Andrew J. Osgood

San Diego, CA drew@andrewosgood.com

I specialize in bringing order and creative data-driven scientific solutions to unstructured problems throughout a wide range of both DoD and scientific areas, thanks to more than a decade of experience in research and analysis.

What that means is that I've worked in a lab, studying and manipulating individual atoms and molecules at temperatures from near absolute zero to hundreds of degrees, in vacuum conditions cleaner than any bit of outer space from here to moon and beyond. I've developed and fabricated experiments that took months to design, and weeks bent over a bench to build, only to watch it fail within moments of testing on an apparatus I helped create. Then I've done it again and again and again, correcting weaknesses and flaws until it finally worked. I've written and published papers based on those successes, and failures. I've remained dedicated to projects through the tough times when years of results were invalidated, labs were flooded, and collaborators stopped collaborating. I've seen those seemingly impossible projects through to fruition.

I've also worked in offices, on ships, in tents, and out of various militarty bases around the world on concerns and issues that the Navy and Marine Corps often has trouble defining. I've walked into the Pentagon with no more than a few months' experience and briefed a two-star admiral on a project I had only recently taken over, resulting in crucial changes to how people thought and talked about the issue. I've been a part of team studies involving more than twenty other analysts, and also directed a few smaller projects on my own that help inform billion-dollar acquisition decisions. I've driven ten hours through the night to an unknown destination so I could ride a hovercraft to an amphibious ship to collect and record operational data for an unknown length of time. I've traveled to various commands around the world to talk to and interview everyone from enlisted to flag level, contractors to SES, just so I could learn enough about a topic to ask the right questions. I've worked directly with a Navy command for a two-star admiral, acting as objective advisor and analyst, and as just another seat in a three number Ncode. I've designed data collection, reconstruction, and analysis plans for multi-national exercises whose results are reported to the CNO. I proposed, organized, designed, and directed a multi-command collaboration for the operational test and evaluation of aging systems to determine future concepts of employment.

I started with no appreciable experience in this field, and worked through on-the-job experience and self-directed training to become a subject matter expert in fewer than two years. I believe I can do a little bit of anything, but within a short amount of time, can learn to do a lot, better.

Experience

DOD – related

CNA Field Analyst to NMAWC

NMAWC (Naval Mine and Anti-Submarine Warfare Command) - San Diego, CA CNA (Center for Naval Analyses)

Produced flag-level, data-driven, objective analytical products focused on mine and undersea warfare and countermeasures, operations research and analysis, and ship and shore-side exercise support

- Developed and executed systems testing and CONOP/CONEMP validation events with program-level influence
- Led data collection, reconstruction and analysis for force-level assessments
- Initiated major revisions of reconstruction and assessment methodologies
- Developed proposals for major Navy-funded CNA studies
- US DOD Security Clearance

Research Scientist

CNA - Alexandria, VA

Conducted objective independent and group analytical projects for the US Navy and Marine Corps including:

- Naval aviation reserve recapitalization helped determine cost-effective recapitalization strategies
- Major naval weapons systems AoA developed and evaluated complex system comparison matrices as a fundamental step in the acquisition process
- Combat logistics force efficiency and use found and documented potential efficiencies through data base management and analyses
- Operations analyses embarked during operations to gather data and observations for force-flow studies

Research

Graduate Research Assistant

Rice University

- Developed new techniques, experiments, theories, and research tracks for completely new nanoscale surface systems
- Investigated aspects of nanotechnology, including the novel Nanocar, fullerenes, nanotubes, SAMs, and dynamic single molecule devices
- Developed an aptitude for scanning probe microscopy, ultra high vacuum surface science tools, and chemical self-assembly
- Performed data and image analysis/processing with MATLAB, WSxM, WinSTM, XPM Pro, and other software
- Supervised research of beginning graduate students and undergraduates

Undergraduate Research Fellow

Princeton Plasma Physics Laboratory - Princeton, NJ

- Directed, and ran simulations for the National Spherical Torus Experiment
- Edited and wrote code in Fortran and C++ for simulation software
- Organized, interpreted, and presented findings to committee

June 2008 - August 2010

August 2010 - Current

2002 - 2008

2001

Writing / Teaching

Workshop Instructor

Rice University - Houston, TX

Led workshops and taught introductory vector math to undergraduate physics students

Tutor, Mentor, Assistant

Muhlenberg College - Allentown, PA

- Assessed students' writing problems and difficulties and devised both immediate and long-term solutions
- Worked with professors to develop first-year class curricula
- Ran group workshops and private sessions to help cultivate better writing technique and ability

Promotional Copywriter

Harcourt Health Sciences / W. B Saunders - Philadelphia, PA

- Wrote original copy and edited past copy for promotional materials
- Researched and evaluated unpublished health-sciences titles for inclusion in future promotions

Teaching Assistant	1999 - 2000
Muhlenberg College - Allentown, PA	

- Ran introductory undergraduate physics lab sessions
- Provided guidance and help on homework problem sets

Education

Rice University, Houston, TX

Ph.D. Applied Physics 2008 Thesis: "Variable Temperature Scanning Tunneling Microscopy Analysis of Nanocar Dynamics"

M.S. Applied Physics

Thesis: "Investigation and Manipulation of New Fullerene Derivative Molecules by Scanning Tunneling Microscopy"

Muhlenberg College, Allentown, PA <u>B.S.</u> Double Major – Physics, English GPA: 3.618	2002
Honors and Awards Recognized for <i>most downloaded</i> research article of all ACS journals	2005
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02
02

2005

1999 - 2001

2000

2005

Student Activities

Phi Kappa Tau, Eta chapter founding brother, community service and fundraising chairman

	2000 – 2002
Student Advisor	1999 – 2002
Society of Physics Students chapter Co-Founder and Vice President	2000 - 2001
Muhlenberg Campus Delegate	1999 – 2001
Muhlenberg Weekly Staff Writer	1999 – 2000

Publications

<u>Directional Control in Thermally Driven Single-Molecule Nanocars</u> Yasuhiro Shirai, Andrew J. Osgood, Yuming Zhao, Kevin F. Kelly, James M. Tour *Nano Letters* **5**(11), 2330 (2005). *Was the #1 most-accessed ACS journal article of 2005

Surface-Rolling Molecules Y. Shirai, Andrew J. Osgood et. al. *J. Am. Chem. Soc.*,**128** (14), 4854 (2006).

<u>Nanocar Step Crossing Facilitated by the Smoluchowski Effect</u> Andrew J. Osgood, Yasuhiro Shirai, Takashi Sasaki, James M. Tour, Kevin F. Kelly *Physical Review Letters*

<u>The Nanocar Family of Fullerene-derivative Moleucles: Behavior and Properties</u> Andrew J. Osgood, Takashi Sasaki, Yasuhiro Shirai, James M. Tour, Kevin F. Kelly *ACS Nano*

<u>Automated Large-Scale Fullerene Detection and Analysis of High Temperature Nanocars</u> Andrew J. Osgood, Takashi Sasaki, James M. Tour, Kevin F. Kelly *Physical Review Letters*

<u>Flexibility in Oligo(phenylene ethynylene)-Fullerene derivatives</u> Andrew J. Osgood, Takashi Sasaki, James M. Tour, Kevin F. Kelly ACS Nano

Select Presentations

American Physical Society March MeetingDenver, CO - March 2007The Smoluchowski Effect and the Step-Crossing Behavior of NanocarsAndrew J. Osgood, T. Sasaki, Y. Shirai, J. M. Tour, K. F. Kelly

Rice Quantum Institute Colloquium <u>The Smoluchowski Effect and the Step-Edge Behavior of Nanocars</u> Andrew J. Osgood, T. Sasaki, Y. Shirai, J. M. Tour, K. F. Kelly

American Physical Society March Meeting Imaging and Manipulation of Nanocars by Scanning Tunneling Microscopy Andrew J. Osgood, T. Sasaki, Y. Shirai, J. M. Tour, K. F. Kelly

Nanoscale Design and System Integration (poster)Houston, TX - April 2005Fundamental Issues in Single Molecule Manipulation: Driving Nanocars

Andrew J. Osgood, Y. Shirai, J. M. Tour, K. F. Kelly	
American Physical Society March Meeting Investigation and Manipulation of new Fullerene-Based Me	Los Angeles, CA - March 2005 plecules by Scanning Tunneling
<u>Microscopy</u> Andrew J. Osgood, Y. Shirai, Y. Zhao, J. M. Tour, K. F. Ke	elly
Rice Quantum Institute Colloquium <u>Molecular Manipulation by Scanning Tunneling Microscop</u> Andrew J. Osgood, Y. Shirai, Y. Zhao, J. M. Tour, K. F. Ke	
Physical Electronics Conference Imaging and Manipulation of new Fullerene-Based Molecu Microscopy Andrew J. Osgood, Y. Zhao, Y. Shirai, James M. Tour, Ke	
Rice Quantum Institute Colloquium <u>Single Molecule Imaging with Scanning Tunneling Microsc</u> Andrew J. Osgood, Y. Zhao, J. M. Tour, K. F. Kelly	Houston, TX - August 2003 <u>copy</u>
Research Highlighted in the Popular Press	

National Geographic Magazine, Nano's Big FutureJune 2006Popular Science, Big Wheels for Little CarsFebruary 2006Popular Mechanics, World's Smallest CarOctober 2005MSNBC, The World's Smallest CarOctober 2005Washington Times, Scientists Build a Single Molecule NanocarOctober 2005ABC News, Researcher Develops World's Smallest CarOctober 2005New York Times, Scientists Build Tiny Vehicles for Molecular PassengersOctober 2005

Research Profile

In six years at Rice I studied a number of nanoscale systems and topics, most from a surface science perspective utilizing the Scanning Tunneling Microscope in both ambient and variable temperature (30 - 1300 K) ultra high vacuum environments. I developed and performed unique experiments and new methodology from immediate post-synthesis protocols to in-situ manipulation on a completely novel class of synthetic molecule, including sample preparation, molecule deposition, scanning parameters and methodology, single molecule manipulation techniques, and cryogenic and high temperature imaging. I performed and analyzed I-V spectroscopy, developed and utilized complex image processing and analysis in various software environments (including original matlab code and in-built routines,) prepared and imaged numerous surfaces, SAMs, compounds, types of nanotubes, fullerenes and fullerenederivative molecules with both STM and AFM, and investigated both electronic and dynamic mechanical aspects of novel nanoscale devices. Like all equipment-intensive experimental research, my work required a very hands-on approach to problem solving. From diagnosing and fixing electronic components to wrenching on stainless steel ultra high vacuum equipment, I often learned more about how something works and how to fix it from hands-on experience than theoretical knowledge - something I believe to be invaluable when no one but you has the answers, but you still aren't quite sure what to do at first. In addition, I helped build and establish a new lab as my advisor's first graduate student, taught new techniques and protocols, and helped newer students develop varied research specialties, all the while teaching myself

the myriad techniques, skill sets, disciplines, and nuances necessary to complete successful research in a top-level graduate program.