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### **Personal information**

Date and place of birth: July 16 1970, Kiev Ukraine.

Citizenship: US.

Languages: Russian, English.

### **Degrees**

Ph.D., Physics, University of Chicago, August 1996.

B.S. Summa cum laude, Physics, Indiana University, Bloomington, Indiana, 1992.

### **Experience**

**Visiting Assistant Professor.** Physics Department, Georgetown University, 2007–present.

**Research Scientist,** Department of Earth Atmospheric and Planetary Science, Massachusetts Institute of Technology, 2005–2007.

**Postdoctoral Fellow,** Department of Earth Atmospheric and Planetary Science, Massachusetts Institute of Technology, 2002–2005.

**Postdoctoral Fellow,** Department of Physics, Northeastern University, 2001–2002.

**National Research Council Postdoctoral Fellow,** National Institute of Standards and Technology, Metallurgy Division, 1999–2001.

**Postdoctoral Fellow,** Institute for Theoretical Physics, University of California, Santa Barbara, 1996–1999.

### **Honors**

Deans list Indiana University, 1990–1992.

Hugh Brown Memorial Scholarship, 1991.

Honors Division Independent Summer Research Grant, 1992.

First place at the Moscow Math Olympiad, 1989 (similar to the Putnam Competition).

**Experience**

Visiting Assistant Professor, Georgetown University, 2005 – 2007

*Fluid flow through polymer gels* In an effort to understand the properties of cytoplasm we experimentally study fluid flow through cross-linked polymer gels. We aim to understand a peculiar absence of the linear response regime in soft gels which is tentatively attributed to the partial collapse of the polymer in the crosslinker-poor regions. With J. §. Urbach and D. L. Blair.

Research Scientist, MIT, 2005 – 2007

*Stochastic modeling of the microtubule tip dynamics* Constructed and analyzed a stochastic model for the dynamics of the microtubule tips. Cracks play an essential role in explaining the bistable dynamical behavior exhibited by microtubules. With L. A. Mirny.

*Onset of granular flow driven by a viscous fluid: Theory* Introduced a model of the stochastic onset of granular flow. The crucial features of the onset phenomenon stem from the evolving granular surface packing driven by granular flow.

*Onset of granular flow driven by a viscous fluid: Experiment* Analyzed an experiment in which surficial granular flow is imaged via an index-matching technique. Determined the threshold condition for flow and the granular flow rule above threshold forcing. With A. Kudrolli and A. Orpe (Clark)

*Channelization driven by subsurface flow: Field measurements* Performed topographic and hydrologic measurements in the naturally occurring sapping canyons in FL. The data will test theories of channel network evolution and sediment motion. With D. C. Mohrig (U. of Texas) and D. H. Rothman.

Postdoctoral Fellow, MIT, 2002 - 2005

*Channelization driven by subsurface flow: Data analysis* Explained regimes of granular motion in a table-top experiment in which subsurface water flow erodes a pile of glass beads. Verified the total shear stress on the bed controls the onset of erosion. Introduced the concept of a generalized Shields number which includes gravitational forces.

*Channelization driven by subsurface flow: Model of channel evolution* Used the time-resolved experimental height data obtained via laser-aided imaging to construct an effective theory of channel evolution. The theory has far reaching consequences for a broad range of problems in geomorphology. With A. Kudrolli (Clark U.) and D. H. Rothman.

Postdoctoral Fellow, Northeastern University, 2001 – 2002.

- Coarse grained model of dynamic fracture instability* Analyzed dynamic fracture instability within a coarse grained in a theory of mode III fracture. Within our model, the crack undergoes a tip splitting instability at a critical speed dependent on the dissipation in the bulk. With A. Karma.
- Dynamics of Ising interfaces* Derived an intuitive representation of kinetic Ising interfaces and obtained an equation of motion for the density of kinks. The formalism is extensible to more complex situations such as the presence of impurities. With D. J. Srolovitz (Princeton).

National Research Council Postdoc, National Institute of Standards and Technology, Gaithersburg, Maryland, 1999 – 2001.

- Diffusion in a lamellar system with screw dislocations* Explained the origin of super-diffusion in a lamellar phase with screw dislocations. Given the density of positive and negative screw dislocations, we analytically calculated the statistics of transport. With V. Gurarie (U. of Colorado).
- Premelting of grain boundaries* Explored the behavior of grain boundaries near the melting temperature using a modification of the traditional phase field model of solidification which includes the effect of crystal orientation in the solid phase. Found that high angle grain boundaries can undergo a discontinuous premelting transition at a temperature below the melting point.
- Dynamics of crystalline grains* Performed a matched asymptotic expansion of a phase field model of grain boundary dynamics. In this model, a degree of crystallinity order parameter is coupled to the crystal orientation order parameter. The resulting Allen-Cahn type evolution equation for the orientation order parameter is singular and must be interpreted within an extended gradient framework. The model predicts grain rotation. With J. A. Warren, R. Kobayashi and G. McFadden.

Postdoctoral Fellow, Institute for Theoretical Physics, University of California, Santa Barbara, 1996 – 1999.

- Expanding hole in a viscoplastic medium* Studied a simple situation in which both stress concentration as well as inhomogeneous plastic flow occur. Found that conclusions of conventional plasticity emerge in a static limit only for a certain range of parameters of the dynamic plasticity model. The very existence of the yield surface, for example, depends on a basic parameter which measures sensitivity of plastic flow to applied stress. With J. S. Langer.
- Dynamics of elastic boundaries* Studied motion of elastic boundaries such as cracks or earthquake faults subject to simple physically motivated boundary conditions. Found that under quite general assumptions travelling kinks exist on the boundary. If the boundary is disordered, its threshold dynamics is governed by the creation and annihilation of these kink solutions. With S. Ramanathan.
- The dynamic ductile to brittle transition* Constructed a one dimensional model of decohesion. Found that, if the decohering membrane obeys the dynamic viscoplasticity constitutive relations, there is a sharp transition as a function of the yield stress. With J. S. Langer.
- Plasticity of amorphous materials* Developed a phenomenological model of plasticity based on the notion of generalized defects. The model incorporates strain hardening and plastic yield stress observed in molecular dynamics simulations and is well suited to fully dynamic calculations in fracture mechanics. With M. L. Falk and J. S. Langer.
- Fracture stability* Numerically solved the singular integral equation which determines fracture stability of a crack described by a cohesive-zone model. Established important limitations of cohesive-zone models. Defined classes of fracture mechanics problems which may be addressed with a cohesive-zone model. With J. S. Langer.

Graduate student, University of Chicago, 1992 – 1996.

- Strongly deformed thin elastic plates and shells* Performed computer simulations of thin elastic sheets distorted by external forces and identified a novel ridge singularity. Determined scaling properties of an idealized ridge singularity in the limit of the vanishing sheet thickness by an energy scaling argument and an asymptotic analysis of von Kármán thin plate equations. Qualitatively established the degree to which ridges in a crumpled sheets may differ from an idealized ridge.
- Acoustic emission from a crumpled elastic sheet* Analyzed noise emitted from crumpled mylar sheets under slow large scale deformation. The sound consisted of well-defined clicks with stretched exponential relaxation and a power law distribution of amplitudes. With E. M. Kramer.
- Surface Energy of Dipolar Crystals* Using Ewald summation methods as well as continuum electrostatics found that surface energies of dipolar crystals exhibit cusps with novel logarithmic behavior. These results should be relevant to determination of droplet dynamics in Electrorheological Fluids.
- Shape of Dielectric Fluid Drop in Electric Field* Established that dielectric fluid drops undergo a shape transition in an electric field. Found that sharp conical vertices at which the electric field diverges algebraically develop above a threshold field. With Hao Li and Thomas Halsey.

## References

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**Publications**

- A. E. Lobkovsky and L. A. Mirny, “Stochastic cracks: the dynamic instability of microtubules,” in preparation.
- A. E. Lobkovsky, D. H. Rothman and D. C. Mohrig, “Longitudinal profile of marginally stable channels driven by subsurface flows,” in preparation.
- A. E. Lobkovsky, A. V. Orpe, R. Molloy, A. Kudrolli and D. H. Rothman, “Erosion of a granular bed driven by laminar fluid flow,” *J. Fluid Mech.*, under review.
- A. E. Lobkovsky, B. E. Smith, A. Kudrolli, D. C. Mohrig and D. H. Rothman, “Erosive dynamics of channels incised by subsurface water flow,” *J. Geophys. Res.*, **112**, p. F03S12 (2007).
- M. R. Horton, S. Manley, S. R. Arevalo, A. E. Lobkovsky, A. P. Gast, “Crystalline protein domains and lipid bilayer vesicle shape transformations,” *J. Phys. Chem. B*, **111** (4), p. 880 (2007).
- M. Upmanyu, D. J. Srolovitz, A. E. Lobkovsky, J. A. Warren and W. C. Carter, “Simultaneous grain boundary migration and grain rotation,” *Acta Materialia*, **54**, p. 1707 (2006)
- A. Karma and A. E. Lobkovsky, “Low-temperature dynamics of kinks on Ising interfaces,” *Phys. Rev. E*, **71**, no. 3, p. 36114 (2005).
- A. E. Lobkovsky, B. Jensen, A. Kudrolli and D. H. Rothman, “Threshold phenomena in erosion driven by subsurface flow,” *J. Geophys. Res.* **109**, p. F04010 (2004).
- A. E. Lobkovsky and A. Karma, “Unsteady Crack Motion and Branching in a Phase-Field Model of Brittle Fracture,” *Phys. Rev. Lett.* **92**, no. 24, p. 245510 (2004).
- A. E. Lobkovsky, A. Karma, M. I. Mendeleev, M. Haataja and D. J. Srolovitz, “Grain shape, grain boundary mobility and the Herring relation,” *Acta Materialia*, **52**, no. 2, p. 285 (2004).
- J. A. Warren, R. Kobayashi, A. E. Lobkovsky and W. C. Carter, “Extending phase field models of solidification to polycrystalline materials,” *Acta Materialia* **51**, no. 20, p. 6035 (2003)
- V. Gurarie and A. E. Lobkovsky, “Tracer diffusion in a dislocated lamellar system,” *Phys. Rev. Lett.* **88**, 178301 (2002).
- A. E. Lobkovsky and J. A. Warren, “Phase field model of premelting of grain boundaries” *Physica D* **164**, no. (3-4) p. 202 (2002).
- A. E. Lobkovsky and J. A. Warren. “Sharp interface limit of a phase-field model of crystal grains,” *Phys. Rev. E* **6305**, p. 1605 (2001).

- A. E. Lobkovsky and J. A. Warren, "Phase-field model of crystal grains," *J. Cryst. Growth*, **225**, p. 282 (2001).
- A. E. Lobkovsky and J. A. Warren, "A Phase Field Model of the Premelting of Grain Boundaries in Pure Materials," *MRS Proceedings v. 652* (2000).
- J. S. Langer and A. E. Lobkovsky, "Rate-and-state theory of plastic deformation near a circular hole," *Phys. Rev. E*, **60**, p. 6978 (1999).
- A. E. Lobkovsky and J. S. Langer, "Dynamic ductile to brittle transition in a one-dimensional model of viscoplasticity," *Phys. Rev. E* **58**, p. 1568 (1998).
- A. E. Lobkovsky and J. S. Langer, "Critical Examination of Cohesive-zone Models in the Theory of Dynamic Fracture," *J. Mech. Phys. Solids* **46**, p. 1521 (1998).
- A. E. Lobkovsky and T. A. Witten, "Properties of Ridges in Elastic Membranes," *Phys. Rev. E* **55**, p. 1577 (1997).
- A. E. Lobkovsky, "Boundary Layer Analysis of the Ridge Singularity in a Thin Plate," *Phys. Rev. E* **53**, p. 3750 (1996).
- E. M. Kramer and A. E. Lobkovsky, "Universal Power Law in the Noise from a Crumpled Elastic Sheet," *Phys. Rev. E* **53**, p. 1465 (1996).
- A. E. Lobkovsky, S. Gentges, H. Li, D. Morse and T. A. Witten, "Stretching Ridges in Crumpled Sheets," *Science* **270**, p. 1482 (1995).
- A. E. Lobkovsky and T. C. Halsey, "Surface Energy Anisotropy for Dipolar Lattices," *J. Chem Phys.*, **103**, p. 3737 (1995).
- H. Li, T. C. Halsey and A. E. Lobkovsky, "Singular Shape of a Fluid Drop in an Electric or Magnetic Field," *Europhys. Lett.*, **27**, p. 575 (1994).

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