Washington University in St. Louis

Department of Earth and Planetary Sciences

Newsletter

Fall 2010 Issue 10

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Department of Earth and Planetary Sciences
Washington University in St. Louis
St. Louis, MO 63130

New Environmental Earth Sciences Major

Jennifer Smith

Starting this year, undergraduates at Washington University will have several new ways to study the environment. The EPS department will be hosting a new major in Environmental Earth Sciences (EES), the successor to the Environmental Studies-Geoscience major that is being phased out. Biology and Political Science are similarly hosting and/or developing new majors in Environmental Biology and Environmental Social Science. This is an excellent opportunity for us to be able to provide a rigorous, interdisciplinary academic experience to students with a passion for bringing an earth science perspective to the study of the environment. We also look forward to integrating these students with our close-knit community in the undergraduate Earth and Planetary Sciences (EPS) major.

The new major is structured quite differently from the existing EPS curriculum; EPS majors currently take a year of chemistry and physics, 3 semesters of calculus, a core sequence in earth and planetary science (the introductory level Earth and the Environment, and the intermediate level Earth Materials and Earth Forces), a writing intensive course, field camp, and five upper level EPS courses distributed amongst the subfields geology, geophysics, and geochemistry. In the new EES major, we have maintained the scientific rigor required by the classic curriculum, but allowed students more opportunity to explore biology, upper level chemistry, environmental engineering, and the social science aspects of environmental issues. In addition to grounding in math, chemistry, physics, and geology, EES students are required to take an introductory environmental biology and environmental ethics course. They may then choose to pursue advanced statistics, organic chemistry, ecology, or environmental engineering, or take additional calculus and physics similar to EPS majors. EES students then build on this foundation by taking five courses within a "theme", or topical area of interest. We have currently designated three themes, "Climate and energy", "Human altered environments", and "Life in its environment". Courses were selected for these lists through discussion with faculty in related and relevant programs, and in addition to a core of courses in EPS, include offerings from Energy, Environmental and Chemical Engineering, Architecture, Biology, Anthropology, Political Science, and Economics, among others. Students may, with faculty approval, design their own theme if they wish to pursue a topic not covered.

Above: Students, faculty, and staff examine volcanic rocks on a field trip to Yellowstone National Park.

These themes are designed around existing research and curriculum strengths in the EPS department and across campus. We expect

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Overview

Douglas Wiens

It is a pleasure to send you this update on the progress of our department during the last year. There have been several exciting developments, some of which are outlined in more detail elsewhere in this newsletter. Washington University has been the recipient of a large gift from Scott Rudolph, endowing a new chair in the petrology of the Earth and planets. The new chair will draw together some of our existing interests in terrestrial petrology and planetary materials, and allow us to teach a wider range of classes at both the undergraduate and graduate levels. We will begin interviewing candidates for the Rudolph chair in January.

We are moving forward with a new second undergraduate major in Environmental Earth Sciences. This major was developed in response to undergraduate interests in a rigorous program that is more multidisciplinary and more oriented towards environmental problems than our long-standing major in Earth & Planetary Sciences. Students will be able to start declaring their major in Environmental Earth Sciences this academic year.

Our younger faculty continue to build their research programs and impress their colleagues in the department and around the country. This is well illustrated by the awarding of a Packard Fellowship to David Fike to support his work in isotope biogeochemistry and the evolution of the earth's environment through geological time. David is one of only 17 awardees in all fields across the country this year, and will have the enviable task of deciding how to effectively spend $850,000. I expect this will produce even more activity from his side of the building.

Unfortunately we will be saying goodbye to two of our long-time colleagues in the next few months. Frank Podosek will be retiring in May, 2011 after a long and productive career. Frank, who joined the department in 1973, will be moving to Texas but will retain his involvement in geochemistry as the editor of *Geochemica et Cosmochemica Acta*. Jan Amend will also be leaving the department for a new and challenging position as professor at USC and associate director of the Center for Dark Energy Biosphere Investigations (C-DEBI). Fortunately we have been given approval for an additional faculty search in Biogeochemistry and Global Change, which will be going on in spring, 2011 along with the Rudolph Chair search.

In closing, I urge you all to keep in contact with us by sending us your news items. We will be hosting a reception at the Fall AGU meeting again this year so please stop by and share your stories over food and drinks (details p. 15). I would like to thank those who have donated money during this past year. Alumni donations to the department allow us to improve our educational activities and fund special activities such as field trips. For example, a donation recently allowed us to purchase new mineral and dislocation models for Earth Materials and Structural Geology classes. Jill Pasteris can finally stop taping and gluing the old models together every year.

David Fike awarded Prestigious Packard Fellowship

Congratulations are in order for EPS Prof. David Fike who has been awarded a 2010 Packard Fellowship for Science and Engineering. The Packard Fellowship Program was established in 1988 and arose out of David Packard's commitment to strengthening university-based science and engineering programs. By supporting unusually creative researchers early in their careers, the Foundation hopes to develop scientific leaders and further the work of promising young scientists and engineers. Fellows are nominated by presidents of the 50 universities that participate in the Packard Fellowship program. In 2010 only 17 were awarded in the entire United States. David intends to use the $875,000 over five years to build and expand his research program investigating the interactions between microbial metabolic activity and the ambient geochemical environment.

Scott Rudolph Chair in Earth and Planetary Sciences

Ray Arvidson and Douglas Wiens

A search is underway to fill the Scott Rudolph Chair in Earth and Planetary Sciences with an outstanding senior scientist who focuses on petrology, with an interest in extraterrestrial materials. The chair was established as a result of discussions with Chancellor Wrighton and former Chancellor Danforth about the importance of the McDonnell Center for the Space Sciences and its connections to the Department of Earth and Planetary Sciences. Scott Rudolph, Chairman and CEO of NBTY, Inc., the world's largest vitamin manufacturer, generously provided the gift to Washington University to endow the chair. Mr. Rudolph is also an avid mineral collector so it is fitting to have this endowed chair named for him.

The McDonnell Center for the Space Sciences is a world-class intellectual cluster of faculty, staff, and students pursuing astrophysics, planetary sciences, and examination and analysis of extraterrestrial materials. What has been missing from this cluster is a petrologist who can provide a unique perspective on the rock-forming processes revealed by lunar samples, meteorites (including pieces of the Moon and Mars), and cosmic dust. The need for a petrologist to enhance the Center's expertise was a primary driving factor for the Chancellor to match the department with Mr. Rudolph and establish the chair. Petrology is also a central sub-discipline for study of the Earth and a senior professor in this area will find natural collaborations with our outstanding group of geodynamicists, geochemists, and geologists who primarily focus on understanding the history and dynamics of the Earth. It is expected that the new chair will also help teach critically important classes ranging from introductory-level courses to graduate offerings. At the graduate level advanced courses in petrology and related areas are important to train our developing scientists who will go on to become world leaders in understanding how rocks form and evolve throughout the solar system.

ALUMNI UPDATE CARD

Let us know what you are doing now.

Name: _____

Address: _____

Phone: _____ Email: _____

Year graduated/degree: _____

Advanced degree(s): _____

Current Employer: _____

Other news for the next newsletter: _____

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Either send an email to mueller@wunder.wustl.edu or fill out this card and send it to:
Washington University in St. Louis, Department of Earth & Planetary Sciences, Margo Mueller,
Campus Box 1169, One Brookings Drive, St. Louis, MO 63130.

Shaping Planets with Giant Impacts

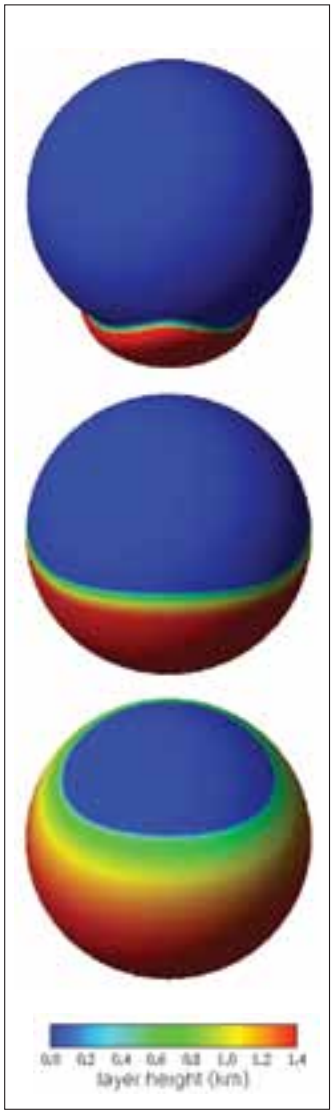
Slava Solomatov

"How big are we talking?" "It's the size of Texas, Mr. President." In the movie "*Armageddon*" (1998), this was all that was needed to explain the threat of an asteroid which was on a collision course with the Earth. Although a Texas-size asteroid does sound big, impacts of this size were not unusual in the beginning of planetary evolution, about four and a half billion years ago. Earth and other planets were hit by bodies even bigger than Texas. These bodies were the building material of the Earth. It's just that the "delivery method" was a bit rough.

Studying giant impacts, which happened billions of years ago, is a daunting task. Computational models are sometimes the only way to analyze these events. The Earth might seem like a good planet to start with because so much data is available to constrain the models. However, one of the major difficulties in studying the Earth is that plate tectonics erased most of the evidence of early impacts. If not for the Moon which is believed to be formed by a giant impact, it is unclear if the whole idea of giant impacts on early Earth would ever reach the status that it enjoys today. Mars, on the other hand, does not have plate tectonics and might provide some additional information about the giant impacts. So we turned to Mars.

Mars has plenty of large old impact basins. For example, the Hellas impact basin would cover half of the United States. However, statistically speaking, there should have been even larger impacts on Mars. Where is the evidence for these impacts? A long time ago researchers speculated that the Martian northern lowlands, occupying about 40 percent of the planetary surface, might have been formed by a large impact. A quantitative assessment of this hypothesis began only in the past few years, mounting observational and theoretical support for the impact hypothesis of the origin of the northern lowlands. Recent numerical models developed by Chris Reese, Chris Orth, and Slava Solomatov suggest a new and rather counterintuitive idea. It turns out that if the impact is sufficiently large, it melts the mantle to such extent that after the melt gets extruded on the Martian surface, it covers the impact basin and produces highlands instead of lowlands. These models, while supporting the impact hypothesis for the origin of the Martian northern lowlands, suggest that the location of the giant impact might be in the southern hemisphere rather than in the northern hemisphere. In other words, the giant impact might have formed the southern highlands rather than excavated the northern lowlands.

So far, the models seems to be consistent with observations including the width, depth, and shape of the transition between the lowlands and highlands (the dichotomy boundary). Perhaps, the ultimate test of this hypothesis is the age difference between the lowlands and highlands (by "age" geologists mean the age of crystallization). If the impact indeed formed the highlands, then the highlands must be younger than the lowlands. If the impact formed the lowlands then the age difference is opposite. At first glance, the southern highlands are more heavily cratered than the northern lowlands and thus appear to be significantly older. This is what everyone thought until very recently. High-precision measurements of the Martian topography by MOLA and subsurface radar sounding by MARSIS discovered a significant number

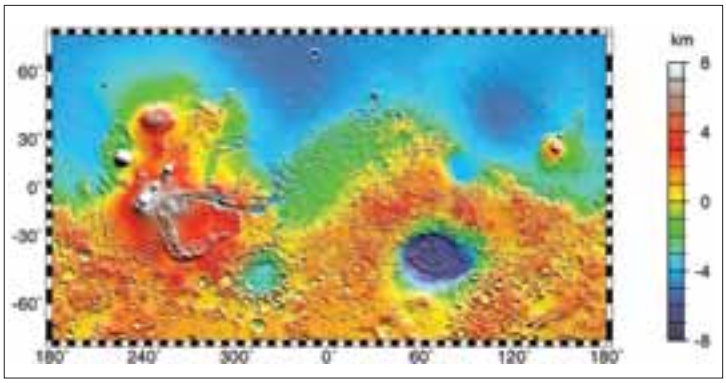


Above right: The spreading of a large volume of partially molten rocks on the Martian surface after a giant impact. Cooling and crystallization eventually cause rock hardening and the cessation of spreading. Unlike small impacts that produce craters, this giant impact forms highlands. The volume of melt that it generates is so large that it is sufficient to fill up the impact basin and even build highlands on top of it. The lowlands form in the northern hemisphere that is antipodal to the impact site and can be mistaken for an impact basin. For visualization purposes, the topography in the figure is exaggerated by a factor of 100. The colors indicate the elevation: lowlands are blue and highlands are red.

of buried craters that were previously invisible. These new data drastically changed the crater count and the northern hemisphere now appears to be as heavily cratered as the southern hemisphere, making it impossible to determine which one is older.

Although we do not know the answer now, future measurements might eliminate one of the two hypotheses.

Right: Mars' global topography (courtesy NASA/GSFC).



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them to evolve as the composition of the faculty changes. "Climate and energy" principally draws on expertise in paleoenvironmental reconstruction and in resource geology, and will feature a new course in development by Prof. Wysession on energy issues. In the future, we hope to see research initiatives in biofuels and solar energy, under the I-CARES umbrella (see icares.wustl.edu for more information), translate into curriculum offerings we can make available to majors under this theme. The theme "Human altered environments" is intended to encompass the topics of pollutant transport, urbanization, and the integrated effects of agriculture on natural systems. We anticipate students in this theme taking coursework not only in EPS but also in Engineering and in Anthropology. Finally, "Life in its environment" is the natural choice for students interested in the geoscience/bioscience interface and includes coursework in soils, ecology, and biogeochemistry.

We are excited at the opportunity the new Environmental Earth Sciences major presents to draw a new population of students into the EPS department. We also hope to foster interaction between students in all three new environmental majors, so as to encourage the kinds of interdisciplinary discussions necessary to address modern environmental issues.

PHD's Awarded 2010

Mitchell Barklage
Studies of mantle structure and seismicity in the Mariana Islands and Antarctica using temporary deployments of seismographs

Kimberly Lichtenberg
Remote sensing and terramechanics study of Mars using orbital and rover data sets

Credits

Editors
Margo Mueller, Doug Wiens

Contributors
Kelsi Singer, Doug Wiens,
David Heeszel, Ray Arvidson,
Jennifer Smith, and Slava Solomatav.

Mountains of Mystery

David Heeszel and Douglas Wiens

The Gamburtsev Subglacial Mountains are the size and scale of the European Alps, but no one has ever seen their peaks. This is because they lay buried by more than 1000 meters of ice in the center of East Antarctica. As part of a multidisciplinary, multinational project we set out to explore this most hidden of earth's mountain ranges. During the 2007 and 2008 austral summers we deployed 26 broadband seismometers across the Gamburtsev Subglacial Mountains to image the crust and upper mantle structure of the region in hopes of better understanding their origin.

The AGAP Project

The International Polar Year was a two year initiative supported by national funding agencies around the world with the aim of providing significantly more support for polar science than is typically available. A major component of this initiative was the Antarctica's GAmburtsev Province (AGAP) project which combined scientific and logistical support from six nations to conduct two large scale imaging experiments in the Gamburtsev Mountains. One experiment consisted of airborne geophysics conducted by researchers from Australia, Germany, the United Kingdom, and the United States. The second project, carried out by researchers from China, Japan, and the United States consisted of a passive seismic array across the Gamburtsev Mountains. The seismic project (GAMSEIS for short) began in 2007 with an initial deployment of 10 stations and expanded in 2008 to more than 30 stations operated either jointly by the United States/Japan or by China. Researchers from the Department of Earth and Planetary Sciences have been at the forefront of the GAMSEIS project from inception, through three field seasons, and currently as we move into data processing and interpretation.

Figure 1: Work tent and equipment at AGAP-S field camp, where all of the stations were assembled and tested before deployment.

Getting There is Half the Battle

Travel to the Antarctic continent is a non-trivial pursuit in and of itself, and getting to the center of the continent is even more challenging. Researchers first travel to Los Angeles, CA and from there to Christchurch, New Zealand. While in Christchurch we are outfitted with extreme cold weather gear or ECW to help protect from the elements in East Antarctica. Following a short layover in New Zealand we continue on to McMurdo station, an NSF operated station on Ross Island. This flight can take anywhere from 5-10 hours depending on weather in Antarctica and the type of military aircraft used for the flight. While at McMurdo researchers are given courses in survival and prevention of cold-related injury. When we are ready to leave McMurdo we board another military transport plane bound for South Pole, a trip of approximately three hours. Since the AGAP region is at high elevation (our camp had an elevation of over 11,500 ft.), we are required to undergo acclimatization at South Pole to help ensure that we do not get altitude sickness. Following a minimum of three days spent sitting around and eating, we are transported to our base camp on the East Antarctic plateau via twin otter aircraft. These small twin-engine planes are our ferries on the plateau and transport a group of four passengers and all of our equipment to the installation sites scattered across the mountain range. Getting home takes nearly as long as getting to the field and can be just as mind-numbing and frustrating.

Figure 2: Field team for the 2008-2009 field season. Team included Doug Wiens, Patrick Shore, David Heeszel, and Amanda Lough.

The Mountains

The structure and origins of the Gamburtsev Mountains are still a mystery, but one that is slowly being solved. Preliminary results are providing tantalizing clues about the age, formation and structure of what is probably the most hidden mountain range on earth. For instance, we now know that beneath hundreds of meters of ice there are jagged peaks, and that the crust beneath the mountains is thicker than the crust of the surrounding regions. This combined with previous studies on ocean sediments believed to have come from the mountains is providing us with a picture of a mountain range that is incredibly old (>500Ma) and yet preserves the rough topography and thickened crust of an active mountain range. As we seek to puzzle out the origin and history of the Gamburtsev Subglacial Mountains, we are slowly building a picture of the central portions of East Antarctica and placing it in a broader context. The work done by Wash. U. researchers during International Polar Year will continue to inform our understanding of East Antarctica's place within earth's tectonic history.

Figure 3: Turning the station on. All of the electronics were stored in insulated boxes to conserve heat.

The Many Enigmatic Features of Saturn's Moon Iapetus

Kelsi Singer

The Outer Solar System Geology and Geophysics Group (newly coined) at Washington University is presently involved in studying many different moons (Europa, Ganymede, Iapetus, Titan, and Triton to name a few). Each moon is an interesting, unique world, but for this short article I want to showcase Saturn's intriguing moon Iapetus.

Iapetus the Tennis Ball

Iapetus sports an albedo dichotomy with an odd pattern (Fig. 1a). Dark material coats the leading side of this synchronous moon and extends into the trailing side in the equatorial regions, while the poles and the majority of the trailing side are bright white (albedos range from 0.05 to 0.5). Images taken by the Cassini spacecraft revealed that small fresh craters had excavated bright material, leading to the conclusion that the dark material was a surface coating (Fig. 1b). A process called thermal segregation has been modeled for Iapetus: it shows that enhanced sublimation occurs in dark areas and the water vapor will redeposit as bright frost in the colder polar areas, leading to the observed albedo pattern.

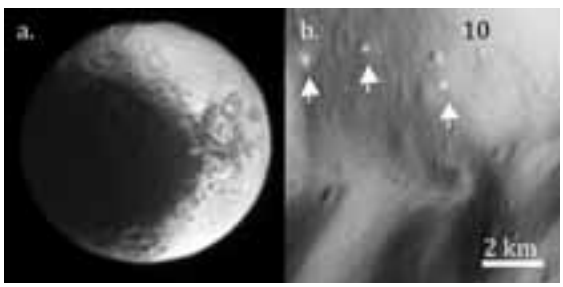

Figure 1. Images of Iapetus' albedo dichotomy. Arrows indicate where small fresh craters have exposed underlying bright material. NASA / JPL / SSI

Where did the coating of dark material come from originally? Phoebe, a small, dark moon orbiting outside of Iapetus, has long been a suspect. In 2009, a team us-

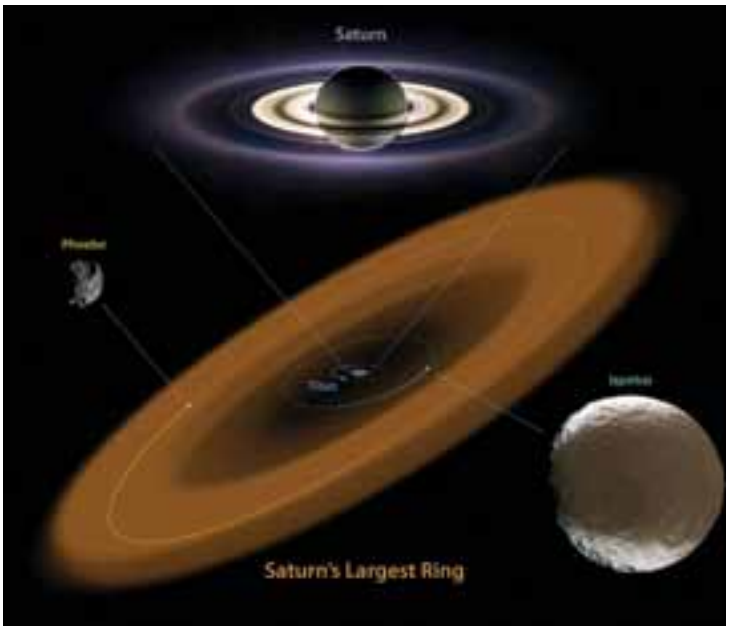

Figure 2. Illustration of the newly discovered Phoebe ring and how dust could be transferred to Iapetus' orbit. NASA / JPL-Caltech

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ing the infrared Spitzer Space Telescope discovered the largest ring of Saturn (Fig. 2). The Phoebe ring originates from dust blasted off Pheobe by impacts. It is a huge but sparse structure, spanning 300 Saturns wide and 20 Saturns tall. This new finding implies that dark material from Phoebe can be transferred to Iapetus' orbit, and it is thus a plausible source.

Iapetus the Walnut

The other striking feature on Iapetus is an equatorial ridge that reaches heights of 20 km and widths up to 70 km (the average radius of Iapetus is only 735 km). The morphology of the ridge varies greatly along strike: in some areas it is flat topped, in others it is made up of mountainous peaks, and in some places it has been obliterated by basin forming impacts. The ridge is a heavily cratered ancient feature.

The origin of the ridge is still being debated. Theories range from a tectonic episode (many strange ones have been proposed) to the idea that Iapetus had its own ring which formed after a large impact, and the debris then re-accreted on the equator. All are speculative at the moment, but the later has the advantage of producing a straight feature precisely on the equator.

Faulting

To add to the list of odd features on Iapetus, it also retains a large fossil equatorial bulge (independent of the ridge) and it has the shape of a body spinning with a 16 hour rotation period. Iapetus is now rotating synchronously with a period of 79.3 days. The flattening of Iapetus is ~1/22, which is quite large compared to Earth's flattening of ~1/300. As part of my research on Iapetus, I conducted a search for linear features or faults to look for signs of despinning.

Stresses associated with despinning from a period of 16 hours to 79.3 days could cause faulting in a predictable pattern. Unfortunately, the faults on Iapetus are not abundant and do not show an obvious pattern. The tectonic signature of despinning may have been obscured over time as the surface of Iapetus is very ancient, or the thick lithosphere may have inhibited its full expression. Many lineaments are straight segments of crater walls, which may be faults or joints reactivated during complex crater collapse. Most striking are several large troughs located in one area on the bright, trailing hemisphere. These troughs appear to be extensional and are distinctive because the interior floors and walls contain dark material.

Landslides

The landslides on Iapetus are the largest and most numerous observed on an icy body, and among the largest in the solar system. They occur off of basin walls (as does the example in Fig. 3), off of the equatorial ridge, and also in smaller craters. They have a variety of morphologies, from massive and hummocky to smooth and lobate. The run out lengths range from 5-80 km. Iapetus has the largest topography for its size of any body in the solar system, and the drop heights for the landslides range from 2-11 km.

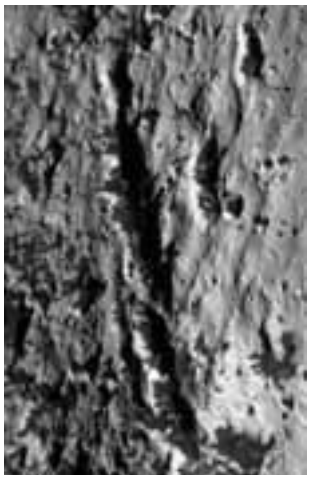

Figure 3. Linear trough on Iapetus. Trough length is ~ 70 km.

These landslides can help us understand the material properties of the Iapetian surface, and may also help us understand how long run-out landslides occur in general. The processes occurring in terrestrial long run-out landslides are still somewhat of a mystery. Landslides across the solar system, from Mars to icy bodies, increase the sample size and the range of known conditions under which they can occur.

On Iapetus, we use the landslides to draw an additional conclusion: the equatorial ridge, though ancient, is not permanent. Beyond being over-printed by subsequent large craters, it is disintegrating of its own accord – by mass wasting (Fig. 4).

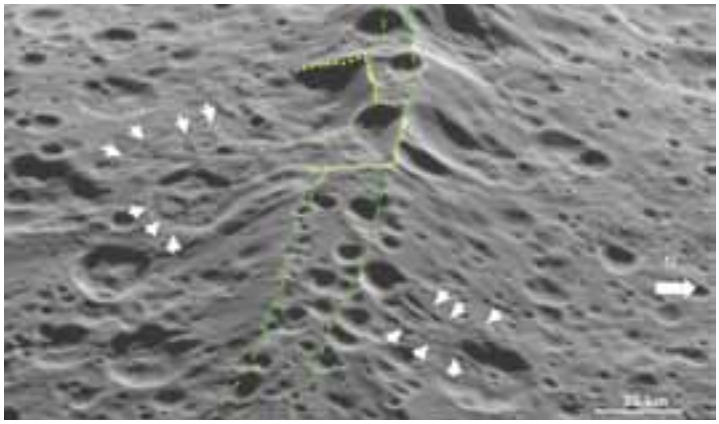

Figure 4. Landslides on Iapetus' equatorial ridge. The ridge runs through the center of this image (outlined in green) and is somewhat flat topped along this portion. Alcoves produces by mass wasting are outlined in yellow, and the approximate margins of landslides are indicated by arrows. The ridge has been degraded considerably by both impacts and mass wasting. The light is from the upper right.

McKinnon new President-elect

Bill McKinnon was voted the new president–elect of the AGU planetary sciences section. Bill will serve two years in this capacity before taking over the presidency in 2012.

Arvidson wins award for Phoenix mission

Ray Arvidson received the NASA Exceptional Public Service Medal in June, 2010. The award was given for exemplary scientific contribution and leadership to the Phoenix Robotic Arm Team. Ray and his lab provided the data and guidance for the landing site selection of the Phoenix Lander as well as contributions to data archiving, surface operations and safety activities of the mission.

Asian magazine honors Wang

"Jessica," the number one professional women's magazine in Asia, awarded Alian Wang as one of the Most Successful Women 2010. A ceremony was held in Hong Kong on May 31, 2010 to bestow the award to Dr. Wang.

Wiens elected to Director's term for IRIS

Doug Wiens was elected to a 3 year term on the Board of Directors of the Incorporated Research Institutions in Seismology (IRIS). IRIS is a consortium of universities engaged in seismological research, with an annual budget of about $15 million. Founded in 1984 with support from the National Science Foundation, IRIS is a consortium of over 100 US universities dedicated to the operation of science facilities for the acquisition, management, and distribution of seismological data. IRIS programs contribute to scholarly research, education, earthquake hazard mitigation, and verification of the Comprehensive Nuclear-Test-Ban Treaty.

Lodders at NSF

Katharina Lodders is currently on detail at the National Science Foundation in Arlington, Virginia, as Program Director in the Division of Astronomical Sciences. She is still affiliated with Washington University and continues her research, although on a much smaller scale.

Wysession helps formulate New Education Standards

That National Academy of Science has appointed Michael Wysession to be in charge of the creation of the Earth & Space Science content of the new K-12 National Science Education Standards. Wysession was leader of the Earth & Space Science team of the National Research Council's "Conceptual Framework for New Science Education Standards," and has been asked to lead the actual writing of the new National Education K-12 Science Standards in the areas of Earth & Space Science.

National Academies appoints Wiens

The National Academies appointed Doug Wiens as a member of the Scientific Committee on Antarctic Research Standing Scientific Group in Geosciences. This international committee provides advice to the Antarctic Treaty System which governs the continent.

Wang promotes archiving space science data abroad

With the help from Planetary Data System (PDS) Geosciences node and Shandong University-PDS lab, Alian Wang helped organize the second PDS workshop for Yinghuo-1 mission (China's first Mars Orbiter) at Shandong University (Weihai) in July 2010. Four experts from NASA's PDS PPI and NAIF nodes gave presentations to 53 Chinese attendees.

Cull selected as AWF Graduate Student

Selby Cull was selected as one of the 2010 recipients of the Association of Woman Faculty (AWF) "Graduate Student Award." These annual awards were designed to recognize scholarly excellence and leadership potential among women students in the second year of graduate study or beyond.

Tolman prize won by Orth

Annually one of our graduate students has been honored for their excellent work as teaching assistants by receiving the Carl Tolman TA award. This year Chris Orth was named the outstanding TA for 2010.

Jan P. Amend, Associate Professor, University of California- Berkeley, 1995, Microbial geochemistry

Raymond E. Arvidson, James S. McDonnell Distinguished University Professor, Brown University, 1974, Remote sensing, surficial geology

Jeffrey G. Catalano, Assistant Professor, Stanford University, 2004, Environmental geochemistry and mineralogy

Robert E. Criss, Professor, California Institute of Technology, 1981, Stable isotopes and hydrology

Robert F. Dymek, Professor, California Institute of Technology, 1977, Metamorphic and igneous petrology

M. Bruce Fegley, Jr., Professor, Massachusetts Institute of Technology, 1977, Planetary chemistry and cosmochemistry

David A. Fike, Assistant Professor, Massachusetts Institute of Technology, 2007, Isotope geochemistry

Daniel Giammar, * Associate Professor, California Institute of Technology, 2001, Aquatic chemistry, water treatment, environmental biogeochemistry and nanotechnology

Anne M. Hofmeister, Research Professor, California Institute of Technology, 1984, Mineral physics

Bradley L. Jolliff, Research Professor, South Dakota School of Mines and Technology, 1987, Geology, petrology, and geochemistry of the Earth, Moon, and Mars

Randy L. Korotev, Research Professor, University of Wisconsin, Madison, 1976, Lunar geochemistry

Katharina Lodders, Research Professor, Johannes Gutenberg-Universitat and Max-Planck-Institut fur Chemie, 1991, Cosmochemistry, planetary chemistry, and astronomy

William B. McKinnon, Professor, California Institute of Technology, 1981, Planetary geophysics and dynamics

Frederic Moynier, Assistant Professor, Eleve a L'Ecole Normale Superieure de Lyon, 2006, Isotope geochemistry

Richard V. Morris, Adjunct Professor, University of Wisconsin, 1973, Planetary spectroscopy and mineralogy

Jill D. Pasteris, Professor, Yale University, 1980, Biomineralization and fluid-rock interactions

Frank A. Podosek, University of California-Berkeley, 1968, Isotope geochemistry

Philip Skemer, Assistant Professor, Yale University, 2007, Experimental rock deformation and structural geology

Jennifer R. Smith, Associate Professor, University of Pennsylvania, 2001, Quaternary geology, geoarchaeology, and paleoenvironmental reconstruction

William H. Smith, Professor, Princeton University, 1966, Observational astronomy, planetary physics

Slava Solomatov, Professor, Moscow Institute of Physics and Technology, 1990, Geodynamics and planetary evolution

Alian Wang, Research Associate Professor, Université des Sciences et Techniques de Lille Flandres Artois, France, 1987, Planetary spectroscopy

Douglas A. Wiens, Professor and Department Chairman, Northwestern University, 1985, Seismology and geophysics

Michael E. Wysession, Associate Professor, Northwestern University, 1991, Seismology and geophysics

Ernst K. Zinner,* Research Professor, Washington University, 1972, Astrophysics and space physics

** Primary appointment in another department*

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New Employees

Adrian Corman, Postdoctoral Research Associate

Adrian Corman spent most of his formative years in Summerville, South Carolina. He received his undergraduate degrees (physics and math) from the College of Charleston in South Carolina. He headed west to study physics at the University of Missouri in Columbia where he earned his doctorate. He has been working in Anne Hofmeister's lab since the end of May, 2010. Adrian appreciates that the research he conducts is very "hands-on" and not quite as tedious as the number crunching required by his doctoral degree. He also appreciates that the cost of living in St. Louis is relatively low compared to other cities of its size. Adrian thinks Forest Park is awesome (we agree) and spends some of his leisure time there. He is interested in art and is working to improve his drawing skills but he reserves some leisure time for hanging out with friends.

Julien Foriel, Research Scientist

Julien Foriel spent his childhood in the beautiful French countryside of Normandy until the age of 15 when he moved to Paris. He received his undergrad degree in Earth Sciences from the University of Paris 6 (Pierre and Marie Curie University) and Ecole Normale Superieure. Julien finished graduate studies at Institut de Physique du Globe in Paris in 2004. He spent 5 years at the University of Washington in Seattle and one year at Princeton before joining EPS. What Julien likes best about being a geochemist is experimenting with new analytical techniques. He has only been in St. Louis a short time but already likes the city's beautiful neighborhoods. In his spare time he enjoys walking, cooking and photography. Julien, his wife, Kris, and their dog, Sid, are getting used to their new life in St Louis.

William Gilhooly, Lecturer in Earth and Planetary Sciences

Bill Gilhooly and his wife are happy to be in St. Louis although they may rethink that once they experience all four of our seasons. Bill comes to us from Riverside, CA where he spent four years as a postdoctoral fellow at the Department of Earth Sciences, University of California, Riverside. He worked with Tim Lyons' biogeochemistry laboratory which sparked an interest in metals cycling that compliment his interests in geomicrobiology and isotope geochemistry. In 2006, Bill received his Ph.D. in Environmental Sciences from the University of Virginia in Charlottesville, VA. His primary research interests include studying the chemical and biological processes that occur during early diagenesis. He and his wife, Marian, have two children, their son, William who is three and daughter, Maija (pronounced My-ya) who is one. Currently they are living in the Central West End and enjoying getting to know St. Louis and Forest Park. This fall Bill will be teaching "Natural Disasters" and in spring 2011 he will teach "Earth and the Environment" and "Geologic Field Methods," all the while continuing his research.

Paul Gorjan, Research Scientist

Paul Gorjan is a native of Sydney, Australia. He attended Macquarie University in Sydney where he majored in chemistry and ultimately received his doctorate in 1999. As a research scientist in David Fike's lab he is interested in using carbon and sulfur isotopes to reconstruct environmental changes in Earth history, particularly during important biological diversification or extinction events. He and his wife, Sue, have been in St. Louis since October of 2009 and when asked what he likes best about our town, his first answer was not "Ted Drewes" but was "snow." Paul and Sue have two children, Louis, age six, and Conrad, age three. With two boys to look after, Paul and Sue rarely get to the movies and cafes, their favorite activities. Prior to coming to the US, the family spent two years in Japan. He admits that "life in St Louis is not terribly different from Sydney." The Gorjans hope to travel some and see more of the United States while living here.

Roy Price, Postdoctoral Research Associate

Roy Price was born and raised in West Plains, MO, a medium size town in south central Missouri. He received his BS in Geology from the University of Arkansas in Fayetteville and then moved to Florida ultimately where he finished his PhD in biogeochemistry at the University of South Florida in Tampa. For the past two years he has been a postdoctoral research fellow at the MARUM Center for Marine Environmental Science located at the University of Bremen, Germany. When asked what he liked best about his job, Roy said he loves science and especially the opportunities his research offers to travel. In his spare time he loves participating in outdoor sports with mountain biking being at the top of his favorite things to do. Roy started work in Jan's lab effective September but spent most of that month in the field and actually did not physically join us until October 4th.

Feng Zhou, Programmer Analyst

Feng Zhou spent his childhood in a small village in China, close to the city of Jiangshan in the Zhejiang province. He graduated with a master's degree in structure engineering from Tongji University in Shanghai and then left China for graduate study at the Ohio State University in Columbus. There he received his master's degree in Geographic Information Systems (GIS) under Dr. Ron Li. He started working in the remote sensing lab in April of 2010. What he likes best about his job is exploring new worlds though the magic of GIS. Currently he is working with Keith Bennett on the Orbital Data Explorer (ODE). His favorite places to visit in St. Louis include the Zoo, the Botanical Gardens and Forest Park. He and his wife, Jue, have 2 children, Jessica, age one and Michael, age four. When he is not otherwise engaged in playing with the kids, he likes watching sports on TV specifically, NCAA football, NBA basketball, and professional soccer.

Catherine "Grace" Barcheck, Seismic Laboratory Assistant

Grace Barcheck grew up in Richmond Heights, MO, just a stone's throw from Washington University. She is a 2010 graduate of the Earth & Planetary Sciences Department with a minor in architecture. Grace is working for Doug Wiens this year getting ready for the seismology research trip to Antarctica. Her favorite part of St. Louis is Forest Park because it is so close to where she lives and works. In her spare time Grace likes to ride her bike on the biking trails of the park or play her banjo. She is also an avid gardener and enjoys her time outdoors.

Franklin Koch, Seismic Laboratory Assistant

Franklin Koch grew up in Texas, on the outskirts of Houston in a place familiar to anyone who has attended the last few Lunar and Planetary Science Conferences, namely The Woodlands, TX. He graduated from Washington University this past May with a double major in Physics and Earth and Planetary Sciences. As an undergrad, he worked in the seismology lab processing data and found it fascinating. According to Franklin, "You can learn so much about the earth by just manipulating squiggly lines." He is also excited about upcoming field work in Antarctica. Franklin's favorite St. Louis haunts are the coffee shops in town. When he is not messing around with those "squiggly lines," he is off juggling whatever he can. As an undergrad he was part of the Washington University Juggling club and since he is back in St. Louis he will be keeping up with the club and tossing up all sorts of items, keeping them in the air all at once.

Alumni News (or where they are now)

Hal Levin (PhD '56) can still be seen on occasion around the department, although he's been retired for many moons now. Hal is using the great library, pestering professors for photographs, and collecting data for use in his texts. This teacher of the dinosaur course refuses to become extinct and we believe his is related to the proverbial Energizer Bunny. Currently he is working on what will be the tenth edition of *The Earth Through Time* and a book for the popular market to be titled *The Ascent of Life*. Hal and our alumnus **Michael Smith** (PhD '91), a professor at North Carolina-Wilmington, will soon be revising the tenth edition of *Laboratory Studies in Earth History*. Hal always enjoys hearing from former students and colleagues.

M. Allan Kays (PhD '61) retired from teaching at the University of Oregon in 2004. He is trying to finish some research projects in the Kangerdlugssuaq Fjord area of East Greenland and the Kalmath Mountains in Oregon. He would love to know what old classmates from 1956 to the early 60's are up to so if you know Allan, email him at makays@uoregon.edu.

Alumni: Join the alumni facebook page and communicate with old friends. Go to Facebook and search for Washington University Earth & Planetary Sciences.

Ernie Anderson (PhD '65) was honored by having GSA Special Paper 463 entitled "Miocene tectonics of the Lake Mead region, central Basin and Range" dedicated to him for his long-term research in the area. He has two papers in this volume and is coauthor on two others. The volume is an outgrowth of a special session and associated field trip in his honor at the 2005 Annual Meeting of the GSA.

Gary Knapp (AB '79) is working for Miller and Lents, Ltd., a US-based firm that provides a comprehensive range of professional consulting services to the upstream oil and gas industry. He is evaluating oil and gas fields in Russia and former Soviet Union countries. He is the proud grandfather of two.

Michael Rockow (PhD '95) is still teaching 8th grade science in Salem, OR. He got the chance to participate in Honeywell's Space Academy for Educators program this summer. Michael will begin his term as the president of the Oregon Science Teachers Association in November. He was also named Oregon's Outstanding Earth Science Teacher by the National Association of Geosciences Teachers.

Keith Koper (PhD '98) was hired in July by the department of Geology and Geophysics in the College of Mines and Earth Sciences at the University of Utah. He has been appointed as a full professor and Director of Seismographic Stations. Joining him in August as a post doc will be **Moira Pyle** (PhD '09) who will assist him with research in the department.

Erik Melchiorre (PhD '98) was promoted to Full Professor of Geology at California State University, San Bernardino. He is currently researching the Atacama desert of Chile and the gold fields of Nicaragua.

Brian Shiro (AM '02) is still pursuing his passion for human space exploration. At the end of January, 2010, he visited "Mars" completing a simulated mission in the Utah desert for two weeks. Shortly thereafter, Brian and a few of his crewmates co-founded the organization "Astronauts for Hire" which aims to provide services to researchers wanting to fly experiments or other payloads in space. Brian and Holli are expecting their second child next March.

Gillian Galford (BA '04) successfully finished her doctoral studies at Brown University in November, 2009 and moved to the Earth Institute at Columbia University in New York City where she accepted a postdoc position studying tropical agriculture in sub-Saharan Africa. Gillian is looking at possible new initiatives to grow more food in this climate and if it is possible, what are the environmental impacts? Living in Manhattan is a challenge for someone who does research in Africa but she is surviving.

Dawn Cardace (PhD '06) concluded her postdoc at NASA Ames Research Center, working with Tori Hoehler on the geobiology of high pH springs sourced in ophiolite mantle units. She is now an assistant professor in Geosciences at the University of Rhode Island. She continues research in geobiology and is also building a network with geoscience educators in the region. Dawn will be juggling a lot in the coming years (teaching

mineralogy, geochemistry, climates--drilling a few holes in the ground in the Coast Range Ophiolite to look for microbes), but if you need any interesting rocks or mud analyzed, just send them on!

Jeff Andrews-Hanna (PhD '06) joined the Geophysics Department at the Colorado School of Mines as an assistant professor in the fall of 2008. He is building a planetary geophysics research group, currently consisting of four graduate students and one undergraduate. He and Jessica are enjoying the Colorado foothills outside of Golden.

Jeffrey Marlow (BA '07), current graduate student at the California Institute of Technology, spent part of his summer writing blogs called "Posts from the Hydrate Ridge" for the New York Times (http://scientistatwork.blogs.nytimes.com). While Jeff was doing research for Professor Victoria Orphan, he had the opportunity to live aboard the Atlantis, a Woods Hole Oceanographic Institute ship which conducts research in the deep sea. Jeff was on Atlantis for two weeks, as part of a National Science Foundation-sponsored expedition to study the biology around methane-emitting cold seeps. In addition to collecting samples and data, Jeff got the once in a lifetime chance to ride in Alvin, the oceanographic submersible that allows scientists to conduct research on the ocean floor.

Sara Pozgay (PhD '08) will soon be changing her last name to Rawlinson. She and Nick tied the knot on September 25, 2010. Sara is the co-convener of the Masters of Natural Hazards and Disasters in the Research School of Earth Sciences at the Australian National University in Canberra, AU.

Sandra Wiseman (PhD '09) has left her postdoc position at Washington University's Earth and Planetary Sciences and will work with remote sensing data at Brown University doing Mars and Moon research for Jack Mustard and Carle Pieters. Husband, Charlie, is happily ensconced at Wentworth Institute of Technology in Boston, MA.

Mitchell Barklage (PhD '10) has taken a position with BHP Billiton Petroleum whose headquarters are in Houston, TX. The petroleum division is part of the global resources and mining giant, BHP Billiton.

Kim Lichtenberg (PhD '10) has recently been hired by the California Institute of Technology's Jet Propulsion Laboratory in Pasadena, CA. She is working as a system engineer on NASA's Mars Science Laboratory (MSL), assisting Nicole Spanovich with developing the science activities that will be used in tactical planning. Once MSL arrives at Mars in August 2012, she will transition to working operations on the rover for the primary mission.

Visiting Graduate Students News

Zongcheng Ling (Lewis) has completed his Postdoctoral training in ChangE-1 science team at National Astronomical Observatory of China (NAOC), and started working as lecturer at the School of Space Science and Physics of Shandong University in Weihai. Recently, his proposal to the China National Science Foundation "Mapping FeO by using Chang'E-1 IIM data" was accepted for funding.

Weigang Kong AKA **Gavin**, a Shandong University doctoral candidate has finished a 2 year joint-training program in our department under Alian Wang's instruction. Gavin returned to China on Aug. 31, 2010. During his stay at Earth and Planetary Sciences, Gavin finished three research projects, two which are related to Mars and one related to the Moon. His first paper was accepted for publishing. His second paper is under review.

ALUMNI, VISIT US THIS DECEMBER

Fall AGU Meeting
San Francisco
Department and Alumni Reception
Jillian's@Metreon

101 Fourth Street
San Francisco
Tuesday
Dec. 14, 2010
5:30 to 7:30 PM

Washington University in St. Louis

Department of Earth & Planetary Sciences
Campus Box 1169
One Brookings Drive
St. Louis, Missouri 63130