

Special
Edition

Nevada NASA Space Grant Consortium

A Look at 2010

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- **Short Courses**
- Curriculum Development
- **Hands-On-Training**
- Pre-College
- **Informal Education**
- Research Infrastructure
- **Internships**
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On the cover: "Nebula NGC 3603 shows globules of gas and dust; giant, gaseous pillars; young stars surrounded by debris disks; all various stages in star life."
Credit: NASA, ESA, R. O'Connell (University of Virginia), F. Paresce (National Institute for Astrophysics, Bologna, Italy), E. Young (Universities Space Research Association/Ames Research Center), the WFC3 Science Oversight Committee, and the Hubble Heritage Team (STScI/AURA)



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The Nevada NASA Space Grant Consortium program is administered by the Nevada System of Higher Education.

WHO WE ARE

courtesy of ERIC WANG, Ph.D.



Nevada NASA Space Grant Consortium

The Nevada NASA Space Grant Consortium (NVSGC) was established in 1991. The consortium is comprised of members from each of Nevada's eight institutions of higher learning and affiliates from aerospace and science industries, informal education, and local and state government.

Our mission is to create and expand opportunities for Nevada students and faculty to be active participants in NASA aeronautics and space programs.

We support the national agenda to develop a strong math, science, engineering and technology education base through the funding of research and higher education programs, and by supporting students through scholarships, fellowships and internships, and by partnering with industry and local government.

Consortium Members

University of Nevada, Las Vegas • University of Nevada, Reno •
 Desert Research Institute • College of Southern Nevada • Truckee
 Meadows Community College • Western Nevada College •
 Nevada State College • Great Basin College

Digital Solid State Propulsion • Equipment Links, Inc. • Sierra
 Particle Technologies • Summit Products

Jack C. Davis Observatory • Fleischmann Planetarium & Science
 Center • The Planetarium • Challenger Learning Center of
 Northern Nevada

SHORT COURSES

Jeff LaCombe, Ph.D.

UNIVERSITY OF NEVADA, RENO

Short Course on Atmospheric and Earth Sciences

Participants were provided with hands-on experience in creating exciting experiments built into payloads consisting of such things as radios, cameras, tracking systems, sensors and other ideas to be tested at high altitudes. These are then connected to and launched on large Helium filled balloons.

High-altitude ballooning provided these educators

and mathematics fields. Participant skills were enhanced in the areas of curriculum development, particularly in the atmospheric and earth science disciplines, and electronics. After the program, participants have the opportunity to borrow or rent equipment (at low cost) from the University of Nevada, Reno NevadaSat project for use in their classrooms. This enables them to further inform, excite and inspire their students to consider ongoing education in the space sciences, technology and engineering fields.

courtesy of NASA/JPL-CALTECH



as the animal locomotion in mammals, amphibians and invertebrates provide a wide range of examples for students to study and incorporate into the creation of biorobots. This course combined the principles of biology and engineering to enrich the experience of students in both disciplines and to show them how they are part of a team in addressing the challenges of design, analysis, measurement, building and operating of remote all-terrain robots.

programming software developed at Tufts University (using the National Instruments LabVIEW as an engine), teachers learned fundamental building and programming techniques that allowed them to replace traditional lectures with interactive classroom activities inspired by space exploration. Emphasis was placed on content instruction in physics, the scientific process and the use of technology to design laboratory activities for their classrooms.

The modules used in the course increased teachers knowledge of science, technology, engineering and mathematics subjects, as well as cultivated their creative and thinking skills and gave them confidence for implementing new physics lesson plans using robotics to meet educational standards for their students.

Ann-Marie Vollstedt, Ph.D.

TRUCKEE MEADOWS COMMUNITY COLLEGE

Educating Nevada with Robotics

Middle school teachers were trained to use robotics as a base for instruction of physics. Using LEGO® Mindstorms education kits and Robolab GUI-based

courtesy of LEONE THIEMAN



with an inexpensive means of reaching the environment of near-space from the classroom (approximately 100,000 feet, which is above 99% of the earth's atmosphere). Participating educators, both pre-college and in-service teachers, were given the skills and confidence to then provide their own students and future students with unforgettable near-space experiences, thus motivating them to pursue fields in the sciences, technology, engineering

David L. Lee, Ph.D.

UNIVERSITY OF NEVADA, LAS VEGAS

Short Course in Biorobotics

To compliment one of NASA's mission objectives in developing scouting robots for exploring the surface of Mars, as well as near-Earth asteroids, the field of bio-inspired robots, or biorobots, draws from the innovative solutions of nature to solve engineering problems. Biological marvels such as bees and humming birds, as well

CURRICULUM DEVELOPMENT



COURTESY OF LEONE THERMAN

Margaret Ferrara, Ph.D.

UNIVERSITY OF NEVADA, RENO

Sprouting STEMs: A Collaborative Civic Engagement Project

Prospective middle and secondary school educators were given an new awareness of the historical, social, political and economic forces influencing schooling in the United States.

Working with community partners on meaningful projects centered on science, technology, engineering and mathematics, the students of this course gained a better understanding of the link between their classroom and the needs

of local society. They participated in at least 20 hours of volunteer service with a community mentor, which provided them with both practical and inspiring ways to connect their learning and skills to the larger community.

Ed Price, Ph.D.

NEVADA STATE COLLEGE

Introductory Course in Climate Change

Newly offered at the NSC campus (formerly only taught at UNLV), this course investigates the major scientific data and projections by NASA and other agencies to assist students to understand why most scientists believe Earth's climate is in a state of human-caused crisis.

Daniel Loranz, Ph.D.

TRUCKEE MEADOWS COMMUNITY COLLEGE

Enhancement to the Lab Portion of Physics 117

Physics 117 is a new course at Truckee Meadows Community

COURTESY OF LEONE THERMAN



College and engages students in real-world problem solving.

The course has attracted a number of students from various disciplines and provides an introductory exposure to central concepts of Newtonian dynamics, properties of materials, systems engineering and the space environment.

It also offers the opportunity for students to participate in various extracurricular science related activities, such as the TMCC Ligher-Than-Air vehicle competition and the UNR high-altitude balloon program.

The enhancements to the established course includes the addition of the development of prototype projects which can be used by the students as example implementation of the techniques covered in the course.

Sandip Thanki, Ph.D.

NEVADA STATE COLLEGE

Research in Astronomy

All data for this course is acquired through the Sloan Digital Sky Survey server.

The course prepares students with the content, skills and tools necessary to conduct research in astronomy, which includes theory, data collection, data processing, programming, data analysis and literature search.

COURTESY OF LEONE THERMAN

Laxmi Gewali, Ph.D.

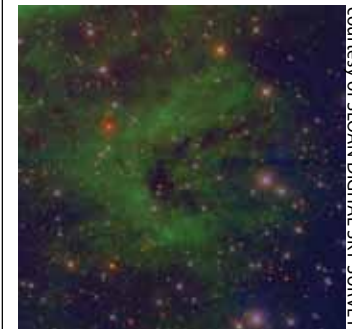
UNIVERSITY OF NEVADA, LAS VEGAS

Enhancing Environmetrics Curriculum

An interdisciplinary course for Environmental Engineering and Computer Science students, this course provides an interface of environmental science, pattern recognition and sensor networks.



COURTESY OF SLOAN DIGITAL SKY SURVEY



Hands-On-Training

Eric Wang, Ph.D.

UNIVERSITY OF NEVADA, RENO

NevadaSat: Nevada Student Satellite Program

NevadaSat is an ongoing multi-faceted program in which students study and develop complex aerospace systems through hands-on activities, such as high-altitude ballooning, high-powered rocketry, CanSats (data collecting instruments fit into the size of a twelve ounce soda can), RockSats (a program that prepares students to design payloads for space for a relatively low cost), autonomous and tele-operated robotics and CubeSats (a type of miniaturized satellite for

COURTESY OF LEONE THIEMAN



launches), the Mars University Rover Challenge and RockSat.

In the last two years, these programs, using student-built hardware to conduct various scientific missions, have provided over 145 participants with experiences and opportunities to develop hands-on skills relevant to NASA and the aerospace technical workforce.

Nick Fiore, Ph.D.

UNIVERSITY OF NEVADA, LAS VEGAS

Hands-On-Training for Middle & High School Teachers-A Pathway to Engineering Education for Their Students

Middle and high school teachers were trained in mechanical and electronic engineering systems. The teachers built a bench-top robotic vehicle from a

kit developed by the University of Nevada, Las Vegas. These teachers then took this training and knowledge back to their classrooms to expose, motivate and train their students in engineering and technology.

George Bebis, Ph.D.

UNIVERSITY OF NEVADA, RENO

Workforce Training in Imaging and Robotics

This program engaged students in training opportunities at NASA centers through well-

structured activities and mentoring by NASA personnel, as well as through classroom activities that expose students to various research efforts currently underway at various NASA centers.

The program has been designed to integrate workforce development efforts throughout the college curriculum, offering systematic and constant training and research experiences to students with an emphasis on NASA applications.



COURTESY OF ERIC WANG, PH.D.

space research that usually has a volume of exactly one liter (2.64 gallons), weighs no more than 1.33 kilograms (2.93 pounds), and typically uses commercial off-the-shelf electronics components). This year, the program focused on its most productive programs for aerospace workforce development: BalloonSat (high-altitude balloon



COURTESY OF LEONE THIEMAN

PRE-COLLEGE

The purpose of this specific NVSGC-sponsored activity is to promote and increase awareness regarding the availability of NASA content-based materials among pre-college teachers so they can effectively integrate these materials into their future or ongoing teaching endeavors.

Dale Etheridge, Ph.D.
COLLEGE OF SOUTHERN NEVADA
STEMulating Teacher Training

This project is designed to encourage teachers-in-training to consider a teaching career in science, technology, engineering and mathematics (STEM) core content areas and

Participants develop a STEM core content lesson plan and then teach it to a group of children. This early field experience helps the new teachers hone their skills and to develop their ability to communicate, model and deliver science-based instruction to students in a supportive setting.



courtesy of PAM MAHER

to enhance instructional opportunities for students who have already chosen this as their career path.

The program also provides pre-service teachers with classroom materials needed to effectively teach their subject.

Dan Ruby
THE FLEISCHMANN PLANETARIUM & SCIENCE CENTER/
UNIVERSITY OF NEVADA, RENO

AACT Space Habitation Program

This program laid the groundwork for a Space



courtesy of WOOSON VIM, PH.D.



courtesy of FLEISCHMANN PLANETARIUM & SCIENCE CENTER

Habitation Program at the Academy of Arts, Careers, and Technology High School in Reno, Nevada for grades nine and ten.

The program involved incorporating NASA materials across courses specifically for the Engineering & Manufacturing Academy at the Academy of Arts, Careers, and Technology High School.

Partnering with the Fleischmann Planetarium & Science Center located on the University of Nevada, Reno campus, AACT offered a hands-on approach to STEM education through a student design team submission to a NASA competition.

Educators from the College of Education at the University of Nevada, Reno served as mentors to the students participating in the engineering project to manufacture

a moonbuggy vehicle. The students designed, engineered and manufactured their vehicle to compete in NASA's annual Great Moonbuggy Race at Marshall Space Flight Center in Huntsville, Alabama in spring 2011.

The moonbuggy had to be human-powered and carry two students, one female and one male, over a half-mile simulated lunar terrain course, such as craters, rocks, lava ridges, inclines and lunar soil.



courtesy of NASA'S MARSHALL SPACE FLIGHT CENTER

In 2011, the AACT team took home the *Rookie of the Year* award for the fastest time by a first-year team and finished in the top 15 among 84 high school and university teams from around the world.



COURTESY OF FLEISCHMANN PLANETARIUM & SCIENCE CENTER

Introductory topics in astronomy, physics and engineering were developed to emphasize STEM objectives by introducing the participants to activities and personal projects that can be constructed and implemented in a classroom setting. Students had at their disposal standard laboratory equipment, telescopes through the Jack C. Davis Observatory, as well as computers and hand tools.

Participants were then able to build at least one science project and demonstrate their creation to their peers in the program.

Each project was judged based on Nevada Science standards and STEM applications relating to more than one academic discipline.

COURTESY OF NASA



Robert Collier
WESTERN NEVADA COLLEGE

Pre-College Science Educator Program

A new emphasis and concentration on pre-teacher training in basic STEM disciplines is an absolute imperative for this country to maintain its competitive edge in the world today.

The objective of this program helped elevate pre-educators' basic skills in physical science and enhanced their professional confidence in teaching basic science, technology, engineering and mathematics.



COURTESY OF LEONETHEIRMAN

INFORMAL EDUCATION

VISIT NEVADA NASA SPACE GRANT CONSORTIUM AT WWW.NVSPACEGRANT.ORG
courtesy of CHALLENGER LEARNING CENTER OF NORTHERN CALIFORNIA



Dan Ruby
THE FLEISCHMANN
PLANETARIUM &
SCIENCE CENTER/
UNIVERSITY OF
NEVADA, RENO

Impact Earth: Program
Expansion for Grades
6-8 Outreach

Working with the
Challenger Learning
Center of Northern
Nevada (CLC), the
Fleischmann Planetarium
& Science Center and
CLC have developed a
joint outreach program
centered around a shared
portable digital dome
theater system (pictured

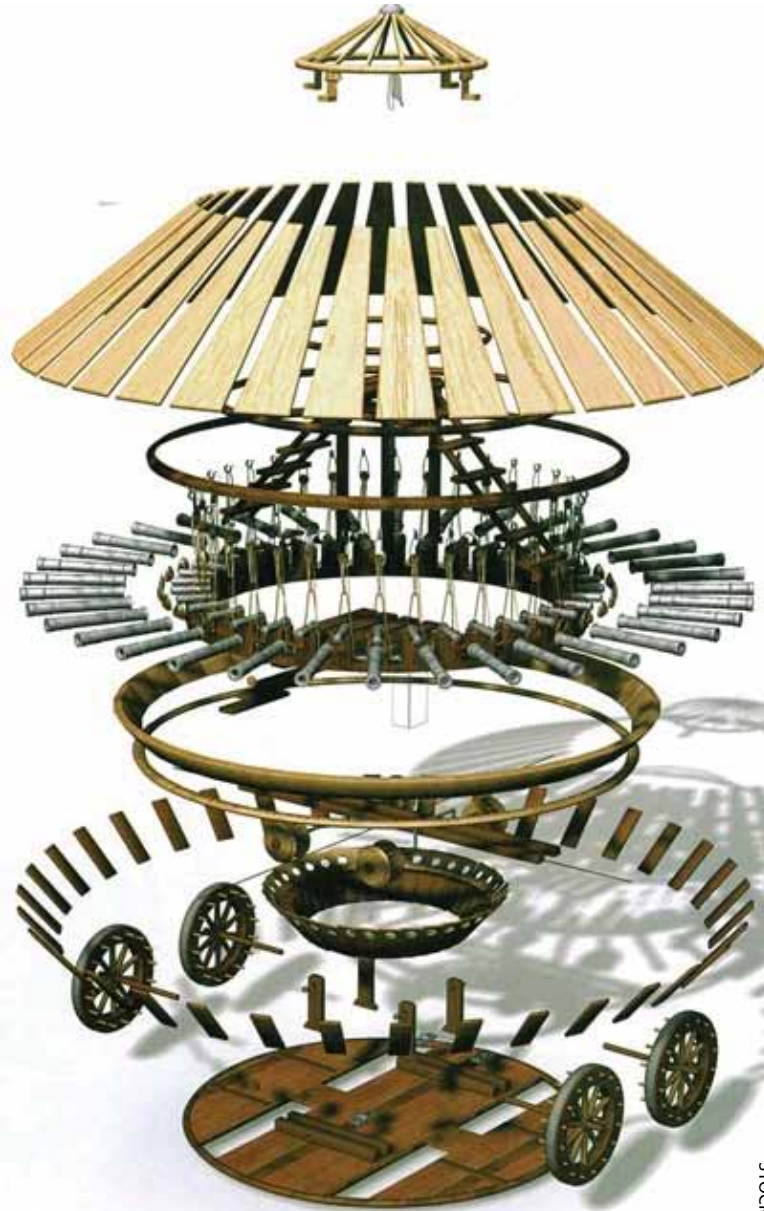
here). The theater provides
immersive space science
shows coupled with
hands-on activities. This
program specifically
targets outreach to grades
6-8, students which
have previously not been
included in the program.

**Stephen McFarlane,
Ph.D.**

THE CHALLENGER
LEARNING CENTER OF
NORTHERN NEVADA

One Earth, One Sky:
Outreach Expansion for
K-10 students

In partnership with the
Fleischmann Planetarium
& Science Center, this
program provides
additional ability to take
the portable digital dome
theater and associated
activities to more students
at more sites around
Sparks and surrounding
Reno area schools. For
middle school students,
the planetarium has
introduced a new
program, *Impact Earth*,



courtesy of NASA

STOCKPHOTO

that teaches about
meteors, meteorites,
asteroids and comets.

Alan Tucka
COLLEGE OF SOUTHERN
NEVADA

Understanding Physics
Through the Machines
of Leonardo da Vinci
Using models of the
machines of Leonardo
da Vinci, this program is
designed to offer informal
educational programs to

children and the general
public. Participants
studying physics and pre-
engineering are mentored
by faculty of the College
of Southern Nevada and
The Planetarium.

Participants created
original handouts and
learning materials to
distribute to the general
public. These materials
used the models of the
machines of da Vinci to
create interest and social
interaction in the sciences.



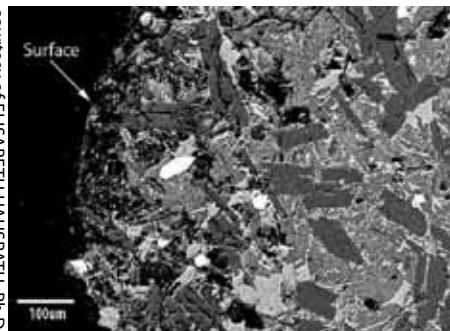
courtesy of LEONE THIERNAN



Emil Geiger, Ph.D.
UNIVERSITY OF NEVADA, RENO
Microfluidic Based Diagnostics for Microalgae Technology and NASA's Contribution to Green Aviation

Microalgae technology continues to show tremendous promise for becoming a major source of renewable transportation fuel in the coming decades. This is of particular interest to NASA, as it can contribute to the development of closed life support systems for long-duration space flight. It can also play a role in NASA's efforts to develop carbon neutral fuels – fuels that neither contribute to nor reduce the amount of carbon released into the atmosphere. In other words, the CO₂ released by burning a gallon of biodiesel today is absorbed from the atmosphere by soybean plants being grown to produce tomorrow's next gallon. No net carbon added. Cultivating microalgae fuels on an enormous scale and developing appropriate sensor networks to provide critical information about the environmental parameters

courtesy of ELISABETH HAUSRATH, Ph.D.



(pH, oxygen and nutrient levels) and algae characteristics (size, oil content and viability) are just some of the challenges involved with this technology.

Elisabeth Hausrath, Ph.D.
UNIVERSITY OF NEVADA, LAS VEGAS

Alteration of Mars-analog Clay Minerals Under Mars-like Conditions

Clay minerals have been documented on the surface of Mars, in particular nontronite, which forms on Earth from the weathering on biotite and basalts in deep sea hydrothermal vents. Some evidence suggests that microorganisms may play an important role in their formation.



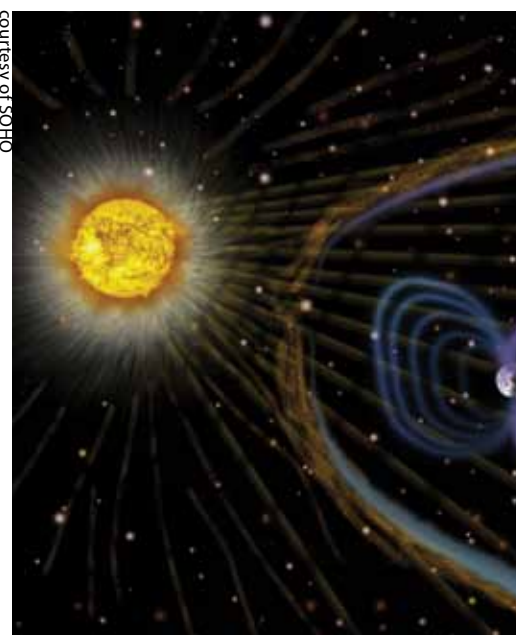
courtesy of NASA/PL/UNIVERSITY OF ARIZONA

Since clay minerals result from water-rock reactions that may record the life cycle of habitable environments, there is a great deal of interest in characterizing the evolution or formation conditions of different clays. Available evidence suggests clays on Mars are ancient

and may have been altered over time.

This project experimentally alters nontronite to provide a more complete understanding of the formation conditions of ancient clay minerals and the processes by which those clays have matured in the Martian environment.

courtesy of SOHO



Andrei Derevianko, Ph.D.
UNIVERSITY OF NEVADA, RENO
Generation of Dielectronic Recombination Data

NASA has collected an enormous amount of data from the various satellites, probes and crafts sent into space over the past fifty years.

A new window in X-ray astrophysics will be opened with the planned launch of the International X-ray Observatory, which combines a large X-ray mirror with powerful new instrumentation to explore the high energy Universe.

Detailed understanding of the underlying astrophysics requires input from large-scale atomic physics calculations. This creates an even stronger need for highly productive numerical code to address the calculation of fundamental atomic, molecular and nuclear parameters important for the analysis of NASA's space data.

INTERNSHIPS

SETH GAINEY

Ph.D. CANDIDATE, UNIVERSITY OF NEVADA, LAS VEGAS

NVSGC-sponsored intern at Jet Propulsion Laboratory - NASA Center

Seth Gainey spent his time at the Jet Propulsion Laboratory (JPL) facility this summer working on spectral observations from orbiter space craft that have detected clay minerals in ancient rock deposits exposed at the Martian surface. These minerals are believed to have been formed from the hydrolysis of silicate minerals, indicating the past presence of liquid water. Gainey was mentored by Joel A. Hurowitz, Ph.D., Research Scientist at JPL.



courtesy of SETH GAINEY

JOSH AURICH

UNDERGRADUATE, UNIVERSITY OF NEVADA, LAS VEGAS

NVSGC-sponsored intern at Goddard Space Flight Center - NASA Center

Over the course of the summer, Josh Aurich worked on a team conducting an independent assessment of an autonomous flight safety system. Black box testing of hardware and software was conducted through the use of modeling and simulation to produce realistic rocket and navigation sensor inputs for the Automated Flight Service Station (AFSS). Aurich's role on the team was to help analyze and identify requirements and behavior for testing, produce simulation scripts to achieve the desired testing situation, and assist in analyzing telemetry output from the AFSS to identify both expected and unexpected results. Aurich was mentored by Thomas Hempler of TASC. TASC is a leading provider of advanced systems engineering, integration and decision-support services to the intelligence, defense, homeland security and other federal domains.



courtesy of JOSH AURICH

GABE HERZ

UNDERGRADUATE, UNIVERSITY OF NEVADA, RENO

NVSGC-sponsored intern at Jet Propulsion Laboratory - NASA Center

As an NVSGC-sponsored summer intern at the Jet Propulsion Laboratory (JPL), Gabe Herz had the opportunity to be part of the ATHLETE mechanical team. ATHLETE (All-Terrain Hex-Limbed Extra-Terrestrial Explorer) is a vehicle concept developed at JPL with six limbs - each having six degrees of freedom of motion. A wheel at the end of each limb allows ATHLETE to roll over gentle terrain and climb over rough terrain. A tool attachment point at the end of each wheel allows ATHLETE to use any of its limbs as a robotic arm. The recent focus of the ATHLETE team has been to develop it for a potential asteroid mission.

The ATHLETE team has constructed the Low Gravity Test Bed to simulate the micro-gravity environment that ATHLETE would be operating in on an asteroid mission. Over his ten-week long internship, Herz had the opportunity to work on a number of projects supporting this area of development. He finished the construction of a counter rotating auger anchor that ATHLETE could use to secure itself to the surface of an asteroid. Related to this project, Herz developed a test bed that will allow the ATHLETE team to test the effectiveness of the auger anchor and demonstrate the robot's anchoring capabilities. Another focus of his work was to develop a system to allow ATHLETE to test a variety of tools in a general test bed.



courtesy of GABE HERZ

FELLOWSHIPS & SCHOLARSHIPS

Fellows

Christopher Adcock, Ph.D. candidate, UNLV, Geoscience
Katie Bowden, Masters, UNR, Environmental Engineering
Matthew Kelley, Ph.D. candidate, UNR, Astronomy
Brittany Myers, Masters, UNR, Geochemistry
Kelly Robertson, Ph.D. candidate, UNLV, Geology
Robert Thompson, Ph.D. candidate, UNLV, Astronomy
Timothy Waters, Ph.D. candidate, UNLV, Physics

Scholars

Marcie Arai, UNLV, Electrical Engineering
Colin Ashmore, UNR, Neuroscience
Benjamin Baxter, UNR, Mechanical Engineering
Perry Butters, UNLV, Secondary Education
James Campbell, UNLV, Secondary Education
Daniel Childs, UNR, Geological Engineering
Steven Correia, UNLV, Computer Engineering
Jade Diaz, UNR, Geological Engineering
Rene Flores, UNR, Secondary Education
Ann Frappier, UNLV, Mechanical Engineering
Chequala Fuller, UNLV, Electrical Engineering
Justin Galli, UNLV, Mechanical Engineering
Gabe Herz, UNR, Mechanical Engineering
Christopher Higgins, UNLV, Physics
Jason Jaacks, UNLV, Physics
Magdalena Jesse, WNC, Mathematics
Susan Konkol, UNR, Hydrogeology
Stephanie Kover, UNR, Civil Engineering
Justin Kunert, UNR, Civil Engineering
John-Henry Lambin, UNR, Engineering/Physics
Rachel Lambin, UNR, Engineering
Breanna Linsley, CSN, Aviation Technology
Brian Magann, UNLV, Mechanical
Daniel Mayes, UNR, Physics/Astronomy
Danae Moser, UNR, Mechanical Engineering
Nadia Noel, UNR, Secondary Education
Leah Preston, UNLV, Civil Engineering
Erica Romero, UNR, Geological Engineering
Marvin Smith, UNR, Computer Science
Maile Sweigert, UNLV, Geology
Matthew Tooth, UNR, Physics
Sarah Trabia, UNLV, Mechanical Engineering
Valerie Tu, UNLV, Geology
Christopher Williams, UNR, Mechanical Engineering



Courtesy of NVSGC SCHOLARS & FELLOWS

NEVADA FROM 107,000 FEET

NevadaSat: High Altitude Balloon launch from US95 and I-80, September 27, 2009. Photo was taken with a fisheye lens from 107,000 feet. Over 500,000 square miles are shown in the field of view. The dark blue body of water on the left of the images is Pyramid Lake and the large light area is the Carson Sink (Alkali Flat). Sponsored by the Nevada NASA Space Grant Consortium.

VISIT NEVADA NASA SPACE GRANT CONSORTIUM AT WWW.NVSPACEGRANT.ORG



courtesy of LEONE THIERMAN

Neil deGrasse Tyson, Ph.D.

The World as Seen Through the Lens of a Scientist

Dr. Tyson is the Director of the Hayden Planetarium at the American Museum

of Natural History in New York City.

Dr. Tyson spoke to an audience of nearly 2,000 which filled the Redfield Auditorium and overflowed into classrooms in the Davidson Academy's Mathematics and Science Center on the University of Nevada, Reno campus on February 3, 2011.

His lecture, "The World as Seen Through the Lens of a Scientist," explored how knowledge of math, biology, chemistry and physics can transform the way we live, work and play.

During the lecture, Dr. Tyson emphasized his message about our place in the universe. "As I stare into the night sky, I feel a sense of belonging. In a way, our journey is commingled with the journey of the stars, because we are chemically related to what the stars produce. We are atomically related to all matter in the entire universe. Therefore, not only are you in the universe, the universe is in you," Dr. Tyson said.

Dr. Tyson said his goal is to spend as much time as possible with traditional

and social media, sharing his expertise and enthusiasm for science – a process in which he blends humor whenever possible. Dr. Tyson spent the whole day on campus, lunching with Presidential and National Merit scholars and talking to students studying astronomy and physics.

A few weeks later Dr. Tyson was honored with the 2011 Distinguished Service award at the National NASA Space Grant Directors meeting in Washington, D.C.