOV, M. CHAIKA, A. YAREMKEVICH, A. LUKOWIAK, Y. GERASYMCHUK, W. STREK, A. PAKALNISKIS, R. SKAUDZIUS, A. KAREIVA, Y.M. FOMICHOV, V.V. SHVARTSMAN, S.V. KALININ, N.V. MOROZOVSKY, and A.N. MOROZOVSKA, *Ferromagnetic-like behavior of* $Bi_{0.9}La0.1FeO3$-KBr nanocomposites, arXiv preprint arXiv:1901.08913
60. X. LI, O.E. DYCK, M.P. OXLEY, A.R. LUPINI, L. MCINNES, J. HEALY, S. JESSE, and SERGEI V. KALININ, *Manifold learning of four-dimensional scanning transmission electron microscopy*, npj Computational Materials **5**, 5 (2019)
61. K. VEENHUIZEN, S. MCANANY, R.K. VASUDEVAN, D. NOLAN, B. AITKEN, S. JESSE, S.V. KALININ, H. JAIN, and V. DIEROLF, *Ferroelectric domain engineering of lithium niobate single crystal confined in glass*, MRS Communications, 1 (2019)
62. X. LI, O. DYCK, S.V. KALININ, and S. JESSE, *Compressed Sensing of Scanning Transmission Electron Microscopy (STEM) With Nonrectangular Scans*, Microscopy and Microanalysis **24**, 623 (2018).
63. D.K. PRADHAN, S. KUMARI, R.K. VASUDEVAN, E. STRELCOV, V.S. PULI, D.K. PRADHAN, A. KUMAR, J.M. GREGG, A.K. PRADHAN, S.V. KALININ, and R.S. KATIYAR, *Exploring the Magnetoelectric Coupling at the Composite Interfaces of FE/FM/FE Heterostructures*, Scientific reports **8**, 17381 (2018).
64. M.D. GLINCHUK, A.N. MOROZOVSKA, Y. KIM, and SERGEI V. KALININ, *Possible Electrochemical Origin of Ferroelectricity in* HfO_2 *Thin Films*, arXiv preprint arXiv:1811.09787
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Patents

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6. S.V. KALININ, A. GRUVERMAN, J. SHIN, H.N. LEE, H.M. CHRISTEN, A.P. BADDORF, E. KARAPETIAN, and M. KACHANOV, *Ultra High Density Ferroelectric Storage and Lithography by Second Order Ferroelectroelastic Switching*, U.S. Patent No. **7,292,768**

7. S.V. KALININ, H.M. CHRISTEN, A.P. BADDORF, and V. MEUNIER, *Asymmetric Ferroelectric Tunneling Element* (AFTE) *and Applications for Non-volatile Random Access Memory*, U.S> Patent 7,759,713 B2, filed March 6, 2006, issued Jul. 20, 2010

8. **(R&D100 Award, three patents)** S. JESSE and S.V. KALININ, *Adaptive Band Excitation Method in Scanning Probe Microscopy*, **licensed by Asylum Research Corporation,** US9097738 B2 (Aug 4, 2015), US7775086 (Aug 17, 2010), US8448502 (Jun 2, 2010)

9. S. JESSE, S.V. KALININ, A.P. BADDORF, K. SEAL, B.J. RODRIGUEZ, A. GANNEPALLI and R. PROKSCH, *Harmonic Balance Method in Scanning Probe Microscopy*, patent disclosure submitted

10. S.V. KALININ, S. JESSE, P. MAKSYMOVYCH, M. NIKIFOROV, and A.P. BADDORF, *Rapid Functional Recognition in Scanning Probe Microscopy*, patent disclosure submitted

11. M. NIKIFOROV, S.V. KALININ, S. JESSE, *Spatially Resolved Quantitative Mapping of Thermomechanical Properties and Phase Transition Temperatures Using Scanning Probe Microscopy*, patent disclosure submitted
12. S.V. KALININ, N. BALKE, A. KUMA, N.J. DUDNEY, and S. JESSE, *Real Space Mapping of Ionic Diffusion and Electrochemical Activity in Energy Storage and Conversion Materials*, US Patent 8,719,961 B2, granted May 6, 2014
13. SERGEI V. KALININ, N. BALKE, A. BORISEVICH S. JESSE, P. MAKSYMOVYCH, Y. KIM, and E. STRELCOV, *Real space mapping of oxygen vacancy diffusion and electrochemical transformations by hysteretic current reversal curve measurements*, US Patent, 8,752,211
14. H.N. LEE, S.V. KALININ, H.J. JEEN, W.S. CHOI, L. JIANG, S. DONG, Y. KIM, M.G. HAN, Y. ZHU, E. DAGOTTO, and T. EGAMI, *Colossal Tunneling Electroresistance Induced by Interfacial Phase Transitions in Ultrathin Oxide Heterostructures*, patent disclosure submitted
15. S.V. KALININ, S. JESSE, L. COLLINS, and B. RODRIGUEZ, *Electrochemical Force Microscopy*, US Patent 20,160,025,773
16. S. JESSE, A. BELIANINOV, S.V. KALININ, and S. SOMNATH, *Full Information Acquisition in Scanning Probe Microscopy*, US Patent 9,612,257,2017
17. S.V. KALININ, P. MAKSYMOVYCH, and A. TSELEV, *Methods for Detection and Quantification of Conductance and Dielectric Permittivity*, 201503548, DOE 138,181
18. P. MAKSYMOVYCH, A. TSELEV, and S.V. KALININ, *Microwave AC conductivity of domain walls*, US Patent 20,170,099,055 US Patent App. 15/285,332, 2017
19. S. JESSE, A.Y. BORISEVICH, Q. HE, S.V. KALININ, A.R. LUPINI, and R.R. UNOCIC, *Bulk Nanofabrication with Single Atomic Plane Precision via Atomic-Level Sculpting of Crystalline Oxides*, 201503502, DOE S-138,134, US Patent App. 15/697,541
20. S. JESSE, O. DYCK, B. Sumpter, and S.V. KALININ, *Atom Assembly Device*, IDSA submitted S-138,604
21. O. DYCK, S. JESSE, S.V. KALININ, A.Y. BORISEVICH, and R. UNOCIC, *Atomic-Scale E-Beam Sculpter*, IDSA S-138,605
22. L. COLLINS, S. JESSE, S.V. KALININ, *Fast free force recovery (F3R) for ultrafast force reconstruction in SPM*, ID 3971,

Invited talks - conferences

1. (invited) S.V. KALININ, *Deep Learning in Scanning Transmission Electron Microscopy: From Learning Physics to Atomic Manipulation*, International Conference on Frontiers of Characterization and Metrology for Nanoelectronics, April 2-4, Monterey, CA
2. (invited) S.V. KALININ, *Electron Microscopy of Quantum Materials: From Learning Physics to Atomic Manipulation*, APS Meeting, March 2019
3. (invited) S.V. KALININ, *Deep learning in atomically resolved imaging: feature extraction and feedback*, APS Meeting, March 2019

4. (**invited**) S.V. KALININ, *Deep learning in Scanning Transmission Electron Microscopy: from physics to atomic manipulation*, International Symposium on Materials Informatics, Tokyo, Japan Feb. 2019
5. (**Symposium X**) S.V. KALININ, *The Lab on a Beam: Big Data and Artificial Intelligence in Scanning Transmission Electron Microscopy*, MRS Fall meeting, 2018
6. (**invited**) S.V. KALININ, *Coupling between ferroelectricity and chemistry on mesoscopic and atomic scales*, MRS Fall meeting, 2018
7. (**invited**) S.V. KALININ, *Machine Learning in Electron Microscopy: from Learning Physics to Atomic Manipulation*, RASA meeting, Washington DC
8. (**invited**) S.V. KALININ, S. JESSE, C.T. NELSON, M. ZIATDINOV, R.K. VASUDEVAN, O. DYCK, and A.R. LUPINI, *The Lab on a Beam: Big Data and Artificial Intelligence in Scanning Transmission Electron Microscopy*, PNNL NextSTEM workshop
9. (**invited**) S.V. KALININ, *Machine learning in STEM: learning physics of multiferroic materials, Gordons conference on Multiferroics*, Lewistown, August 5-10, 2018
10. (**invited**) S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, U Penn. Conference on STEM, August 10, 2018
11. (**invited**) S.V. KALININ, *Imaging in information dimension: from learning physics to atomic-scale robotics*, Blavatnik conference, NY, July 2018
12. (**invited**) S.V. KALININ, *Ferroionic states: on the boundary between ferroelectricity and electrochemistry*, IFAAAP, Hiroshima, Japan, May 2018.
13. (**plenary**) S.V. KALININ, *Big data and machine learning in scanning probe microscopy*, Multi Frequency conference, Madrid, Spain 2018
14. (**invited**) S.V. KALININ, Imaging in information dimension: from learning physics to atomic-scale robotics, CODA, Santa Fe, August 2018
15. (**invited**) S.V. KALININ, *Imaging in information dimension: from materials design to atomic fabrication*, US-Cz conference on chemistry and nanoscience
16. (**invited**) S.V. KALININ, *Electrochemistry on Nano- and Aotmic scale: challenges and opportunities*, MIT Conference 2017
17. (**invited**) S.V. KALININ, *Atomic fabrication by electron beams*, MRS Fall 2017
18. (**invited**) S.V. KALININ, *Atomic fabrication by electron beams*, Singapore Nano, 2017
19. (**invited**) S.V. KALININ, *Imaging in information dimension: from materials design to atomic fabrication*, Kanazawa AFM, 2017
20. (**keynote**) S.V. KALININ, *Ferroionic states in ferroelectric films*, International Meeting on Ferroelectricity, San Antonio, September 2017
21. (**plenary**) S.V. KALININ, *Big, deep, and smart data in atomically resolved imaging: From better materials towards Atom by Atom fabrication*, Electron Microscopy Society of India, July 2017
22. (**plenary**) S.V. KALININ, *Big, Deep, and Smart Data in Imaging: from Full Information Capture to Atomic Manipulation*, FRIMACHAT, Limerick, Ireland, July 2017

23. S.V. KALININ, *Ferroionic states: coupling between surface electrochemical and bulk ferroelectric functionalities on the nanoscale*, APS March meeting, New Orleans 2017

24. (**Keynote**) S.V. KALININ, *Full information acquisition and chemical imaging in scanning probe microscopy: what happens on the tip surface junction*?, STLE, Atlanta, May 2017

25. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: Atomic View and Control of Materials Structure and Functionalities*, Materials Research Society Fall Meeting, Boston MA, USA, November 28 - December 2, 2016,

26. S.V. KALININ, *Direct mining of structure-property relationships from atomic and mesoscopic imaging data*, Materials Research Society Fall Meeting, Boston MA, USA, November 28 - December 2, 2016

27. S.V. KALININ, *Coupled ferroelectric and metal-insulator transitions in Oxides*, DOE Contractor meeting, Gatesburg, October 2016

28. (**plenary**) S.V. KALININ, *Chemical boundary conditions and emergence of coupled electrochemical-ferroelectric states on the nanoscale*, 13th International Symposium on Ferroic Domains & Micro- to Nano-scopic Structures (ISFD-13), Vancouver, Canada, October 2-6, 2016

29. S.V. KALININ, *Atomic Forge: Building Matter atom by Atom in 3D*, Foresight institute meeting October 1, 2016.

30. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: Accelerating Materials by Design*, Quantum Materials Synthesis, New York, September 1, 2016

31. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: Accelerating Materials by Design*, Blavatnik symposium, July 2016

32. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: Atomic View on Chemical Bonding*, International Conference on Chemical Bonding, Lihue, Hawaii, July 2016

33. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: Towards Nanoscience 2.0*, OLCF User meeting, ORNL 2016

34. S.V. KALININ, *Big, Deep, and Smart Data in Atomic Imaging: Mining Local Structure-Property Relationships*, Data Science and Optimal Learning for Materials Discovery and Design, Santa Fe, May 2016

35. S.V. KALININ, *Big Data for materials*, ORAU meeting, March 2016

36. S.V. KALININ, *Scanning Probe Microscopy: The Information Dimension*, MultiFrequency conference, Madrid, April 2016

37. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, SKKU Oxide Conference, February 2016 2016

38. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Materials Research Meeting, Boston, December 2015

39. S.V. KALININ *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Materials Research Meeting, Boston, December 2015

40. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Microscopy and Microanalysis Conference, Manchester, UK

41. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, MRS Spring meeting, San Francisco, CA

42. S.V. KALININ *Deep Data in Nanoscience: Exploring Local Structure-Property Relationships by Scanning Probe Microscopy*, MRS Fall meeting, Boston, MA

43. S.V. KALININ *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, International Materials Research Council Meeting, Cancun, Mexico, August 2014

44. S.V. KALININ *Atomic View at Oxide Surfaces: Physics and Electrochemistry*, International Conference on Physics of Semiconductors, Austin, TX, August 2014

45. S.V. KALININ *Mapping Oxygen Vacancy Dynamics and Reactivity in Solids at the Nanometer and Atomic Scales*, Gordon's Research Conference on Solid State Studies in Ceramics, South Hadley, MA, July 2014

46. S.V. KALININ *Physical and Electrochemical Phenomena on Oxides Surfaces with Atomic Resolution: Merging In-Situ PLD-STM Studies with Deep Data*, Spring MRS Meeting, San Francisco, 2014

47. S.V. KALININ *Probing Local Ionic Dynamics in Functional Oxides: From Nanometer to Atomic Scale*, American Physical Society, Denver, March 2014

48. A.V. IEVLEV, E. STRELCOV, S. JESSE, A.N. MOROZOVSKA, E.A. ELISEEV, Y.V. PERSHIN, A. KUMAR, I.I. KRAVCHENKO, V.YA. SHUR AND S.V. KALININ, *Intermittency, quasiperiodicity, and chaos during ferroelectric domain switching*, Fundamental Physics of Ferroelectrics, Washington DC, February 2014

49. S.V. KALININ, "*Electrochemical Force and Strain Microscopies: Window in Nanoscale Electrochemistry*" Gordon Research Conference on Electrochemistry, Ventura, January 6 2014

50. S.V. KALININ, E. STRELCOV, A. BELIANINOV, and S. JESSE, *Big Data in Nanoscience: Exploring Dynamic Phenomena in Solids by Multidimensional Scanning Probe Microscopy*, MRS Fall Meeting 2014

51. S.V. KALININ, S. JESSE, and N. BALKE, *In-situ Electrochemistry at the End of the Tip*, MRS Fall Meeting 2014

52. S.V. KALININ, A. TSELEV, Z. GAI, R.K. VASUDEVAN, A. BELIANINOV, P. MAKSYMOVYCH, and A.P. BADDORF, *Atomic view on the surface electrochemistry of oxides*, MRS Fall Meeting 2014

53. S.V. KALININ, A. MOROZOVSKA, and V. SHUR, *Interplay of polarization dynamic and surface electrochemistry in ferroelectrics: from ionic transport to chaotic dynamics and fractal growth*, International Symposium on Applied Ferroelectrics, Prague, July 2013

54. (**keynote**) S.V. KALININ, *Imaging and spectroscopy in PFM*, 2013 International Tutorial Workshop on Piezoresponse Force Microscopy and Nanoscale Electromechanics of Polar Materials, July 6-8, 2013, Nanjing University, Nanjing, China

55. S.V. KALININ, A. TSELEV, Z. GAI, P. MAKSYMOVYCH, M. PAN, and A.P. BADDORF, *Probing coupled metal-insulator and ferroic transitions from atomistic to mesoscopic scales:* in-situ

PLD-STM study, International Conference on Materials for Advanced Technologies, June 300-July 5, Singapore

56. (**keynote**) S.V. KALININ, *Surface electrochemical phenomena in oxide thin films: from ionic transport to chaotic dynamic in ferroelectric domain switching*, International Conference on Materials for Advanced Technologies, June 300-July 5, Singapore
57. S.V. KALININ, *Emergent mesoscopic lengthscales in disordered systems*, MRS Spring Meeting, San Francisco, April 2013
58. S.V. KALININ, *Mapping electrochemical functionality in oxides on mesoscopic and atomic scales*, Argonne January 2013
59. S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics*, MRS Fall 2012
60. S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics,* AVS Meeting, Tampa, FL
61. S.V. KALININ, *Band Excitation SPM,* Multifrequency conference, Madrid, Spain, October 2012
62. S.V. KALININ, L.Q. CHEN, A. MOROZOVSKA, AND A. BORISEVICH, *Linking Mesoscopic and Atomic Scale Behaviors in Disordered Ferroelectrics*, "International Workshop on Relaxor Ferroelectrics", Shloss Edesheim, Germany 2012
63. S.V. KALININ, *Emergent SPM Modes and their Application to Energy and Memory Materials*, SMASIS, September 2012
64. (DOE Contractor meeting), *Probing Coupled Metal-Insulator and Ferroic Transitions from the Atomistic to Mesoscopic Scales*, DOE Contractor Meeting, Gaitesburg, MD
65. (**plenary**) S.V. KALININ, *Static and dynamics conductance of topological defects in ferroelectrics*, ISAF-ECAPD 2012, Aveiro, Portugal
66. SERGEI V. KALININ, AMIT KUMAR, STEPHEN JESSE, and ALBINA BORISEVICH, *Electrochemical Strain Microscopy: Challenges and Opportunities in Probing Electrochemical Reactivity of Solids below* 10 nm *level*, Workshop on solid state ionics, Heidelberg, Germany July 2012
67. S.V. KALININ, *Probing bias-induced phase transitions and electrochemical reactions on a single defect level,* ASM Local, May 21, 2012
68. S.V. KALININ, *Electrochemical Strain microscopy: probing batteries and fuel cells on the nanoscale*, Gordon's research conference on batteries, 2012
69. S.V. KALININ, P. MAKSYMOVYCH, N. BALKE, A. BORISEVICH, L.Q. CHEN, and A.N. MOROZOVSKA, *Static and dynamics conductance of topological defects in ferroelectrics*, Fundamental Physics of Ferroelectrics, Argonne 2012
70. S.V. KALININ, *Probing local bias-induced transitions: the case for 6D SPM,* MRS Fall Meeting 2011
71. S.V. KALININ, S.V. Kalinin, S. Jesse, A. Kumar, D.N.Leonard, and A. Y. Borisevich *nome, Probing oxygen vacancy dynamics on the nanoscale – from fuel cells to ferroelectrics,* MRS Fall Meeting 2011
72. S.V. KALININ, *Role of ionic phenomena in electromechanical SPM of correlated oxides*, MRS Spring Meeting 2011.

73. S.V. KALININ, *Probing local ionic motion and conductivity phenomena in correlated oxides*, Heraus Seminar, Bad Honneff, Germany January 2011.
74. S.V. KALININ, *Probing and controlling bias-induced phase transitions on the nanoscale: from local Preisach densities to switching at a single defect*, EMA2011, January 2011.
75. S.V. KALININ, *Mapping Ionic dynamics and electrochemical reactivity on the nanometer scale*, MRS Fall, 2010
76. S.V. KALININ, *Mapping Ionic dynamics and electrochemical reactivity on the nanometer scale*, AVS 2010, Albuquerque, October 2010.
77. S.V. KALININ, *Recent Advanced in Piezoresponse Force Microscopy*, ESFD-PFM, Czech Republic, September 2010
78. (**plenary**) S.V. KALININ, *A Biased View on the Nanoworld: From Ferroelectrics and Multiferroics to Energy Storage Materials*, ISAF 2010, Edinburgh, Scotland
79. S.V. KALININ, *Artificial Intelligence Methods in Scanning Probe Microscopy*, MRS Spring, 2010
80. S.V. KALININ, *Nanoscale Electromechanics: from Ferroelectrics to Energy Storage Materials*, APS March Meeting, 2010
81. S.V. KALININ, *Electromechanics on a Nanoscale: Hidden Dimension(s) of Scanning Probe Microscopy*, MRS Fall, 2009
82. S.V. KALININ, *Probing Bias-Induced Phase Transitions in Ferroelectrics and Energy Storage Materials on a Single Defect Level*, MRS Fall, 2009
83. S.V. KALININ, *Spatially resolved spectroscopy of ferroelectric polarization switching on a single defect level*, ACerS 2009
84. S.V. KALININ, *Surface-and Temperature Induced Phase Transitions on Relaxor Surfaces by SPM*, IMF-ISAF 2008, Xi'an, China
85. S.V. KALININ, *Probing Local Bias-Induced Phase Transitions by SPM*, ISPM 2009, Madrid, Spain
86. S.V. KALININ, *Probing Thermodynamics and Kinetics of Phase Transitions and Order Parameter Dynamics in complex materials on a single defect level*, NSRC Contractors Meeting, Annapolis, MD June 2009
87. S.V. KALININ, *Probing the Role of Single Defects on Polarization Switching in Ferroelectric and Multiferroic Materials*, MST 2008, Pittsburg, PA
88. S.V. KALININ, *Multidimensional SPM of Phase Transitions and Order Parameter Dynamics in complex materials*, DOE Contractors Meeting, Warrenton, PA
89. (**Peter Mark award talk**) S.V. KALININ, *Probing the Order Parameter Dynamics and Energy Dissipation on a Single Defect Level: Hidden Dimensions of Scanning Probe Microscopy*, AVS Meeting, Boston, MA
90. S.V. KALININ, *Multidimensional SPM of Phase Transitions and Order Parameter Dynamics in complex materials*, BES DMSE Workshop Frontiers of Atomic-Scale Functionality Imaging, Annapolis, MD

91. S.V. KALININ, *Electromechanical Imaging of Biological Systems with Sub-10 nm Resolution*, ISE 14, September 2008, Tokyo, Japan

92. S.V. KALININ, *Electromechnics on the Nanoscale: A Hidden Dimension of Scanning Probe Microscopy*, PiezoSalon, September 2008, Tokyo, Japan

93. S.V. KALININ, *Nanoscale Electromechanics: Phenomena, Devices, and Applications*, Gordons Research Conference on Microfabrication, Tinton School, NH, July 12-16, 2008

94. S.V. KALININ, *PFM^2: Probing the Role of Single Defects on Polarization Switching in Ferroelectric and Multiferroic Materials*, ISAF 2008

95. S.V. KALININ, *Spectroscopic Studies of Defect-Mediated Polarization Dynamics on the Nanoscale: Intrinsic Switching, Landauer Centers, and Hysteresis Loop Fine Structure*, MRS Fall Meeting, 2007

96. S.V. KALININ, *Electromechanical and Energy Dissipation Imaging of Polarization Dynamics in Ferroelectric PVDF Films*, APS March Meeting, 2007

97. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Microstructural Origins of Landauer Paradox*, International Conference for Young Scientists, NIMS, Japan, February 2007.

98. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Spatial and Energy Distribution of Nucleation Centers in Ferroelectrics*, Fundamental Physics of Ferroelectrics 2007, Williamsburg, VA, February 2007.

99. S.V. KALININ, *Electromechanics on the nanoscale: A new dimension in Scanning Probe Microscopy*, International Symposium on Scanning Probe Microscopy 14, Japan 2006.

100. S.V. KALININ, *Electromechanics on the Nanoscale: Imaging, Spectroscopy, and Control of Ferroelectric Materials and Devices*, Mat Sci. Tech., Fall 2006, Cincinnatti, OH.

101. S.V. KALININ et al. *Interaction of Order Parameters and Energy Dissipation in Strongly Correlated Oxides by Scanning Probe Microscopy*, Surface and Interface Science at the Atomic Scale, DOE Program Meeting, Warrenton, VA October 29, 2006

102. S.V. KALININ, *Electromechanics on the Nanoscale: a New Dimension in Scanning Probe Microscopy*, UK SPM 2006, UK, June 2006

103. **(plenary talk)** S.V. KALININ, *Electromechanical Phenomena on the Nanoscale: polarization dynamics, patterning, and molecular orientation imaging*, 12th US-Japan Seminar on Dielectric and Piezoelectric Ceramics, Annapolis, MD, November 6–9, 2005.

104. (**press luncheon talk**) SERGEI KALININ, BRIAN RODRIGUEZ, and ALEXEI GRUVERMAN, *Recreating Galvani's Experiment at the Nanoscale*, AVS 52nd international symposium and exposition press luncheon, Monday October 31, 2005, Boston, MA.

105. SERGEI V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins*, AMS Meeting, Knoxville, TN June 2005

106. S.V. KALININ, *Electromechanical Phenomena on the Nanoscale: from Perovskites to Proteins*, American Ceramics Society Meeting, April 13, 2005

107. S.V. KALININ, J. SHIN, A.P. BADDORF, R.J. HARRISON and V. MEUNIER, *Transport imaging in* 1D *structures: from nanowires to nanotubes*, Materials Research Society Spring Meeting, March 2005.

108. S.V. KALININ, V. MEUNIER, S. JESSE, J. SHIN, A.P. BADDORF, R.J. HARRISON, and D.B. GEOHEGAN, *Electronic Transport in Individual Carbon Nanotubes and Nanotube Networks by Scanning Probe Microscopy*, Microscopy and Microanalysis 2004, Savannah, Georgia, August 1-5, 2004

109. S.V. KALININ, J. SHIN, A.P. BADDORF, V. MEUNIER, and R.J. HARRISON, *Electronic properties of individual defects in carbon nanotubes and semiconductor nanowires by Scanning Probe Microscopy*, American Ceramics Society Meeting April 2004, Indianapolis, IN

Invited talks – Workshops and Tutorials

110. S.V. KALININ, *Ionic phenomena in condensed matter physics*, APS Workshop, Argonne, May 2018

111. S.V. KALININ, *Ionic phenomena in condensed matter physics*, ALS Workshop, Berkeley, CA January 2017

112. (**1 lecture, 50 min, workshop organizer**) S.V. KALININ, *Electrochemical Strain Microscopy*, ORNL ESM Workshop, September 2014

113. (**2 lectures, 50 min, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Imaging and Spectroscopic Modes*, ISAF-PFM School, March 2014

114. (**3 lectures, 50 min, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, ORNL PFM School, March 2013

115. (2 **tutorial**) S.V. KALININ, *Piezoresponse Force Microscopy and Spectroscopy*, MRS Fall Meeting, Boston November 2012

116. (**tutorial**) S.V. KALININ, *Emergent SPM Modes and their Application to Energy and Memory Materials*, ISAF-ECAPD, Aveiro July 2012

117. (**tutorial**) S.V. KALININ, *Piezoresponse Force Microscopy and Spectroscopy*, Nanomotion workshop at ISAF-ECAPD, Aveiro July 2012

118. (**tutorial**) S.V. KALININ, *Imaging energy materials by SPM*, ISAF meeting, Vancouver, July 2011.

119. (**tutorial**) S.V. KALININ, *Imaging energy materials by SPM*, MRS Spring meeting, 2011.

120. (**keynote**) S.V. KALININ, *Electrochemical Strain Microscopy – Probing Ionic Flows and Reactivity on the Nanoscale*, Vanderbilt University Nano day, October 27, 2010

121. S.V. KALININ, *Hidden Dimensions of Scanning Probe Microscopy*, AVS ASSD meeting, Albuquerque, October 2010

122. (**2 lectures, 50 min, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 9th PFM workshop and ISFD conference, Prague, Czech Republic, September 2010

123. (**3 lectures, 40 min, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 8th PFM workshop, Beijing, China, August 2010

124. S.V. KALININ, *Mapping defect dynamics by SPM*, Argonne workshop on defect control, July 2010

125. S.V. KALININ, *Spectroscopic Imaging of Polarization Dynamics in Ferroelectric Materials*, MRS 2009 Fall Meeting, Boston, MA

126. (**1 lectures, 1.5 hour, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 6th PFM workshop, ORNL, September 2009

127. (**3 lectures, 1 hour each, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 5th PFM workshop, NIMS, Japan, August 2009

128. (**3 lectures, 1 hour each, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, 4th PFM workshop and conference at Aveiro, Portugal, June 2009

129. S.V. KALININ, *Probing Thermodynamics and Kinetics of Phase Transitions and Order Parameter Dynamics in complex materials on a single defect level*, Stanford NSEC Workshop, April 2009

130. (**3 lectures, 1.5 hour each, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at CNMS User meeting, Oak Ridge, September 2008

131. (**6 lectures, 45 min. each, workshop co-organizer with Nava Setter**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at EPFL, Switzerland, June 2008

132. S.V. KALININ, *Probing Electromechanical Energy Conversion on the Nanoscale – Recent Progress and Limitations*, DARPA MTO workshop, San Francisco, March 2008.

133. S.V. KALININ, *Piezoresponse Force Microscopy of Nanoscale Ferroelectrics: Imaging, Modification, and Spectroscopy*, MRS 2007 Fall Meeting, Boston, MA

134. (**3 lectures, 1.5 hour each, workshop organizer**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Workshop at CNMS User meeting, Oak Ridge, October 2007

135. (**10 hour workshop**) S.V. KALININ, *Piezoresponse Force Microscopy: Theory, Instrumentation, and Applications*, Intel Corporation, San Jose, CA, August 24, 2006.

136. (**1 hour workshop**) S.V. KALININ, *Nanoelectromechanics of Piezoresponse Force Microscopy: Application to Biological and Macromolecular Systems*, APS March Meeting, DPOLY, 2007

137. (**2 hour workshop**) S.V. KALININ, *Recent Advances in Local Studies of Low-Dimensional Ferroelectrics*, NIMS, Japan, February 2007.

138. S.V. KALININ, *Local Probing of Polarization Dynamics in Low-Dimensional Ferroelectrics*, Meeting of the International Technology Roadmap for Semiconductors of the Emerging Research Materials Work Group on Dynamic Properties of Correlated Electron State Materials, Stanford University, Palo Alto, CA, November 15.

139. *Scanning Probe Microscopy of Nanoscale Electrostatic Properties of Ceramics*, Seminar and Workshop on Electrical Characterization Techniques by Scanning Probe Microscopy, April 25, 2000, Princeton Materials Institute, Princeton, NJ

Invited talks – Seminars

140. (**Pollak award lecture 3**) S.V. KALININ, *Scanning probe microscopy: exploring the information dimension (of electromechanics)*, Technion, Israel, March 15 2019

141. S.V. KALININ, *Deep learning in Scanning Transmission Electron Microscopy: from Physics to Atomic Manipulation*, Weitzmann Institute, Israel, March 14 2019

142. (**Pollak award lecture 2**) S.V. KALININ, *Coupling between ferroelectricity and electrochemistry*, Technion Israel, March 13 2019

143. S.V. KALININ, *Deep learning in Scanning Transmission Electron Microscopy: from Physics to Atomic Manipulation*, Tel Aviv University, Israel, March 12 2019

144. (**Pollak award lecture 1**) S.V. KALININ, *Deep learning in Scanning Transmission Electron Microscopy: from Physics to Atomic Manipulation*, Technion Israel, March 11 2019

145. S.V. KALININ, *Deep learning in Scanning Transmission Electron Microscopy: from Physics to Atomic Manipulation*, BNL, December 2018

146. S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, AIST (Suenaga group), Tsukuba, Japan, June 2018

147. S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, Hitachi Research Center, Tokyo, Japan, June 2018

148. S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, Tokyu University, Tokyo, June 2018

149. S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, Hitachi, Japan, June 2018

150. (**3 lectures**) S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, INL, 2018

151. S.V. KALININ, *Machine learning in STEM: from learning physics to atomic manipulation*, ISU, 2018

152. S.V. KALININ, *Ferroionic states in ferroelectric films*, Czech Academy of sciences, 2018

153. S.V. KALININ, *Imaging in information dimension: from materials design to atomic fabrication*, Ernst Ruska Institute, Juelich 2018

154. S.V. KALININ, *Imaging in information dimension: from materials design to atomic fabrication*, Zernicke lecture, Groeningen 2018

155. S.V. KALININ, *Ferroionic states in ferroelectric films*, NUS, Singapore 2017

156. S.V. KALININ, *Big Data in Atomically Resolved imaging: from Materials Genome to Atom by Atom Fabrication*, Imperial College, London, July 2017

157. S.V. KALININ, *Big Data in Atomically Resolved imaging: from Materials Genome to Atom by Atom Fabrication*, NIST, July 2017

158. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, U. Wash, January 2017

159. S.V. KALININ, *Big, Deep, and Smart Data in Imaging: from Full Information Capture to Atomic Manipulation*, CAMERA seminar, Berkeley, January 2017

160. S.V. KALININ, *Ferroionic states: coupling between surface electrochemical and bulk ferroelectric functionalities on the nanoscale*, UNL January 2017

161. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, GaTech, May 2016

162. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Stanford, May 2016

163. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, University of Maryland, May 2016

164. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Yale, April 2016

165. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, UPenn April 2016

166. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Drexel April 2015

167. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Sung Kyun Kwan University, February 2016

168. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, KAIST February 2016

169. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, SNU, February 2016

170. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, University of Tennessee-Knoxville, October 2015

171. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, BNL CFN Seminar, October 2015

172. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, BNL CFN Seminar, October 2015

173. S.V. KALININ, *Data Needs for Scientific Facilities: Electron and Scanning Probe Microscopies*, ASCR Workshop, September 2015

174. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, Northwestern University ChiMAD seminar, September 2015

175. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, ANL, September 2015

176. S.V. KALININ, *Electrochemistry on Nano- and Atomic Levels: Scanning Probe Microscopy Meets Deep Data*, UC Berkeley, September 2015

177. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, LBL, September 2015

178. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, Queens University Belfast, UK

179. S.V. KALININ, *Big, Deep, and Smart Data in Energy Materials Research: Atomic View on Materials Functionalities*, University College Dublin, Ireland

180. S.V. KALININ, *Imaging in information dimension*, Physical Sciences Directorate Advisory Meeting, Spring 2015

181. S.V. KALININ, *Deep Data in Scanning Probe Microscopy*, Materials Science Division Seminar Series, Spring 2014

182. S.V. KALININ, *Electrochemistry on the Nanoscale: The Force Dimension*, CalTech, January 9, 2014

183. S.V. KALININ, *Electrochemistry on the Nanoscale: The Force Dimension*, UPenn, December 2013

184. S.V. KALININ, *Electrochemistry on the Nanoscale: From Surface Ionic Transport to Chaos in Domain Switching*, Drexel, December 2013

185. S.V. KALININ, *Electrochemical Strain Microscopy of Li-ion and Oxygen conductors*, MPI Stuttgart (J. Maier group), October 2012

186. S.V. KALININ, *Electrochemical Strain Microscopy: How I stopped Doing Physics and Started to Love Electrochemistry*, Rutgers LSM symposium , February 2012

187. S.V. KALININ, *Materials Science on a Single Defect Level: Mapping Bias-induced Transformation in Ferroelectric and Electrochemical Systems*, University of Pennsylvania NBIC meeting, 2012

188. S.V. KALININ, *Electrochemical Strain Microscopy of Energy materials*, Caltech, May 2011

189. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, West Virginia U. March 2011

190. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, University of Pennsylvania, February 2011

191. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping ionic flows and electrochemical reactivity on the nanoscale*, Sandia National Laboratory, October 2010

192. S.V. Kalinin, *Electrochemical Strain Microscopy: mapping electrochemical reactivity at the 10 nm lenghtscale*, Heyrovsky institute, September 2010

193. S.V. Kalinin, *Electromechanics on the Nanoscale: from Ferroelectrics and Multiferroics to Energy Storage Materials*, Argonne, June 2010

194. S.V. Kalinin, *Novel Applications of Piezoresponse Force Microscopy: from Ferroelectrics and Multiferroics to Energy Storage Materials*, Simon Fraser University, April 2010

195. S.V. Kalinin, *Mapping* Li-*ion dynamics on the Nanoscale: Novel Applications of Piezoresponse Force Microscopy*, LBL, April 2010

196. S.V. Kalinin, *Mapping* Li-*ion dynamics on the Nanoscale: Novel Applications of Piezoresponse Force Microscopy*, IBM Almaden, April 2010

197. S.V. KALININ, *Spatially-resolved Spectroscopic Probing of Polarization Switching in Ferroelectrics and Multiferroics on a Single Defect Level,* Tokyo Institute of Technology, Japan August 2009.

198. S.V. KALININ, *Direct Imaging of Bias-Induced Phase Transitions on a Single Defect Level,* Argonne CNM, November 2008.

199. S.V. KALININ, *Direct Imaging of Phase Transformations and Energy Dissipation in Ferroelectric Materials on a Single Defect Level,* Penn State, June 2008.

200. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials,* RTW Aachen, June 2008

201. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials,* MPI Halle, June 2008

202. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials,* University of Geneva, Switzerland, May 2008

203. S.V. KALININ, *The Hunt for a Snark: Imaging Nucleation Centers in Ferroelectric Materials,* EPFL, Switzerland, May 2008

204. S.V. KALININ, *Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Physics Department, Vanderbilt University, April 2008

205. S.V. KALININ, *Direct Imaging of Nucleation Centers and Energy Dissipation in Ferroelectric Materials*, University of Minnesota, February 2008

206. S.V. KALININ, *Direct Imaging of Nucleation Centers and Energy Dissipation in Ferroelectric Materials,* Penn State, December 2007.

207. S.V. KALININ, *The Hunt for the Snark: Microstructural Origins of Landauer Paradox*, Argonne User Meeting, May 2007.

208. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Physics Department, Vanderbilt University, April 2007

209. S.V. KALININ, *Electromechanics on the Nanoscale: A New Dimension in Scanning Probe Microscopy of Biomaterials*, Biology Department, Vanderbilt University, April 2007

210. S.V. KALININ, *Electromechanics on the Nanoscale – A New Dimension in the Scanning Probe Microscopy*, BioSecurity and Nanoscience Directorate, Lawrence Livermore National Laboratory, April 2007

211. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, IBM-Almaden, April 2007

212. S.V. KALININ, *The Hunt for the Snark: Real-Space Imaging of Nucleation Centers and Energy Dissipation in Ferroelectrics*, Molecular Foundry Seminar, Lawrence Berkeley Laboratory, April 2007

213. S.V. KALININ, *The Hunt for the Snark: Real Space Imaging of Microstructural Origins of Landauer Paradox,* Department of Materials Science, University of Tokyo, Japan, December 2006.

214. S.V. KALININ, *Electromechanics on the nanoscale: A new dimension in Scanning Probe Microscopy,* NCSU NIRT Meeting, September 2006.

215. S.V. KALININ, *Electromechanical Imaging by Scanning Probe Microscopy: Galvani's experiment on the Nanoscale*, South Carolina Bioengineering School, Clemson University, Greenville, SC, June 16, 2006

216. S.V. KALININ, *Electromechanics on the Nanoscale: a New Dimension in Scanning Probe Microscopy*, Leeds University, June 2006.

217. S.V. KALININ, *Electromechanics on the Nanoscale: Imaging, Spectroscopy, and Control of Ferroelectric Materials and Devices*, University of Nebraska-Lincoln, April 28, 2006

218. S.V. KALININ, *A Biased View on the Nanoworld: Transport and Electromechanics on the Nanoscale*, University of Nebraska-Lincoln, April 27, 2006

219. S.V. KALININ, *Electromechanical Imaging of Calcified and Connective Tissues*, University of Pennsylvania, Dental School, January 2006

220. S.V. KALININ, *Electromechanical Imaging of Calcified and Connective Tissues: from Bones to Butterflies*, University of Pennsylvania, Dept. Mat. Sci., January 2006

221. S.V. KALININ, *A Biased View on the Nanoworld: Electromechanical Imaging of Perovskites and Proteins, Brown University*, Department of Mechanical Engineering, December 2005.

222. S.V. KALININ, *Nanoelectromechanical Imaging: From Bone to Ceramics*, Tufts University, Departmen of Mechanical Engineering, November 10, 2005

223. S.V. KALININ, *A Biased View on the Nanoworld: From Complex Oxides to Biosystems*, Suffolk University, Fall 2005

224. S.V. KALININ, *Probing Nanoscale Electromechanical Phenomena in Inorganic and Biological Systems*, Asylum Research, January 2006

225. S.V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins*, MIT, Boston, MA, April 8, 2005

226. S.V. KALININ, *Bioelectromechanical Imaging by Scanning Probe Microscopy: Repeating Galvani's Experiment on the Nanoscale*, Rutgers University, Piscataway, NJ, April 6, 2005

227. S.V. KALININ, *A Biased View on the Nanoworld: From Perovskites to Proteins and Back*, Drexel University, Philadelphia, PA, April 5, 2005

228. S.V. KALININ, *Nanoelectromechanics of Scanning Probe Microscopy: From Perovskites to Proteins and Back*, University of Pennsylvania, Philadelphia, PA, April 4, 2005

229. S.V. KALININ, *Nanoelectromechanics of Scanning Probe Microscopy: from Perovskites to Proteins*, North Carolina State University, Raleigh, NC, November 12, 2005

230. S.V. KALININ, *Local mechanical and electromechanical behavior by SPM: Repeating Galvani's experiment on molecular level*, ORNL Life Sciences Division Seminar, November 8, 2004

231. S.V. KALININ, *A Biased View of the Nanoworld: Transport, Defects and Ferroelectrics*, National Institute of Standards and Technology, April 2004

232. *A Biased View on the Nanoworld: Nanoscale Electric Phenomena by Scanning Probe Microscopy*, Georgia Institute of Technology, Materials Science Department, April 2003

233. *Nanoscale Electric Phenomena by Scanning Probe Microscopy*, Oak Ridge National Laboratory, Solid State Division, February 2002

234. *Nanoscale Electric Phenomena by Scanning Probe Microscopy,* Lawrence Livermore National Laboratory, February 2002

235. *Nanoscale Electric Phenomena by Scanning Probe Microscopy,* North Carolina State University, Physics Department, February 2002

236. Nanoscale Phenomena in Ferroelectric Oxides, Cornell University, Applied Engineering Physics Department, Craighead group, January 2002