



# FLAGSTAFF FESTIVAL of SCIENCE: the **FIRST** 25 YEARS

BY KEVIN SCHINDLER  
& BONNIE STEVENS



**FREE ADMISSION INTO EVERY ACTIVITY**

*In loving memory of Flagstaff Festival of Science  
founding members Robert Fried and Amy LeGere.*

## Acknowledgments

KS – Thanks to fellow Festival of Science board members—past, present and future—for your shared passion of Flagstaff’s science, and to the scientists who gave us a reason to celebrate. Jeff Hall, Bryan Bates and Mary DeMuth reviewed portions of the text. As with all things, thanks to my wife Gretchen and children Alicia, Sommer and Lauren for a lifetime of inspiration and love.

BS – Thank you to all the inquisitive souls who have wondered beyond the boundaries of our knowledge and enriched the Flagstaff Festival of Science. Special thanks to Fred for his love and enthusiasm and to all my children who are making the world a better place: Logan, Tyler, Ashley, Jacob, Jillian, Paul and Lily.

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## Preface

The story of the Flagstaff Festival of Science is as rich as the subject it celebrates. We intend this book to capture the spirit and significance of this annual event while recalling the unique circumstances that make it possible. While a year-by-year review would be enjoyable for many of us to read, such an effort is beyond the scope of this book. We have, however, included a yearly listing of themes, keynote speakers and program titles, host sites, sponsors and board members (starting with the first board in 1992).

Regarding the keynote presenters—in the early years multiple individuals were sometimes highlighted as featured speakers. Our list identifies the keynote speaker as the top-billed speaker for the year, with a presentation usually on the opening Friday evening. In 1997, the main speaker was forever identified as the Shoemaker Keynote Presenter, in honor of Gene Shoemaker, who tragically died earlier that year.

The sponsor listings include the Festival’s supporters at the following levels: Cometary Friend, \$250; Planetary Friend, \$500; Cosmic Friend, \$1,000; Galactic Friend, \$2,500; and Supernova Friend, \$5,000.

Much of the historical information in this book was gleaned from the private records of board members Steve Smith and Brenda Strohmeier. These, along with transcripts of interviews with Ivo Lucchitta, John and Ginger Giovale, Jeannette Baker and Gene Hughes, are now stored in Cline Library’s Special Collections and Archives at Northern Arizona University.



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**1990**  
**SCIENCE FROM THE GROUND UP**  
*Antarctica—The Earth's Barometer*  
 Arctic Explorer Will Steger

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**1991**  
**SCIENCE AT ITS PEAK**

*Field Trip to the Moon*  
 Apollo Astronaut Jack Schmitt

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## Foreward

Apollo astronauts Jack Schmitt and Alan Bean; geophysicist Larry Soderblom; Space Shuttle astronauts Linda Godwin, Bonnie Dunbar and John Grunsfeld; astronomer/comet discoverer Carolyn Shoemaker; paleontologist David Gillett; National Geographic Emerging Explorer Alexandra Cousteau; and now, one of the world's leading researchers in DNA and anthrax, Dr. Paul Keim! And this is only a partial list of the distinguished nationally and internationally known scientists who have appeared here in Flagstaff, Arizona, over the past 25 years as keynote speakers for the Flagstaff Festival of Science. Their appearance has been a significant part of what evolved from a luncheon meeting of Flagstaff area scientific leaders in October 1989, with a pledge to develop a Festival of Science to be held in April 1990, as a part of Northern Arizona University's Honor's Week activities. Details of the Festival were to be developed by a working group... and work they did! You will see, as you read this brief history of the Flagstaff Festival of Science, that their work, and that of successive groups, has led to the development of one of the finest, if not the finest, festivals in the nation. As the one whose claim to fame is for having called the original group together and for appointing Dr. Jeanette Baker as the university representative, I can only say how pleased and proud I am of the Festival, of its accomplishments, of its successes and of its longevity. The cooperation exhibited by Northern Arizona University and its scientific neighbors in bringing about this world-class Festival attests to the synergistic relationship that can be developed between an institution of higher education and its community.

And now, read, enjoy and look forward to the next 25 years!

Dr. Eugene M. Hughes, President Emeritus  
 Northern Arizona University

## The Essence of the Flagstaff Festival of Science

Anticipating the collision of a fiery comet screaming toward a huge gaseous planet; unearthing and imagining a new kind of dinosaur as it reveals itself bone by bone; or making human footprints in the impossible stillness of moon dust. Such are the moments that make hearts pound, breaths quicken and adrenaline surge. It is in these instances that we feel most alive.

If scientists were writing the novel of their lives, there would be long, tedious passages of training, researching, questioning, experimenting, disappointment, exasperation, failure and then trying again. But some pages would be page-turners, some chapters would be cliffhangers, and every discovery would ignite a new spark, encouraging them to

*"Science is an adventure of the mind."*

— Ivo Lucchitta  
 U.S. Geological Survey Planetary Geologist

find out, "What happens next?"

Scientists understand why Christopher Columbus had to, needed to, sail. It's a hunger for knowledge that overrides everything else—resources, comfort, exhaustion, even safety. Scientists are driven by such passion that they enter into that zone where they forget to eat. They lose track of time. Their imagination and thoughts of the possibilities put a spring, bounce or even a leap in their step. They can't wait for the mysteries of their environment to reveal themselves. For them, the workday doesn't end and they don't want it to. For scientists, every day holds such possibility that it feels like Christmas Eve.





## 1992 OUR CHANGING PLANET

Planetary Fire and Ice  
Geophysicist Larry Soderblom

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## 1993 SCIENCE AND THE FUTURE

*The Mystery of Dead Dinosaurs: The Smoking Gun & The Mexican Connection*  
Paleontologist Walter Alvarez

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"The driving force for me is the adventure," says storm chaser Warren Faidley. "I like it when I don't know what I'm going to see. It's like opening a present. Odds are you are not going to see something over the top...but you might. It's about trying to be in the right place at the right time and being as prepared as you can be. It's that anticipation, like waiting for the fireworks show. You know something is going to happen, and then of course, when it happens, when it's bigger than life, it re-energizes you and teaches you to be more patient for the next big moment."

The Flagstaff Festival of Science is about such adventures and the pure joy of discovery. It's about storytelling from pioneering spirits who dare to push beyond the boundaries of what is known. And it's about being lucky enough to join in, alongside some of the world's most brilliant and



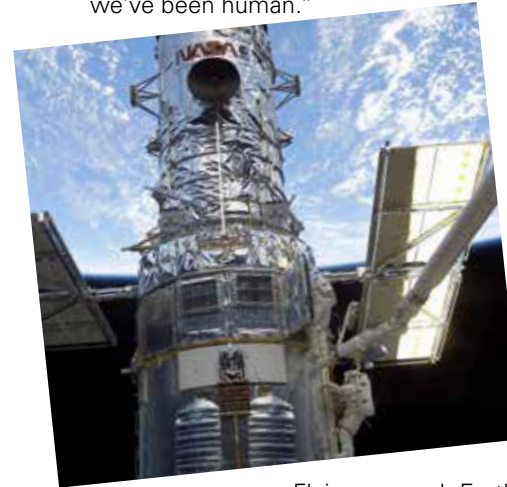
Lightning: National Weather Service; Stellar spine in Eagle Nebula: NASA, ESA, and The Hubble Heritage Team (STScI/AURA)

*"Every time I dive, I am reminded of archaeologist Howard Carter's famous comment at the door to Tutankhamen's tomb. 'What do you see?' he was asked. 'Wonderful things!' he answered.*

— James Delgado, Ph.D.  
Maritime Archaeologist

inquisitive minds, to see what they see, feel what they feel, have access to what few people have access to. With the Festival everyone has the opportunity to hold a front row ticket into the known and the unknown.

Astronaut, test pilot and NASA Science Mission Director John Grunsfeld, Ph.D., says, "It's that curiosity that drives us all, and has driven us since we've been human."



Flying around Earth at 17,500 miles per hour, Grunsfeld was tasked with making delicate adjustments to the Hubble Space Telescope, one of the most expensive and complex telescopes of all time. He admits he had fleeting thoughts about his vulnerability, fully aware that the only thing separating him from a hostile environment was a thin parachute-type suit that could easily be punctured by the sharp tools

he was using.

"I couldn't really articulate why space was important to me," he says. "Certainly, it's important for improving the quality of life on Earth, for increasing our knowledge, for helping to develop new technologies and for economic reasons. But ultimately, I found out, it's because it's really fun and exciting. It's engaging. Now, I can say without any hesitation, that I love going into space and working on big telescopes. Space is really magical."

Also magical, say scientists, is the underwater world. Not just what could live in the deep, pressure-filled oceans, but also what washed-away relics wait there to reveal their stories. Marine archaeologist James Delgado's fascination with this mystery takes him far under the waves, diving for shipwrecks in a dark, foreboding, watery world.

"Part of the record of humanity's achievements, its triumphs and tragedies, rests out of sight on the seabed; the greatest museum of all lies at the bottom of the sea," he says.



John Grunsfeld: NASA; James Delgado next to stern of clipper ship Ambassador: FFoS Archives

## 1994 THE HISTORY OF SCIENCE IN FLAGSTAFF

**Astronaut Training in Flagstaff**  
Space Shuttle Astronaut Linda Godwin

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## 1995 Envisioning the Future

**Pioneering Space Docking**  
Space Shuttle Astronaut Bonnie Dunbar

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Delgado, Ph.D., explains the allure of the unknown like this, "Every time I dive, I am reminded of archaeologist Howard Carter's famous comment at the door to Tutankhamen's tomb. 'What do you see?' he was asked. 'Wonderful things,' he answered. No matter how many times I dive, how many shipwrecks I see, the awe, the thrill of discovery are always there. I, too, see wonderful things."

As a little girl, growing up in Wynnewood, Oklahoma, Donna Shirley would stare at the stars and wish she could be among them. Pondering how she could do this, she started taking flying lessons at age 15. By 16 she had her pilot's license. She understood that education and dedication could further stretch her wings, so she studied aerospace and engineering. Eventually, her lifelong quest led her to Mars. At the NASA Jet Propulsion Laboratory, Shirley headed the team that created micro-robot Sojourner and landed it successfully on the red planet.

Back on Earth she's been dubbed "Woman of the Year" by *Ms. Magazine*. *The New York*



Mars: USGS Astrogeology Science Center; Donna Shirley: NASA/JPL/Caltech



*Times* called her one of "a new breed of scientists."

Meanwhile, another new breed, Jane Poynter, was traveling the world on research vessels, acquiring

first-hand experience on how to survive with limited resources and tiny spaces. Along the journey she learned how to milk and butcher animals and grow crops. This prepared her for perhaps the greatest adventure of her life as one of the original eight Biosphereans. In 1991, she stepped into the hermetically sealed Biosphere 2 near Tucson, a three-acre mini world, to find out if humans could create a self-contained habitat for themselves and potentially colonize the moon or other uninhabitable places. This, she says, was the closest thing to living on Mars.

"Sometimes we need extraordinary experiences to shock our senses alive, to rip a hole in our well-protected worldview," she says.

Her extraordinary experience included what she calls "an atomical game of hide and seek" as she and the seven others searched for seven tons of oxygen that disappeared. Another obstacle occurred when mites devoured their white potato crop. While trying to solve challenging

problems, the voices of critics in Biosphere 1 (planet Earth) grew louder.

She offers this advice for all who are considering embarking on a difficult, but exciting adventure. "Throw stereotypes to the wind and take opportunities. The opportunity was put in front of me. Instead of thinking how difficult it would be, just go do it."

That attitude is expressed in the actions of 2013 Flagstaff STEM Teacher of the Year Jillian Worssam. She fills her summers with scientific ventures to distant oceans, bringing topics like plate tectonics and ocean currents to life in the classroom.

"Science is everything, it is the air we breathe, the ink in our pens and the children in our arms," she says. "To know more about the science of this planet helps to make me a better educator and person. I do not see rough seas as uncomfortable but exhilarating, it reminds me of the elemental nature of life and I am so glad to be alive. I feel reborn every time I go to sea. There are no words



**"Science is everything, it is the air we breathe, the ink in our pens and the children in our arms,"**

— Jillian Worssam

2013 Flagstaff STEM Teacher of the Year

Jane Poynter: FFoS Archives; Jillian Worssam: FFoS Archives



## 1996 Discover Science

Treasures of the Rain Forest  
Ethnobotanist Mark Plotkin

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in any language I know to put my feelings of excitement, exhilaration, wonder and awe into perspective. It is a feeling inside that causes my heart to pump differently and at times my eyes to water, because I am just so overwhelmed about the amazingness of our world. Every breath is new and each sight a wonder unto itself. From mud to waves, to ice to puffins, each image is wonderfully stored in my brain and when I think about them, I realize there is always a smile on my face."

Smiling with the discovery of a subspecies of dinosaur, paleontologist David Gillette, Ph.D., meticulously scans the Southwest for fossils. "I am a paleontologist because I want to learn about the evolution of life on Earth and the evolution of the Earth itself," he says.

That desire to learn led him to find an odd, big-bellied, long-tailed creature with claws, the *Therizinosaur*.



"Every time we find a new fossil bone we are excited, not just me but everyone in the field crew. Is it a dinosaur, a plesiosaur, a turtle, or a mosasaur? Will the bones be complete? Will there be other bones, too? Will we find the head and jaws and teeth? Will it be a complete skeleton? Will it be a species that is already known or a species new to science? This excitement of discovery is what we live for when we are doing fieldwork," says Gillette. "Later, after lots of field time and lab time, we can determine if what we have found is indeed new to science, but no matter if it's not. Every



new specimen has its own story to tell."

Creating stories to tell, based on science, is the work of *New York Times* best-selling novelist Richard Preston, Ph.D. In his effort to carefully

research his topics, he chases down information. While writing his book, *The Dead Zone*, Preston donned a bio-medical suit to get close to, and better understand, deadly germs.

"When I was in college, I became hungry to explore the limits of human knowledge. Today, when I write about something, I try to capture the feeling of wonder that comes from opening the doors of a mystery. Writing, as with science, is about seeing the world differently and slightly more clear than anyone has ever seen it before."

The desire to see the world or other worlds more clearly can be as strong as a gravitational pull. Flagstaff astronomer Marc Murison, Ph.D., felt



the tug of scientific inquiry as a child. "I still remember it like it happened yesterday," he recalls. "My parents had bought me a small two-inch refractor when I was about 10 years old. It was on a very wobbly tripod, and the only eyepiece supplied yielded a rather high magnification... I was getting very frustrated since I didn't know what to look for. However, one evening I aimed at a bright 'star,' managed to get it in the eyepiece, and lo and behold there was Saturn. It was magnificent. I was hooked from then on, and Saturn has always been my favorite object through any eyepiece."

When asked how it felt to walk on the moon, Apollo 12 astronaut Alan Bean says, "It's that feeling of excitement a person experiences only when his life's vision becomes a reality. It's the feeling one has when years of intense dedication and training finally make your most cherished dream come true."

Bean, the fourth man to walk on the moon, credits the scientists of the U.S. Geological Survey for facilitating an important learning period in his life that prepared him for his historic lunar mission. "Flagstaff was the beginning of my journey into learning and understanding the world of geology. I now love geology, thanks to these early experiences in Flagstaff."



## 1997 Science the Ultimate Voyage

The 21st Century  
Futurist B. Gentry Lee

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For many, the fascinating realm of science continues to expand in Flagstaff. SenesTech CEO Loretta Mayer, Ph.D., has built a biotechnology company specializing in rodent control around the world. "You can't swing a shovel in Flagstaff without hitting a biologist or ecologist or young people who want to change the world," she says.

And changing the world can start in a basement, as was the case with W. L. Gore & Associates. With five children to support, Bill and Vieve Gore launched a business out of their home by manufacturing cables. Bill, a chemist, kept exploring new uses for the synthetic material polytetrafluoroethylene (PTFE). As a result, the company expanded to become a multi-billion dollar global leader in the fabrics, medical, industrial and electronic products markets.

Their son, Bob Gore, Ph.D., has been the chairman of the company's board of directors since 1986. "We have created thousands of valuable, life-enhancing products, achieved enviable growth and have



Mouse: A. Kleinman; Bill & Vieve Gore, 1970: W.L. Gore & Associates, Inc.;  
Bob Gore Stretching ePTFE, 1969: W.L. Gore & Associates Inc.

been recognized around the world as a great workplace. I am tremendously proud of the associates' accomplishments, enthusiasm and creativity, as I know my parents would be. Today, I can say with confidence that we have surpassed even my parents' wildest dreams."

Moving beyond what can be imagined is often the reward for scientific pursuit. For the Christopher Columbuses of our time, and all those with a zest for knowledge, exploring our world fulfills a purpose of living, along with some very real benefits in health, technology and quality of life. And then there's the gratitude that comes with having the opportunity to gain new insight. Astronaut Bean expresses it this way, "On the moon, everything is gray. And then you realize, we live in the Garden of Eden."

That spirit of discovery is what is celebrated and shared through the Flagstaff Festival of Science. Lowell Observatory Director Emeritus Robert Millis, Ph.D., describes it like this, "The Flagstaff

Festival of Science sets our city apart as one that truly values science, technology and learning. Through the Festival, we celebrate and seek to continue our heritage as a community of thinkers and dreamers, always striving to extend our knowledge and understanding of the world around us."

In a Sept. 25, 2009 editorial, the *Arizona Daily Sun* prepared readers for the Festival. "Science and discovery produce as many questions as they help answer, but it's that desire to understand, that curiosity and wonderment at how the world works and how we can make it work better that we celebrate in Flagstaff—not just this coming week but every day of the year."

Thus, the Flagstaff Festival of Science is a celebration of science and also of the scientists who lead the way, daring to wonder, chasing after discovery and inspiring greatness. The essence of the Festival is that unquenchable thirst for, "What happens next?"



Lowell Observatory: FFoS Archives



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## Celebrating Science in the Skylight City

We now understand the essence of the Festival of Science, but why Flagstaff? Why does this community throw back its shoulders, puff up its chest, and openly celebrate science? Communities across the globe hold fairs, festivals and other celebrations to honor some aspect of their cultures, from significant historical events and people to local arts and home brews. But why, for 25 years and counting, has Flagstaff boasted such a celebration that pays homage to the pursuit of scientific discovery and understanding?

One obvious reason relates to Flagstaff's incredible breadth and diversity of natural resources, a bounty of riches that has inspired observations and scientific study for nearly as long as people have rambled across the mountains, valleys and plains of northern Arizona. A second reason involves the passionate support of these scientific pursuits by a curious community. Since Flagstaff's early days, residents have openly celebrated scientists and their research, embracing opportunities to engage with these scholars while establishing a scientific consciousness for the community.



Penstemon: The Arboretum at Flagstaff

This chapter will address these two factors, focusing first on the history of scientific discovery in the area and the extraordinary natural resources that continue to seize the attention of scientists. Supplementing this is a look at the community's longstanding custom of celebrating its scientific heritage.

Scientific exploration often involves a maturation process consisting of three stages, including 1) basic surveys, 2) focused, longer-termed studies and 3)



Ira Flatow: FFoS Archive; Richard Hofstetter, FFoS Archives;  
 Night Sky Over Flagstaff, © 2008 Dan & Cindy Duriscoe, FDSC, Lowell Observatory, USNO



*"You can't get a cup of coffee in  
 Flagstaff without bumping into  
 a scientist."*

— Ira Flatow  
 Host of NPR's ScienceFriday

"permanent" ongoing research. The exploration of Flagstaff's scientific resources and related development of the community as a center for scientific study follows this pattern: the area's scientific resources were first truly recognized by 19th century expeditions looking for transportation routes. Later expeditions came to the area for targeted scientific observations, ultimately setting the stage for the establishment of permanent scientific facilities.



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## Early Surveys Hint at Scientific Importance of Northern Arizona

The first local observations with scientific elements date back centuries. At some archaeological sites, certain ancient structures might have been used as calendars for recording astronomical phenomena, information that the residents could then use to plan their lives. An example is Crack-in-Rock, located within the confines of modern-day Wupatki National Monument. Crack-in-Rock features a wall with three small windows that archaeologist Bryan Bates of Coconino Community College believes might have been used to observe and mark sunrise at different seasons. The sun passed through the middle window, for instance, at the midpoint of spring, known as the "May cross-quarters." This signaled the time to plant crops, as the crippling frosts were likely done for the season. In August, the same window marks the advent of shorter days, indicating the coming fall season.

While such observations may not be purely scientific in the modern sense, they do indicate a desire by the ancients to observe and understand the universe around them. Furthermore, these celestial surveys set the scene for northern Arizona's ultimate place as a center of astronomical study.

The first non-Natives to see northern Arizona were likely members of a party led by Garcia Lopez de Cardenas that broke off from the main Coronado expedition of 1540. While these Spaniards never did find the riches of the fabled Seven Cities of Cibola for which they searched, they did locate a natural treasure that would itself become legendary and, centuries later, welcome a new brand

of explorers called scientists.

Three centuries after Cardenas's party saw the south rim of

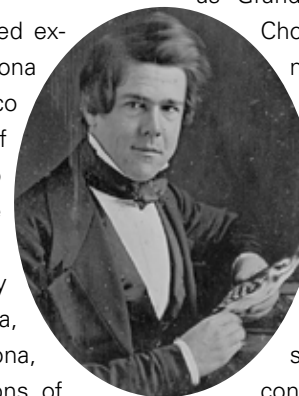


the Grand Canyon, detailed exploration of northern Arizona began. In 1848, Mexico had transferred control of a wide section of land to the United States. The so-called Mexico Cession included the present-day states of California, Nevada, Utah and most of Arizona, along with smaller portions of other states such as New Mexico. The geography and natural resources of these lands were largely unknown to Anglos so U.S. government officials planned several expeditions to learn about the area, primarily for establishing transportation routes. Several of these campaigns traveled through northern Arizona and encountered the area's natural resources.

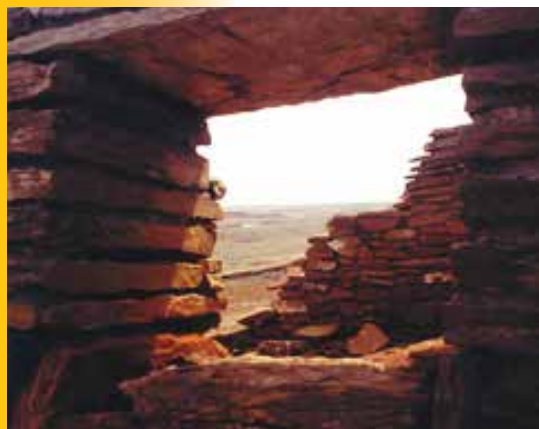
In 1851 Captain Lorenzo Sitgreaves of the U.S. Army's Corps of Topographical Engineers led the first expedition through the area, exploring the Zuni and Colorado rivers in hopes of finding a water route to California. One of the

supporting goals of this mission was to learn about the natural history of the area. Samuel Woodhouse, M.D. was hired to serve as expedition naturalist, describing plants, rocks, animals and geography.

Leaving from Santa Fe on Sept. 24 and following the Zuni River to the Little Colorado, the party of 50 halted on day 15 as they arrived at a steep waterfall with a vertical drop exceeding that of Niagara Falls. This feature would become known as Grand Falls or, to some locals, Chocolate Falls because of its muddy brown water. While this discovery essentially extinguished any thoughts of using the waterway for regular transportation, later generations of explorers would realize a different kind of value of the river and surrounding span of cinder cones and volcanic rock—scientific. Geologists would study these



features to learn about the inner workings of Earth while astronauts, the explorers of other worlds, would train here in preparation for their voyages to the moon.



Pueblo Window, Wupatki National Monument: FFOs Archives

Grand Canyon: A. Kleinman; Samuel Woodhouse: Marian S. Carson Collection, Library of Congress;  
Grand Falls: Jeffrey B. Plescia

## 2000 Huge Impacts

*Huge Impacts*  
Paleontologist Jack Horner

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Following the advice of expedition guide Antoine Leroux, the expedition left the river at Grand Falls and headed west toward the San Francisco Peaks with the idea of meeting up with the Colorado River near the Grand Canyon and then following its course. On the way to the Peaks the expedition came across the ruins at Wupatki, marking the first Euro-American record of the site. Several days later, the expedition stopped at a spring on the west side of the Peaks. Later named Leroux Spring, it became a critical water source for future travelers and, eventually, residents. Just west of the spring was a stretch of land later called Fort Valley, the future site of the U.S. Forest Service's first research facility.

In his role as expedition naturalist, Woodhouse became the first Anglo to carry out extensive scientific observations and collections in the area, establishing the critical groundwork for later generations of explorers and scientists. Due to the massive flow of immigrants heading to California in response to the 1848 discovery of gold at Sutter's Mill, the need for a reliable transportation route to the west coast



dramatically increased. Most interested parties realized that a railroad would be the best option, so Congress appropriated money to undertake several surveys to determine the best route.

One of these surveys traveled along the 35th parallel during 1853-1854 and was led by Lieutenant Amiel Weeks Whipple. The core of the expedition left Fort Smith, Ark., on July 14, 1853. This group was later joined by Lieutenant Joseph Christmas Ives, guide Antoine Leroux and others in Albuquerque on their way to northern Arizona and California.

The many scientists—approximately 17—of the Whipple expedition made widespread collections and observations, significantly adding to the sum knowledge of the area's natural history. Botanist John Bigelow, for example, collected more than 60 new species of plants.

In Arizona, the party discovered remarkable samples of petrified wood in an area later designated as Petrified Forest National Monument. Future generations of scientists would exhaustively study these world-famous deposits, which included a rich sampling of dinosaur and other fossils. Additional expedition stops included a chasm that Whipple named Canyon Diablo, the archaeological site Cosnino Caves and nearby Turkey Tanks, a site that would serve as a reliable water stop for future travelers through the area. Leroux Spring later served as a base for the expedition as small groups split off to explore the area, including the land encompassing



Grand Falls: Baldwin Mollhausen

Grand Falls: Baldwin Mollhausen; Petrified Forest National Park: FFOs Archives



## 2001 Extreme Science

*Microbes, Meteorites and Mutants: The Real Science Behind the X-Files*  
X-Files Consultant/Plant Virologist Anne Simon

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present-day Museum of Northern Arizona. Little could these explorers know that this section of land would one day serve as home to a museum dedicated to the study and preservation of the local natural history and culture that they were then exploring.

The surveys by Whipple and others indicated several feasible railroad routes, but politicians couldn't agree on one and decided to perform additional surveys. In the meantime, they authorized a wagon road that could temporarily serve travelers and hired Edward Fitzgerald Beale to head the project. Beale, known for contributing to the gold rush by carrying the first California gold samples across the country and delivering them to the federal government, brought in more than 50 men and, famously, dozens of camels to build the road.

Beginning in 1857, Beale and crew traveled back and forth several times constructing and improving the road, following a path that passed through Flagstaff. Often following the trail created by Whipple, Beale's route passed by Cosnino Caves and Turkey Tanks to Leroux Spring and through modern-day Flagstaff on its way westward to California.

While science was not part of Beale's efforts, the road he built had a long-lasting impact on the



Edward Fitzgerald Beale: U.S. Air Force

development of science in northern Arizona, as it laid the groundwork for the arrival of the railroad that led to the founding of Flagstaff in 1882.

Another survey expedition, in 1857-1858, that did incorporate strong elements of science began aboard a steamboat that headed up the Colorado River to explore that body of water's navigability for a potential trade route. Whipple's former assistant Ives took charge of the Colorado Exploring Expedition, known today as the Ives Expedition, and was joined by the eminent geologist and physician John Strong Newberry.

The journey followed the Colorado River up to the end of the lower Grand Canyon, where some of the party members headed back downriver and the rest ventured overland toward eastern Arizona. The latter group approached the Grand Canyon near Diamond Creek and became the first known non-Native Americans to walk in the bottom of the Canyon. Newberry was the first geologist to study the Grand Canyon and his geological reports opened the door to future observations by the likes of John Wesley Powell and others, all despite the miserable assessment by of Ives, who famously wrote, "It [the Grand Canyon] looks like the Gates of Hell. The region... is, of course, altogether valueless. Ours has been the first and will undoubtedly be the last, party of whites to visit the locality. It seems intended by

nature that the Colorado River along the greater portion of its lonely and majestic way, shall be forever unvisited and undisturbed."

The era of transportation surveys wound down in the late 1860s. In 1867-1868 William Jackson Palmer led an expedition through northern Arizona, following the path of Whipple and Beale and demonstrating once and for all the viability of a 35th parallel route for the railroad. In his 1869 published report of this excursion, Palmer not only named Agassiz Peak but also used the term "Grand Cañon" in print for the first time.



Grand Canyon: Bob Fain

## 2002 Stellar Science

*Stellar Science—  
A Crash Course in Astronomy*

**Astronomer/Comet Discoverer Carolyn Shoemaker**

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## Scientists Target Northern Arizona for Research

The year after Palmer completed his survey, John Wesley Powell heralded in the middle era of exploration in northern Arizona, a time that saw scientific studies focused on specific natural resources. In 1869, Powell led the first expedition down the Colorado River and through the Grand Canyon, a three-month-long excursion that unveiled the vast scientific potential of this geological paradise.

Powell returned to northern Arizona numerous times, revisiting the Grand Canyon, exploring other geological features in northern Arizona, documenting the area's native cultures and studying regional water resources. While in Flagstaff, he sometimes stayed with the Riordan brothers, who owned the area's largest lumber mill. The Riordans were prominent citizens who often hosted visiting scientists, realizing the value of science as a component of Flagstaff's emerging community.

Powell's impact on the development of science in northern Arizona was profound. He studied and named many geological features in the area, including Sunset Mountain (later modified to Sunset Crater), and investigated the limited water resources of the region, warning government officials about the effect this paucity would have on America's westward expansion. He

performed many of these efforts while serving as the second director of the U.S. Geological Survey, an organization that would establish a Flagstaff station a century later and build on Powell's early research. Powell also laid the groundwork for other geologists such as Clarence Dutton and Grove Karl Gilbert.



John Wesley Powell: NAU Cline Library Special Collection

Dutton studied the Grand Canyon and in 1882 published a seminal report about its geology. Gilbert, who in 1873 named Humphreys Peak after topographical engineer Andrew Atkinson Humphreys, is remembered in northern Arizona for his research of Meteor Crater. Among Gilbert's many geological interests were the origins of craters, both terrestrial and lunar. In 1891, he spent two weeks at the northern Arizona crater then known as "Coon Butte", surveying its topography and magnetism. Despite some evidence indicating the crater had been formed by the impact of a rock from space, Gilbert nonetheless declared a volcanic origin. Three quarters of a century would pass before another geologist interested in impacts, Eugene Merle Shoemaker, would conclusively prove that Meteor Crater had, in fact, been caused by an extraterrestrial collision.

The early expeditions to northern Arizona had revealed quite a diversity of geographical regions, often harboring distinct plant and animal life. This caught the attention of Clinton Hart Merriam, Ph.D., a naturalist and the first director of the Division of Economic Ornithology and Mammalogy, a predecessor of the U.S. Fish and Wildlife Service. In 1889, Merriam led a biological survey to northern Arizona in order to study the succession of climate zones and corresponding life, ranging from the depths of the Grand Canyon and deserts to the east of Flagstaff, to the top of the San Francisco Peaks.

Based on this two-month-long study, Merriam published the first comprehensive report of the animal and plant life of the area while introducing his now-famous life zone scheme. This groundbreaking work revealed northern Arizona's vast array of environmental and agricultural resources, leading to the eventual establishment of facilities such as the nation's first forest experimental station and a high-altitude horticultural research center now known as The Arboretum at Flagstaff.

In Merriam's 1890 paper, he acknowledged the assistance of those ever-present community builders, the Riordan brothers. They would soon welcome another scientist who would forever change the landscape of Flagstaff by establishing the town's first permanent scientific institution.



Clinton Hart Merriam: Frances Benjamin Johnston



## 2003 Science Erupts Chasing Volcanoes, Near and Far Volcanologist Wendell Duffield

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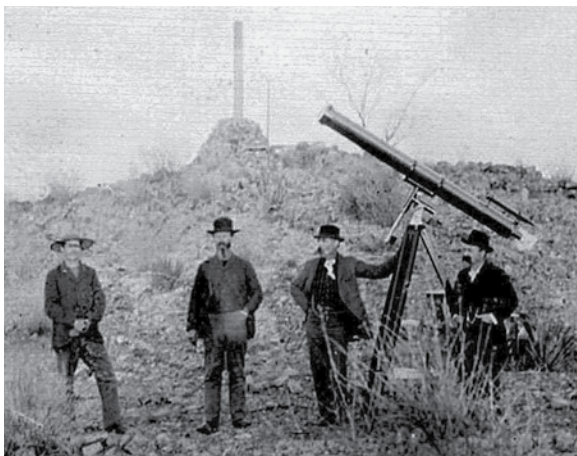
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## Science Plants its Roots in Flagstaff



Flagstaff was founded in 1882 and incorporated as a town in 1894. By that time, the community had started referring to itself as the "Skylight City" in reference to its clear air and bright stars. Little could anyone then realize the long-lasting impact of those skies on Flagstaff's future.

In the spring of 1894, a young astronomer named Andrew Douglass arrived in town with a telescope in tow. Douglass was one month into a solo expedition with the goal of finding a suitable site to build an astronomical observatory. He had traveled to several localities around the Arizona Territory before arriving in Flagstaff. At each stop, he used the telescope and a suite of meteorological equipment to test the quality of the air for astronomical observing. Douglass was warmly welcomed in each community by their leaders who, presciently believing a scientific institution could generate income and prestige,



Commemorative Flag Staff: A. Kleinman; Tombstone Leaders Stand Next to the Telescope during 1894 Expedition by Douglass: Lowell Observatory

encouraged Douglass to choose their community as the site for the new facility.

When Douglass arrived in Flagstaff he met with the Riordans, who worked with other community leaders to offer incentives to Douglass and his employer Percival Lowell. Lowell ultimately chose Flagstaff and Lowell Observatory began operations in May 1894. This was the first permanent scientific establishment in Flagstaff and its success demonstrated the viability of ongoing research in northern Arizona, paving the way for the arrival of later institutions of research. Furthermore, the founding of Lowell established northern Arizona as a center of astronomical research.

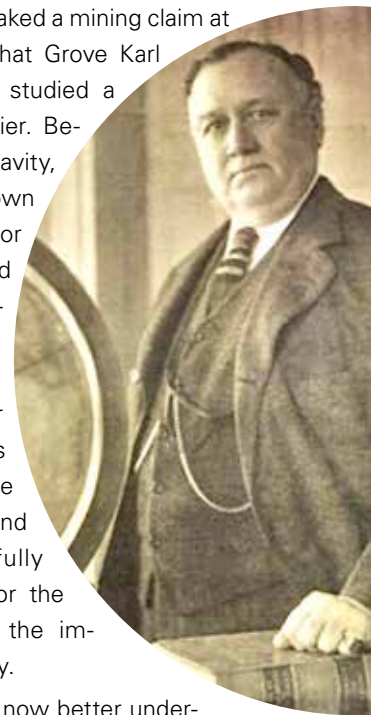
Four years after Lowell Observatory opened its doors, the first weather station in Flagstaff was established to monitor local conditions. Elizabeth Renoe, who married Arizona's first U.S. Senator, Henry Fountain Ashurst, was the first observer. The bureau was located at the Ashurst home, still standing and now a private residence near the intersection of Aspen Street and North Park Street. The station later moved to downtown Flagstaff's Federal Office Building, Flagstaff Municipal Airport and, finally, to the Camp Navajo Army Depot in Bellemont, where meteorologists and other scientists study the weather and communicate their observations to the public.

The arrival of the twentieth century brought a further influx of scientific organizations to northern Arizona. In 1903, mining engineer Daniel Moreau

Barringer staked a mining claim at the crater that Grove Karl Gilbert had studied a decade earlier. Believing the cavity, today known as Meteor Crater, had been created by a meteorite, Barringer spent years studying the feature and unsuccessfully searching for the remains of the impacting body.

Scientists now better understand impact dynamics and realize the majority of the impacting body vaporized when it crashed. While the crater will thus never yield the mineralogical treasure Barringer searched for, its scientific value is inestimable. It is the best-preserved impact crater on Earth, the Holy Grail for impact specialists. Moreover, it is analogous to lunar craters and in the 1960s served as an outdoor classroom for astronauts learning about the geology of the moon in preparation to traveling there.

A year after Barringer staked his claim, Andrew Douglass, no longer employed at Lowell Observatory, began examining tree rings exposed in the ponderosa pine logs stacked at the Riordan brothers' mill. Douglass hoped to show a connection between solar activity, as



Daniel Moreau Barringer: FFOs Archives

## 2004

### Life Forms

#### Our African Ancestors

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evidenced by astronomers' records of sunspot observations, and Earth's climate, indicated by tree rings (each ring represents one year of growth; the wider the ring, the more precipitation in a given year).

Douglass continued his tree ring research after he moved to Tucson, where he worked at the University of Arizona. While he did not make a definitive connection between solar activity and climate, he did unexpectedly establish a method for dating archaeological remains by examining the trees rings exposed in beams. Douglass went on to found the science of dendrochronology and worked closely with Harold Colton and Lyndon Hargrave of the Museum of Northern Arizona in establishing ages of ruins at sites including Wupatki.

The trees that Douglass studied at the mill all came from nearby forests that are part of the most extensive stand of ponderosa pine trees in North America. The heavy logging of these trees concerned early conservationists and in 1898 the General Land Office established the San Francisco Mountain Forest Reserve to protect these forests. Officials later reclassified the area as National Forest and in 1908 it was combined with other land to create the Coconino National Forest

That same year, the U.S. Forest Service designated this new forest as the site for the country's first forest research station. Located in Fort Valley just north of Flagstaff, the Coconino Experiment Station is now

known as the Fort Valley Experimental Forest and joins Northern Arizona University's Centennial Forest as a leading facility for forestry research and education.



In 1912, Arizona earned statehood status and V.M. Slipher of Lowell Observatory detected the expanding nature of the universe. Meanwhile, a young couple from Pennsylvania camped near the San Francisco Peaks for four days on their honeymoon to the Southwest. They returned in 1916 and, discovering an archaeological site, fell in love with the area. Zoologist Harold Colton and his artist wife Mary-Russell Ferrell Colton began making archaeological surveys of the area and in 1926 permanently moved to Flagstaff.

The following year, Harold attended the first Pecos Conference on southwestern archaeology and learned that many archaeological resources were disappearing at an alarming rate. He decided to establish a museum to collect, preserve and study the



archaeology and natural resources of the Colorado Plateau. In addition

to archaeological work, the museum would carry out studies of geology, botany and other disciplines. Furthermore, and in line with Mary-Russell's passion, the museum would be a center for art.

In 1928, the Northern Arizona Society of Science and Art, later called the Museum of Northern Arizona, was incorporated. Not surprisingly, among the 12 individuals who signed the articles of incorporation was one of the Riordan brothers, Timothy. One of the defining aspects of the museum is the melding of science and art, a tradition carried on and encouraged today by the museum, the Flagstaff Arts Council, and other organizations and individuals.

As the United States entered into the Great Depression and World War II, scientific research in the area ebbed. Despite this, the eyes of the world were focused on Flagstaff in 1930 with Clyde Tombaugh's discovery of Pluto at Lowell Observatory.

Two decades would pass before another scientific facility came onto the scene. In 1948, astronomer Art Adel began working at Arizona State College

at Flagstaff (now Northern Arizona University), shepherding in a quickly expanding aspect of scientific research at the college that saw the construction of

the Atmospheric Research Observatory in 1952. Since then, Northern Arizona



## 2005 Swing Into Science

*Life in the Treetops:  
Exploration in Tropical Forests*  
Treetop Biologist Margaret 'Canopy Meg'  
Lowman

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University has added a stable of world-class scientific research and teaching programs focusing on forestry, biology, geology, and other natural sciences. Part of this effort included the addition of study centers such as the Merriam-Powell Research Station and Ecological Research Institute at NAU (ERI) and collaborations with partners including the Translational Genomic Research Institute (TGen). These programs are led by such renown leaders as Wally Covington, Ph.D., also known as the "Father of Forest Restoration" and the world's foremost DNA expert Paul Keim, Ph.D.

On the heels of the arrival of the Atmospheric Research Observatory came more astronomical facilities. In 1955 the U.S. Naval Observatory, hampered by the murky skies at its Washington, D.C. facility, established a new observing site at a more appropriate location. Officials targeted Flagstaff for the new field station largely based on Lowell Observatory's long-standing success in the area. Decades later, the Naval Observatory joined forces with Lowell to construct a powerful array of telescopes called an interferometer, which captures light from targeted objects at exceptionally high resolution.



Less than a decade after the Naval Observatory established its Flagstaff Station, the spirits of John Wesley Powell and Grove Karl Gilbert returned to Flagstaff in the person of Gene Shoemaker, a geologist working for the U.S. Geological Survey.

Shoemaker is considered the father of astrogeology, the study of the geology of planetary bodies such as the moon and planets. He founded the U.S. Geological



Survey's Astrogeology Research Program in California and moved it to Flagstaff in 1962/1963, primarily because of the vast array of nearby geological features. The initial goal was to support the Apollo program to the moon by creating lunar maps, training the astronauts, and developing scientific observing and collecting techniques.

Shoemaker hoped to apply for the astronaut program and fly to the moon but was disqualified after he was diagnosed with a rare disease. Not able to attain his goal of becoming an astronaut himself, he did the next best thing and trained the astronauts at Meteor Crater and several volcanic sites around Flagstaff.

Years later, in 1993, Shoemaker made international headlines when the comet he had co-discovered with wife, Carolyn, and amateur astronomer David Levy spectacularly crashed into Jupiter, a fitting event for a man who spent his life studying impacts. After Shoemaker's

untimely death in 1997, the Flagstaff Festival of Science named its annual featured presentation the Shoemaker Keynote Presentation.

In the late 1960s, while the space race escalated, a new science-based company unlike any other in Flagstaff began operations. While most previous scientific research in Flagstaff can be described as basic or pure (research that builds a basic understanding of some phenomenon), the arrival of W.L. Gore & Associates opened the door to extensive applied research (designed to solve practical problems, such as treating illnesses).

The W.L. Gore company was founded in 1958 by Wilbert (Bill) Lee Gore and his wife, Genevieve. The business initially developed ribbon cable used in the electronics industry. In 1967, some 30 years after stopping in Flagstaff on their honeymoon—just like the Coltons had done—the Gores returned to Flagstaff

## 2006 Dive into Science

*Adventures of a Sea Hunter*

Maritime Archaeologist James Delgado

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and opened a branch for the company on the east side of town. In the four decades since, Gore has established several additional facilities in Flagstaff, including the Medical Products Division that designs and builds various life-improving and life-saving devices.

Just a few miles south of Gore's west-side complex stands a testament to northern Arizona's ongoing concern for plant conservation and study, building on the legacy of Clinton Hart Merriam and the U.S. Forest Service. The Transition Zone Horticultural Institute, known today as The Arboretum at Flagstaff, was founded in 1981 to research and conserve the native plants of the Colorado Plateau. The Arboretum plays an important role in the story of science in Flagstaff for two reasons. First, it was the last major, independent research facility established prior to the founding of the Flagstaff Festival of Science in 1990. Second, it was created by a person who symbolizes the community's longstanding support of scientific pursuits in Flagstaff, Frances Burt McAllister.



The Arboretum at Flagstaff: A. Kleinman

## Flagstaff Supports Science

Frances McAllister was a generous philanthropist who sponsored assorted scientific and cultural efforts in northern Arizona, including the Festival of Science and its various affiliated organizations. Her passionate and active support of science typifies the attitudes of local residents. While most locals may not have McAllister's financial resources, many do possess her community pride and awareness that science is an important fabric in the tapestry that is Flagstaff.



This local support dates back to the pioneer days of Flagstaff. Perhaps this is because the development and maturation of Flagstaff as a municipality closely parallels the same growth stages as its scientific identity. Furthermore, many of Flagstaff's early leaders, such as the Riordan brothers, visualized building an enlightened community establishing the trend of welcoming and supporting scientists and their research endeavors. Unlike most other 19th century western outposts, Flagstaff saw traveling scientists rubbing elbows with local lumbermen and cattle drivers. Later, when scientists planted their roots in town, they became active members of the community.

Then there is the mindset of scientists such as Percival

Lowell, who said in his 1906 book *Mars and its Canals*, "To set forth science in a popular, that is, in a generally understandable, form is as obligatory as to present it in a more technical manner. If men are to benefit from it, it must be expressed to their comprehension." In 1896, Flagstaff residents participated in the "Summer School of Science," attending free lectures by leading scientists such as Lowell and Merriam. More than a century later, the locals still come out to hear scientists speak, attending formal presentations at scientific organizations, informal programs at pubs and book stores and a concentrated mix of activities at the annual Festival of Science.

Further evidence of Flagstaff's support for its scientific heritage is the ongoing effort to protect the area's natural resources. An example is the decades-long effort to limit light pollution in a



*"If men are to benefit from it [science], it must be expressed to their comprehension."*

— Percival Lowell  
Astronomer, Lowell Observatory

Frances B. McAllister: The Arboretum at Flagstaff; Percival Lowell: FFoS Archives



## 2007

### Dig Science

*Therizinosaur: Mystery of the Sickie-Claw Dinosaur*  
Paleontologist David Gillette

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community once nicknamed the “Skylight City.” In 1958, city officials enacted the first-known lighting ordinance in the country, updating the code in later years to reflect the changing nature of lighting standards. In 2001, these efforts were recognized when Flagstaff was designated the world’s first International Dark Sky City. In 2014, Flagstaff hosted the first Dark Skies and Emerging Technology Conference. This summit welcomed policy makers, dark skies advocates, representatives from the lighting industry and other interested parties to discuss outdoor lighting issues.

In 1996, the community created a vision. The document, Flagstaff 2020, named the Flagstaff Festival of Science as an event that fit with the identity of the city and that it wanted to see continue into the future, promoting Flagstaff as a leading scientific center.

Lastly, in acknowledging the community’s collective desire to promote science, technology, engineering and mathematics (STEM), the City Council declared Flagstaff as a STEM city, the first in the United States. This designation sent the message that Flagstaff loves its science and wants to ensure its availability for future generations.



How important is science to Flagstaff’s heritage? Many of the area’s older scientific facilities are listed on the National Register of Historic Places, including the C. Hart Merriam Base Camp Site, Lowell Observatory, the Museum of Northern Arizona exhibit building, U.S. Forest Service Fort Valley Experimental

Forest Station Historic District and Wupatki National Monument.

Returning to the question, “Why a Flagstaff Festival of Science?” The answer comes down to this: the community has an important scientific heritage to celebrate and the desire by its residents to do so.



Flagstaff Road Sign: FFoS Archives; Messy Experiments: FFoS Archives

C. Hart Merriam Base Camp Site: FFoS Archives; Lowell Observatory: FFoS Archives; Museum of Northern Arizona: FFoS Archives; Fort Valley Experimental Forest U.S. Forest Service; Wupatki National Monument: FFoS Archives

## 2008 Zoom Into Science

*Zoom Into the Hidden Depths of the Biological World*

Hot Zone Author Richard Preston

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## Developing the Festival of Science

On Oct. 5, 1990, light from a full moon flooded the landscape of the town once called the Skylight City, symbolically launching a three-day community celebration of science. At 7 p.m., 700 curious residents settled into their seats in NAU's Ardrey Auditorium and listened to NAU President Gene Hughes address the crowd.

"On behalf of Northern Arizona University and the scientific organizations of Flagstaff, I welcome you to the opening ceremonies of the first Flagstaff Festival of Science," announced Hughes. He continued, "This weekend promises to be very exciting. I hope all of you will be able to take advantage of this opportunity to learn about the contributions to science, which are being made by many of your neighbors right here in Flagstaff. It is also an opportunity for the young people of our community to see first-hand the diversity and excitement of science." With these words, Hughes kicked off the inaugural festival that would evolve into an annual ten-day salute to science.

Such a large-scale, community-wide event had been slowly germinating for decades, with several organizations holding their own public open houses. The USGS, for instance, had for years opened their doors



Full Moon: FFoS Archives; U.S. Geological Survey: FFoS Archives

for annual behind-the-scenes tours that allowed visitors the chance to experience first-hand the excitement of scientific endeavors. Ivo Lucchitta, Ph.D., a retired geologist and onetime director at the USGS, remembers, "The USGS open house was typically a one-day affair but we realized that it was really popular. At one point, some of my colleagues and I, we thought well, if it is so well received, why don't we really make a big effort and have a three-day open

house, which we did. It was a success beyond expectations and we estimated maybe 5,000 people came. We were blown away."

The success of this three-day event got Lucchitta and colleagues John Sass, Wendell Duffield and Wes Ward thinking on an even grander scale. "It seemed logical that perhaps we should tap into all of this local interest in science," Lucchitta said. "It was completely uncertain how, but somehow have an event, maybe annual, maybe not annual, we didn't know, where we would have sort of a mega open house with lectures and so on. This would not be just the USGS but everybody else, too. After all, there was Lowell, the Naval Observatory, other observatories, the university, the Forest Service, the museum; there were a lot of outfits doing research."

Meanwhile, Eugene Hughes was developing his own ideas about celebrating science. In his position as university president, Hughes had nurtured both formal and informal associations with

the scientific organizations around Flagstaff. Hughes remembers, "All of that effort, in terms of relationships,



*"We want people to see that science is much more than nerds and pocket protectors. It's exciting and fun and you don't even need to be a scientist to work in science."*

Steve Smith, W.L. Gore & Associates

led me to think that we should be able to find some way to celebrate the sciences in Flagstaff."

In the fall of 1989, Hughes took action. W. L. Gore's John Giovale recalls, "Gene called, it must have been 12-15 business leaders from the community, to NAU to try this idea out of a science festival. We had lunch at NAU and there was a uniformly enthusiastic response to Gene's proposal."

Hughes said the group initially decided to hold an event in conjunction with NAU's honors week in April 1990. An organizational meeting was held that saw Lucchitta and other leaders from the community's scientific organizations attend. Retired NAU administrator Jeanette Baker, Ph.D., remembers, "They had the idea of what they wanted to see happen but they didn't have a clear idea of what to do next. So they got a few of their staff people involved—there was me, Amy LeGere and Steve Smith from Gore and others—people who were maybe more familiar with how to

Steve Smith: FFoS Archives



## 2009 Launch Into Science

Reaching Your Own Special Star  
Apollo Astronaut Alan Bean

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organize events.”

A steering committee was initially formed that included Richard Heintz, publisher of the *Arizona Daily Sun*. In January, 1990, this group was split up into science and operations committees. The former, headed by Lucchitta, focused on establishing scientific content while the latter took care of the details of event planning and promotion.

As discussions ensued, leaders identified the following key points, as listed in a Jan. 18, 1990 memo from Lucchitta:

- Each institution should focus on just a few subjects that it is particularly strong in. We cannot all do everything.
- It would be good to have activities that are particularly interesting to the public, including hands-on displays, movies and videos and displays with a strong graphic content.
- We must remember that we are dealing with the general public: jargon and esoteric details must be avoided.
- We need to show that science is vital to the country (and the human race), exciting, and, above all, fun. We should also try to show how it is an integral and indispensable part of everyday life, not some exotic thing that only select high priests engage in.
- We need to get



Abert's Squirrel: A. Kleinman

young people interested and excited about science and show them that they might consider it seriously as a career.

- We need to show the public that scientific research, and therefore decent scientific education, are not some kind of luxury, but one of the keys not only to our well-being as a nation, but also to our survival. It is knowledge that sells in today's world.

Planners ultimately set the weekend of Oct. 5-7, 1990 for the first Festival. More than 50 events at 10 sites were planned, with special attention given to programming appropriate for all ages. W.L. Gore's Director Ginger Giovale said, "Adults in this town like to go to places that are interesting not only for their kids but for themselves. It gives them a break, but they also get to see cool stuff."

Will Steger, co-leader of the 1990

International Trans-Antarctica Expedition, was targeted as the keynote speaker. W. L. Gore & Associates played a key role, sponsoring both the expedition—which saw its human and canine members clothed in Gore-Tex® wear—and Steger's travels to Flagstaff for the festival.

Media buildup for the festival was strong. An August 1990 press release stated, "As a tribute to the scientists, engineers and technologists who over the years have brought fame and honor to this mountain city, Flagstaff will hold its first-ever Flagstaff Festival of Science." An editorial in the Aug. 17, 1990 *Arizona Daily Sun* read, "Flagstaff Festival of Science—what does that mean to you? If you think it will be the Northland's largest nerd convention in years, you've got a lot to learn. If it sounds like a pretty big public relations stunt that packs a



Laws Spring: Neil Weintraub

## 2010 Livin' Science

*Biosphere 2: The Human Experience*  
Biospheric Jane Poynter

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scientific punch, well, you're getting closer. And if you think it is basically a baring of the heart, mind and soul of Flagstaff's scientific community, bingo! "

That first Festival proved to be quite successful and planners soon began looking to the future. Baker recalls, "With the success of that first weekend, we found that more organizations wanted to get involved. We decided to expand it into a longer-running event because of the additional organizations and also so more people would have the opportunity to attend. We also started in-school and after-school programs."

Leaders realized that to sustain the Festival, particularly considering the longer running event and ongoing need for fundraising, a more formal organizational structure would be needed. The Festival incorporated in 1992 and established a board and slate of officers, including President Jeannette Baker (NAU), Vice President/President Elect Steve Smith (W.L. Gore), Secretary Amy LeGere (W.L. Gore & Associates), Treasurer Otto Franz (Lowell), David Chase (David Chase & Co.), Ginger Giovale (W.L. Gore & Associates), Wes Lockwood (Lowell), Ivo Lucchitta (U.S.G.S.) and Patsy Reed (NAU). Three years later, the paid position of coordinator was added to ensure continuity and year-round planning.



Science In The Park: Bonnie Stevens, FfOs Archives

In the ensuing quarter of a century, the Festival has matured into an event that annually repeats popular activities such as Science in the Park—featuring hands-on activities by four dozen organizations—while introducing new ones that tie in to current scientific and educational opportunities. Each year, organizers produce a "passport" that serves the dual purpose of listing all festival events while allowing students to keep track of their travels to various events. For several years contests were held as part of the Festival, including "Name an Asteroid" and "Ugly Bug."

The first Name an Asteroid contest in 1996 inspired creativity from northern Arizona to England. Astronomers Chris Luginbuhl and Brian Skiff identified unnamed asteroids and reviewed the 120 submitted names. Tse Naat'a'i, a Navajo word for flying rock, submitted by 13-year-old Derekson Bert of Rocky Ridge Boarding School, was the winner.

In an afternoon ceremony at Bert's school two miles north of Kykotsmobi in the town of Dinnebito, Festival representatives presented Bert with a photo of the asteroid and \$50 savings bond from Flagstaff Medical Center. Skiff, the asteroid discoverer, said the name grabbed his attention because

it was symbolic of the Navajo culture's influence in the Flagstaff area.

Meantime, the Ugly Bug Contest was the brainchild of NAU's Marilee Sellers, who magnified insects tens of thousands of times, splashed them in neon colors and showcased them on posters. These monster-like images of bugs with multiple eyes, hairy legs and sometimes wings, demonstrated the power and function of the electron microscope, which she used in her lab on campus. In 1996, the winner of the Ugly Bug Contest was a ladybird beetle, also known as a ladybug. Submitted by 3rd graders at Cromer Elementary School in Flagstaff, it won them \$100 in science videos and bright ugly bug posters. Marshall Elementary's centipede took second place and DeMiguel's milkweed came in third. The third graders were asked to submit dead bugs. Photos of the bug mugs were displayed at local libraries and on the Internet. The public

## Asteroid Contest Winners

1996 - (5460) Tse Naat'a'i, Derekson Bert

1997 - (6229) Tursachan, Alice Dennis

1998 - (10039) Keet Seel, Michael Gibson

1999 - (6370) Malpais, Van Campbell

2000 - (11831) Quivira, Jesse Roberts

2001 - (12557) Caracol, Gary Bennett

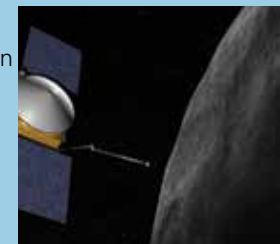
2002 - (12912) Streator, Mark Decker

- (14566) Hokulea, Erik, Mara, Scott and Troy Hardman

- (12079) Kaibab, Leszek Pawlowicz

See more about the winners at

<http://www.nofs.navy.mil/festsci/winners.html>



Artist Concept of NASA's Dawn Spacecraft and the Giant Asteroid Vesta: NASA/JPL/Caltech



## 2011 Illuminating Science

*Illuminating Science through  
the Hubble Space Telescope*  
Space Shuttle Astronaut/Astronomer  
John Grunsfeld

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was asked to choose the ugliest.

The list of keynote speakers from the past 25 years is a who's who of leading scientists and explorers—Donald Johanson, Ph.D., who discovered the fossil hominid Lucy, moonwalkers Harrison "Jack" Schmitt, Ph.D., and Alan Bean, environmental advocate Alexandra Cousteau and astronomer Carolyn Shoemaker, to name a few.

The Flagstaff Festival of Science is the longest continuously running free science festival in the United States and in 2012 was recognized by the *Arizona Daily Sun* as the Organization of the Year while also winning the Viola Award for Flagstaff Event of the Year. Most importantly, the Festival continues to inspire both young and old to learn more about the universe around them.

Donald Johanson, Harrison "Jack" Schmitt, Alan Bean, Alexandra Cousteau,  
Carolyn Shoemaker: FFOs Archives

## Science: The Endless Frontier

Looking to the future, we might find ourselves vacationing in moon cities, growing our own human replacement organs, "printing" out a hamburger or monitoring "smart" baby onesies that tell us when the child's electrolytes are running low. Of course, we're all living much longer, healthier lives.

And we look better, too! Cancer, Alzheimer's disease and other hereditary disorders can be treated, now that our own personal DNA strands have been decoded and any kinks molecularly re-wired. There's a vaccination for everything, of course, and no gloomy days unless we order them up. Meanwhile, investors of space mining companies are getting rich, as platinum is being excavated from asteroids. And our bathrooms are self-cleaning because

*"We really believe strongly in the need to inspire science in education and to help students see the need in that. And to see that scientists aren't weird, wild people."*

Otto Franz,  
Astronomer, Lowell Observatory

engineered microorganisms are feeding off the grime and then flushing themselves away.

It's an amazing place, this future, but we didn't get here without science. And through community efforts like the Flagstaff Festival of Science, we didn't get here without scientists themselves inviting the next generation to explore the wonders of their world with them.

So with the first quarter century of the Festival behind us and a generation of



Otto Franz, NAU Science & Engineering Day, Science In The Park, Willow Bend Environmental Education Center, Flagstaff Medical Center's Fantastic Voyage, NAU's Mountain Campus Science Day: FFOs Archives

## 2012 Making Waves

*Making Waves with Alexandra Cousteau*  
National Geographic Emerging Explorer  
Alexandra Cousteau

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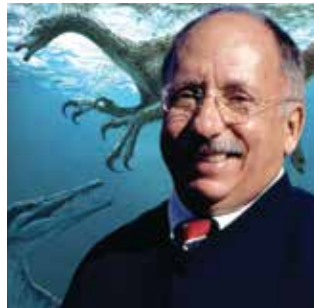
young adults now, who grew up with an annual celebration of science, was the Festival successful in nurturing their interests? Did this exposure to science influence their lives?

If there is any doubt, meet the Harrison twins.

"We moved to Flagstaff when we were 9 years old," explains Quinn. "We didn't know a lot of people, but our new friends at school encouraged us to attend the Flagstaff Festival of Science. So, we did as a family. We went to a physics lab at NAU and we watched as scientists blew up a watermelon! Our school lab was fun, but not this much fun. The NAU scientists were really enthusiastic."

Enthusiasm for science appears to be contagious.

As paleontologist David Gillette, Ph.D., explains, "Everyone in northern Arizona can be a part of this kid-friendly and adult-friendly event. It's a wonderful opportunity to reach the public every year, in a community that's hungry for science and learning."



Quinn's sister Mackenzie remembers being fascinated with interactive exhibits showcased by W. L. Gore & Associates. "We were in 6th grade and I really enjoyed the Festival because that was the first year in school that we had a human anatomy unit. Some of the exhibits tied in to what we were learning. I was especially drawn to displays about the heart."

Mackenzie had been interested in science since preschool. "I love chemistry and math. All sciences and math come to me easily. Attending the Festival added to my education and helped boost my interest in cardiology. I want to be a cardiologist or possibly a heart surgeon. My other interests are in pathology and neurology."

While Mackenzie's heart is with the heart, her sister

Quinn loves gems and crystals. She has always enjoyed how they sparkle. During the Festival, her fascination with rocks and minerals took on new depth when geologists showed her what they looked like under a microscope. She was captivated.

"After seeing this, I started a rock and gem collection at home. I also knew then that my grandfather really liked panning for gold in Prescott. It was one of his hobbies. So, for a couple of years, he and I would pan for bits of gold in a Prescott creek. He also had the tools to cut rocks, chemicals to clean them up and materials to polish them. The Festival turned my interest in rocks into a study of geology, which led to a wonderful interest that I could share with my grandfather."

Using the tools that scientists use and learning from the scientists themselves are important components of the Festival.

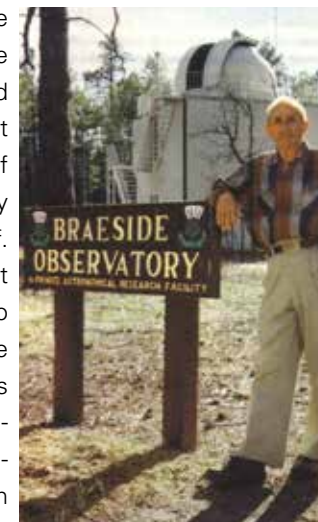
"When you are not involved in something, it's easy to see a certain mystique about that field," said astronomer Robert Fried, founder of Braeside Observatory just west of Flagstaff. "With a scientist or a physicist, so much of the image of these people is from cartoons or stereotypes—mad scientists and people in

white coats. I think any scientist would want people to understand that they are human beings and they don't have all the answers. Indeed, not having all the answers is what makes scientists scientists."

For Samantha Christensen, meeting the scientists and being in their workspace made science real. "I could envision myself as a scientist."

As she points out, the typical visitor doesn't get that opportunity. "You're not invited into a scientist's office. You're not often exposed to what it means to be a scientist. But at the Festival you're seeing people creating things and engaged in things. I think about visiting the U.S. Geological Survey, for example. There were all these maps and images on the walls that the public wouldn't otherwise see. You really got that inside look and it made that goal of working in science more attainable because you could see that these were real people."

She could also see science coming alive. Samantha began attending the Festival with her father as an 8-year-old in 1990, its inaugural year. "My dad capitalized on scientific things whenever he could because of my interest and so was all over the Festival. He also has an interest in science and I think that's the spirit of the Festival, that it appeals to all ages and is something that a parent and a child can do together and both be



David Gillette In Front of Illustration By Victor Leshyk: FfOs Archives

Robert Fried: FfOs Archives



## 2013 Life in the Extreme

Life in the Extreme  
Geologist Steve Squyres

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entertained and educated.”

The Festival, says Samantha, is one of the reasons she studied science in college. At the University of Arizona she earned a bachelor’s degree in math, a minor in physics and took a lot of courses in astronomy. She also worked for the National Optical Astronomy Observatory. After returning to Flagstaff, she began designing and managing summer space camps for kids at Lowell Observatory, while continuing to attend the Festival with her dad.

“I appreciate the Festival in a whole new way as an adult and look back and see how much it has influenced my life. In that sense, I have a whole new appreciation for what’s happening. Being able to see kids go to these things is really thrilling because I have a taste for what they are experiencing and how this may influence their lives. I am also able to appreciate the events in a different way. Because I have now pursued science scholastically, I can get more out of the talks that first inspired me. I’ve also had the opportunity to represent Lowell Observatory at Festival events such as Science in the Park and create content specifically for them. I now see kids as excited as I was at that age, and now I’m the one who gets to inspire kids, the way I was inspired years ago.”

“To me, raising the awareness of the fantastic science taking place every day in Flagstaff is one of the most important things about the Festival,” says founding Festival board member and former NAU administrator Dr. Jeanette Baker. “Related to that is the opportunity the Festival presents to get young people interested in science and its importance in the world around them.”

As volcanologist Wendell Duffield, Ph.D., says, “Flagstaff’s Festival of Science is a wonderful way to highlight and celebrate what an incredible variety of scientific research this town



Wendell Duffield: FFoS Archives



has to offer.”

Nathan Smith says that exposure to the many different fields of science pushed the limits of his perception. He can remember participating in Festival activities from the time he first learned to walk, and probably before that.

“It sparked my interests in learning and developing a greater understanding of myself, nature and our intricate, interdependent relationships,” he says. “The Festival provided me with numerous, invaluable experiences and opportunities for developing my inquisitive character and inspired me toward a life devoted to finding understanding of our place in the grand scheme of life, whether that be in the form of an imagination-igniting visit to Lowell Observatory to gaze through the telescope at distant lands, getting a hands-on lesson in soil structure from The Arboretum or listening to a speech by keynote speakers on topics ranging from dinosaur bones to Martian stones.”

As Nathan grew up, he volunteered at Science in the Park, helping younger kids interact with science while he continued to learn. “Involvement in the Festival helped build strong personal skills

of hard work, leadership, working with others, and follow through.”

For several years, he was charged with managing a small group of other child volunteers. Tasks included running the passport stamp booth and, his favorite assignment, the Gore-Tex® Scrunchies Worms booth. “Through these experiences I was able to get an early taste of group management and leadership and developed skills that will carry me for years to come.”

Nathan’s older sister, Michelle, also grew up with the Festival, attending events and serving as a volunteer.

“The best word I can use to describe my experience is FUN. It was a blast helping set everything up and getting Science in the Park up and running every year. My favorite was



Telescope Viewing: Russ Ruggles; Radiosonde launch: National Weather Service

## 2014 A Grand Adventure

**A Grand Adventure:  
Tracking Microscopic Public Enemies**  
DNA Expert Paul Keim, Ph.D.

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the Gore tent and the life-size Operation game. My 'aha moment' was when I went to the National Weather Station and got to watch a demonstration of how they gauge the wind and watch all of the monitors that help the meteorologists forecast the weather. There is a lot more that goes into it than I originally thought! When I was little I really enjoyed all of the hands-on activities and as I have gotten older now I love to watch all the kids' excitement in learning all about science."

After visiting Flagstaff as the Festival keynote presenter in 2006, rainforest biologist Margaret Lowman, Ph.D., also known as "Canopy Meg," said she would like to see a similar celebration of science in her hometown of Sarasota, Fla. "Science literacy is earmarked as an urgent crisis throughout America," she wrote in a Sarasota newspaper. "Science festivals are a great way to foster science education and also create a venue for family fun!"



Michelle Smith says she has enjoyed watching the Festival transform from a very small event with a couple of tents to a 10-day, citywide community celebration. "It gets kids excited about learning, which I think is the coolest part. It has definitely sparked my interest in many things. I find myself more curious about the science behind-the-scenes in many aspects of my life."

"What really counts in science education," says

Margaret "Canopy Meg" Lowman: FFoS Archives

Arctic explorer and 1990 Festival keynote speaker Will Steger, "is the future of Earth. We are the stewards, the protectors of that life. We must educate ourselves, make the right decisions for our children and pave the way so our children can carry on."

Young adults, like Nathan Smith, who grew up with the Festival see science education as an important part of the future. "I believe that our drive to find answers to life's greatest questions is at the heart of scientific advancement and discovery. Science has and will play an invaluable role in expanding the horizons of human possibility and open our future to new and ever-expanding areas for greater growth and exploration. Our future is truly limitless in its potential, and science and technology will play key

roles in assisting mankind in developing an intimate understanding of the nature of our reality and our relationship to nature and the greater universe."

Whether cultivating a new wave of cardiologists, geologists, astronomers or strategic thinkers through efforts like the Flagstaff Festival of Science, Science Foundation Arizona CEO and President William Harris, Ph.D., says our future depends on how well we prepare our young people.

"If our young people are well educated and grounded in science and math," says Harris, "they will discover and build the future, as science is the Endless Frontier."



*"If our young people are well educated and grounded in science and math, they will discover and build the future, as science is the Endless Frontier."*

William Harris,  
Science Foundation Arizona CEO and President



William Harris: FFoS Archives; Science in the Park: Tanya Rae



## The Authors



### Kevin Schindler

Kevin Schindler has worked at scientific research organizations for nearly thirty years, first in the Invertebrate Paleontology Division of the Florida Museum of Natural History and later as the Outreach Manager at Lowell Observatory. He now serves as Lowell's Communications Manager. Schindler regularly writes for various publications, with topics including history, science and baseball. He contributes a regular column, "The View from Mars Hill", to the *Arizona Daily Sun*. In 2012 he was awarded a Viola Award as Flagstaff's Science Educator of the Year.

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### Bonnie Stevens

Bonnie Stevens is an Emmy award-winning journalist, broadcaster, public relations consultant, author and has served as the Flagstaff Festival of Science coordinator since 1995. Her media career includes more than 15 years in science and environmental news reporting. She hosts the weekly KNAU Arizona Public Radio science research program *Brain Food*; and, is the editor of *Flagstaff Business News* and *Quad Cities Business News*. Stevens has been honored with the Athena Award for business leadership and the Viola Award for Science Leadership. Stevens also is the author of the children's science education book *Quaking Aspen*.

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