

**Crystal Cooper**  
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### **Education**

American University, Washington, D.C, Ph.D. Physics 8/1997  
Honors: Special Opportunity Fellow, NIH IRTA Summer Fellow

New York Institute of Technology B.S. Physics Cum Laude 6/1985  
Honors: Dean's List, Harvey Pollack Scholarship

### **Research Interests**

- Reaction-Diffusion Equations in Biological Pattern Formation
- Theoretical Nonlinear Neurodynamics
- Nephron Dynamics and Morphogenesis
- Focal Segmental Glomerulosclerosis
- Theoretical and Experimental Chaos
- Computational Physics
- Parallel Processing

### **Research Experience**

Research Associate, PI Nonlinear Dynamics Lab, University of Maryland, Institute For Physical Science and Technology, 10/2001 – present

Projects:

- Supervisor of undergraduate research chaotic behavior of coin flips
- Chaotic behavior of a particle in a cone
- Chaotic behavior in an oscillatory infrared diode circuit
- Chaos in thin vibrating plates in conjunction with colleague at NASA
- Nonlinear neurodynamic models: strange and point attractors in the brain, ionic diffusion of neurotransmitters and modulators, 3D neuronal dynamics
- Kidney studies: mesoderm and morphogen dynamics, focal segmental glomerulosclerosis

Assistant Professor of Physics, PI, Physics Nonlinear Dynamics Lab, Buffalo State College, 8/2000 – 8/2001

Projects:

- Design and Implementation of a fiber optic detector for chaotic plate project in conjunction with colleague at NASA
- Parallel processing Appleseed and Beowulf projects for lab and computational group (HiPerc) use
- Quantum Computing Study Group
- Supervisor of student project for voice recognition guitar amplifier
- Supervisor of student projects in fiber optics, electronics, and robotics

PI, Physics Nonlinear Dynamics Lab, American University, 1/98 – 8/2000

- Design and implementation of studies in chaos in circuits and plates
- Proposal writing
- Built Parallel processing Appleseed supercomputer

Doctoral Research, Physics Department, American University

- Reaction-Diffusion equations in biological pattern formation, Computational Physics; Chaos, Fractals 6/1985

Undergraduate Research, Physics Department, New York Institute of Technology, 1984-5

- Chaos in fluid flow; hologram production

### **Teaching Experience**

Lecturer, Physics department, University of Maryland, spring semester 2002-present

- Duties include directing independent study for undergraduates in projects for NASA and nonlinear dynamics lab
- Taught in lower level physics course for non-majors spring 2002

Assistant Professor of Physics, Buffalo State College, 8/2000 – 8/2001

- Duties included teaching in both lower level and upper level undergraduate physics courses

Instructor, Independent Study, American University 1/2000 - 6/2000

- Duties included training undergraduates in the areas of computer repair and construction, electronics, Html design and implementation

Adjunct Assistant Professor, Trinity College, 8/99 – 12/99

- Duties included teaching an introductory computer course for the Macintosh platform

### **University and Community Services**

University of Maryland

- Participation, along with 3 undergraduate lab assistants, at 2003 Undergraduate Research Day
- Computer and networking services to teachers at Alice Deal Junior High School in Washington D.C.
- Currently planning, along with three public school teachers, K-12 summer 2004 Physics Education Information Technology Conference

Buffalo State College 8/2000 – 8/2001

- Established joint colloquium program for Supercomputing Group
- Establishment of HIPERC Center For Supercomputing in conjunction with math and philosophy faculty
- Use of research connections at NASA to obtain jobs and internships for Buffalo State College students
- Participant in McNair program for underprivileged students
- Participation, along with 11 lab assistants, in 2001 Student Research and Creativity Celebration
- Equipment trips: Initiated participation in NASA Stevenson Wilder program

American University 1/1997 – 6/2000

- Trained public school teacher and senior citizen in computer usage, repair, and construction
- Equipment trips: Initiated participation in NASA Stevenson Wilder program, and with the various agencies of GSA, Fort Mead, NIST, and the Smithsonian. Made several trips to procure donated equipment.

### **Other Work Experience**

NASA Goddard Space Flight Center Contractor 11/01 – present

- DAQ programming using Labview for mission critical testing, equipment recommendations and testing in support of program, personnel supervision and training in support of program, web and database design, programming, and development

Freelance Web Programmer, 4/99 – present

- Freelance web programming, including HTML, Java, Cold Fusion, Perl, graphics, databases

Computer Consultant/Trainer, Physics Department American University, 1/97 – 6/2000

- Software and hardware recommendation, installation; HTML design, development, maintenance and training; Internet programming, database design and implementation for MS Access; Visual Basic, Cold Fusion; Netscape Enterprise administration, NT and Linux

administration, general troubleshooting; training staff and students in computers and web design

Java Programmer, Systems Planning Corporation, 4/96 – 11/98

- Java, HTML, Perl, Javascript, some Oracle and SQL Server
  - Microsoft Visual Interdev for Asp, NT web administration, Cold Fusion
- Platforms: Macintosh, Windows NT/95, Linux
- Systems Planning Corporation Data Analyst/Programmer 10/95 - 3/96
- Data analysis, Pascal, wrote small dispatch program using SQL, Visual Foxpro, Visual Basic

Consultant, Logistics Management Institute, 11/94 - 6/95

- Duties included advanced statistical and graphical analysis, technical writing, C++ programming

Computer Programmer NIH, 6/1994 - 9/1994, IRTA Summer Fellow

- Converted RTE-A HP Fortran programs to HP Unix system for a laser lab
- Secondary duties included machining and laser alignment

Patent Searcher, part-time freelance, optical, electrical, mechanical 12/93 - 4/94

- Performed validity, novelty, and patentability searches; wrote technical reports

Computer Programmer NASA Goddard, summer 1989

- Converted spreadsheet to FORTRAN code

Patent Examiner, U.S. Patent and Trademark Office, optics specialty, 8/85 - 8/88

- Examined applications for compliance with patent law
- Wrote technical reports, Conducted interviews

### **Grants Awarded**

Bookstore Allocation Grant, PI, 2k, Fall 2000

Joint TIP award with members of HIPERC group, 3k, Spring 2001

Joint Research Incentive award with members of HIPERC group, 15k, Spring 2001

NASA Parts Reliability Initiative Grant, PI, 25k, Summer 2001

### **Pending Grants**

Research Experiences For Undergraduates (REU), PI, NSF, \$400,080

Chaotic Dynamics In Thin Plates, PI, NSF, \$551,207

Optical Communication Using an Oscillatory Chaotic Diode Circuit, PI, Air Force, \$281,408

Mesoderm and Morphogen Dynamics in Pronephric Nephron Formation, PI, NSF, \$300k

Pattern Formation and Chaotic Attractors in State Transitions by Synaptic Changes in Mesoscopic Neuron Populations, PI, NSF, \$300k

### **Publications**

1. C. Cooper, Chaotic behavior in coupled Gierer-Meinhardt equations, Computers and Graphics, Vol. 25 #1
2. C. Cooper, K. Conway, On the dynamics of morphogen concentrations in the developing eye of a *Xenopus Laevis* frog, Journal of Theoretical Biology. Submitted.
3. C. Cooper, Experimental observation and characterization of chaotic properties in a driven infrared diode circuit. Chaos, Solitons, and Fractals. Submitted.
4. S. Hudak, P. Khetarpal, C. Mass, A. Schmidt, C. Cooper, Coins, Chaos, and Con Artists: The Length of Games, Computers and Graphics, Pending.
5. P. Khetarpal, S. Hudak, C. Mass, A. Schmidt, C. Cooper, Coins, Chaos, and Con Artists: A Close Look at Individual Games, Computers and Graphics, Pending.
6. C. Cooper, H. Leidecker, Chaotic Dynamics in Thin Vibrating Plates, Pending.

### **Achievements**

Sigma Pi Sigma Physics Honor Society

### **Memberships**

American Physical Society

IEEE

High Performance Computing Group (HIPERC) Buffalo State College

### **References**

Dr. Kevin Conway (kevin.conway@verizon.net) 301-330-4311

Dr. Julio Friedmann, Dept. of Geology, University of Maryland College Park (juliof@geol.umd.edu), 301-405-4087

Dr. Markus Luty, Dept. of Physics, University of Maryland College Park (luty@umd.edu), 301-405-6018

Dr. James A. Yorke, Dept. of Mathematics, Physics, University of Maryland College Park (yorke@ipst.umd.edu), 301-405-4875