

CURRICULUM VITAE

Timothy C. Beers

Date of Birth: June 24, 1957
Place of Birth: Lafayette, Indiana
Nationality: US

Employment Status: Notre Dame Chair in Astrophysics
University of Notre Dame

Current Address: Department of Physics, University of Notre Dame
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Notre Dame, IN, 46556

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Education

Harvard University

Ph.D. in Astronomy, November 1983
Thesis: "Dynamical Studies of Clusters of Galaxies"
Advisor: Margaret J. Geller

A.M. in Astronomy, November 1980

Purdue University

B.S. in Physics, Summa Cum Laude, June 1979
B.S. in Metallurgical Engineering, Summa Cum Laude, June 1979

Professional Societies, Honors, and Awards

Thomson-Reuters/ISI Highly-Cited Author 2009, 2014, 2015
Notre Dame Chair in Astrophysics 2014, Notre Dame
Humboldt Senior Research Award 2009, Humboldt Foundation (Germany)
University Distinguished Professor 2007, MSU
University Distinguished Faculty Award 2006, MSU
College of Natural Science Distinguished Faculty Award 2006, MSU
Outreach Award Dept. of Physics/Astronomy 2006, MSU
Scientist of the Year 2003, Impressions 5 Museum, Lansing, Michigan

International Astronomical Union, Commissions 29 and 30
American Astronomical Society
American Physical Society

Bantrell Post-Doctoral Research Fellow (Caltech)
Hughes Aircraft Company Masters Fellow (Harvard)
Argonne National Lab Summer Research Fellow (Purdue)
Frank Gannett Undergraduate Fellow (Purdue)
Sigma Xi -- Science Honorary (Purdue)
Sigma Pi Sigma -- Physics Honorary (Purdue)
Tau Beta Pi -- Engineering Honorary (Purdue)

Research Experience

1986 – Present: Assistant/Associate/Full/University Distinguished Professor, Michigan State University, KPNO Director, Astronomer (NOAO), Notre Dame Chair in Astrophysics, Notre Dame

- * Keck 10m Telescope
- * Hobby–Eberly 9.2m Telescope
- * European Very Large Telescope 8m (VLT)
- * Japanese National Telescope 8m (SUBARU)
- * Hubble Space Telescope
- * SOAR 4.1 m Telescope
- * CTIO 4m Telescope
- * KPNO 4m Telescope
- * ESO New Technology Telescope
- * Anglo–Australian 3.9m Telescope
- * ESO 3.6m Telescope
- * CFHT 3.6m Telescope
- * ARC 3.5m Telescope
- * Italian National Telescope 3.5m (TNG)
- * McDonald Observatory 2.7m Telescope
- * Las Campanas Dupont 2.5m Telescope
- * ARC 2.5m Telescope
- * Siding Spring Observatory 2.3m Telescope
- * McDonald Observatory 2.1m Telescope
- * KPNO 2.1m Telescope
- * OHP 1.9m Telescope
- * Lowell Observatory 1.8m Telescope
- * ESO 1.5m Telescope
- * Danish 1.5m Telescope
- * KPNO 1.3m Telescope
- * CTIO 1m Telescope
- * KPNO 0.9m Telescope
- * CTIO Curtis Schmidt Telescope
- * KPNO Burrell Schmidt Telescope
- * International Ultraviolet Explorer
- * ROSAT X–ray Satellite

1983 – 1986: Bantrell Post–Doctoral Research Fellow, Caltech

- * Hale 5m Telescope
- * Las Campanas Dupont 2.5m Telescope
- * Palomar 1.5m Telescope
- * Palomar 1.2m Telescope
- * Arecibo 1000 ft dish

1979 – 1983: Research Fellow, Center for Astrophysics

- * SAO/UA Multiple Mirror Telescope
- * SAO 1.5m Telescope
- * SAO 0.6m Telescope

1980: Research Assistant, Einstein Observatory

- * Micro–channel plate lifetime testing
- * Einstein data analysis

- 1979: Member of Technical Staff, Hughes Aircraft
- * Orbit design and mission analysis -- VOIR
 - * Venusian gravity perturbation analysis
- 1979: Research Assistant, Purdue University
- * Developed control program for X-ray spectrometer
- 1978: Research Fellow, Argonne National Laboratory

Teaching Experience

- 2014–present: Notre Dame Chair in Astrophysics, Univ. of Notre Dame
- * PHY 80202 – Stars (1 term)
- 1986 – 2011: Assistant/Associate/Full/University Distinguished Professor, Michigan State University
- * CBI -- Summer Courses (1 term)
 - * ISP 205 -- Integrative Studies (Astronomy) (11 terms)
 - * ISP 205L -- Integrative Studies Lab (Astronomy) (16 terms)
 - * PRO 101 -- Freshman Seminar (Origin of the Elements) (1 term)
 - * AST 119 -- Introductory Astronomy (5 terms)
 - * AST 202 -- Introductory Astronomy (Majors) (4 terms)
 - * AST 207 -- The Science of Astronomy (4 terms)
 - * AST 217 -- Introductory Astronomy (1 term)
 - * AST 229 -- Introductory Astrophysics (4 terms)
 - * AST 308 -- Galaxies and the Universe (1 term)
 - * AST 402 -- Galaxies and Cosmology (3 terms)
 - * AST 442 -- Radiational Astrophysics (2 terms)
 - * AST 462 -- Galactic Astronomy (2 terms)
 - * AST 463 -- Extragalactic Astronomy (1 term)
 - * AST 801 -- Introductory Astrophysics (1 term)
 - * AST 820 -- The Galaxy (1 term)
 - * AST 825 -- The Galaxy (1 term)
 - * PHY 957 -- Statistical Techniques (1 term)
- 1981 – 1982: Teaching Fellow in Astronomy, Harvard University
- * Conducted recitation sections
- 1980 – 1981: Teaching Fellow in Astronomy, Harvard University
- * Developed and instructed laboratory projects
- 1977 – 1979: Teaching Fellow in Physics, Purdue University
- * Conducted Electricity and Magnetism lab
 - * Conducted Electricity and Magnetism course
- 1978 – 1979: Teaching Fellow in Engineering, Purdue University
- * Conducted Mechanics of Materials lab

Funding

- 2014 – 2019: NSF Grant (\$12.5 Million)
“Physics Frontier Center: JINA – The Joint Institute for Nuclear Astrophysics – Center for the Evolution of the Elements” (Co-PI)
- 2012 – 2015: NASA Grant – Hubble Space Telescope (\$33,274)
“The Origins of Carbon-Enhanced Metal-Poor Stars”
- 2010 – 2011: NASA Grant – Hubble Space Telescope (\$23,328)
“Production of Heavy Elements in the Universe”
- 2009 – 2012: NSF Grant (\$121,311)
“Distances to High Velocity Clouds”
- 2009 – 2010: NASA Grant – Hubble Space Telescope (\$18,789)
“Cosmochronometry and Elemental Abundance Distribution of the Ancient Star HE1523-0901”
- 2008 – 2013: NSF Grant (\$10.0 Million)
“Physics Frontier Center: JINA – The Joint Institute for Nuclear Astrophysics” (Co-PI)
- 2007 – 2010: NSF grant (\$256,740)
“Collaborative Research: Discovery and Analysis of Carbon-Enhanced Stars in SDSS-I and SDSS-II”
- 2006 – 2009: NSF Grant (\$61,669)
“High Velocity Clouds in the Milky Way”
- 2004 – 2009: MSU Research Excellence Fund (\$1.5 Million)
“Center for the Study of Cosmic Evolution” (Co-I with Astronomy & Astrophysics group)
- 2003 – 2008: NSF Grant (\$4.5 Million)
“Physics Frontier Center: JINA – The Joint Institute for Nuclear Astrophysics” (Co-I with H. Schatz)
- 2004 – 2007: NSF Grant (\$313,961)
“An Intensive Search for r-Process-Enhanced Stars, and Abundance Patterns in the Early Galaxy”
- 2005 – 2006: NASA Grant – Hubble Space Telescope (\$11,780)
“The Old Star CS 31082-001, The Age of the Universe, and the Nature of the r-Process,” (Supplement to original grant)
- 2003 – 2005: NSF Grant (\$148,787)
“Widefield Upgrade for the Spartan Infrared Camera” (Co-I with Astronomy & Astrophysics group)

- 2002 – 2005: NSF Grant (\$74,848)
 “Collaborative Research: Fundamental Properties of Local Subdwarfs,” (in cooperation with D. Terndrup, Ohio State University)
- 2002 – 2004: NASA Grant – Hubble Space Telescope (\$26,123)
 “The Old Star CS 31082–001, The Age of the Universe, and the Nature of the r-Process,” (Co-I with C. Sneden, J. Cowan)
- 2001 – 2004: NSF Grant (\$37,473)
 “Collaborative Research: Completion of the Southern Proper Motion Survey,” (in cooperation with W. van Altena, Yale University) – Supplemental Funding
- 2001 – 2004: NSF Grant (\$230,769)
 “The Nature of Carbon-Enhanced Metal-Poor Stars in the Galaxy”
- 2001 – 2004: NSF Grant (\$105,829)
 “Collaborative Research: Completion of the Southern Proper Motion Survey,” (in cooperation with W. van Altena, Yale University)
- 2000 – 2002: NSF Grant (\$45,000)
 “Collaborative Research of the Joint Institute for Nuclear Astrophysics,” (Co-I with B. Sherrill, H. Schatz, S. Austin)
- 1999 – 2001: NASA Grant – Hubble Space Telescope (\$24,500)
 “CS 2892–052: A Rosetta Star for the Age and Early History of the Galaxy” (Co-I with C. Sneden, J. Truran, J. Cowan)
- 1999 – 2001: NASA Grant – Hubble Space Telescope (\$17,000)
 “Abundances in Halo Stars and Galactic Element Formation” (Co-I with J. Cowan, C. Sneden, J. Truran)
- 1998 – 2000: NATO Grant (\$10,000)
 “Search for Metal Poor Stars in the Galaxy,”
 US/Italy/Spain Collaboration, Renewal
- 1996 – 2000 NSF Grant (\$255,000)
 “Discovery and Analysis of Extremely Low Metallicity Stars, Horizontal-Branch Stars, and A-Type Stars in the Galactic Halo”
- 1995 – 1998: INT (NSF) Grant (\$16000)
 “Discovery and Analysis of Extremely Low Metallicity Stars in the Thick Disk and Halo of the Galaxy,”
 US/Australia Collaboration
- 1995 – 1997: NATO Grant (\$10,000)
 “Search for Metal Poor Stars in the Galaxy,”
 US/Italy/Spain Collaboration

- 1993 – 1996: INT (NSF) Grant (\$11,000)
"Spectroscopy and Analysis of Horizontal-Branch and A-type Stars in the Galactic Halo," US/Denmark Collaboration
- 1993 – 1995: NSF Grant (\$195,000)
"Discovery and Analysis of Extremely Low Metallicity Stars, Horizontal-Branch Stars, and A-type Stars in the Galactic Halo"
- 1993 – 1994: NASA Grant (\$18,000)
"ROSAT Observations of the Cluster of Galaxies A2151"
- 1992 – 1993: All University Research Initiation Grant (\$3500)
"The Abundance of Lithium in Extremely Metal-Poor Stars"
- 1991 – 1993: NSF Grant (\$36,000)
"Small Telescopes for Observational Astronomy Laboratory" (Co-I with Horace Smith)
- 1990 – 1993: NSF Grant (\$185,000)
"Discovery and Photometry of Low Metallicity and Horizontal-Branch Stars in the Galactic Halo"
- 1989: REU Supplement (\$3500)
"Hot Stars in the Galactic Halo"
- 1989 – 1990: All University Research Initiation Grant (\$2500)
"Relative Abundances for Extremely Metal-Poor Stars"
- 1988: REU Supplement (\$5000)
"Calibration of Stellar Metallicities"
- 1987 – 1990: NSF Grant (\$75,000)
"A Search for Extremely Low Metallicity Stars in the Galactic Halo"
- 1986 – 1987: All University Research Initiation Grant (\$5000)
"A Search for Extremely Low Metallicity Stars in the Galactic Halo"

STUDENTS WHOM I HAVE SUPERVISED

i) PhD Students

I have served as thesis supervisor or co-supervisor for:

Thomas Hettinger, who took his PhD (at Michigan State University) in summer, 2015, and is presently working in the computer industry.

Daniela Carollo, who took her PhD in fall 2011 (at the Australian National University), and is presently a Research Assistant Professor at Notre Dame.

Catherine Kennedy, who took her PhD in summer, 2011, and is presently an Assistant Professor at the University of Tampa.

Jason Smolinski, who took his PhD in summer, 2011, and is presently an assistant professor at Calvin College, MI.

Young Sun Lee, who took his PhD in summer, 2008, and is presently an assistant professor at Chungnam University in Korea.

Nathan De Lee, who took his PhD in summer, 2008, and is presently an assistant professor at the University of Northern Kentucky.

Brian Marsteller, who took his PhD in summer, 2007, and is presently an assistant professor at The American University in Washington, D.C.

Lamya Saleh, who took her PhD in spring, 2001, and is presently an assistant professor at Loyola University.

Jaehyon Rhee, who took his PhD in summer, 2000, was a Postdoctoral fellow at the University of Virginia, and with the GALEX mission at Yonsei University (Korea) and Caltech, and is presently at the Gemini Observatory.

Jeffrey Kriessler, who took his PhD in summer, 1997, was a Postdoctoral Fellow at the University of Minnesota, and presently is employed in the computer industry.

Ronald Wilhelm, who took his PhD in fall, 1995, was a computer specialist in the Department of Astronomy at the University of Texas, then a member of the faculty at Southwestern University in Texas, and is presently a member of the faculty at the University of Kentucky.

Christina Bird, who took her PhD in spring, 1993. After completing a Postdoctoral appointment at the University of Kansas, Christina took a job as a computer systems manager in Kansas City, Kansas, and is presently working in the computer industry.

ii) Masters Students I have supervised:

Deborah Frank, who took her masters degree summer of 2005.

Dagny Ulrich, who took her masters degree spring of 1996.

Mark King, who took his masters degree spring of 1995.

Regina Daly, who took her masters degree spring of 1993.

Karl Gebhardt, who took his masters degree spring of 1990. Karl Gebhardt took his PhD at Rutgers University, was a Postdoctoral fellow at the University of Michigan, a Hubble Fellow at the University of California at Santa Cruz, and is now a member of the faculty at the University of Texas.

Steve Doinidis, who submitted a thesis. and took his masters degree spring of 1990, and is now working in the computer industry.

Jon Truax, who submitted a thesis, and took his masters degree winter of 1989.

Kevin Flynn, who took his masters degree spring of 1989.

iii) Undergraduate Students

I have served as an advisor to many of our undergraduate astronomy majors over the past five years. In addition, I have supervised and, in all but a few cases, obtained research support through the REU program for the following students over the past years:

Spencer Clark (Notre Dame)
Siyu He (China, REU Student)
Laura Green (MSU)
Nikole Nielsen (MSU)
Ryan Norris (MSU)
Shannon Snider (MSU)
Andrew Trotter (MSU)
Julie Krugler (MSU, co-author)
Nicholas Boros (UM, Dearborn)
Stelios Tsangarides (MSU, co-author)
David Vuletich (MSU)
Thomas Shefler (Western Michigan, co-author)
William Bestman (MSU, co-author)
Caroline Mattson (University of Virginia, co-author)
Jairo Alvarez (Ohio University, co-author)
Sarah Fuhrman (University of Evansville)
Kevin Griffin (MSU, co-author)
Kipp Bertke (MSU)
Julie Ann Kage (MSU, co-author)
Eric Sullivan (MSU)
Peter Mulroy (MSU)

THESIS STUDENTS WHOM I PRESENTLY SUPERVISE

I am presently supervising four 1st or 2nd year students at Notre Dame: Sarah Dietz, Geoffrey Lentner, Kaitlin Rasmussen, and Devin Whitten. I have served in the past as an external member of thesis committees for Jennifer Simmerer and Inese Ivans, when they were PhD candidates at the University of Texas, Austin, as well as for Anna Frebel, when she was a PhD candidate at the Australian National University, Vinicius Placco, and Rafael Santucci, of the University of Sao Paulo, Brazil.

SEMINARS AND COLLOQUIA PRESENTED IN THE PAST FIVE YEARS

- 2015 University of Sao Paulo, (Sao Paulo, Brazil)
Pontificia Universidad Catolica (Santiago, Chile)
Universidad Andres Bello (Santiago, Chile)
Calvin College
First Stars, Galaxies, and Black Holes (Groningen, Netherlands)
Pontificia Universidad Catolica University (Santiago, Chile)
GNASH Meeting (Victoria, Canada)
Frontiers of Stellar Spectroscopy Meeting (Heidelberg, Germany)
JINA-CEE Frontiers Meeting, Michigan State University
Purdue University
- 2014 Louisiana State University, Baton Rouge, Louisiana
Arizona State University, Tempe, Arizona
Joint DNP/JPS Meeting (Kona, Hawaii)
Gemini Observatory (Hilo, Hawaii)
Harvard University (2 talks)
University of Sao Paulo (Sao Paulo, Brazil)
Nuclei in the Cosmos XIII (Debrecen, Hungary)
Overcoming Great Barriers II (Palm Cove, Australia)
University of Sydney (Sydney, Australia)
University of New South Wales (Sydney, Australia)
Australian Astronomical Observatory (Sydney, Australia)
CTIO/Gemini Observatory (La Serena, Chile)
University of Notre Dame (2 talks)
Monash University (Melbourne, Australia)
Australian National University (Canberra, Australia)
FLASH talk, NOAO, Tucson, Arizona
- 2013 EWASS Meeting (Turku, Finland)
CTIO 50th Anniversary Science Symposium (La Serena, Chile)
New Mexico State University, Las Cruces, New Mexico
University of Sao Paulo Conference (Sao Paulo, Brazil)
REU Presentation, NOAO, Tucson, Arizona
- 2012 Hertzberg Institute for Astrophysics, Victoria, Canada
University of Victoria, Canada
Nuclei in the Cosmos XII Meeting (Cairns, Australia) (2 talks)
Galactic Archaeology Meeting (Sydney, Australia)
Purdue University
NOAO, Tucson, Arizona (2 talks)
Gemini Science Meeting, San Francisco, California
Argonne National Laboratory, Argonne, Illinois
University of Arizona, Tucson, Arizona
- 2011 University of Central Lancashire (Preston, United Kingdom)
Niels Bohr Institute (Copenhagen, Denmark)
Lund University (Lund, Sweden)
ZAH Colloquium (Heidelberg, Germany)
SEGUE Discussion Meeting (Potsdam, Germany)
LAMOST Plus Meeting, RPI
Institute for Nuclear Physics (Mainz, Germany)
Assembling the Puzzle of the Milky Way Meeting (Le Grand Bornand, France)
NOAO, Tucson (2 talks)
Mount Stromlo and Siding Springs Observatory (Canberra, Australia)
Astronomy with Radioactivities Meeting (Phillip Island, Australia)

SERVICE TO THE UNIVERSITY, THE PROFESSION, AND THE PUBLIC

i) Departmental Service Committee Assignments – Last Five Years

- 2015: JINA–CEE Executive Committee
Graduate Admissions Committee
Departmental Space Committee
Departmental Strategic Planning Committee
- 2014: JINA Executive Committee
Graduate Admissions Committee
- 2013: JINA Executive Committee
- 2012: JINA Executive Committee
- 2011: JINA Executive Committee
Distinguished Lecture Series
Departmental Newsletter
SOAR Telescope (fundraising)
Undergraduate Advisor
Honors College Advisor

ii) College Committee Assignments – Last Five Years

iii) University Committee Assignments – Last Five Years

iv) National and International Committees – Last Five Years

- 2015: Member of Editorial Board, Annual Review of Astronomy and Astrophysics
Notre Dame Representative to the Sloan Digital Survey Collaboration Council
Member of International Advisory Board, Publications of the Astronomical Society of Australia
Member of LSST (Large Synoptic Survey Telescope) Science Team
Member of Scientific Organizing Committee (Two meetings)
Member of Editorial Board – JINA Virtual Journal
Member of Editorial Board – SEGUE Virtual Journal
Referee for Nature
Referee for the Astrophysical Journal
Referee for the Astronomical Journal
Referee for Astronomy and Astrophysics Journal
Referee for Monthly Notices of the Royal Astronomical Society

- 2014: Member of Editorial Board, Annual Review of Astronomy and Astrophysics
Member of International Advisory Board, Publications of the Astronomical Society of Australia
Member of WIYN Futures Committee
Member of LSST (Large Synoptic Survey Telescope) Science Team
Member of Editorial Board – JINA Virtual Journal
Member of Editorial Board – SEGUE Virtual Journal
Referee for Nature
Referee for the Astrophysical Journal
Referee for the Astronomical Journal
Referee for Astronomy and Astrophysics Journal
Referee for Monthly Notices of the Royal Astronomical Society
- 2013: Member of Editorial Board, Annual Review of Astronomy and Astrophysics
Member of DESI Steering Committee
Member of WIYN Telescope Board
Member of WIYN Science Steering Committee
Member of WIYN Finance Committee
Member of LSST (Large Synoptic Survey Telescope) Science Team
Member of Scientific Organizing Committee (Two meetings)
Member of Editorial Board – JINA Virtual Journal
Member of Editorial Board – SEGUE Virtual Journal
Referee for Nature
Referee for the Astrophysical Journal
Referee for the Astronomical Journal
Referee for Astronomy and Astrophysics Journal
Referee for Monthly Notices of the Royal Astronomical Society
- 2012: Member of Editorial Board, Annual Review of Astronomy and Astrophysics
Member of WIYN Telescope Board
Member of WIYN Finance Committee
Member of LSST (Large Synoptic Survey Telescope) Science Team
JINA Representative to the Sloan Digital Survey Collaboration Council
Member of Scientific Organizing Committee (Two meetings)
Member of Editorial Board – JINA Virtual Journal
Member of Editorial Board – SEGUE Virtual Journal
Referee for Nature
Referee for the Astrophysical Journal
Referee for the Astronomical Journal
Referee for Astronomy and Astrophysics Journal
Referee for Monthly Notices of the Royal Astronomical Society
- 2011: Publications Officer, SDSS–III
Survey Scientist, SEGUE–2 (SEGUE continuation during SDSS–III)
Member of Editorial Board, Annual Review of Astronomy and Astrophysics
Member of LSST (Large Synoptic Survey Telescope) Science Team
Member of Sloan Digital Sky Survey Advisory Council
JINA Representative to the Sloan Digital Survey Collaboration Council
Member of Scientific Organizing Committee (Three meetings)
Member of Editorial Board – JINA Virtual Journal
Member of Editorial Board – SEGUE Virtual Journal
Referee for Nature
Referee for Science

Referee for the Astrophysical Journal
Referee for the Astronomical Journal
Referee for Astronomy and Astrophysics Journal
Referee for Monthly Notices of the Royal Astronomical Society

v) Other Service – Last Five Years

2015: Primary Interviewee, Discover Magazine, “The Hunt for First Stars”
Google Hangout – Public presentation of JINA–CEE
Radio Interview, Big Picture Science, on NPR

2014: Radio Interview, National Public Radio’s Weekend Edition with Rachel Martin,
365 Days of Astronomy podcast

2013: Presented talks on Kitt Peak National Observatory to the Tonoho O’odham
Schuk Toak District Council

2012: Presented talks on Kitt Peak National Observatory to the Tonoho O’odham
Schuk Toak District Council

Presented talk of the Future of Large Survey Astronomy, KPNO Docents

Numerous radio interviews, local NPR affiliate

2011: On Leave from Michigan State University

I, along with my group at MSU, have developed, validated, and tested the primary software product use to derive stellar atmospheric parameters for the Sloan Digital Sky Survey, referred to as SSPP: SEGUE Stellar Parameter Pipeline, which has thus far determined temperatures, surface gravities, and metallicities for over 400,000 stars in the Milky Way galaxy. It has recently been extended to determine both the carbon to iron ratios, and alpha–element to iron ratios for the same sample of stars. This pipeline, or something quite similar, will become the parameter pipeline for the new survey efforts to be carried out with the LAMOST telescope in China, which will obtain spectroscopic data similar to SDSS for over 10 million stars. It is being actively considered for adoption for use by the proposed Galactic Archeology Survey, to be conducted with the Japanese Subaru 8m Telescope, and the proposed DESI Galactic Archeology Survey, to be conducted with the Mayall 4–m Telescope.

I completely revamped the ISP 205 laboratory course, so that it is now offered in a “hybrid” fashion, partially on the web, and partially in the Abrams Planetarium. This new version is far more cost efficient (in terms of TA resources required), and better suited to the desires/expectations of our ISP 205 students.

I have written and distributed a major statistical analysis package, ROSTAT, which is being used by on the order of 100 researchers worldwide for analysis of radial velocity distributions in clusters of galaxies. I have also developed and distributed programs suited for mixture model analyses (KMM) and for the production of optimal contour maps (ADAPT).