# Dervis C. Vural, Assistant Professor

Department of Physics, **University of Notre Dame**
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## Research Interests

Many-body systems where interactions and disorder plays an important role. Condensed Matter and Quantum Many-Body Theory, Soft Matter, Population and Evolutionary Dynamics, Complex Network Theory, Dynamical Systems, Swarm Dynamics and Active Matter.

## Education

**University of Illinois at Urbana-Champaign**, Urbana-Champaign, IL, USA

Ph.D., Physics, 2011

- Thesis Topic: *Universal Sound Attenuation in Disordered Solids*
- Adviser: Professor Anthony J. Leggett
- Area of Study: Theoretical Condensed Matter

M.S., Physics, 2004

- Adviser: Professor Anthony J. Leggett
- Area of Study: Theoretical Condensed Matter Physics

**Middle East Technical University**, Ankara, Turkey

B.S., Physics, 2002

- Special (Honors) Program, *Magna cum Laude*.
- Undergraduate research on Carbon Nano Structures.

## Academic Appointments

**University of Notre Dame**, Assistant Professor
Department of Physics 2014-present

**Yale University**, Postdoctoral Researcher
Department of Molecular Cellular and Developmental Biology 2014

**Harvard University**, Postdoctoral Researcher
School of Engineering and Applied Sciences 2011-2014

**University of Illinois at Urbana-Champaign**, Postdoctoral Researcher
Department of Physics 2011-2012

**University of Illinois at Urbana-Champaign**, Research Assistant
Department of Physics 2002-2011

## Journal Publications

N. Rupprecht, D.C. Vural, Collective Motion of Predictive Swarms, PLoS ONE, 12(10) (2017), e0186785

V. Nguyen, D.C. Vural, Morphological Inversion of Complex Diffusion, Physical Review E, 96.3 (2017): 032314

G. Forte, D.C. Vural, Iterative Control Strategies for Nonlinear Systems, Physical Review E, 96.1 (2017): 012102

S. Ghonge, D.C. Vural, Inferring Network Structure from Cascades, Physical Review E, 96.1 (2017): 012319

A. Acun, D.C. Vural, P. Zorlutuna, A Tissue Engineered Model of Aging: Interdependence and Cooperative Effects in Failing Tissues, Nature, Scientific Reports, 7.1 (2017): 5051

I.U. Can, N. Nagarajan, D.C. Vural, P. Zorlutuna. "Muscle-Cell-Based Living Diodes", Advanced Biosystems, 1600035 (2017) [**Cover Article**]

D.C. Vural, A. Isaakov, L. Mahadevan. "Organization and Control of Evolving Interdependent Populations", *Proceedings of the Royal Society Interface*, 12: 20150044 (2015)

D.C. Vural, G. Morrison, Mahadevan. "Aging in complex interdependency networks." Physical Review E 89.2 : 022811 (2014).

A.J. Leggett, D.C. Vural, The "Tunnelling Two-Level Systems" Model of the Low-Temperature Properties of Glasses: Are "Smoking-Gun" Tests Possible?, *The Journal of Physical Chemistry B* (2013).

D.C. Vural, A.J. Leggett, Universal sound absorption in amorphous solids: A Theory of Elastically Coupled Generic Blocks *Journal of Non-Crystaline Solids* 357(11), 3528-3537 (2011),

D.C. Vural, When Models Interact with their Subjects: The Dynamics of Model-Aware Systems. *PLoS ONE* 6(6): e20721 (2011)

T. Achler, D.C. Vural, E. Amir. Counting Objects with Biologically Inspired Regulatory-Feedback Networks, Neural Networks IJCNN, IEEE Proceedings, 5178976, pp. 36-40 (2009)

S. Erkoc, D.C Vural, Molecular-Dynamics Simulations of Carbon Nano-Cage Structures: Nanoballs and Nanotoroids. *International Journal of Modern Physics*. 12(5) 685-690 (2001)

## Invited Talks

- "Universal Properties of Disordered Materials", Workshop on Large Fluctuations and Collective Phenomena in Disordered Materials, May 16-19, 2011, University of Illinois at Urbana Champaign, IL

- "Evolution of Interdependence and Aging", NSF Workshop: Biological and Physical Principles of Mammalian Aging, May 14-16, 2014, Arlington, VA
- "How things Fall Apart", Colloquium: Indiana University-Purdue University at Indianapolis, November 5, 2015, Indianapolis, IN
- "Statistical Mechanics of Aging and Death", Colloquium: Western Michigan University, December 7, 2015, Kalamazoo, MI
- "Beyond Cellular Aging: How Complex Structures Fail", NSF Workshop: Physics of Wear, Tear, Aging and Failure in Living and Non-May, 6-8, 2015, Living Systems, Tysons Corner, VA
- "Filling the Gap Between Cell Damage and Tissue Failure', Aging and Failure in Biological, Physical and Engineered Systems, May 15-18, 2016
- "Evolutionary Control Theory", DARPA, Biological Technology Office / Biological Control Program Kickoff, December 1, 2016, Booz Allen Hamilton One Preserve facility, Rockville, MD.

## Service

- Organizer and chair in NSF funded Workshop on Aging and Failure in Biological, Physical and Engineered Systems", May 15-18, 2016
- Chair APS Prairie Section. "Biological and Complex Systems".

## Research Support

- DARPA HR0011-16-C-0062 01/01/2016 - 12/31/2016
  Biological Technology Office $338,682
  "Ecological & Biosocial Control: Directing Coevolving Networks"
  **Role**: Sole PI
- NSF PHY-1607643 6/15/2016 - 5/31/2017
  Physics of Living Systems $31,442
  "Workshop on Aging and Failure in Biological, Physical and Engineered Systems"
  **Role:** PI

## Outreach and Synergistic Activities

- Science Fair Judge, Marian High School, South Bend, IN
- Public Lecture in "Our Universe Revealed" Series.
- Graduated from the Piano Department at Bilkent University, Turkey. Number of awards from compositions and concerts involving algorithmic composing and wave design. Visual and acoustic experiments available at www.dcvural.info