Gary B. Hughes, Ph.D.

CURRICULUM VITAE

CONTACT INFORMATION

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gary.hughes@flir.com
gb_hughes@yahoo.com

EDUCATION

Ph.D.
Earth & Environmental Science, 1999
University of Pennsylvania, Philadelphia, PA

M.A.
Applied Mathematics, 1992
University of California at Santa Barbara

B.A.
Mathematics, 1986
Northwestern University, Evanston, Illinois

ACADEMIC POSITIONS

January 2008 – June 2011
Lecturer in Statistics
Cal Poly State University San Luis Obispo
Courses: Statistical Methods for Engineers

2005 – 2009:
Adjunct Instructor in Geology and Mathematics
Cuesta Community College
Recent Courses: Geology of California, Astronomy and Geology, College Algebra

2003 - Fall Semester:
Lecturer in Geology and Mathematics
California State University Channel Islands
Courses: Foundations of Earth Science, Calculus for Business

1999 - 2003:
Adjunct Professor of Mathematics and Geology
Ventura College

1995 - 1999
Teaching and Research Assistant
University of Pennsylvania

1994 - 1995
Adjunct Professor of Mathematics
Ventura County Community College District
(Ventura College, Moorpark College)

1994 - 1995
Adjunct Professor of Mathematics
Santa Barbara City College

1992 - 1993
Research Assistant
Center for Remote Sensing / Environmental Optics
University of California at Santa Barbara

PROFESSIONAL EXPERIENCE

2005 - Present
Reliability Engineer
Long-Wave Infrared Imaging Systems
FLIR Systems Indigo Operations

2003 - 2005
Scientist/Engineer
Climate Data Analysis
ATK/Mission Research Corporation

1999 - 2005
Principal Multi-Disciplined Engineer
Numerical Analysis
Raytheon - Vision Systems and Santa Barbara Remote Sensing
Consultant: 04/2002 – 07/2005
Raytheon Employee 07/1999 - 04/2002

1997 - 1999
Software Engineer
Power Systems Integration
KVB-Enertec, Inc.

1990 - 1994
Member of the Technical Staff, Mechanical
Infrared Dewar Design and Manufacture
Hughes Aircraft Company - Santa Barbara Research Center

1986 - 1990
Communications Officer
Bridge Watch Officer
United States Navy

JOURNAL PUBLICATIONS

Hughes, G.B., and Chraibi, M.
Calculating Ellipse Overlap Areas. *Submitted*.

Hadjiyska, E., Lubin, P., and Hughes, G.B.
Transient Optical Sky Survey (TOSS) Automated Image Processing and Transient Search Algorithms. *Submitted*.

Hughes, G.B.
Algorithms for Sensor Chip Alignment to Blind Datums. Journal of Electronic Imaging, Vol 15, Issue 3, Jul - Sep 2006.

Hughes, G.B., Giegengack, R., and Kritikos, H.N.
Modern Spectral Climate Patterns in Rhythmically Deposited Argillites of the Gowganda Formation (Early Proterozoic), Southern Ontario, Canada. Earth and Planetary Science Letters, v. 207/1-4, pp. 13-22, 2003.

Kusakabe, T., Tsuzuki, K., Hughes, G.B. and Sweda, T.
Extensive Forest Leaf Area Survey Aiming at Detection of Vegetation Change in Subarctic-Boreal Zone. Polar Bioscience, 13: 133-146, 2000.

Hughes, G.B., Giegengack, R. and Kritikos, H.N.
Spectral Indications of Unexpected Contributors to Atmospheric CO_2 Variability? International Journal of Climatology 19: 813-819, 1999.

BOOK CHAPTER

Hughes, G.B., and Thayer, C.W.
Sclerosponges: Potential High-Resolution Recorders of Marine Paleotemperatures; in Gerhard, L.C., Harrison, W.E., and Hanson, B.M., Editors, Geological Perspectives of Global Climate Change, AAPG Studies in Geology #47, ISBN 0-89181-053-6, 2001.

CONFERENCE PROCEEDINGS

Hadjiyska, E., Lubin, P., Taylor, S. and Hughes, G.B.
Transient optical sky survey automated telescope system Ground-based and Airborne Telescopes II, Proc. of SPIE Vol. 7012, 70122P, (2008).

Hughes, G.B.
Additional Algorithms for Sensor Chip Alignment to Blind Datums.
Novel Optical Systems Design and Optimization IX, Proc. of SPIE, Vol. 6289, 62890K (2006).

Moore, S., and Hughes, G.B.
Instrument Cross-Comparisons and Automated Quality Control of Atmospheric Radiation Measurement Data.
Fifteenth ARM Science Team Meeting Proceedings, Daytona Beach, Florida, March 14-18, 2005

Kehoe, K., Sonntag, K., Peppler, R., Burkholder, B., Shafer, C.,Zaman, M., Thompson, T., Moore, S., Hughes, G.B., and Doty, K.
Improvements To and Status of the Data Quality Health and Status System.
Fifteenth ARM Science Team Meeting Proceedings, Daytona Beach, Florida, March 14-18, 2005

Moore, S., and Hughes, G.B.
Latest Tools for Viewing, Quality Checking ARM Data.
Fourteenth ARM Science Team Meeting Proceedings, Albuquerque, New Mexico, March 22-26, 2004

Hayes, R.G., Hughes, G.B., Dorin, P.M., and Toal, R.J.
Numeric Issues in Test Software Correctness.
Proceedings of the IEEE Autotestcon Systems Readiness Technology Conference, Huntsville, Alabama, October 2002, IEEE Catalog Number 02CH37350, pp. 662-677, ISBN 0-7803-7441-X

Hughes, G.B., Giegengack, R., Johnson, A.H., and Kritikos, H.N.
Evidence for Short-Term Forcing of Land-Surface Air Temperature by Anthropogenic CO_2 Emissions.
Earth System Processes Conference Proceedings, Annual meeting of the Geological Society of America and the Geological Society of London, Edinburgh, Scotland, 24-28 June 2001

Hughes, G.B., Thayer, C., Lohmann, K.C. and Aiello, R.
Two Millenia of ENSO History Potentially Recorded in Sclerosponges.
Proceedings of the American Association of Petroleum Geologists Annual Meeting, San Antonio, Texas, 11-14 April 1999.

U.S. PATENTS

Speake, G., *et al.*
Sensor Calibration Systems and Methods for Infrared Cameras.
Patent Pending, September, 2008

Granneman, R., *et al.*
Calibration Methods for Infrared Cameras.
Patent Pending, September, 2008

Hughes, G.B., Högasten, N., and Nagahawatte, N.
Filtering Systems and Methods for Infrared Image Processing.
Patent Pending, August, 2007

Hughes, G.B.
Automated Image Anomaly Detection for Infrared Detectors.
U.S. Patent No. 8,004,564 23 Aug 2011

Hughes, G.B., McDonald, J.P., Schweidler, A.V., and Ingle, L.D.
Fabrication Method for Adhesive Pressure Bonding Two Components Together With Closed-Loop Control.
U.S. Patent No. 6,802,918 12 Oct 2004

Peck, L.E., Romano, T.S., Evans, T.K., Hughes, G.B. and Neumann, K.H.
Electrical Feedthrough and its Preparation.
U.S. Patent No. 6,156,978, 05 Dec 2000

Romano, T.S., Evans, T.K., Hughes, G.B. and Neumann, K.H.
Preparation of Gold-Coated Molybdenum Articles and Articles Prepared Thereby.
U.S. Patent No. 5,750,202, 12 May 1998

Eneim, A.A., Evans, T.K., Romano, T.S. and Hughes, G.B.
Semi-Permanent Vacuum Closure with Multiple Retubulation Capability.
U.S. Patent No. 5,713,610, 03 Feb 1998

Romano, T.S., Evans, T.K., Hughes, G.B. and Neumann, K.H.
Brazed Lower Vacuum Housing for a Dewar.
U.S. Patent No. 5,598,966, 04 Feb 1997

Romano, T.S., Evans, T.K., Hughes, G.B. and Neumann, K.H.
Electrical Feedthrough Pin and Process for its Preparation and Electrical Feedthrough made Therewith.
U.S. Patent No. 5,595,514, 04 Feb 1997

GRANTS

Sweda, T., and Hughes, G.B.
Conifer Forest Attributes Inferred from the Fourier Spectrum of Canopy Profile Data.
Chapter in Sweda, T., Editor, Development of Extensive Measurements for Surface Vegetation as a Global Environmental Resource and a System for Functional Evaluation of Surface Vegetation Resources, 1996-1998 Ministry of Education Grant-in-Aid for Scientific Research, Report of Results, March 2000

Thayer, C.W., and Hughes, G.B.
A 2,000-year El Niño History from Cross-Dating of Growth Bands in Western Pacific Coralline Sponges
Matching Grant: The Mellon Foundation and The University Research Foundation, University of Pennsylvania, 1999

Thayer, C.W., and Hughes, G.B.
El Niño History and Ocean Paleotemperatures Recorded in PacificCoralline Sponges
Matching Grant The Mellon Foundation, and The University Research Foundation, University of Pennsylvania, 1998

Giegengack, R., and Hughes, G.B.
Seeking High-Resolution Evidence of Orbitally Forced Paleoclimatic Variability from Annually Laminated Sediments in the Gowganda Formation (Precambrian), Ontario, Canada
The University Research Foundation, University of Pennsylvania, 1998

Hughes, G.B.
Paleotemperatures Below the Photic Zone: Stable Isotope Measurements of Sclerosponge Skeletal Silica and Carbonate, 1997
Geological Society of America Grant-in-Aid
(**Proposal recognized for exceptional merit**)

INTERNATIONAL CONFERENCE PRESENTATIONS

Hadjiyska, E., Lubin, P., Taylor, S. and Hughes, G.B.
Transient Optical Sky Survey Data Pipeline–Object Identifcation and Characterization Algorithms
American Astronomical Society, AAS 211th Meeting, Austin, TX, 7-11 January 2008.

Hughes, G.B.
Eating One's (Sclero)Sponge Cake and Having it Too: Pre-Determining Growth Bands by Scanning Electron Microscope Energy Dispersive X-Ray Analysis
Workshop on the Use of Sclerosponges as Proxy Indicators of Climate, University of Miami, Florida, 22-24 March 1998.

Smith, J., and Hughes, G.B.
Describing Fossil Assemblages: Optimizing Quadrat Sizes.
Paleobiology Symposium VII, University of Pennsylvania, Philadelphia, PA, 29 Mar 1996.

REGIONAL AND INDUSTRY CONFERENCE PRESENTATIONS

Hughes, G.B.
Objective LWIR Image and Video Quality Assessment by Method of Paired Comparisons
FLIR Systems, Inc. Engineering Symposium, Sedona, AZ, 27-30 May 2008

Hughes, G.B.
Sensor-Level Calibration of Un-Cooled Microbolometer Arrays (**Received Best Paper Award**)
FLIR Systems, Inc. Engineering Symposium, Orcas Island, WA, 30 May-01 June 2007

Hughes, G.B.
Toward Automated Detection of Subtle Image Quality Defects (**Received Cost Savings Award**)
FLIR Systems, Inc. Engineering Symposium, Las Vegas, NV, 1-5 May 2006

Scussat, M., Matson, A., and Hughes, G.B.
Image Focus Quality and FPA Parallelism Alignment: A Case Study
FLIR Systems, Inc. Engineering Symposium, Las Vegas, NV, 1-5 May 2006

Hayes, R.G., and Hughes, G.B.
High Throughput Production Testing of Linear Cryocoolers (**Received Innovation Award**)
Raytheon Electro-Optical Systems Technology Network, Manhattan Beach, California, 14-16 May 2002

Hughes, G.B.
Test-Software PID Control of Cryocooler Tip Temperature: Energy Balance Model Predictions, Tuning and Empirical Results
Raytheon Electro-Optical Systems Technology Network, Plano, Texas, 03-05 October 1999

Hughes, G.B.
Interpreting the Fourier Spectrum of Atmospheric CO_2 Concentration
Graduate Student Symposium, University of Pennsylvania, 12 Nov 1997

Hughes, G.B.
Spatio-Temporal Modeling of Climate (and Paleoclimate) Parameters with Geographic Information Systems
Graduate Student Symposium, University of Pennsylvania, 15 Nov 1996

Hughes, G.B.
A Lower Bound on Meteorite Impact Flux Near Earth.
Graduate Student Symposium, University of Pennsylvania, 12 Dec 1995

COURSES TAUGHT

Academic Term	Institution	Course #	Course Title	# of Sections
2011 Spring Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2011 Winter Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2010 Fall Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**2**
2010 Spring Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2010 Winter Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2009 Fall Quarter	**Cal Poly SLO**	**STAT-312**	**Statistical Methods for Engineers**	**1**
2009 Spring Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2009 Winter Quarter	**Cal Poly SLO**	**STAT-312**	**Statistical Methods for Engineers**	**1**
2009 Spring Semester	Cuesta College	GEOL-220	Geology of California	2
2008 Fall Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2008 Fall Semester	Cuesta College	GEOL-220	Geology of California	2
2008 Spring Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**1**
2008 Winter Quarter	**Cal Poly SLO**	**STAT-312/542**	**Statistical Methods for Engineers**	**2**
2008 Spring Semester	Cuesta College	GEOL-220	Geology of California	1
2007 Fall Semester	Cuesta College	GEOL-220	Geology of California	1
2007 Spring Semester	Cuesta College	GEOL-20	Geology of California	1
2007 Spring Semester	Cuesta College	PHYSCI-1B	Astronomy and Geology	1
2007 Spring Semester	Cuesta College	MATH-32	College Algebra	1
2006 Fall Semester	Cuesta College	GEOL-20	Geology of California	1
2006 Spring Semester	Cuesta College	GEOL-20	Geology of California	1
2006 Spring Semester	Cuesta College	PHYSCI-1B	Astronomy and Geology	1
2005 Spring Semester	Cuesta College	GEOL-20	Geology of California	1
2003 Fall Semester	**CSU Channel Islands**	**GEOL-300**	**Foundations of Earth Science**	**1**
2003 Fall Semester	**CSU Channel Islands**	**MATH-140**	**Business Calculus**	**2**
2003 Fall Semester	Ventura College	MATH-V01	Elementary Algebra	1
2003 Fall Semester	Ventura College	MATH-V03	Intermediate Algebra	1
2003 Spring Semester	Ventura College	MATH-140	Precalculus	1
2003 Spring Semester	Ventura College	GEOL-11	Oceanography	1
2002 Fall Semester	Ventura College	MATH-140	Precalculus	1
2002 Fall Semester	Ventura College	GEOL-11	Oceanography	1
2002 Spring Semester	Ventura College	MATH-140	Precalculus	1
2002 Spring Semester	Ventura College	GEOL-11	Oceanography	1
2001 Fall Semester	Ventura College	MATH-140	Precalculus	1
2001 Fall Semester	Ventura College	GEOL-11	Oceanography	1
2001 Summer Term	Ventura College	MATH-04	College Algebra	1
2001 Spring Semester	Ventura College	MATH-44	Statistics	1
2001 Spring Semester	Ventura College	GEOL-11	Oceanography	1
2000 Fall Semester	Ventura College	MATH-38	Math for Elementary School Teachers	1
2000 Spring Semester	Ventura College	MATH-03	Intermediate Algebra	1

COURSES TAUGHT				
Academic Term	**Institution**	**Course #**	**Course Title**	**# of Sections**
2000 Spring Semester	Santa Barbara CC	MATH-140	Precalculus	1
1999 Fall Semester	Santa Barbara CC	MATH-117	Statistics	1
1997 Spring Semester	Univ. of Pennsylvania	GEOL-125	(**TA**) Earth and Life Through Time	1
1996 Fall Semester	Univ. of Pennsylvania	GEOL-003	(**TA**) Evolution of the Physical World	1
1996 Spring Semester	Univ. of Pennsylvania	GEOL-130	(**TA**) Introduction to Oceanography	1
1995 Fall Semester	Univ. of Pennsylvania	GEOL-003	(**TA**) Evolution of the Physical World	1
1995 Summer Term	Ventura College	MATH-55/55L	FORTRAN and FORTRAN Lab	1
1995 Spring Semester	Ventura College	MATH-44	Statistics	1
1995 Spring Semester	Ventura College	MATH-03	Intermediate Algebra	1
1995 Spring Semester	Santa Barbara CC	MATH-117	Statistics	1
1995 Spring Semester	Santa Barbara CC	MATH-150	Calculus	1
1994 Fall Semester	Ventura College	MATH-55/55L	FORTRAN and FORTRAN Lab	1
1994 Fall Semester	Santa Barbara CC	MATH-117	Statistics	1
1994 Fall Semester	Santa Barbara CC	MATH-150	Calculus	1
1994 Fall Semester	Santa Barbara CC	MATH-199	Calculus EMSE Workshop	1
1994 Summer Term	Ventura College	MATH-55/55L	FORTRAN and FORTRAN Lab	1
1994 Spring Semester	Moorpark College	MATH-16A	Applied Calculus	1

Gary B. Hughes, Ph.D.

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cell: (805) 598-7201 e-mail: gbhughes@calpoly.edu

PROFESSIONAL OBJECTIVES

- **To Apply Analytic Methods and Numerical Modeling toward Addressing Real-World Issues: Physical System Modeling and Structural Simulation; Mathematical and Statistical Analysis; and Data Analysis.**

PROFESSIONAL EXPERIENCE

2/'05-Present: **RELIABILITY ENGINEER, FLIR Systems Inc.**
- **Job Functions**: Quality Analysis and Statistical Process Control for production-level night-vision imaging systems. Systems Engineering, Microbolometer Array Calibration; Modeling and algorithm development, computational methods and data acquisition/analysis.

1/'08 –6/'11: **LECTURER IN STATISTICS, California Polytechnic State University, San Luis Obispo**

8/'03 –12/'03: **LECTURER IN GEOLOGY AND MATHEMATICS, Cal State University Channel Islands**
- **Job Functions**: Teach college courses in Statistics, Mathematics, Geology. Courses included Calculus, Earth Science, Oceanography, Statistics and Precalculus, with applications in Astronomy and Navigation.

12/'03 –2/'05: **SCIENTIST/ENGINEER, ATK / Mission Research Corporation**
- **Job Functions**: Developed automated data quality algorithms for US Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) spectral radiometers and other sensors. Performed statistical analysis of spectral radiometer and derived climate data.

6/'90 -6/'05: **PRINCIPAL MULTI-DISCIPLINED ENGINEER, SBRC and Raytheon Vision Systems**
- **Consultant**: 04/2002 to 06/2005 • **Raytheon Employee**: 07/1999 to 04/2002
- **Santa Barbara Research Center Employee**: 06/1990 to 09/1994
- **Job Functions**: Mathematical and numerical models of optical and electro-mechanical systems, automation and control algorithms. Basic research in hermetic joining of dissimilar materials. Finite element structural simulation and analysis of Dewar packages in ANSYS. Statistical and Data Analysis.
- **Accomplishments**: U.S. Patents 6,802,918, 5,595,514, 5,598,966, 5,713,610, 5,750,202 and 6,156,978; Developed a robotic, ultra-precision alignment system for production assembly of infrared detectors.

6/'97 - 3/'99: **SOFTWARE ENGINEER, KVB-Enertec, Inc., Lansdale Pennsylvania**
- **Job Functions**: Developed communication drivers for electrical substation integration systems.
- **Accomplishments**: Assisted with testing, installation and commissioning of four substation integration systems on the Tucuruí Tramo Oeste line, Brazil.

1986 - 1990: **COMMUNICATIONS OFFICER, BRIDGE WATCH OFFICER, United States Navy**

1982 - 1984: **ELECTRONICS TECHNICIAN, United States Navy**
- **Job Functions**: Implemented secure data communications networks in support of shipboard and terrestrial military operations. Served as Bridge Watch Officer. Taught laboratory electronics courses.
- **Accomplishments**: Navy Commendation Medal for outstanding service, Foreign Expeditionary Medal, Sea Service Award. Honorably Discharged in June 1990.

EDUCATION

5/'99: **Ph.D., EARTH & ENVIRONMENTAL SCIENCE, University of Pennsylvania, Philadelphia, PA**
6/'92: **MASTER OF ARTS, APPLIED MATHEMATICS, University of California, Santa Barbara, CA**
6/'86: **BACHELOR OF ARTS, MATHEMATICS, Northwestern University, Evanston, Illinois**

SKILLS

Computers: •C/C++/C#, FORTRAN, Matlab/Simulink, IDL and Perl Programming, Finite Element Structural Simulation and Analysis, ANSYS, Numerical Analysis, Maple, Data Acquisition/Analysis, Image Processing, DOS/Windows 3/95/NT/2000/XP/Vista, some UNIX.

Language: •Reading, Writing and Speaking Proficiency in Portuguese and Spanish (English is first language)

Working in industry since 1990, I have gained extensive experience applying advanced mathematical and computational techniques to investigate a wide range of issues in engineering, physics and natural science. I have an excellent track record of utilizing creativity, intelligence and perseverance to resolve difficult problems and implement complex solutions. A key aspect of my approach is the incorporation of probabilistic elements that allow realistic simulation of stochastic systems. My work has resulted in several US Patents and publications in peer-reviewed journals. The following excerpts were selected from previous projects.

1. **Structural Simulation: Satellite Vibration-Induced Line of Sight Error Optical Model**
   Methods: Numeric solution of coupled system of partial differential equations of motion
   Tools: Matlab/Simulink, C
2. **Photovoltaic Sensor Solar Calibration Incident Light Model**
   Methods: Analytic solution of model system, implemented numerically
   Tools: Maple, C++, Mathcad
3. **Terrestrial Meteorite Impact Cratering Model**
   Methods: Monte Carlo approach with inversion of probability density function
   Tools: C, FORTRAN
4. **Infrared Detector Element Red Noise Model**
   Methods: Non-linear least squares parameter estimation
   Tools: Maple, C, Data Acquisition
5. **Linear Cryocooler Effective Resistance Model**
   Methods: Non-linear least squares parameter estimation, Monte Carlo approach with inversion of probability density function for parameter error estimates
   Tools: Maple, C, Excel, Data Acquisition
6. **Automated, Ultraprecision Six-Axis Positioning System, including Math Model**
   Methods: Vector-based alignment algorithms computed in real time give actuator motions
   Tools: Maple, C, C++, Excel, Data Acquisition
7. **Residual Stress Analysis and Mechanical Deformation Models**
   Methods: Finite-element modeling and analysis of part geometry with boundary conditions
   Tools: Patran, Pro-Engineer/Pro-Mechanica, ANSYS
8. **Structural Beam with Spatially Distributed Active Feedback Vibration Control Model**
   Methods: Solution of motion equation by finite-difference algorithms (Master's Thesis)
   Tools: Maple, C, FORTRAN, Patran, ANSYS, Data Acquisition
9. **Paleoclimate and Greenhouse Warming Data Analysis**
   Methods: FFT-based time-series analysis, correlation analysis (Dissertation Research)
   Tools: Maple, C, Excel
10. **Continuous Spatial Modeling of Point Climate Data**
    Methods: Co-Kriging to produce maximum likelihood estimator and variance estimates
    Tools: C, Geographic Information Systems (Infomap, Idrisi)
11. **Laser Altimeter Forest Canopy Profile Model**
    Methods: Monte Carlo methods, inversion of probability density function, and FFT-based spatial data series analysis
    Tools: C, Excel
12. **Automated Quality Assessment of Continuous Climate Data**
    Methods: Historical Distributions and Instrument Cross-Comparisons for Data Quality Assessment
    Tools: Perl, IDL, C, FORTRAN
13. **Spectral Analysis of Mechanical Vibration Data**
    Methods: System Transfer Function creates displacement from accelerometer data, then FFT-based spectral analysis
    Tools: ANSYS, C, Maple, Excel, Data Acquisition
14. **Algorithms for Automated Detection of Subtle Image Quality Defects (U.S. Patent 8,004,564)**
    Methods: Application of Spatial Filters to a digital Image Array, then Nearest-Neighbor calculations
    Tools: Maple, C and C++
15. **Algorithms for Automated Processing of Astronomical Images from a Survey Telescope**
    Methods: Astronomical Image Object Detection and Characterization, Database
    Tools: Matlab, C