

Department of Geology & Planetary Science  
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## TEACHING / SERVICE

### EDUCATION:

**Arizona State University:** Ph.D. (1996), Geological Sciences

Dissertation Title: *Quantitative analysis of geological surfaces: A deconvolution algorithm for midinfrared remote sensing data*

Advisors: Dr. Philip Christensen and Dr. Jonathan Fink

**Drexel University:** B.S. (1990), Mechanical Engineering / Geology Minor (1990)

Senior Design Title: *Geothermal power plant design and geologic analysis of the Salton Sea region, CA*

Advisors: Dr. Edward Doheny and Dr. Harry Brown

### APPOINTMENTS:

**University of Pittsburgh, Department of Geology and Planetary Science**

2011 - present: Professor

2007: sabbatical leave (*Arizona State Univ., Alaska Volcano Observatory, Univ. of Hawaii*)

2006 - 2011: Associate Professor with tenure

2000 - 2006: Assistant Professor

**University of Alaska - Fairbanks, Department of Geology and Geophysics**

2004 - present: Affiliate (*Adjunct*) Associate Professor

**Arizona State University, Department of Geological Sciences**

1998 - 2000: Visiting Assistant Professor

1997 - 1998: Faculty Research Associate

1996 - 1997: Postdoctoral Research Associate

1990 - 1996: Graduate Teaching/Research Associate

### RESEARCH:

#### MAJOR THEMES:

##### Laboratory Infrared Spectroscopy:

High precision vibrational spectroscopy provides information on the atomic structure of the minerals and glasses that comprise any geologic material. This new research is focused on the theory behind the structural and chemical changes in minerals and rocks as the samples are heated above their melting point. Such experiments have not been previously attempted, but could lead to fundamental information about mineral phase changes and their spectral response on lava flows.

##### Eolian Processes and Desertification:

New research is being conducted into eolian processes, including sediment transport, the radiative effects of dust and desertification. Using remote sensing techniques to study dynamic dune fields provides the synoptic ability to examine changes over time. It also allows for the

monitoring of marginal drought-prone regions susceptible to future desertification, soil moisture, and the point-sources for larger atmospheric dust storms.

#### **Remote Sensing of Volcanic Eruptions and Processes:**

A primary focus is that of thermal infrared (TIR) remote sensing as applied to physical volcanology and eruption monitoring. Of specific interest is the linkage between the renewal of activity at an explosive volcano and the ability of remote sensing to detect that activity and help monitor subsequent hazardous activity. The tools employed include laboratory-based infrared spectroscopy, field-based TIR imaging and differential global positioning system (dGPS) data collection, as well as satellite image analysis.

#### **Planetary Surface Geomorphology:**

Small-scale (< 2km) impact craters and lava flows on Mars can represent some of the most recent surface processes on the planet. Distinguishing impact craters from similarly-sized volcanic craters (maars) is not straightforward, but could lead to the identification of water-rich regions of the subsurface. By examining terrestrial analogs and developing new remote sensing techniques, a better understanding is developed for these recent processes on Mars.

#### **Lava Flow Petrology and Emplacement Dynamics:**

Fundamental to understanding the behavior of lava flow emplacement and its surface structure is the ability to extract key physical parameters. This is accomplished by way of near-field observations using thermal cameras or laboratory TIR spectroscopy. The formation of glassy rinds, vesicular textures, and phenocrysts are each measurable using the tools. These data allow for the modeling of properties such as flow inflation, viscosity changes, and crustal formation.

#### **Urban Environmental Science and Hazards:**

Another research interest involves the application of remote sensing and a geographical information system (GIS) to monitor and analyze urban growth, its impact on the surrounding environment, and the associated hazards. By using approaches similar to the data analysis and visualization used for volcanic studies, key urban data products can be generated such as calibrated/geometrically accurate land use change, material identification, and heat island maps.

### **MAJOR RESEARCH FUNDING:**

**Thermophysical properties of mantled volcanic surfaces: Constraints on lava composition and emplacement processes**

Period: 2011-2015

NASA, Planetary Geology and Geophysics Program

PI: Michael Ramsey

**Volcanic forcing effects on climate and solid-earth systems: Integration of Terra and Aqua datasets into the ASTER Urgent Request Protocol (URP)**

Period: 2011-2014

NASA, The Science of Terra and Aqua Program

PI: Michael Ramsey

**Infrared spectroscopy of melts: New approaches to understanding lava flow emplacement**

Period: 2010-2013

NSF, Petrology and Geochemistry Program

PI: Michael Ramsey

**Mars Odyssey participating scientist: Super-resolving THEMIS data for improved temperature, composition, and spatial resolution**

Period: 2006-2012

NASA, Mars Odyssey Research Program

PI: Michael Ramsey

**Mineral and gas identification using a high-performance thermal infrared imaging spectrometer**

Period: 2008-2012 (*now in no-cost extension*)

NASA, Instrument Incubator Program

PI: Jeff Hall (*Aerospace Corporation*)

Co-I: Michael Ramsey

**Expansion and synergistic use of the ASTER Urgent Request Protocol (URP) for natural disaster monitoring and scientific analysis**

Period: 2008-2012 (*now in no-cost extension*)

NASA, Earth System Science Research Program

PI: Michael Ramsey

**PENDING PROPOSALS:**

**Synergistic analysis of InSAR and TIR data for multiscale characterization of active volcanic processes**

Period: 2012-2015

NASA, Earth Surface and Interior Program

PI: Michael Ramsey

**Development of a long-wavelength infrared camera for planetary exploration**

Period: 2012-2014

NASA, Planetary Instrument Definition and Development Program

PI: Philip Christensen (*Arizona State University*)

Co-I: Michael Ramsey

**Compact LWIR spectrometer for surface composition identification and mapping**

Period: 2012-2015

NASA, Planetary Instrument Definition and Development Program

PI: David Tratt (*Aerospace Corporation*)

Co-I: Michael Ramsey

**PAST/COMPLETED PROJECTS:**

***Investigations of terrestrial and planetary lava flows***

Period: 2007-2011

NASA, Planetary Geology and Geophysics Program

PI: David Crown (*Planetary Science Institute*)

Co-I: Michael Ramsey

***Infrared spectroscopy of silicic glasses & melts: Deriving volcano-scale processes from laboratory-scale measurements***

Period: 2007-2011

NSF, Petrology and Geochemistry Program

PI: Michael Ramsey

***Thermal infrared observations of explosive volcanoes: A comparative study of Bezymianny (Russia) and Colima (Mexico)***

Period: 2007-2008

NGS, Committee for Research and Exploration Program

PI: Michael Ramsey

Co-PI: Adam Carter

***Using multi-sensor data fusion to estimate dust aerosol composition and its affect on longwave radiative forcing***

Period: 2006-2010

NASA, Earth and Space Science Graduate Fellowship

PI: Michael Ramsey

GSR: Stephen Scheidt

***Characterization of terrestrial primary, eroded, and mantled volcanic surfaces for a more complete understanding of Martian volcanic deposit modification***

Period: 2006-2010

NASA, Mars Fundamental Research Program

PI: Jeffrey Byrnes (*Oklahoma State University*)

Co-I: Michael Ramsey

***Geochemical analysis of S-bearing species using Differential Optical Absorption Spectroscopy (DOAS) and infrared imaging at Cerro Negro's (Nicaragua) fumarole field***

Period: 2005-2006

NSF, Exploration Research Program

PI: Matthew Watson (Michigan Technological Institute)

Co-I: Michael Ramsey

***Mars lava flow surface morphology: An avenue for answering fundamental questions regarding the rates and styles of volcanism***

Period: 2005-2009

NASA, Mars Fundamental Research Program

PI: Steve Anderson (University N. Colorado)

Co-I: Michael Ramsey

***Automation of the ASTER emergency data acquisition protocol for volcanic disaster monitoring and preparedness***

Period: 2004-2009

NASA, Earth System Science Research Program

PI: Michael Ramsey

***Investigation of rapid urbanization processes using ASTER, MODIS, and Landsat data***

Period: 2004-2008

NASA, Earth System Science Research Program

PI: Philip Christensen (Arizona State University)

Co-I: Michael Ramsey

***Eolian processes in arid regions: Tracking land surface change using orbital data***

Period: 2003-2008

NASA, Solid Earth and Natural Hazards Program

PI: Nicolas Lancaster (Desert Research Institute)

Co-I: Michael Ramsey

***Quantitative analyses of terrestrial crater deposits: Integrated remote sensing studies of Martian surfaces***

Period: 2003-2007

NASA, Mars Fundamental Research Program

PI: Michael Ramsey

***Emission spectroscopy of silicic lavas: Implications for dome processes and hazards***

Period: 2003-2007

NSF, Petrology and Geochemistry Program

PI: Michael Ramsey

***Emplacement of terrestrial and planetary lava flows***

Period: 2003-2006

NASA, Planetary Geology and Geophysics Program

PI: David Crown (Planetary Science Institute)

Co-I: Michael Ramsey

***Multi-spectral remote sensing of brush fire scars in arid urban regions: Analysis of future fire and flooding hazards***

Period: 2000-2003

NASA, Office of Earth Science

PI: Michael Ramsey

Co-I: J Ramón Arrowsmith (Arizona State University)

***Monitoring the hazards of silicic volcanoes with remote sensing***

Period: 2000-2003

NASA, Office of Earth Science

Co-PI: Michael Ramsey

Co-PI: John Fink (Arizona State University)

**INVITED SEMINAR & COLLOQUIA TALKS:**

- 11/11 **Thermal infrared imaging science of active volcanoes and other geological processes**, Keynote Talk, InfraMation 2011 Annual Conference, Las Vegas, NV.
- 10/11 **From active volcanoes to active dunes: Application of thermal infrared data to geoscience research**, Geosciences Department Colloquium, Stony Brook University, Stony Brook, NY.
- 3/11 **Thermal infrared spectroscopy and remote sensing: Deciphering natural disasters and other surface processes**, Department of Geology and Environmental Science Colloquium, Univ. of Akron, OH.
- 5/10 **What are we learning from quantitative thermal infrared data of volcanoes other than they are hot?**, Hawaii Volcano Observatory Seminar, Kilauea, HI.

- 12/09 **What more have we learned from thermal infrared remote sensing of active volcanoes other than they are hot?**, AGU Fall Meeting, San Francisco, CA.
- 8/09 **Deriving soil moisture and sediment mobility using future HypsIRI-derived thermal inertia**, Second HypsIRI Science Workshop, Pasadena, CA.
- 8/09 **Human health and urbanization**, Second HypsIRI Science Workshop, Pasadena, CA.
- 8/08 **Thermal infrared emission spectroscopy: Deciphering surface processes on Earth and Mars**, Department of Earth Sciences Colloquium, University of Bristol, Bristol, UK.
- 3/08 **Thermal emission infrared spectroscopy for geological research**, Thermo Electron Scientific Symposium, Montreal, QC.
- 2/08 **NASA's future lunar exploration program: What can we learn about Earth processes from the lunar surface?**, Geology and Planetary Science Department Colloquium, University of Pittsburgh, Pittsburgh, PA.
- 4/07 **Thermal infrared remote sensing of volcanoes**, Michigan Technological University EHaz Course Lecture, Houghton, MI.
- 3/07 **Thermal infrared data from the Moon: Hazards & hot-spots**, Workshop on Science Associated with the Lunar Exploration Architecture, Tempe, AZ.
- 2/07 **Deciphering planetary geological surface processes using thermal infrared vibration spectroscopy**, Thermo Electron Scientific Symposium, Santa Clara, CA.
- 9/06 **Quantitative surface observations of the Earth and Mars: Seeing through the "eyes" of the thermal infrared**, Geological Sciences Department Colloquium, Ohio University, Athens, OH.
- 1/06 **Quantitative surface observations of the Earth and Mars: Seeing through the "eyes" of the thermal infrared**, Geology and Planetary Science Department Colloquium, University of Pittsburgh, Pittsburgh, PA.
- 9/05 **Comparative infrared observations of dome growth processes at Mt. St. Helens and the volcanoes of Russia's Kamchatka Peninsula**, Geological/Mining Engineering & Sciences Department Colloquium, Michigan Technological University, Houghton, MI.
- 9/04 **Through the "eyes" of the thermal infrared: Observations and results from the surfaces of Mars and Earth**, Geological/Mining Engineering & Sciences Department Colloquium, Michigan Technological University, Houghton, MI.
- 5/04 **Quantitative geological surface processes extracted from infrared spectroscopy and remote sensing**, Mineralogical Association of Canada Thermal Infrared Spectroscopy Workshop, London, Ontario, Canada.
- 3/03 **Monitoring, assessment and mitigation of volcanic hazards using data from space and the field**, Pittsburgh Geological Society Meeting, Pittsburgh, PA.
- 6/02 **Two years of observations and results from the ASTER volcano monitoring program: Silicic dome mapping at Medicine Lake, CA and Bezymianny, Kamchatka**, Cascade Volcano Observatory Seminar, Vancouver, WA.
- 6/02 **Using terrestrial multispectral images as a proxy for constraining new thermal infrared data of Mars**, Mars Infrared Spectroscopy Workshop, Lunar and Planetary Science Inst., Houston, TX.
- 10/01 **Active volcanology close up: Results from the new class of NASA satellites and the lessons learned from field work on explosive volcanoes**, Geology Department Colloquium, University of Western Ontario, London, Ontario.
- 7/01 **Lessons learned from field work on active, explosive volcanoes: Comparison of Shishaldin, Alaska and Semeru, Indonesia**, Geology & Geophysics Department Seminar, University of Hawaii, Honolulu, HI.
- 11/00 **The Advanced Spaceborne Thermal Emission and Reflectance Radiometer (ASTER) Urban Environmental Monitoring program: Local results using airborne MASTER data from Phoenix, AZ**, (MASTER airborne special session), Las Vegas, NV, November, 2000.

- 10/00 **Contrasting volcanic hazard mitigation in Japan and Indonesia: Can remote sensing help augment these efforts?**, Geology Department Colloquium, Indiana University of Pennsylvania, Indiana, PA.
- 5/99 **Understanding the “big picture”: Strategy development for the global monitoring of planetary processes on Earth and Mars**, Geology and Planetary Science Department Colloquium, University of Pittsburgh, Pittsburgh, PA.
- 11/98 **Beyond thermal anomaly detection: The next decade of volcanic monitoring and hazard mitigation using infrared remote sensing**, Department of Geology Pegrum Seminar, State University of New York - Buffalo, Buffalo, NY.
- 5/98 **Big bucks and tiny bubbles: What can multi-million dollar satellites tell us about lava vesicularity, volcanic mapping, and eruption monitoring?**, Alaska Volcano Observatory (AVO) Seminar, Anchorage, AK.
- 11/97 **From dunes to domes: Geologic analysis using a deconvolution approach to thermal infrared remote sensing data**, Geology Department Seminar, University of Washington, Seattle, WA.

### HONORS AND AWARDS:

- 2009 Selected as Best Student First-Author Presentation within the AGU VGP Section  
Lee, R.J. and **Ramsey, M.S.**, A high-temperature micro-furnace for in-situ spectral analysis of quartzofeldspathic melts, *Eos Trans. AGU*, 90(52), Fall Meet. Suppl., Abst. V13B-2030, 2009.
- 2008 Selected as Best Student First-Author Presentation within the AGU VGP Section  
Rose, S. and **Ramsey, M.S.**, The Eruptive Behavior of Klyuchevskoy Volcano, Kamchatka, *Eos Trans. AGU*, 89(53), Fall Meet. Suppl., Abst. V43A-2141, 2008.
- 2006 Awarded promotion to Associate Professor with tenure, University of Pittsburgh
- 2002 Selected as Best Student First-Author Presentation within the AGU Biogeosciences Section  
Misner, T., **Ramsey, M.S.**, and Arrowsmith, J.R., Analysis of Brush Fire Scars in Semi-Arid Urban Environments: Implications for Future Fire and Flood Hazards Using Field and Satellite Data, *Am. Geophys. Union Fall Meeting, Abs. B61C-0740*, 2002.
- 2001 National Finalist, David and Lucile Packard Foundation Fellowship  
*chosen as one of only two nominees from the University of Pittsburgh*
- 1996 Best of Session Award, ERIM Second International Airborne Remote Sensing Conference  
**Ramsey, M.S.**, Object detection utilizing a linear retrieval algorithm for thermal infrared imagery
- 1992 Sigma Gamma Epsilon National Honor Society for the Earth Sciences
- 1991 Phi Kappa Phi National Honor Society

### PROFESSIONAL ORGANIZATIONS:

- 2000-- International Association of Volcanology and Chemistry of the Earth's Interior
- 1993-- Geological Society of America
- 1991-- American Geophysical Union

### COLLABORATORS:

**Steven Anderson** (Univ. of N. Colorado), **Ramón Arrowsmith** (Arizona State Univ.), **Dan Blumberg** (Ben-Gurion Univ., Israel), **Jeffrey Byrnes** (Oklahoma State Univ.), **Philip Christensen** (Arizona State Univ.), **Amanda Clark** (Arizona State Univ.), **Robert Craddock** (CEPS/Smithsonian Inst.), **David Crown** (Planetary Science Inst.), **Ken Dean** (Univ. of Alaska Fairbanks), **Jonathan Dehn** (Univ. of Alaska Fairbanks), **Kenneth Edgett** (Malin Space Science Systems, CA), **Jonathan Fink** (Arizona State Univ.), **Luke Flynn** (Univ. of Hawaii), **Vicky Hamilton** (Southwest Research Inst.), **Jeff Hall** (Aerospace Corp.), **Andrew Harris** (Univ. Blaise

Pascal, Clermont-Ferrand), **Simon Hook** (Jet Propulsion Laboratory), **Penny King** (Australian National University), **Nicholas Lancaster** (Desert Research Inst., NV), **David Pieri** (Jet Propulsion Laboratory), **Mike Poland** (USGS/HVO), **Vincent Realmuto** (Jet Propulsion Laboratory), **Steven Ruff** (Arizona State Univ.), **William Stefanov** (Johnson Space Center), **Matthew Watson** (Univ. Bristol, UK), **Rick Wessels** (USGS/AVO), **Martin Wooster** (King's College, UK)

### **SYNERGISTIC RESEARCH ACTIVITIES:**

Science team member (MAGI instrument – NASA): Chosen as a science team member assisting in the development of the future airborne Mineral and Gas Identifier (MAGI). Funded under the Instrument Incubator Program and built by Aerospace Corporation, MAGI will be a new multispectral thermal infrared design and serve as a prototype for the next generation of Earth-orbiting TIR sensors.

Participating scientist (THEMIS instrument – NASA): Selected as a participating scientist/team member for the Mars-orbiting Thermal Emission Imaging System. Responsible for developing new spatial enhancement algorithms for more accurate detection of sub-pixel mineral and thermal anomalies on the martian surface.

Science team member (ASTER instrument – NASA): Responsible for various instrument calibration/validation and coordination of the new multi-satellite integration program for volcanic monitoring. Work also entails presenting 3-4 talks two times per year at the international ASTER science team meetings detailing/updating ongoing progress.

International workshop organization: Co-organized the Geological/Mineralogical Association of Canada (GAC-MAC) short course, “Molecules to planets: Infrared spectroscopy in geochemistry, exploration geochemistry, and remote sensing”. In conjunction, led two splinter workshops on satellite image processing and thermal infrared spectroscopy principles & applications (May, 2004).

Co-organized and co-led the remote sensing workshop in Cordoba, Argentina in conjunction with the International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI) general assembly meeting in Puçon, Chile. Workshop included several interactive image analysis laboratories and lectures for South American scientists (November, 2004).

International field campaign organization: Coordinated, participated, and planned international field campaigns to investigate eolian processes/desertification (Saharan Desert & Mexico) and active volcanic processes (Chile, Iceland, Indonesia, Japan, Nicaragua & Russia).

### **TEACHING EXPERIENCE:**

**2000-present: University of Pittsburgh (Assistant/Associate Professor)**

#### Undergraduate Coursework:

##### **Natural Disasters (GEOL-0820)**

Natural Disasters was proposed, approved by the School of Arts and Science, and developed to expose introductory students to the geologic, hydrologic, and atmospheric processes that affect the human environment in catastrophic ways. This course covers numerous hazards including: earthquakes, volcanic eruptions, tornadoes, hurricanes, tsunamis, & wildfires. In its first offering it became the largest course taught in recent Departmental history (224 students), and increased significantly in subsequent years.

**Instructor: Ramsey** (Spring 2005-2006, 2008-2012)

**Average class size: 360**

***Earth System Science (GEOL-0840)***

This course was initially developed based on the integrated discipline of Earth System Science that has been rapidly developing over the last two decades. The fundamental concept is a linkage of the four spheres of the Earth: hydrosphere, cryosphere, atmosphere, and lithosphere. By focusing on the biophysical cycles that operate through these spheres, an understanding is developed of many aspects of anthropogenic global change.

**Instructor:** Ramsey (Spring 2002, 2004)

**Average class size:** 46

***The Planets (GEOL-0870)***

This course has been a staple in the Department for years. It examines the historical development of knowledge of the various bodies that make up the planetary system, including planets, satellites, asteroids and comets, how they were formed, and the factors that control the nature of their surfaces and atmospheres.

**Instructor:** Ramsey (Fall 2010-2011)

**Average class size:** 30

***Introduction to Remote Sensing (GEOL-1460)***

Remote Sensing was adapted from a previously offered course in the Department. It provides a foundation in the theory and techniques of image processing and data visualization spanning the electromagnetic (EM) spectrum from the ultraviolet to microwave. Students utilize a state-of-the-art image processing laboratory, software, and newly acquired satellite data. It is a required core course for students in the GIS Certificate and Pro-MS programs.

**Instructor:** Ramsey (Spring 2002-2003; Fall 2004-2006, 2008-2011)

**Average class size:** 35

***Geohazards (GEOL-1640)***

Geohazards examined the geological and natural processes that affect the human environment in catastrophic ways in terms of science, prediction, mitigation, avoidance and policy/safety issues involved. These problems commonly result from human activity in modifying the natural geologic process. *This course is no longer offered in the Department, having been divided into two new courses: Natural Disasters and Advanced Geohazards and Risk Management.*

**Instructor:** Ramsey (Fall 2000, 2002)

**Average class size:** 26

**Graduate Coursework:**

***Applied Remote Sensing & GPS Techniques (GEOL-2460)***

This course was developed primarily for graduate students (and advanced undergraduates) as a follow-on to the Introduction to Remote Sensing course. There is strong emphasis on quantitative EM theory, with the unique addition of field-oriented problems and data collection. The ultimate goal of this course is to explore the connection between remotely-gathered imagery and the physical world.

**Instructor:** Ramsey (Fall 2002; Spring 2001, 2004, 2006, 2009, 2011)

**Average class size:** 13

***Advanced Geohazards & Risk Management (GEOL-2640)***

This newly-developed course was designed to be a more rigorous replacement for the previously-offered GeoHazards course. It explores the geological and natural processes that affect the human environment in catastrophic ways. In addition, policy issues, risk management, and Homeland Security aspects are highlighted, focusing on specific case studies of recent hazards.

**Instructor:** Ramsey (Spring 2005, 2010, 2012)

**Initial class size:** 10

***Volcanology (GEOL-2750)***

This is an introductory physical volcanology course offered at the graduate level. The main topics covered are the physical properties of lavas, the geomorphology of volcanic landforms, the dynamics and monitoring of volcanic eruptions, and the emplacement of volcanic deposits. *Starting in 2005, this course will be taught by Prof. Skilling, with Prof. Ramsey focusing on the Remote Sensing and Hazards sequences.*

**Instructor: Ramsey** (Fall 2001)

**Class size: 11**

**Instructors: Ramsey & Skilling** (Fall 2003)

**Class size: 8**

***Remote Exploration of the Moon & Mars (GEOL-3970)***

This advanced seminar-style course focuses on the theory, technology, and science of the recent and upcoming remote sensing data sets of Mars. Numerous missions from rovers to orbiters have been sent to Mars, with each carrying remote sensing instruments. The data returned from those instrument have led to important discoveries about the Red Planet and are the focus of this course and an independent project performed by the students.

**Instructor: Ramsey** (Spring 2003; Fall 2005, 2010)

**Average class size: 5**

**1997-1999: Arizona State University (Visiting Assistant Professor)**

*Introduction to Physical Geology (GLG-101): average class size: 160 (Spring 1997, 1998)*

*Applied Remote Sensing (GLG-598): average class size: 15 (Fall 1998)*

**1995-1996: Arizona State University (Guest Lecturer)**

Volcanology (GLG-420)

Geology of Mars (GLG-406)

Advanced Remote Sensing (GLG-598)

**1990-1993: Arizona State University (Teaching Assistant)**

Introduction to Geology (GLG-101)

Introduction to Physical Geology I Laboratory (GLG-103)

Introduction to Planetary Science (GLG-105)

Geology of Mars (GLG-406)

Geology Field Camp (GLG-450)

Advanced Field Geology (GLG-455)

Advanced Physical Volcanology (GLG-520)

Remote Sensing (GLG-598)

Advanced Remote Sensing (GLG-598)

**POST-DOCTORAL ADVISING:**

**Rachel Lee**

term at Univ. Pittsburgh: 2011 - present

Research: Thermal infrared (TIR) spectroscopy and petrology of phase transitions in volcanic glasses and melts (*funded by NSF*)

**Christopher Hughes**

term at Univ. Pittsburgh: 2011

Currently: NASA Jet Propulsion Laboratory (Pasadena, CA)

**Stephen Scheidt**

term at Univ. Pittsburgh: 2009 - 2010

Currently: Center for Earth and Planetary Studies, Smithsonian Institution (Washington, DC)

**Adam Carter**

term at Univ. Pittsburgh: 2008 - 2009

Currently: Exxon-Mobile Corporation (Houston, TX)

**Jeffrey Byrnes**

term at Univ. Pittsburgh: 2003 - 2005

Currently: Oklahoma State University (Stillman, OK)

## GRADUATE STUDENT ADVISING:

### Current Graduate Students:

**Nicole Fontanella** (*Ph.D. candidate*) began studies: August, 2011  
Dissertation Topic: Thermal infrared spectroscopy of basaltic melts/glasses

**Jefferson Hungerford** (*Ph.D. candidate*) began studies: August, 2006  
Dissertation Topic: Emplacement of lava under ice: Texture recognition and mechanics of the Tennena Flow eruption, Mount Edziza, British Columbia, Canada

**Redha Mohammad** (*Ph.D. candidate*) began studies: August, 2008  
Dissertation Topic: Eolian processes and dust generation in the Middle East

**Mark Price** (*M.S. candidate*) began studies: August, 2011  
Thesis Topic: Remote sensing of mantled lava flow surfaces

**Kevin Reath** (*Ph.D. candidate*) began studies: August, 2011  
Thesis Topic: Satellite infrared analysis of global volcanic processes

### Previous Graduate Students:

**Adam Carter** (*Ph.D. degree*) completed: August, 2008  
Dissertation Title: *Quantitative thermal infrared analyses of volcanic processes and products: Application to Bezymianny Volcano, Russia*  
Currently: Research Geologist, ExxonMobile Corporation, Houston, TX

**Melanie Hellman** (*M.S. degree*) completed: July, 2002  
Thesis Title: *Analysis of hot springs in Yellowstone National Park using ASTER and AVIRIS remote sensing*  
Currently: New York City Teaching Fellow (NYCTF), NY

**Topher Hughes** (*Ph.D. degree*) completed: November, 2010  
Dissertation Title: Super-resolution of thermal infrared data with contemporaneous visible and near-infrared data  
Currently: Instructor, Dept. of Geology & Planetary Science, Univ. of Pittsburgh

**Sally Kuhn** (*M.S. degree*) completed: November, 2003  
Thesis Title: *Characterization of dome processes at Soufrière Hills Volcano, Montserrat: Synthesis of infrared remote sensing data with a multi-parameter database*  
Currently: Global Volcanism Program (GVP), Smithsonian Institution, Washington, DC

**Rachel Lee** (*Ph.D. degree*) completed: April, 2011  
Dissertation Topic: Thermal infrared (TIR) spectroscopy and petrology of phase transitions in volcanic glasses and melts  
Currently: Post-doctoral researcher, Dept. of Geology & Planetary Science, Univ. of Pittsburgh

**Tamara Misner** (*M.S. degree*) completed: December, 2003  
Thesis Title: *Multi-frequency, multi-temporal, brush fire scar analysis in a semi-arid urban environment*  
Currently: Ph.D. program in the Department of Geology and Planetary Science, University of Pittsburgh (*advisor: Michael Rosenmeier*)

**Shellie Rose** (*Ph.D. degree*) completed: December, 2010  
Dissertation Topic: Thermal infrared remote sensing of active basaltic volcanoes: a thermal and spectral deconvolution approach  
Currently: Army Corp of Engineers, Alexandria, VA

**Kevin Reath** (*M.S. degree*) completed: August, 2011  
Thesis Topic: Hyperspectral thermal infrared analysis of the Salton Sea geothermal field  
Currently: Ph.D. program in the Department of Geology and Planetary Science, University of Pittsburgh (advisor: Michael Ramsey)

**Stephen Scheidt** (*Ph.D. degree*) completed: November, 2009  
Dissertation Title: *Aeolian system dynamics derived from thermal infrared data*  
Currently: Post-doctoral researcher, Center for Earth and Planetary Studies, Smithsonian Institution, Washington, DC

**Shawn Wright** (*M.S. degree*) completed: July, 2003  
Thesis Title: *Thermal infrared data analyses of Meteor Crater, Arizona: Implications for Mars spaceborne data from the Thermal Emission Imaging System*  
Currently: completed Ph.D. program, Arizona State University (advisor: Philip Christensen).  
Now: Post-Doctoral Researcher, University of New Mexico.

### **Pro-M.S. Students:**

Responsibilities include co-advisement and co-supervision of all students within the Professional Science Master's degree program, which started in the Fall of 2002. Work includes recruitment, curriculum development, course scheduling, and project advisement/final evaluation. Students do not perform a traditional research-based thesis, but rather take two years of intensive, highly multidisciplinary coursework, including emphasis in the Schools of Law, Business, Information Science, and Arts and Science (Geology, Communication, Statistics Departments), as well as a summer-long internship in industry.

Current: Jessica Barnabei, Chris DeNero, James Morar, Jon Mori, Michelle Neustein

Graduated: Jessica Benner, Christopher Bostwick, Thomas Bouch, Kari Cavada, Kelly Dreibelbis, Sean Fulton, Lorraine Funkhouser, Bradley Hurlburt, David Knowlton, Randy Lentz, Jeff Mihalik, Emmett Rafferty, Patricia Roncovich, Timothy Seiple, Tina Shendge, Bonnie Stayer, Christopher Urik, Ann VanderSchrier, Kevin Warner, Amanda Wasielewski, Mark Zellman

### **UNDERGRADUATE STUDENT ADVISING:**

GIS Certificate Advisor: responsibilities include supervising each student on a one semester independent study project, which involved some aspect of GIS and/or remote sensing data synthesis. Students are required to submit a final project summary in digital form.

2009: **Nicole Fontanella**, *Petrology and infrared spectroscopy of the Medicine Lake, CA volcanic rocks*

2004: **Moss Clark**, *Analysis of TIR data from the handheld FLIR camera of the Mt. St. Helens Eruption*

2002: **Nicole Nastanski**, *Smithsonian Museum internship: Remote sensing of Mt. Rainier Volcano*

2002: **Kevin Perkey**, *GIS web-based search tool development for ASTER data*

2001: **Morgan Callahan**, *Using GIS and remote sensing to examine grizzly bear habitat in Yellowstone National Park, WY*

Undergraduate Research Advisor: responsibilities include advisement and supervision of an undergraduate research project typically lasting two semesters.

2011: **Nate Wigton**, *Analysis of TIR temporal trends in North Pacific volcanoes*

2011: **Aleeza Harburger**, *Analysis of Hawaii FLIR data to estimate crust formation rates and thickness*

2009: **Nicole Fontanella**, *Data processing and analysis of multispectral FLIR data*

2009: **Michael Muder**, *Analysis of TIR temporal trends in North Pacific Volcanoes*

2007: **Sonja Melander**, *Thermal IR image and spectral analysis of Hawaiian pahoehoe lava flows*

- 2006: **Kelly Larotonda**, *ASTER image analysis and mosaic composite of the Sahara Desert*
- 2005: **Kevin Reath**, *Thermal IR analysis of Hawaiian pahoehoe lava emplacement and inflation*
- 2004: **Topher Hughes**, *IVIS network administration and further expansion/maintenance of the ASTER data scene viewer*
- 2003: **Brad Strittmatter**, *Expansion of the ASTER Scene Viewer using Java and Arc-IMS*
- 2002: **Alex Hanko**, *GIS and airborne TIR analysis of surface textures at Crater Glass lava domes, Medicine Lake, CA*
- 2002: **Erich Zorn**, *Petrographic study of the Mt. Unzen (Japan) lava dome: Comparisons to TIR spectroscopy results*

### **SYNERGISTIC TEACHING ACTIVITIES:**

Co-Director/Advisor: Professional M.S. (Pro-M.S.) Degree Program in Geographical Information Systems (GIS) and Remote Sensing (RS)

The Professional Science Master's degree program began in the Fall of 2002 with funding from the Alfred P. Sloan Foundation. Unlike a traditional thesis/research based M.S. degree, this program is unique in the physical sciences, drawn more from the paradigm of an M.B.A. The unique curriculum provides direct training on the latest GIS/RS software and equipment, while preparing students for careers in the geospatial sciences and management in such diverse fields as consulting, environmental non-profit organizations, research management, government agencies, technology applications, and others.

Planned/Organized: Biennial Volcanology field trip

The field trip is a week long and occurs the summer prior to the start of the semester in which Volcanology is taught (2001, 2003, 2005). Students travel to Long Valley, California to observe numerous volcanological examples, geological mapping and monitoring techniques. Those that participate are commonly more motivated in class, respond quicker and more accurately to questions, and do a more detailed final report.

### **SERVICE:**

Lunar Exploration Analysis Group (LEAG):

2009 -- 2011: Lunar Exploration Roadmap planning committee panel member

NASA HypSIRI Mission Science Support Group (SSG):

2008 -- present: science support and analysis for the mission planning

NASA Advisory Council (NAC):

2006 -- 2009: Earth Sciences Subcommittee (ESS) panel member

International Society for Photogrammetry and Remote Sensing (ISPRS):

2005 - present: Arid Lands, Land Degradation and Desertification Working Group Co-Chair

Editorial Responsibilities:

Co-Editor, Journal of Volcanology and Geothermal Research, (special issue): *Volcanic Observations From Space: New Results From the EOS Satellite Instruments*, Elsevier Press, 2004

Co-Editor, (research textbook): *Infrared Spectroscopy in Geochemistry, Exploration, and Remote Sensing*, Mineralogical Association of Canada, 2004

Chaired conference/workshop sessions:

*Capturing Dynamic Processes with Satellite Imaging*, Geological Society of America Mtg., Northeastern and North-Central Joint Meeting, March, 2011

*Arc Dynamics of Kamchatka: Recent Volcanological, Geophysical, and Petrologic Results*, American Geophysical Union, Co-chairs: A. Simon (Univ. Nevada Las Vegas) and M. West (Univ. of Alaska Fairbanks), Fall, 2008

*NASA Workshop on Science Associated with the Lunar Exploration Architecture*, Planning Committee, Feb, 2007

*Geophysical observations of volcanic processes: Linking surface, air, and space based measurements*, American Geophysical Union, Co-chair: M. Poland (Hawaii Volcano Observatory), Spring, 2004

*Infrared spectroscopy in geochemistry, exploration & remote sensing*, Mineralogical Association Canada Annual Meeting, Co-chairs: P. King (Univ. Western Ontario) and G. Swayze (U.S. Geological Survey), May, 2004

*Closing the Loop: Remote Analysis of Terrestrial and Planetary Surfaces*, American Geophysical Union, Co-chair: J. Mustard (Brown Univ.), Fall, 2002

*Volcanic Observations From Space: New Results From the EOS Satellite Instruments*, American Geophysical Union, Co-chair: L. Flynn (Univ. Hawaii), Fall, 2001

*Planetary Sciences II - Posters*, American Geophysical Union (Spring, 2001)

*Volcano Monitoring - Posters*, American Geophysical Union (Fall, 1999)

Manuscript reviews for the following journals:

Advances in Environmental Monitoring and Modeling; Bulletin of Volcanology; Geological Society of America Bulletin; Geophysical Research Letters; International Journal of Remote Sensing; Journal of Arid Environments; Journal of Geomorphology; Journal of Geophysical Research (*Solid Earth, Planets*); Journal of Volcanology and Geothermal Research; Photogrammetric Engineering and Remote Sensing; Remote Sensing of the Environment

Proposal reviews for the following programs:

Earth Surface Interior (NASA); Mars Data Analysis Program (NASA); Mars Fundamental Research Program (NASA); Planetary Geology and Geophysics Program (NASA); Solid Earth and Natural Hazards Program (NASA); Petrology and Geochemistry Program (NSF); International Program (NSF); International Science and Technology Center (DOS)

NASA panel reviews:

Earth System Science Fellowship (ESS); Mars Data Analysis Program (MDAP); Mars Fundamental Research Program (MFRP); Planetary Geology and Geophysics Program (PGG); Planetary Instrument Definition and Development Program (PIDDP); Petrology and Geochemistry Program (NSF)

University of Pittsburgh service:

2006 - present: elected member of the Plant Utilization and Planning Committee (University of Pittsburgh Faculty Senate)

2002 - 2008: Institutional representative, Universities Space Research Association (USRA)

2001 - 2004: Departmental representative, Climate Change Research Group

Department of Geology and Planetary Science service:

Director of Graduate Studies (2010 - 2011)  
*responsible for the graduate program in the Department*

Graduate Committee (2005 - 2011)  
*aided in the review and reorganization of the graduate student requirements*

Curriculum Committee (2003 - 2006)  
*assisted with the reorganization of the undergraduate B.S. curriculum and the planning of a new graduate core curriculum*

Faculty Search Committee (2001, 2002, 2011)

*assisted with the creation of the job advertisement and coordinated interviews/visits for the volcanology faculty candidates*

Space Committee, chairman (2000 – 2002)

*coordinated the planning and oversight with the A&S Dean's Office for the Department's renovation and relocation of several teaching computer laboratories, faculty offices, and research laboratories*

Departmental interactive multimedia kiosk (2001 – present)

*designed and programmed the point-of-presence kiosk at the entrance of SRCC, which offers a mineral display area, department directory, as well as showing educational videos and a custom-designed, touch screen computer monitor*

Webmaster (2002 - present):

*design and ongoing maintenance of the following sites:*

- IVIS Laboratory [<http://ivis.eps.pitt.edu/>]
- Pro-MS internet websites [<http://pro-ms.geology.pitt.edu/>]

Webmaster (2001 - 2009):

*assumed the responsibility for complete restructuring and redesign of the Departmental web site*

- Original Department Site (circa 2009) [<http://www.geology2.pitt.edu/>]

#### Outreach Activities:

##### **Research highlighted:**

National cable TV

- CNN, CNN International, BBC, Discovery Channel, National Geographic Channel

National Public Radio (Earth & Sky program)

- "["Volcanic Domes"](#) (2002)
- "["Watching Volcanoes from Space"](#) (2008)

Chronicle of Higher Education Article

- "["Under the Volcano"](#) (3/30/01)

NASA Earth Observatory Feature Article

- "["Domes of Destruction"](#) (2002)
- "["Flame & Flood"](#) (2003)
- "["Martian Craters"](#) (2005)

NASA Visible Earth Web Page Feature (2000, 2001, 2004, 2006)

Local TV (*Night Talk*, PCNC, 6 appearances; KDKA, 1 appearance)

Local newspapers (Pittsburgh Post-Gazette & Tribune Review, 2 articles each)

University of Pittsburgh newspapers (Pitt Chronicle, Pitt Campaign Chronicle)

##### **Public talks/seminars:**

**November, 2011:** InfraMation 2011 Annual Conference - Keynote Speaker, Las Vegas, NV.

*Thermal infrared imaging science of active volcanoes and other geological processes*

**April, 2009:** Allegheny Observatory Public Lecture Series (Pittsburgh, PA)

*Thermal infrared geologic observations: Past results and future directions of NASA's Mars, Moon, and Earth programs*

**October, 2008:** University of Pittsburgh's Science 2008 (Pittsburgh, PA)

*The interrelated wicked problems of lava flow emplacement and explosive volcanic hazard mitigation*

**June, 2007:** Challenger Learning Center of Alaska (Kenai, AK)

*Understanding Volcanic Processes on Earth and Mars Using Thermal Infrared Remote Sensing, Teacher Seminar*

**January, 2005:** Twentieth Century Club (Pittsburgh, PA)

*How can satellite data be used for the monitoring and mitigation of natural disasters?*

**April, 2004:** Carnegie Science Center's SciTech Festival (Pittsburgh, PA)

*Mars Mission: "Beyond the nightly news"*

**March, 2004:** Central Catholic Advanced Placement Science Class (Pittsburgh, PA)

*Watching Cities from Space*

**January, 2003:** Astronomers Association of Pittsburgh (Pittsburgh, PA)

*Keeping an eye on active eruptions: Volcanology from the ground and from space*

**March, 2002:** Carnegie Museum of Natural History, Earth Explorer Series (Pittsburgh, PA)

*Exploring active volcanoes: What can be learned from an often deadly field-based science?*

**October, 2001:** Westinghouse Science Honors Institute (Pittsburgh, PA)

*Explosive science: Volcanology on the ground and from space*