STONY BROOK UNIVERSITY

Department of Geosciences

2014 Year in Review

Stony Brook University

Letter from the Chair

2014 was a productive and satisfying year for the Department of Geosciences. We greeted a new faculty member, Joel Hurowitz, and we saw the retirement of one of the key figures in the department's growth and success, Bob Liebermann. Gil Hanson allegedly dropped down to part time - not that you'd know it, as Gil's concept of slowing down closely resembles most peoples' idea of full speed ahead. We continue to be amazed by the quality of our students and our research programs are thriving, particularly in areas related to planetary science. Stony Brook is a university on the rise, and our department remains one of its acknowledged areas of strength.

The keynote speaker at our May Graduation Ceremony was Olga Crnosija, a 2001 graduate of the Earth Science Master of Arts in Teaching program. Olga spoke movingly of her experiences in the department and, since graduation, as a teacher at Smithtown West High School. Joseph Pugliese and Erick Wright shared the Myron Fuller Award, which honors outstanding Geology and/or Earth and Space Sciences majors. In recognition of both her academic achievement and her accomplishments outside of the classroom, graduating senior Alexis Martone received the Oliver Schaeffer Award, which honors the department's founding chairman, Ollie Schaeffer. A Physics/Geology dual major, she had extensive research experience in Tim Glotch's lab. Another outstanding student, Meredith Kraner, received the Oliver Schaeffer Endowed Scholarship, which is supported by Professor Robert Warasila (Ph.D. '76) and the Schaeffer family. A member of the graduating class of 2015, Meredith has carried out productive research with three separate faculty members while maintaining a stellar GPA.

The David E. King Field Work Award, which is made possible through the generosity of David E. King (MS '84), was awarded to Michael Thorpe to support his field research entitled "Source-to-Sink Variations in the Geochemistry and Mineralogy of the Columbia River Basalts: Implications for Chemical and Physical Processes Affecting Planetary Surfaces". The award for excellence in teaching went to Yuan (Sunni) Tang, who set an admirable standard as a TA.

We had a very strong graduating class. This included sixteen students who were GEO BS graduates and thirteen who graduated with the ESS BA. In addition, we had twelve students graduate with a Master of Arts in Teaching Earth Science (of whom ten were part of the ESS BA/MAT program). Our graduates included two who graduated Cum Laude (Michael Bouklas and Jeffrey Lomonaco). Joseph Pugliese graduated Magna Cum Laude and both Erick Wright and Thomas Livingston were Summa Cum Laude. We had a bumper crop of eighteen students graduate with an MS in Geosciences and seven (Jessica Arnold, Josephine Durand, Hui Long, Millicent Schmidt, Elizabeth Sklute, Caitlin Young, and Yuyan Zhao) were awarded the Ph.D in Geosciences.

In this year's issue of the Geosciences Year in Review we conclude newly-retired Bob Liebermann's recounting of his experience of the history of mineral physics at Stony Brook (begun in last year's newsletter). On page 7 of this issue is a description of the department's disproportionately large impact on Brookhaven National Lab, and on page 8 is the story of how our isotope lab has (quite literally) risen from the ashes of a devastating fire. On page 9 we introduce our newest faculty member, Joel Hurowitz, and Joel describes his becoming a key member of the science team for the planned Mars 2020 rover.

Let me conclude by pointing out that this year will be the 50th anniversary of the department. Formed as the Department of Earth and Space Sciences under the leadership of Ollie Schaeffer, the (now) Department of Geosciences has grown in stature and continues to nurture extraordinary students such as this year's impressive array of graduates. We will be celebrating the big anniversary with a series of events to be held on **Friday and Saturday, October 16-17, 2015**. Details will follow, but we plan a dinner on Friday night and a series of talks, lab tours, and social events on Saturday - combined with university activities (and a football game) associated with "Wolfstock" homecoming events.

Please save the date. We'll look forward to seeing you as we celebrate our department's first half century!

-Dan Davis (daniel.davis@stonybrook.edu)

We love to hear from you. Please continue to let us know what you're doing!

Bob Liebermann: *My Life as a Mineral Physicist at Stony Brook: 1976-2014*

Introduction:

In last year's newsletter, Bob Liebermann described how the Stony Brook mineral physics mafia [Liebermann, Prewitt and Weidner] led the way to establishing Stony Brook as a globally-recognized center for high-pressure mineral physics. It is from this point that Bob now continues his story...

From the mid-1980s onward:

During the 1985-86 year, three Japanese scientists spent 9-12 months each as visitors to the High Pressure Laboratory: Hisao Kanda from the National Institute for Research in Inorganic Materials in Tsukuba, Manabu Kato from Nagoya University and Hiroshi Watanabe from Osaka University. Kanda discovered an unused high-pressure apparatus on the loading dock in the Department of Chemistry at Stony Brook. After some detective work, we learned that this press belonged to William LeNoble in Chemistry, who had inherited it from the U. S. Army Benet Weapons Laboratory in Watervliet, NY. He generously gave us the press and, after a difficult passage across campus when the forklift became stuck in the mud, it was installed in the High Pressure Laboratory. Our talented machine shop staff refurbished the press and pumping system and Virginia Haniford, one of Don Weidner's graduate students, painted it a bright green. This press contained two rams, one of 700 ton capacity and one of 300 ton, and had originally been designed by George Kennedy and Ivan Getting at UCLA. We purchased a Walker-type multi-anvil module and inserted it in this press, and christened it the Uniaxial Split-cylinder Apparatus with 1000 ton rams [USCA-1000]. We also moved the 500-ton Harwood press and SAM-85 to the High Pressure Lab and Gabriel Gwanmesia conducted pressure calibration experiments on both of them for his M.S. thesis. Thus, by mid-1986, there were 4 distinct high-pressure systems operational in the High Pressure Laboratory and the lab was fully equipped.

The High Pressure Laboratory in 1986 with the USSA-2000, the 500-ton Harwood press with girdle-anvil and the 1000-ton Kennedy-Getting press installed and operational.

Over the next five years, many graduate students and postdocs exploited the new opportunities for research using these high-pressure apparatus. One of the first experiments in the USSA-2000 apparatus was conducted by Anne Remsberg who studied the transformation in Co_2SiO_4 from the olivine to the spinel phase in collaboration with Jim Boland and Tibor Gasparik; the olivine polymorph is especially colorful and Anne often wore a matching magenta blouse when presenting talks on her research.

For his Ph.D. research at Stony Brook, Gabriel Gwanmesia adapted the hot-pressing techniques we had developed at the ANU in the 1970s for multi-anvil, high-pressure apparatus, in particular the 2000-ton uniaxial split-sphere apparatus (USSA-2000). Subsequently, ultrasonic interferometric techniques were used to measure the sound wave velocities in polycrystalline specimens of the wadsleyite and ringwoodite phases of Mg_2SiO_4 in the piston-cylinder apparatus at the ANU in collaboration with Sally Rigden and Ian Jackson; later this Australian collaboration was extended to pyrope-majorite garnets, stishovite [Baosheng Li], magnesium ferrite [Sytle Antao] and enstatite [Jennifer Kung].

James Hays, who was Division Director of EAR, suggested that we consider becoming a regional/national center for mineral physics research using multi-anvil apparatus, leading to a renewal proposal that was submitted and funded in 1986. The university then decided to create a new research unit, the Mineral Physics Institute, with funding to support the operation of the High Pressure Lab and other research labs in mineral physics and chemistry. Donald Weidner was appointed as the Founding Director.

In 1986, the ESS Department decided to continue the tradition of crystallography and crystal chemistry and we were fortunate to hire John Parise from the University of Sydney in Australia [who had been a postdoc with Prewitt a few years earlier]; John immediately became a valuable member of the mineral physics and chemistry group and actively collaborated with many faculty and students. In 1988, the Reagan administration established the Science and Technology [STC]

Bob Liebermann: *My Life as a Mineral Physicist at Stony Brook: 1976-2014*

At left: Bob with Kawai-type guideblock in USSA-2000 press with Japanese dolls as good-luck charms [gift of Sumitomo company].

At right: Bob's graduate students and postdocs in the High Pressure Lab, circa 1988: Yves Bertran [France], Gabriel Gwanmesia [Cameroon], Ren Lu [China], François Guyot [France], Anne Remsberg [USA], Yanbin Wang and Xing Liu [China].

Below right: Bob with Gabriel Gwanmesia and Sally Rigdon of ANU in the High Pressure Lab in 1991.

initiative in the NSF to enable the U. S. to "catch up" to Japan and Europe in science and technology. The triumvirate of institutions in Washington, Princeton and Stony Brook began to lay plans for a new initiative to take advantage of new NSF initiative. Our second try at a proposal for a Science and Technology Center for High Pressure Research [CHiPR] was funded in 1991 for a total of 11 years to 2002, with total funding of $36 million. Stony Brook served as the headquarters of CHiPR with Weidner as the Principal Investigator [PI] and Liebermann as the Co-PI, and branch campuses at Princeton [Co-PI Navrotsky] and Carnegie [Co-PI Prewitt]. The opening of CHiPR in January 1991 was celebrated on campus and widely publicized in the local TV stations.

One of the new initiatives in my research group during the CHiPR era began in 1994 when Baosheng Li, then a graduate student and now a Research Professor in the MPI, in collaboration with Ian Jackson [my first graduate student and now the Director of the Research School of Earth Sciences at the ANU], developed techniques to incorporate ultrasonic interferometric measurements of sound velocities *in situ* in the Kennedy-Getting high-pressure apparatus. This pioneering development provided the opportunity to conduct sound velocity experiments to pressures of 10 GPa and was exploited over the next few years by many graduate students [Tony Cooke, Lucy Flesch, Yegor Sinelnikov, Jun Liu, Sytle Antao, Kenneth Darling] and postdocs [Ganglin Chen, Frédéric Decremps, Jennifer Kung] for such studies.

At nearby Brookhaven National Laboratory, the National Synchrotron Light Source [NSLS] was built in the early 1980s. Charlie Prewitt opened my eyes to the research opportunities of such synchrotron X-ray facilities, and in the early 1990s at the beginning of the CHiPR era, Don Weidner and his team moved SAM-85 from the campus to the NSLS and installed it on the superconducting beamline [X17B2]. Don recruited Mike Vaughan [Stony Brook Ph. D. 1979] back from the University of Chicago to energize the MPI multi-anvil operation at the NSLS.

Ultrasonic interferometry was first adapted for use in conjunction with synchrotron X-rays at the X17B2 hutch by my research team [led by Baosheng Li]. Such acoustic experiments have been conducted by many of my students/postdocs over the past 15 years [Jun Liu, Yegor Sinelnikov, Kenneth Darling, Ganglin Chen, Gabriel Gwanmesia, Frédéric Decremps, Jianzhong Zhang, Jennifer Kung]. These simultaneous ultrasonic interferometry and X-radiation measurement techniques which we developed at the NSLS have now been implemented at many major synchrotron sources in the world.

During the first quarter century of my research programs at Stony Brook, we were extremely lucky to have access to the personnel and equipment resources of the departmental machine shop and electronics support facility, which the founding fathers [no women on the faculty in the 1960s] of the Department had wisely incorporated into the staffing plan. The Machine Shop, which originally included Bob Muller in addition to Fred Gwinner and Al Catalano, continued to provide excellent service under Paul Hoversen with Ed Vorisek and Herb Schay and later Carey Koleda and Ricky Palencia. For this entire period, Bill Huebsch and Ben Vitale, who had been recruited from Brookhaven National Lab by the founding Chair Oliver Schaeffer, lent their considerable expertise in all things electrical and electronic to our research programs [from major projects such as the High Pressure Lab to the MPI's experimental program at the NSLS to minor needs such as installing antennas on the roof of the Health Sciences Center to receive the signals from our seismic stations on Shelter Island and Lloyd's Neck]. These experimental programs simply could not have achieved their national and international

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stature without the dedicated services provided by these extraordinary staff members. Unfortunately, with the closing of these support facilities, it will likely be difficult or impossible to establish and maintain such world-class experimental programs in the future.

All of the 25 NSF Science and Technology Centers established in the late 1980s and early 1990s were required to wind-down operations in Year #10 and close at the end of Year #12; for CHiPR, this end came in February 2002; at Stony Brook, we marked this occasion with a group photo which we sent as a thank you to Dan Weill, the Program Director for the Instrumentation and Facilities Program in the NSF Division of Earth Sciences.

In anticipation of the "sunset" of CHiPR, we began to develop ideas for an expanded mineral physics initiative to expand access of high-pressure facilities to broader community, especially for graduate students, postdocs and junior faculty at U. S. academic institutions. Following a Town Meeting at the AGU in December 2000, a workshop was convened by Don Weidner at the Scripps Institution of Oceanography in La Jolla, California in January 2001. During this workshop, the attendees laid the groundwork for the submission of a major proposal to the NSF. Guy Masters suggested the acronym COMPRES for "Consortium for Materials Properties Research in Earth Sciences". This proposal was submitted in August 2001 on behalf of 18 universities and national laboratories in the U. S. and approved for funding for 5 years commencing in 2002, with Stony Brook University as the headquarters of COMPRES.

COMPRES held its first annual meeting in September 2002 at Stony Brook. Don Weidner was elected to be the first Chair of the Executive Committee and Jay Bass was appointed as the Interim President. In 2003, I was appointed as President and served until 2010 when Bass succeeded me and the headquarters of COMPRES moved to the University of Illinois at Urbana-Champaign.

A 2002 group photo of faculty staff and graduate students at Stony Brook contributing to research in mineral physics.

Bob as an administrator at Stony Brook

My administrative career while at Stony Brook has been characterized by a series of serendipitous events; each of these has involved finding something good or useful to do even though I was not specifically looking for it.

The first of these events occurred in 1982-83: I had been encouraged to apply for a position as Program Director for Geophysics in EAR at the NSF. I decided not to apply as I was under consideration for Chair of the ESS Department; when the Astronomy faculty vetoed my appointment as Chair, I was free to go on sabbatical leave to France in September 1983 to work with Jaoul and Poirier and their colleagues in Orsay and Paris. After a 3-month stay in Japan, I became the Director of the new High Pressure Laboratory and later the Co-Director of CHiPR [1991]. In 1993, I was a candidate to become the Director of the Research School of Earth Sciences at the Australian National University; however, I withdrew my candidacy after a receiving a generous retention offer from Stony Brook organized by Don Lindsley and Don Weidner.

In 1997, I became Chair of the newly-named Department of Geosciences and found that to be one of the most rewarding administrative experiences of my life; we hired new faculty [including Lianxing Wen and Troy Rasbury], recruited many outstanding graduate students and expanded our research programs.

When Paul Armstrong [Dean of the College of Arts & Sciences] departed for Brown University in 2000, Provost Robert McGrath asked me to serve as Interim Dean. I did so with every intention of only staying a year or so, but became somewhat addicted to the challenges of the College leadership and so applied for the permanent job. When I was not chosen to be the new Dean, I decided to take another sabbatical in France, and was fortunate that Olivier Jaoul and his team had now moved to the Université Paul Sabatier in southern France.

Bob Liebermann: *My Life as a Mineral Physicist at Stony Brook: 1976-2014*

Don Weidner and Mike Vaughan working to install SAM-85 on the superconducting wiggler beamline [X17B2] at NSLS.

On my return to Stony Brook in 2003, I assumed the role of President of COMPRES and held that position until 2010. I am now helping to advise two groups of graduate students: three African-American women who are pursuing M.S. degrees in Geosciences Instrumentation under the supervision of Lars Ehm [Research Associate Professor in the MPI] with the objective of qualifying for positons as Science Associates at the national laboratories of the U.S. Department of Energy [such as Brookhaven National Lab]; and three Chinese women who are working with my colleague Baosheng Li [Research Professor in the MPI] on projects to utilize ultrasonic interferometry in conjunction with synchrotron X-radiation to measure sound velocities of minerals at high pressures and temperatures.

Personal note on serendipity

If I may be allowed a personal note, I would like to relate another serendipitous event in my life. In 1959, I was about to enter my senior year at Moon High School in western Pennsylvania [near the Pittsburgh airport]; I was slated to be the starting quarterback on the football team and likely to become the valedictorian of the Class of 1960.

For financial and personal reasons, my parents [who were both public school teachers and faced with the prospect of funding college education for three children] decided to move to Long Island and found new and more lucrative positions in the Patchogue school system. I quickly learned that the football team already had a starting quarterback and so I changed to defensive end. The Class of 1960 also had a front-runner for valedictorian.

However, the good news from this move to New York was that I found my sweetheart/now wife of 50 years Barbara. We met at the youth fellowship of the Congregational Church, in which she was elected Chair of the Faith Committee and I was elected as Action Chair. The rest is history: after attending college on different coasts [Barbara at Elmira College, with a junior year at the Sorbonne in Paris] and I at Caltech, we were married in June 1964 and had three children [two born in Canberra, Australia in 1973 and 1976].

The family, circa 1988

An afterword from Dan Davis

Last summer, Bob retired. He's not really going anywhere: he's remaining as a member of the research faculty. Still, we're not a group to pass up an opportunity for a good party, so in October we held a dinner and a symposium in Bob's honor. The celebration, unofficially known as 'Bobtoberfest' brought together dozens of Bob's current and former students and co-workers to share in a celebration of the career of their friend, colleague, and mentor. Among those who came to join in the celebration were Jay Bass, Gabriel Gwanmesia, Yanbin Wang, Tony Cooke and Yegor Sinelnikov - as well as (of course) Barbara, Karen, Erica, and Mark. It was not a goodbye, but it was a great opportunity to share our appreciation for Bob and how he has influenced all those who have had the privilege of working with him.

Bob receiving the degree of Docteur Honoris Causa at Université Paul Sabatier from Olivier Jaoul in 2004.

The Department and Brookhaven National Lab

There is a long history of links (including some described in Bob Liebermann's article in this newsletter) between the Department of Geosciences and BNL (Brookhaven National Laboratory), which is located only about 20 miles from campus. These days, though, the department plays a bigger role than ever at BNL.

Martin Schoonen

Since 2013, Professor Martin Schoonen has been Chair of the Biological, Environmental, and Climate Sciences Department at BNL, and he was recently named Associate Laboratory Director for the Environment, Biology, Nuclear Science, and Nonproliferation Directorate. Since he first joined the Department of Geosciences in 1989, Martin and his students have worked in geochemical studies such as environmental molecular chemistry, CO_2 sequestration, medical geology (studying the effects of mineral dust on veterans who served in Afghanistan and Iraq), and astrobiology.

Rich Reeder

Professor Rich Reeder (a member of the Department of Geosciences since 1980) is well known for the work he and his research group have done in areas including the structure-function relationships of disordered and amorphous solids, the sorption behavior of heavy metals on minerals, the bioavailability of contaminants in environmental systems, and in environmental health. Two years ago, the Provost asked Rich to take on the important task of leading Stony Brook's effort to renew its contract (along with the Battelle Corporation) to manage BNL. Rich and his team succeeded, and in November 2014, the Department of Energy announced that the university would indeed have that leadership role at BNL for the next five years, and possibly well beyond. Then, just shortly before this newsletter went to print, Rich was appointed to the position of Associate Vice President for Brookhaven Affairs.

John Parise

The Joint Photon Sciences Institute (known as JPSI) is a joint initiative of Stony Brook University and BNL that will capitalize on the unique capabilities of Brookhaven's new National Synchrotron Light Source II (NSLS-II) which is currently under construction. Our own Professor John Parise, a member of the department since 1989 and a long-time user of x-ray beams at the NSLS at BNL and elsewhere, has been named the founding director of JPSI. John and his students carry out a very broad range of research that is tied together by the idea that no matter what its particular composition may be, the functionality of condensed matter depends on where the atoms are and where they end up after they respond to changes in conditions such as pressure, temperature or pH. With that appreciation, the tools developed to study the mineralogy and reactivity in extreme Earth environments are often applicable to technologically interesting materials and materials in extra-terrestrial environments. John's research group places a strong emphasis on synthesis and students make the samples they later characterize.

On February 6, Secretary of Energy Ernest Moniz dedicated the National Synchrotron Light Source II (NSLS-II), the world's newest and brightest synchrotron light source, at BNL. During the ceremony, Department of Geosciences Ph.D. student Melissa Sims (pictured at right) introduced Secretary Moniz and spoke about her research on meteorite impacts on Earth and other planets at the National Synchrotron Light Source, and how she will continue to study geological samples at the new cutting-edge NSLS-II.

BNL and the new NSLS-II are extraordinary resources for scientific research, and the Department of Geosciences is playing an exceptionally prominent role in their success.

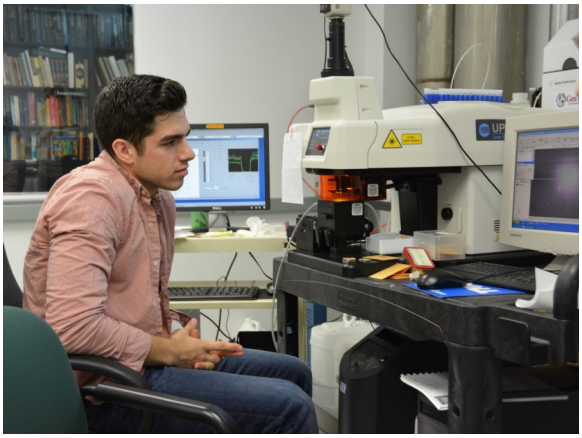
Isotope Lab: Risen from the Ashes

The local fire department to the rescue .

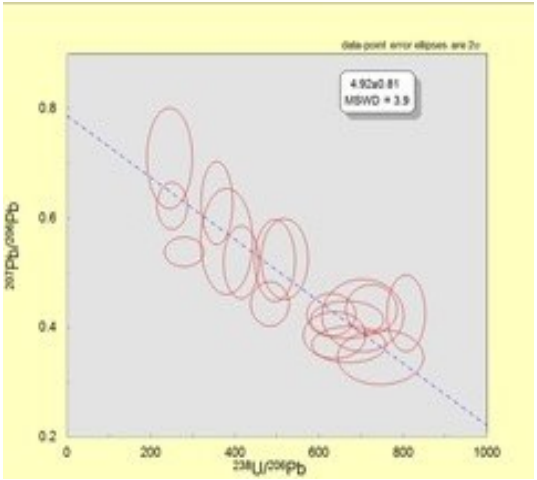
In 2011, an exciting new initiative got underway in the department: a state-of-the art lab for isotopic studies, located in what most of us knew as Gil Hanson's lab (AKA Isotope Lab, room 317). Under the direction of Troy Rasbury, this lab was finally up and running on October 9, 2011 when the installation tests for the new (and, as it turned out, appropriately named) IsotopX Phoenix mass spectrometer were completed.

For quite some time, the ESS building in which we work had been becoming increasingly leaky. The roof sometimes leaked badly enough that large trash bins had to be deployed in hallways to catch the dripping water that filtered down as far as the second floor. Unbeknownst to the people working in the brand new isotope lab, a set of long-overdue repairs were underway on the roof above. Workers were laying down new sheets of rubber-like roofing material, and sealing those sheets together with a device rather like a small flamethrower. One of those seals, made late in the afternoon, gradually smoldered until late in the evening when that section of the roof caught fire.

All this happened on October 10, just one day after the final installation tests of the mass spectrometer. The fire spread downward, causing extensive smoke damage to the newly renovated lab. In addition the windows were broken as the fire department hosed the room, flooding it and damaging the walls, ceiling, and floor of the lab, as well as several laminar flow clean hoods and other equipment. However, it was the soot from the fire that severely damaged our newly installed Phoenix mass spectrometer. Although only a few parts of the mass spectrometer were damaged by the flooding, the soot rendered the instrument unusable. This is because these highly sensitive instruments require extremely quiet and stable electronics. Once soot entered the electronic boards, the high precision isotope analyses that we need for our studies is no longer possible.



Recovering from such a disaster would have been impossible except for the remarkable response from Stony Brook University and from IsotopX. Our university came to the rescue, cleaning up the damage and repairing the walls, ceiling, and floors. But what really saved us was that the University, recognizing that it would be a long time before we could get funds to replace the damaged mass spectrometer, quickly advanced the money needed to buy a replacement. Thanks to that help, the lab is up and running, analyzing geological samples allowing Troy Rasbury's research group to address a range of exciting geological problems with a variety of isotope systems. The phoenix has truly risen from the ashes!

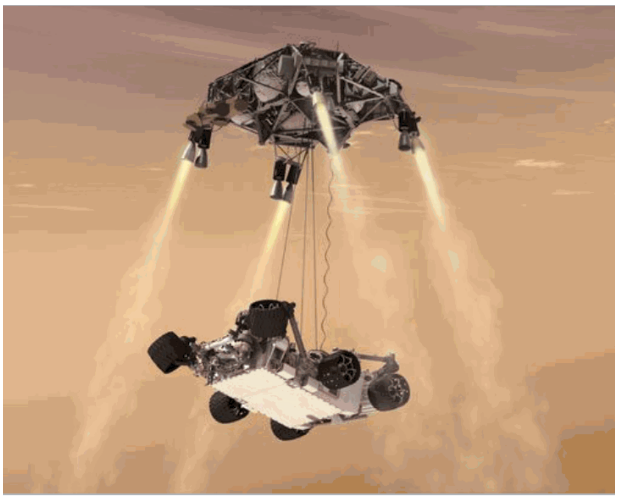


Above: Undergraduate Gavin Picccione doing laser ablation on a fluorite sample from the Trans Pecos area of Texas. Currently a junior, Gavin has worked in the lab since his freshman year and he has recently presented his research at the fall AGU. Right: A refurbished 213UV laser system, which is normally coupled to a quadrupole mass spectrometer, is producing exciting U-Pb ages from zircons, but work in this lab is mostly focused on calcite and fluorite. Fluorite looks particularly exciting for dating with high U/Pb and wide geologic occurrences. Gavin is working on establishing fluorite standards, but meanwhile, using a calcite standard has been able to screen a number of samples, finding some that are quite young from veins that have orientations that are consistent with Rio Grande Rift extension.

Our newest Faculty Member: *Joel Hurowitz*

Our newest faculty member, who started in the fall of 2014, is a familiar face. After completing a B.Sc. in geology at SUNY Albany and working for two years as a hydrogeologist, Joel Hurowitz came to the Department of Geosciences as a graduate student and earned his Ph.D. here in 2006. Working with Scott McLennan, Joel's dissertation research focused on weathering processes and soil geochemistry on Mars. As a grad student, Joel was an active participant in the Mars Exploration Rover (Spirit and Opportunity) program. Last summer, he learned that he will play a very important role in the upcoming Mars 2020 mission. I asked him to describe how that came about, and here is his response:

In July of 2014 (after what I can only imagine was a painful amount of deliberation), NASA Headquarters announced that it had selected 7 instruments to fly as the scientific payload of the Mars 2020 Rover mission. The competition for these slots was fierce, with 58 instruments proposed for the mission – twice the number of instrument proposals that NASA had ever received for an instrument payload competition. I was sitting in Professor Deanne Rogers' laboratory with a number of other faculty and students watching the NASA press conference in which the instrument selections were being announced. When I saw that PIXL was among the instruments chosen to go to Mars, two simultaneous thoughts ran through my mind: "YES!!!" and "What have I gotten myself into?"

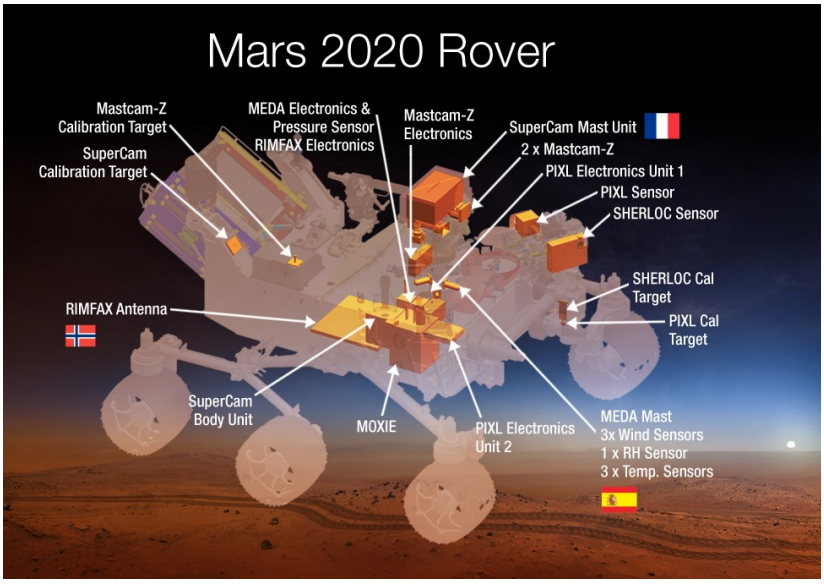


The Mars 2020 mission is designed to take maximum advantage of the design that has worked so well for the Mars Science Laboratory (MSL 'Curiosity') mission in which Joel Hurowitz and Scott McLennan have been taking part. This includes the 'sky crane' landing procedure used by MSL, as shown in the NASA artist's conception.

A bit of background: The NASA Mars 2020 Rover mission is considered the next step in our exploration of the Martian surface – a rover that is intended to characterize a geological site on Mars that is thought to have all of the right ingredients to make a "habitable environment", collect samples that might inform us about whether microbial life had ever existed on Mars, and place the samples in a cache for eventual return to Earth. Once returned (sometime in the late 2020's if all goes according to plan), the samples will be investigated in all the gory detail that the world's scientific laboratories are capable of, in an effort to figure out if Mars was ever a biologically active planet. The Planetary Instrument for X-ray Lithochemistry, or "PIXL", is a microfocus X-ray fluorescence spectrometer that will be carried on the arm of the Mars 2020 rover. This instrument can tightly focus a beam of X-rays onto spots as small as 100 microns (roughly the width of a human hair), and scan that beam across the surface of rocks at the 2020 Rover landing site. By doing this, we can use the PIXL instrument to tell us about the chemistry of the rocks (and soils) at the landing site at a scale and level of detail that has never been possible on Mars before. These measurements will reveal the geological processes that took place at the landing site, and hopefully, inform us about whether biological processes had anything to do with determining the chemical makeup of the rocks that are there.

What's my role in all of this? I am the deputy principal investigator on the PIXL investigation, which I guess is sort of like being the vice president. I'm engaged in the day-to-day development work to get PIXL ready for flight, most of which is being done out at the NASA-Jet Propulsion Laboratory (JPL) in Pasadena, CA under the direction of our PI (principal investigator), Dr. Abigail Allwood. To stay on top of things, I spend a lot of time on teleconferences between Stony Brook and JPL, and my Delta frequent flyer account is rapidly building up miles with all of the travel I need to do between NY

Our newest Faculty Member: *Joel Hurowitz*

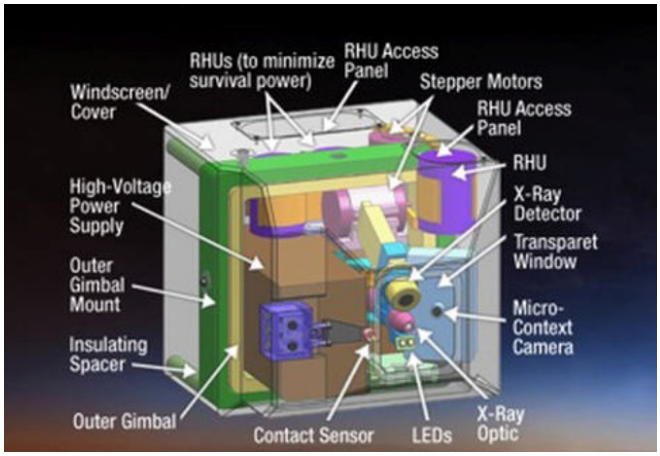


This NASA diagram shows the overall layout of the MARS 2020 rover and its seven science instruments. Note the locations of the PIXL sensor (on the robotic arm), as well as the instrument's electronics unit and calibration target.

and Los Angeles. I'm expected to be able to stand in for Abby when necessary, which means I've got to be knowledgeable about all of the little details that are being worked out in order to ensure that PIXL will survive the journey to Mars and be operate to operate in the harsh environment on Mars once it arrives there. The types of issues we are continually working on are things like: how close do we need PIXL to be to the surface of a rock in order to perform an analysis? How much will the rover arm "jiggle" in the wind during the course of a PIXL measurement? What insulating material should we use for our high voltage power supply module? How long does it take us to map out the chemical composition of a 2.5cm x 2.5cm patch on a rock surface? How much power do we need from the rover to keep us warm through a cold winter night on Mars? We have to figure out the answers to these questions (and more) in order to make sure that PIXL can get the job done.

Oh, and to give you a sense of what I mean by harsh: Mars can go through daily temperature swings of over 100^{o}C between night and day. This is sort of like dealing with the temperature changes you might experience in going between the warmest summer day in Death Valley and the coldest winter night in Antartica. Except worse. And PIXL has to do this every day for a minimum of two years. On top of that, the Martian atmosphere is thin and has just the right properties to make static electricity a major problem… which is not so good when you are operating an instrument that relies on a 28,000 volt power supply! So clearly, this has got to be a robust little instrument by the time we finish building it.

Between now and 2018, the PIXL team (which also includes Stony Brook University professor Scott McLennan) will be working to build and calibrate the final flight version of the PIXL instrument so that it can be delivered to the 2020 Rover project team well in advance of our launch to Mars in 2020. This will give the rover team plenty of time to integrate PIXL onto the rover arm, and test out the inter-operability of PIXL and the rover. After all of those tests have been completed, and the construction and testing of the rover itself (and the other 6 awesome science instruments on the payload!) is done, the rover will be placed atop a rocket and launched from the Kennedy Space Center for a roughly 9 month journey to Mars. I'll be hoping to be sitting on a beach somewhere in view of the launch pad with my family and the rest of the PIXL team, waving goodbye to PIXL. We'll hopefully have some downtime after that, because once we land on Mars – the real work will begin!



PIXL is a powerful scientific tool, but it's also a complicated piece of engineering, as shown in this NASA schematic of the instrument sensor head, to be mounted on the rover's robotic arm.

Our 50th Anniversary - and other news

Remember to Save the Date!

The Department's 50th Anniversary Celebration will take place during Wolfstock on October 17, 2015.

Events on Saturday will include :

- **a welcome back breakfast**
- **lab tours and faculty presentation**
- **a campus geology tour**
- **time to reconnect with faculty and students**
- **Stony Brook's homecoming "Wolfstock" celebrations, leading up to a football game and evening fireworks**

Stay Tuned...

Details will follow, by e-mail and on the department website:

http://www.stonybrook.edu/geosciences/

We gratefully acknowledge gifts to Department of Geosciences Funds in 2014 from the following alumni and friends:

Andrew Au
Kenneth Baldwin
Frederick Bejina
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Linda S. Davis
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Giving to the Department of Geosciences

The Department of Geosciences takes great pride in the "sense of family" that we have maintained ever since our beginnings in 1965. Your contribution to the Department enriches the experience for current and future students, faculty, and staff, and helps to maintain the atmosphere that you enjoyed. Contributions have been used toward special student scholarships and awards, classroom multimedia upgrades, field trips for courses, and other Departmental activities. If you have supported us in the past, we are most grateful, and hope that you will continue to do so. If you are interested in making a gift to the department, there are several funds to select from. You can give directly online (through Stony Brook Foundation's "GIVE NOW" link located at http://www.stonybrook.edu/commcms/foundation/) or send a check directly to us at:

Department of Geosciences, Chairperson
Stony Brook University
255 ESS Building
Stony Brook, NY 11794-2100

Checks should be made payable to **Stony Brook Foundation, Fund #** (insert number as indicated below).

- Geosciences Department Fund for Excellence (# 250500)
- Department of Geosciences Undergraduate Fund (# 299660)
- David E. King Field Work Award (# 236421)
- Mineral Physics Student Fund in Geosciences (# 229280)
- Oliver Schaeffer Endowed Memorial Scholarship Fund (#236537)
- Center for Advancement of Earth and Space Science Education (#264920)

Even if you are unable to support us now, we would still be delighted to hear from you!