# NEWS &NOTES

National Aeronautics and Space Administration

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## FROM THE CHIEF HISTORIAN

At the risk of delaying the production of this edition of *News and Notes*, I'm going to make some comments here on our annual History Program Review, which we just completed on 11 May at the Jet Propulsion Laboratory (JPL) in Pasadena, California. First, let me start with a huge thank-you to Erik Conway, JPL historian, and Julie Cooper, JPL archivist, for their outstanding work organizing the 2017 Program Review. Erik and Julie, working closely with our own Nadine Andreassen here at Headquarters, really took the ball and ran with it. The facilities, the schedule, the "extracurricular" activities, and all other aspects of the meeting were handled smoothly and perfectly. They even ordered cool, overcast weather for the days we spent in meetings indoors and perfect weather for the day when we spent some time outside looking at the historical treasures of JPL and exploring the California Institute of Technology (Caltech). We owe a really big thank-you to Erik, Julie, and Nadine for making this a smooth-running and enjoyable event that allowed us to focus on the key issues before NASA's history program.

There were a lot of issues for us to discuss. Like every government organization, we all face challenges in trying to be more efficient and effective on an ever-tighter budget. For those

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## HOW 11 DEAF MEN HELPED SHAPE NASA'S HUMAN SPACEFLIGHT PROGRAM

By Hannah Hotovy, NASA History Division Intern

Before NASA could send humans to space, the Agency needed to better understand the effects of prolonged weightlessness on the human body. So, in the late 1950s, NASA and the U.S. Naval School of Aviation Medicine established a joint research program to study these effects and recruited 11 deaf men aged 25–48 from Gallaudet College (now Gallaudet University). Today, these men are known to history as the "Gallaudet Eleven," and their names are listed below:

Harold Domich
Robert Greenmun
Barron Gulak
Raymond Harper
Jerald Jordan
Harry Larson
David Myers
Donald Peterson
Raymond Piper
Alvin Steele
John Zakutney

All but one had become deaf early in their lives due to spinal meningitis, which damaged the vestibular systems of their inner ear in a way that made them "immune" to motion sickness. Throughout a decade of various experiments, researchers measured the volunteers' nonreaction to motion sickness on both a physiological and psychological level, relying on the 11 men to report in detail their sensations and changes in perception. These experiments helped to improve humanity's understanding of how the body's

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*From the Chief Historian (continued)*

Attendees pose in front of a model of the Mars Science Laboratory Curiosity rover during the annual History Program Review at the Jet Propulsion Laboratory. (Photo credit: NASA JPL–Caltech)

of us in the history and archival business, those pressures play out in some interesting ways. For example, nearly everyone at the meeting was facing the efforts of NASA's facility managers to demolish outdated buildings that are expensive to maintain. While this is a smart strategic move for the Agency in terms of reducing spending on buildings, most of the archival programs across NASA rely on old, underused buildings to store our archival collections and other items. Moving out of those facilities involves a cost, as well as the inevitable demand for a dramatic reduction in the size of the archival collection when it moves into another facility. The expectation is that archivists will simply digitize all of that paper and then throw it away. However, that expectation ignores a couple of important realities. First, digitization is neither quick nor cheap. Doing it right is hugely expensive (especially when dealing with the types of old paper documents found in archival collections across the Agency). Digitization also comes with an eternal maintenance cost. Digital records can degrade over time and need long-term care. More importantly, as digital formats, software, and security rules change over time, the digital collection needs continuing updates to make sure it remains accessible. A perfect example of this problem is the pile of floppy disks that hold my 1996 doctoral dissertation. Even if I could find a floppy-disk reader, I wouldn't be able to open the Microsoft Word files because Word 1.0 has security vulnerabilities and current versions of the program won't open the old version. (Good thing I made a PDF copy and have re-saved it in the newer versions of the program every few years.) The second issue with digitization is whether it is prudent to throw away the originals. This is a subject of debate in the archival community and outside my area of expertise. But I am mindful that there are some paper records in our collections that have an intrinsic value beyond the information on the page. It is one thing to view an image of meeting notes jotted down by legendary leaders of our organization; it is another to hold their notebooks in your hands. My point here is that implementing the smart strategy for NASA facilities involves costs not normally considered inside the bureaucratic stovepipes where those decisions are made. One of the many tasks we faced in our Program Review was how to break through those stovepipes to make sure that solving one Agency problem doesn't cause another. This is a challenge all of us in government face as we try to be the best possible stewards of our tax dollars.

Throughout the summer, we will be working on this issue (and many others that came up in the Program Review) as we also prepare to mark some major upcoming anniversaries. Upon us as the summer ends will be the 40th anniversary of the launch of the two Voyager probes, followed quickly by the 60th anniversary of the start of the Space Age in 1957 and early 1958. The 60th anniversary of the creation of NASA follows next fall and nearly overlaps the 50th anniversaries of the crewed flights in the Apollo program. These are exciting times for NASA history.

Enjoy the ride and Godspeed,

**William P. Barry**
Chief Historian

*How 11 Deaf Men Helped Shape NASA's Human Spaceflight Program (continued)*

**Left:** Study participants chat in the zero-g aircraft that flew out of Naval Air Station in Pensacola, Florida. (Photo credit: U.S. Navy/Gallaudet University collection)
**Right:** Study participant Harry Larson stands in a 20-foot slow-rotation room. Experiments like these helped NASA understand the effects of gravitational changes on the human body. (Photo credit: Gallaudet University Archives/Harry Larson collection)

sensory systems work when the usual gravitational cues from the inner ear are not available (as is the case of these young men and in spaceflight). "We were different in a way they needed," said Harry Larson, one of the volunteer test subjects.

The experiments tested the subjects' balance and physiological adaptations in a diverse range of environments. One test saw four subjects spend 12 straight days inside a 20-foot slow-rotation room, which remained in a constant motion of 10 revolutions per minute. In another scenario, subjects participated in a series of zero-g flights in the notorious "Vomit Comet" aircraft to help researchers understand connections between body orientation and gravitational cues. Another experiment, conducted in a ferry off the coast of Nova Scotia, tested the subjects' reactions to the choppy seas. While the test subjects played cards and enjoyed one another's company, the researchers themselves were so overcome with sea sickness that the experiment had to be canceled. The Gallaudet test subjects reported no adverse physical effects and, in fact, enjoyed the experience. Test participant Barron Gulak later remarked about such experiments: "In retrospect, yes, it was scary…but at the same time we were young and adventurous."

Based on their findings from a decade's worth of experimentation, researchers gained insight into the body's sensory systems and their responses to foreign gravitational environments. Through their endurance and dedication, the Gallaudet Eleven made substantial contributions to the understanding of motion sickness and adaptation to spaceflight.

On 11 April 2017, our Chief Historian, Bill Barry, had the honor of representing NASA at the opening of Gallaudet University's museum exhibit "Deaf Difference + Space Survival." Curated by Gallaudet student Maggie Kopp, the exhibit highlights the relatively unknown contributions to the study of motion sickness made by these 11 university alums for a decade, from 1958 to 1968. Present were 3 of the 11 former study participants: Harry O. Larson, class of 1961; Barron Gulak, class of '62; and David O. Myers, class of '61.


Pictured is the exhibit's ribbon-cutting ceremony at Gallaudet University Museum. From left to right: Gallaudet exhibit curator Margaret Kopp, NASA Chief Historian Bill Barry, Dr. Paul DiZio of the Ashton Graybiel Spatial Orientation Laboratory at Brandeis University, Harry O. Larson (Gallaudet class of 1961), Barron Gulak ('62), David O. Myers ('61), Gallaudet University President Roberta J. Cordano, and Gallaudet Provost Carol J. Erting. (Courtesy of Jean Bergey, Gallaudet University)

"Deaf Difference + Space Survival" is currently on display at Gallaudet University's Jordan Student Academic Center, open Monday through Friday, 8 a.m.–10 p.m. For more information, visit *https://www.gallaudet.edu/museum/exhibits/deaf-difference--space-survival-exhibit.*

## NEWS FROM HEADQUARTERS AND THE CENTERS

### NASA HEADQUARTERS

**Washington, DC**

#### History Division and Historical Reference Collection (HRC)

By Bill Barry

While everyone at NASA is curious about who our next Administrator will be, life at Headquarters continues. One item that has been settled is the identity of our new Associate Administrator for Communications—the person who oversees the History Division. Jen Rae Wang has more than a decade of experience at the highest levels of state and federal government in media, strategic communications, and organizational leadership. She is a real enthusiast for NASA's mission and brings a refreshing sense of practicality and people skills to a demanding job. In my first meeting with her, she asked a lot of really good (and sometimes tough) questions about the NASA history program. I am sure that we'll be able to count on her for strong support for our history and archival efforts.

Unfortunately, we may need that help sooner than I'd hoped. Our effort to hire a Chief Archivist got caught in the changing personnel policy of the new administration. The presidential hiring freeze was lifted, but NASA is still grappling with personnel planning under some new rules. So our previous hiring effort had to be canceled. Although this is a huge disappointment, we are working to get approval so that we can reinitiate the hiring process. The good news is that I know there are great people out there interested in the work. I, for one, will be thrilled to help one of them fulfill that ambition. Despite the absence of a Chief Archivist, Colin Fries and Liz Suckow continue to keep our archival program on track under the able leadership of Steve Garber. They have had a particularly productive spring, dealing with new acquisitions, scanning thousands of pages of historical budget documents (over 17,000 pages in March alone), and answering an incredible array of questions from within NASA and from outside. Their incredible skill in tracking down information about even the most obscure questions has earned the History Division quite a reputation as the "go to" place for answers.

One of the strategic investments we've been working toward over the last couple of years is an effort to refresh and reorganize the history Web site, *https://history.nasa.gov*. The site is an amazing resource that has grown since the earliest days of the Internet into over 12,000 pages hosting over 61 gigabytes of data. The continuing value of being an early adopter of the Web is evident in our usage statistics. In 2016, the site had over 60 million hits. That's over 160,000 each day! When it was last redesigned over a decade ago, the look, feel, and utility of the site was cutting-edge. But nothing stays still on the Web. The current site has features that are no longer usable, and it is not easy to navigate. More importantly, most people access NASA content from their mobile devices (phones and tablets) these days, and our site is not mobile-friendly. As a result, while 60 million hits is an impressive number, that figure has actually been declining for the last couple of years. Unfortunately, during that same period, the cost of Web design work has gone up dramatically and our budget has been declining. We did get some great initial design work done for an improved version of the site, but lack of funding has put the completion of that work on hold. We hope to restart that work next fiscal year. But, in the meantime, *https://history.nasa.gov* will be stuck in the Internet Bronze Age.

> **"DESPITE THE ABSENCE OF A CHIEF ARCHIVIST, COLIN FRIES AND LIZ SUCKOW CONTINUE TO KEEP OUR ARCHIVAL PROGRAM ON TRACK UNDER THE ABLE LEADERSHIP OF STEVE GARBER."**

As mentioned last quarter, planning for NASA's 60th anniversary (1 October 2018) and the 50th anniversaries of the crewed Apollo missions (Apollo 7's that same month) will be a major challenge for this year. The NASA Communications Coordinating Council (CCC) agreed to set up a committee to plan the anniversary events and try to synchronize efforts. The History Division is leading that committee—and getting our arms around the rapidly expanding list of activities already in progress for the various anniversaries is a big task. As this summer progresses, you'll be hearing a lot more about what NASA plans to do and how we'll work with others to plan related anniversary commemorations.

Helping us this summer (thank goodness) will be three interns. In addition to the usual pair of history interns, the NASA Office of Education is sponsoring an intern whom they want to be part of our team. Jordan Carter, a sophomore at the University of Virginia, joined us late in May and will stay through the end of July. Victoria Wegman, a junior at the Ohio State University, arrived shortly after Jordan and will stay with us until the start of August. Rounding out our super-sized intern team this summer will be Julian Haddad, a graduate student at the University of California, San Diego. He'll be with us into September. We are looking forward to a very productive summer. Of course, the summer interns have a tough act to follow. By the time you read this, our spring intern, Hannah Hotovy, will have graduated from Nebraska Wesleyan University. Hannah was our sole intern this spring and did a marvelous job of juggling all of the intern work herself. She not only kept things on an even keel but produced some really interesting articles on things like the NASA art program and the Gallaudet Eleven (see the articles in this newsletter), among others. We're going to miss her.

## AMES RESEARCH CENTER (ARC)

### Moffett Field, California

By Glenn Bugos and Jack Boyd

The NASA Ames Women's Influence Network (WIN) and the African American Advisory Group (AAAG) were inspired by *Hidden Figures*, the book that shed light on the African American women employed as "computers" at NASA Langley Research Center (LaRC). At a Center-wide event on 1 February 2017,

Shown here with WIN and AAAG are Carol Mead (right) and Carolyn Hofstetter (left), two human computers who worked at Ames in the early 1950s.

Carol Mead and Carolyn Hofstetter answered questions from a standing-room-only crowd on what it was like for women to work in science, technology, engineering, and mathematics (STEM) fields at the start of the Space Age. A month later, the former computers returned for another WIN event featuring Karan Kendrick, an actor from the film.

Vincenti is in the back row, second from the left, June 1940, in one of the staff photographs of the Ames Aeronautical Laboratory

Walter Vincenti was awarded the Guggenheim Medal of the American Institute of Aeronautics and Astronautics (AIAA), perhaps the premier recognition for a lifetime of achievement in the advancement of aeronautics. The award honors Vincenti's "seminal pioneering supersonic wind tunnel research, education in high temperature gas dynamics, and exceptional contributions to the history of engineering technology." Vincenti spent the first 17 years of his remarkable career as an aerodynamicist in high-speed aeronautics at the National Advisory Committee for Aeronautics' (NACA) Ames Aeronautical Laboratory. In 1957, he moved to Stanford University, where he reinvigorated their Aeronautics and Astronautics Department and taught many of the engineers who took Ames into the Space Age. In 1971, he began the third leg of his career by starting the Program in Science, Technology and Society, now one of the most popular majors at Stanford. His book of case studies on early aeronautical engineering, *What Engineers Know and How They Know It* (1990), is one of the key texts in the history of engineering, and he won the Da Vinci Medal for lifetime achievement from the Society for the History of Technology. On 20 April 2017, he celebrated his 100th birthday.

## Reference Collection

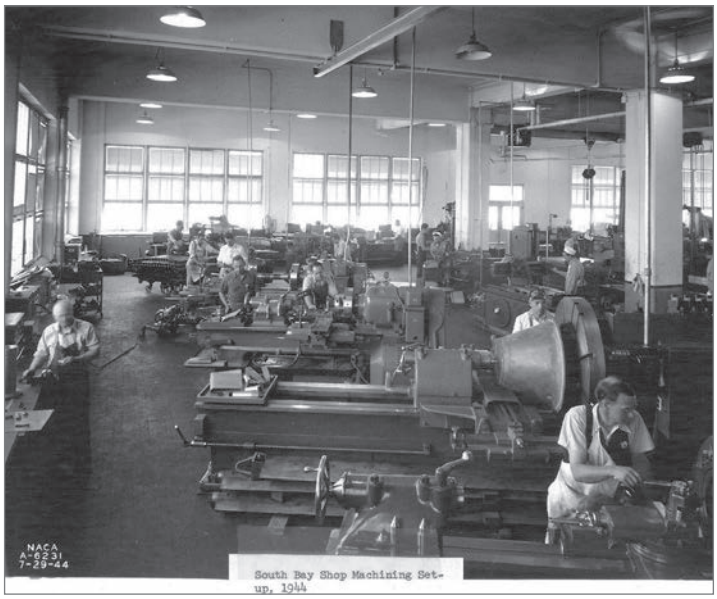
By April Gage and Keith Venter

**Individual Properties and New Wind Tunnel District Listed in National Register of Historic Places:** On 11 January 2017, three individual properties and a Wind Tunnel Historic District at Ames Research Center were entered into the National Register of Historic Places. Below are details from registration materials that were researched and prepared by a team of architectural historians (Trina Meiser, Patricia Ambacher, Madeline Bowen, and Mark Bowen) under the direction of the Ames Historic Preservation Officer, Keith Venter.

*NASA Ames Wind Tunnel Historic District:* Deemed significant for its associations with aeronautical and aerospace research, the development of aircraft and spacecraft, and the evolution of wind tunnel technology

in the United States, this district contains the world's greatest collection of wind tunnels and remains a leading research facility for the aerospace industry. Contributing properties include

- the 7- by 10-Foot Wind Tunnel Number 1 and Army Aeromechanics Lab Technical Services Building;
- the National Full-Scale Aerodynamics Complex, 40- by 80-Foot and 80- by 120-Foot Wind Tunnels;
- the 6- by 6-Foot Supersonic Wind Tunnel; and
- the Unitary Plan Wind Tunnel Complex.[1]



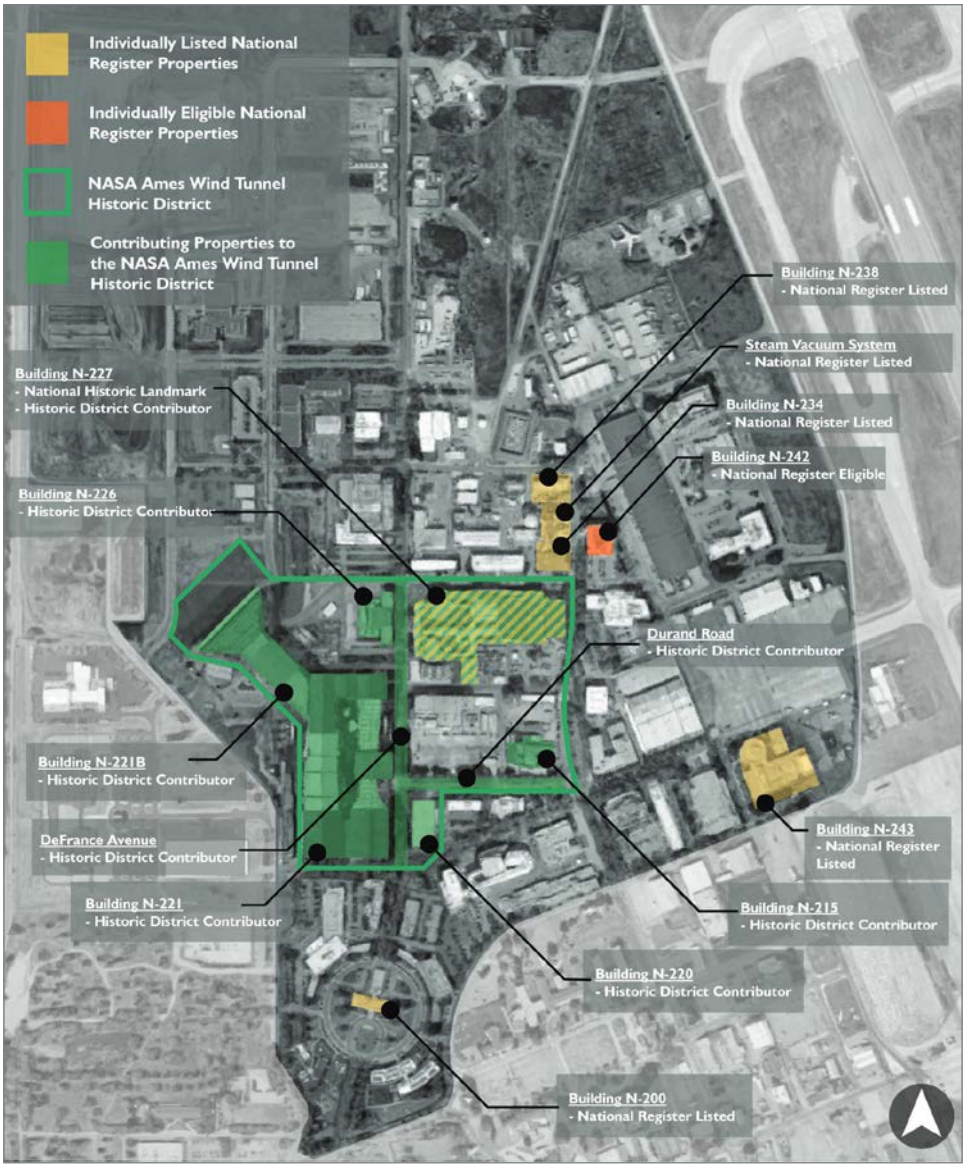

Machinists work in the Technical Services Building during World War II. Though not a wind tunnel, this property was included in the Wind Tunnel Historic District for its function as a production facility for equipment used to support testing and research, notably for aircraft and spacecraft models used in tunnel testing. (Photo credit: NASA/NACA)

*Ames Administration Building (N-200):* Completed in 1943, this building has historical significance due to its role as administrative headquarters for the intensive research and development efforts undertaken at the NACA Ames Aeronautical Laboratory facility and later NASA Ames Research Center—key research facilities that made nationally significant contributions to the fields of aeronautics, aeronautical theory, aviation, and space exploration. Smith J. De France, a pioneer in aeronautics research and development, was responsible for the initial development of the NACA facility and served as its first director from 1940 to 1965, leading the facility to national prominence for the scientific research conducted there.

*Arc Jet Complex (N-238, N-238, and Steam Vacuum System [SVS]):* The complex is nationally significant for its scientific and engineering contributions to arc jet research and development at Ames. Built between 1962 and 1964, the three-unit complex is also associated with the research and development in the area of Thermal Protection Systems (TPS) for NASA's spaceflight programs, including the exceptional role of the 60-megawatt Interaction Heating Facility (IHF) arc jet in developing and refining TPS for the Space Shuttle Program (SSP). The Arc Jet Complex was central to every NASA space transportation and planetary program including Mercury, Apollo, SSP, Viking, Pioneer-Venus, Galileo, Mars Pathfinder, Stardust, National Aero-Space Plane (NASP), X-33, X-34, Slender Hypervelocity Aerothermodynamic Research Probes (SHARP)–B1 and B2, X-37, and the Mars Exploration Rovers. The complex meets Criteria Consideration G based on the exceptional significance of the facility's contributions to nationally and internationally important space science programs, and it meets the internal evaluation standards established by NASA for Resources Associated with the SSP.

*Flight and Guidance Simulation Laboratory (N243):* This laboratory is nationally significant in the areas of science, invention, and engineering. Covering over 108,000 square feet of space, the large Brutalist-style building housed some of the Center's most unique air- and spacecraft research, testing, and training facilities, including the Vertical Motion Simulator (VMS), the

1 This complex is also a National Historic Landmark and an International Historic Mechanical Engineering Landmark.




Shown are historic properties located within the Ames campus. (Photo credit: Page & Turnbull, 2016)

world's largest and most sophisticated motion-based simulator. The intensive research and development work undertaken in the laboratory made crucial contributions to the fields of aeronautics, aeronautical theory, aviation, and spaceflight. The VMS in particular is exceptionally significant within the context of the SSP for its contribution to the development and operation of the Space Shuttle orbiter in providing essential astronaut training in an accurately simulated orbiter.

More information can be found on the Ames Research Center Historic Preservation Office Web site at *https://historicproperties.arc.nasa.gov*.

## ARMSTRONG FLIGHT RESEARCH CENTER (AFRC)

### Edwards Air Force Base, California

By Christian Gelzer

The Armstrong Flight Research Center history office helped put together a display on female computers that went up in a local movie theater that was showing *Hidden Figures*. This display was to promote awareness of the Center and of female computers in general; the Center employed computers who came west from Langley. It then expanded the workforce by hiring locally to render raw flight data into something aeronautical engineers could use. The display garnered about 60,000 views.

We continue to wrestle with the reference collection's future since it resides in a building slated for destruction later this calendar year. Ideally, we'd like to get the collection digitized, after which it could be physically moved to the National Archives and Records Administration, but doing so takes funds we haven't yet rustled up. The individual who is allocated to the collection part-time has finished creating a box-level electronic catalog, which is the first step no matter what turns out to be the collection's fate.

## GLENN RESEARCH CENTER (GRC)

### Cleveland, Ohio

By Anne Mills

The popularity of the movie *Hidden Figures* has been an opportunity to highlight our own hidden figure, Annie Easley. In 1955, Easley began her career as a human computer doing computations for researchers and engineers. This involved analyzing problems and performing calculations by hand. Her earliest work involved running simulations for the newly planned Plum Brook Reactor Facility. When hired, she was one of only four African American employees at the facility. In a 2001 NASA Johnson Space Center Oral History Project interview, Easley said that she had never set out to be a pioneer: "I just have my own attitude. I'm out here to get the job done, and I knew I had the ability to do it, and that's where my focus was," she said.

When human computers were replaced by machines, Easley evolved along with the technology. She developed and implemented code used in researching energy-conversion systems, analyzing alternative power technology, including the battery technology that was used for early hybrid vehicles, as well as for the Centaur upper stage rocket. For her contributions, she was inducted into the NASA Glenn Hall of Fame's inaugural class in 2015.

The history office has been providing materials from our archival collection in support of a number of events tied to *Hidden Figures* and human computers. Some of our Annie Easley photos and audio footage were included at a special presentation during a Cleveland Cavaliers basketball game and also in an educational commercial spot on kids' television network Nickelodeon.

Annie Easley is pictured at the Plum Brook Reactor Facility. (Photo credit: NASA)

## JOHNSON SPACE CENTER (JSC)

### Houston, Texas

By John Uri

The JSC History Office is now in its permanent location on the third floor of Building 1, the main administration building on campus. After our move on 25 January, we quickly settled in so we could host an open house on 8 February. It was a way for us to thank everyone who had had a part in making the design, construction, and move a success, as well as the Center management for their continuing support. (Besides, it was as good an excuse as any for throwing a party!) We had an excellent turnout, and we all had a good time.

One item that has lately occupied a great deal of our time is the restoration of the historic Apollo Mission Control Center. The JSC historian, Dr. Jennifer Ross-Nazzal, has spent many hours in meetings discussing what JSC would like visitors to see, hear, and experience when visiting the National Historic Landmark. In April, JSC hosted a consultation meeting about the restoration with the Texas State Historic Preservation Officer, the National Park Service, and the Advisory Council on Historic Preservation as part of the Section 106 provisions of the National Historic Preservation Act.

“ONE ITEM THAT HAS LATELY OCCUPIED A GREAT DEAL OF OUR TIME IS THE RESTORATION OF THE HISTORIC APOLLO MISSION CONTROL CENTER.”

We continue to expand our extensive oral history collection by conducting interviews for several customers. Along with the ongoing projects for the NASA Headquarters History Division and the JSC Knowledge Management Office, we received additional funding from the NASA Headquarters Science Mission Directorate (SMD) for a new oral history project. Interviews are under way and being scheduled with current and former SMD personnel who have contributed to the success of their directorate and their significant science missions. To manage the additional workload, Rebecca Wright was hired as a part-time consultant—with her significant experience and background, she is a welcome addition to the team.

This photo shows the JSC Mission Control Center during the Apollo 11 lunar landing mission.

At JSC, Jennifer Ross-Nazzal and Sandra Johnson conducted several interviews in an ongoing series with Bill McArthur, former astronaut and Director of the JSC Safety and Mission Assurance Directorate. The interviews with Bill are planned to continue through June. Also, an oral history has been scheduled for the June-July timeframe with JSC Center Director Ellen Ochoa.

During the month of April, the team conducted several interviews with subjects for both Headquarters offices. These interviews were held in Florida; at NASA Headquarters in Washington, DC; and in New Mexico. Future interviews are planned at Ames Research Center and the NASA Jet Propulsion Laboratory during the week of the History Program Review in May and, in June, at NASA Headquarters and Goddard Space Flight Center.

On 8 and 9 March, Jennifer Ross-Nazzal, Sandra Johnson, and John Uri attended a two-day Project Management for History Professionals class sponsored by the American Association of State and Local Historians (AASLH). The host organization was the Sixth Floor Museum in Dallas, and the class was held on the seventh floor of the old Book Depository Building from which Lee Harvey Oswald fired the fateful shots that killed President John F. Kennedy on 22 November 1963. The class was very informative, teaching project-management principles and skills while using real-life projects. We had a chance to visit the Sixth Floor Museum, and the hosts gave a tour of their library and video studio, where they conduct oral histories. There were also opportunities for networking with attendees who represented museums and other organizations.

Jennifer and Sandra attended the Society for History in the Federal Government (SHFG) Annual Conference on 13 April, held at the National Archives Building in Washington, DC. The theme of the meeting was "A Return to the Archives," with welcoming remarks by David Ferriero, the Archivist of the United States. Panel sessions covered topics ranging from using archival holdings to create an online presence for the U.S. House of Representatives' History, Art & Archives Web site to setting up both physical and digital exhibits for federal agencies, incorporating oral histories, photos, audio, and video. Jennifer serves on SHFG's Thomas Jefferson Prize committee. The prize recognizes excellence in documentary editions and research tools (indices, finding aids, and so forth) that make a significant contribution to the history of the federal government.

## LANGLEY RESEARCH CENTER (LARC)

### Hampton, Virginia

On 9 May 2017, NASA Langley staff helped the Headquarters History Division surprise Gail Langevin with the NASA Headquarters History Program Award in recognition of her outstanding career as history liaison and public affairs specialist. Gail will retire in June after 34 years of NASA service. We will miss her, and we wish her luck.

Gail Langevin, recipient of a NASA Headquarters History Program Award, stands with members of the Langley communications team.

## MARSHALL SPACE FLIGHT CENTER (MSFC)

### Huntsville, Alabama

By Brian Odom

The Marshall history program was in full swing this past quarter, supporting ongoing historical preservation projects, conducting oral history interviews, and processing archival collections. Marshall Archivist Jordan Whetstone is currently processing the papers of Dr. Jerry Weinberg, a longtime NASA scientific investigator who worked on many programs, including Skylab's Experiment S073; the Long Duration Exposure Facility (LDEF); and a photoelectric polarimeter that was used during the STS-3 (Columbia) Space Shuttle mission to determine the

brightness, polarization, and color of the diffuse astronomical background. The collection contains numerous technical reports, articles, and correspondence related to these, as well as a range of other experiments.

Several oral history interviews were conducted over the last quarter. One interview was with Acting President of Dynetics Technical Services, Inc., Steve Cook. Cook formerly served as Program Manager for the Ares Program at Marshall. The majority of this conversation focused on Cook's work prior to Ares, including his time with the Next Generation Launch Technology (NGLT) Office and the Advanced Space Transportation Programs (ASTP). Cook provided valuable insight into technology development at Marshall from the Return to Flight effort after the Challenger disaster through the Ares Program, highlighting important management lessons learned and political transitions.

Marshall and the University of Alabama in Huntsville's (UAH) History Department recently hosted the "NASA in the 'Long' Civil Rights Movement" symposium. The event was held 16–17 March 2017 at the U.S. Space and Rocket Center in Huntsville, Alabama, and included 22 presentations on a wide range of topics addressing issues of race, gender, and labor as they applied to the space program during the period of the "long" civil rights movement. The goal of this symposium was to provide more context for the voices and stories and to develop a better understanding of the intersection of NASA and the civil rights movement.

The presentations were certainly stimulating and incredibly diverse in topical and geographic scope. Dr. Brenda Plummer (History, University of Wisconsin, Madison) gave an enlightening talk on the "intersection of the struggle for racial equality and aerospace exploration as both constituted potent narratives of freedom in the American imaginary." Plummer disputed the assumption that NASA was an "instrument of modernization" that was "implicitly allied with the civil rights movement." NASA Chief Historian Dr. Bill Barry presented an overview of how the U.S. struggle over civil rights and the space


MSFC Deputy Director Jody Singer addresses the "NASA in the 'Long' Civil Rights Movement" symposium on 17 March 2017 at the U.S. Space & Rocket Center. (Photo credit: NASA MSFC/Emmett Given)

program were viewed and used by the Soviet Union. National Air and Space Museum curator Dr. Cathleen Lewis explored how this conflict reemerged in the 1980s with the race between the United States and the Soviet Union to place into space the first person of color.

Several of the papers took a comparative approach. A discussion from Tim Pennycuff (University of Alabama at Birmingham) detailed how massive amounts of federal funds pouring into Birmingham for research, health training, and medical treatment (such as the funding that would later arrive with the Apollo program) provided both a justification and a mandate for integration at the university. Marsha Freeman (independent scholar) examined earlier efforts at desegregation in the region by the Tennessee Valley Authority. Dr. Matthew Downs (University of Mobile) argued that, in Huntsville, civic and business leaders moderated their stance on desegregation and "accommodated the forces of change" out of economic necessity. A final panel discussion examined ways those engaged in public history can create more inclusive narratives and collections going forward. In his talk titled "And Where Do We Go from Here? Ensuring the Past and Future History of Space," Dr. Jonathan Coopersmith (Texas A&M University) highlighted the problematic aspects of locating and preserving materials generated by minority movements.

The symposium was open to the public, a fact that enabled many welcome and productive conversations on a difficult topic. The interplay between the audience and panelists created a forum for drawing parallels between the era of the civil rights movement and current discussions of equal employment in the STEM fields. Veronica Henderson, a symposium moderator and interim head archivist at the Historically Black Alabama A&M University, commented, "As historians, we are able to add layers to the conversation, to connect the dots. Having historians get together and relate the different stories to a point in history, we can uncover more. We can explore things not previously thought about or considered, and putting these stories into context allows us to see things from a different point of view." With the recent interest in stories like those of Katherine Johnson, Dorothy Vaughan, and Mary Jackson, as portrayed in the film *Hidden Figures*, we hope to continue to add new voices and greater historical context to such a critical topic.

## STENNIS SPACE CENTER (SSC)

### Stennis Space Center, Mississippi

By Jessica Herr

#### Stennis: Part of Mississippi's 200-Year History

This December, Mississippi will turn 200 years old. The birthday party started in April with the southern bicentennial celebration in Gulfport, Mississippi, and will culminate this December with a celebration in the state capital of Jackson. SSC had a presence at the Mississippi Bicentennial Celebration in Gulfport. The history of the area where SSC now sits can be traced back to 1817, well before Mississippi entered statehood. There were five towns located in what is now the acoustic buffer zone that surrounds SSC: Napoleon, Logtown, Gainesville, Santa Rosa, and Westonia.


History Office Coordinator Jessica Herr greets visitors to an informational exhibit at the Mississippi Bicentennial Celebration in Gulfport. (Photo credit: Tessa Keating)

The town of Napoleon began with 640 acres granted by the British government to John Claudius Favre in 1767. By 1808, John had transferred the land to his son, Simon Favre. Simon built the first house and store in what would become the small town of Napoleon. The town's claim to fame was a large home named Parade Rest that was more than 3,000 square feet with thousands of azaleas and camellias decorating the landscape.

Nearby Logtown had 3,000 residents at its peak, most of whom worked for the lumber industry, which was the most important industry in the area at the time. The earliest owner of what would become bustling

Parade Rest is seen here with owners John and Neita Wheeler. (Photo credit: Hancock County Historical Society)

Logtown was Jean Baptiste Rousseve, who was given the land in 1788. Records relating to this time and place are minimal, but it is thought that in 1845, E. G. Goddard built the first log mill there. The town would grow until 1930, by which time the supply of commercial timber was depleted. With the Great Depression under way and the railroad passing north of the town, only 250 residents remained by 1961.

Gainesville was the only town that lay in what is now the operational portion of SSC. It began in 1810 with a land grant by Dr. Ambrose Gaines for more than 500 acres in what was then Spanish territory. Gaines laid out his plan for a new town, initially naming it Gaines Bluff. Just prior to the Battle of New Orleans in 1813, Andrew Jackson marched his troops through Gainesville so as not to be detected by British troops. Gainesville grew due to the shipping and logging industries along the Pearl River, but in 1883, the Southern Railroad Line between New Orleans and Meridian, Mississippi, bypassed the town by 10 miles. By 1961, when NASA was looking to build the new rocket engine test facility, Gainesville had only 35 families left.

Santa Rosa was one of the more distinctive towns in the buffer zone. At its largest, it had only a handful of homes, but what it lacked in population, it made up for in character. In the town were a couple of stores and churches, a post office, a one-room school house, and several bars. These "dens of iniquity" were closed and chased out of town many times, but the bars always reopened. There was quite a bit of illegal activity going on at the bars for the time, one being the sale of whiskey. Mississippi was a dry state at the time, and moonshiners populated the area surrounding SSC until the mid-1960s.

The town of Westonia was named for the lumber tycoon Horatio Weston, who founded the H. Weston Lumber Company. Westonia grew around the timber industry and also housed a repair station for railroad flat cars and steam engines. Back then, it was a small town with churches, stores, one hotel, a small school, and a couple of wells used for the steam engines that traveled through the town. After 1930, in the midst of the Great Depression, the timber industry in the area shut down, making the town virtually nonexistent by the 1960s.

On 1 November 1961, on the grounds of the Logtown elementary school, U.S. Senator John C. Stennis of Mississippi gave a speech to the 1,500 people from the surrounding area. Stennis spoke about the government project to build a rocket engine testing center on their land and what the government was asking the people to do. "There is always the thorn before the rose;…you have got to make some sacrifices, but you will be taking part in greatness," he said. He billed it as a "call to arms" in the space race against the Soviet Union. Because of the sacrifices of the families in the surrounding towns to allow construction of the rocket engine test site, a local refrain was born: "If you want to go to the Moon, you first have to go through Hancock County, Mississippi."

# OTHER AEROSPACE HISTORY NEWS

By Mike Ciancone

Thanks to Dr. Trevor Sorensen, who was Lunar Mission Manager for the 1994 Clementine mission to the Moon, the Pacific Regional Planetary Data Center (PRPDC) has acquired much of the original documentation for this mission. PRPDC is hosted by the Hawai'i Institute of Geophysics and Planetology, University of Hawai'i at Manoa. The PRPDC is one of 17 NASA Regional Planetary Image Facilities (RPIFs) around the world, with the PRPDC archiving planetary data that serve the planetary research and education communities throughout the Pacific nations. PRPDC strives to provide users of NASA planetary data with some of the latest information about ongoing NASA missions, as well as access to these datasets and derived products that help with their interpretation. Ultimately, they will digitize these materials and make them available on their Web site, but for now, they are just paper copies. The list of materials in the Clementine collection can be viewed online at *https://www.higp.hawaii.edu/prpdc/Clementine.html*.

## SMITHSONIAN NATIONAL AIR AND SPACE MUSEUM

By Valerie Neal, Curator and Chair, Space History Department

"Revitalization" and "transformation"—the key words at the National Air and Space Museum (NASM) this year, and for the next few years—are keeping everyone in the Space History Department busier than ever. The 40-year-old building on the National Mall will soon undergo a revitalization from the outside inward: new façade stone, new vestibules for security screening, new wiring and plumbing, new windows and stronger floors, and redesigned office spaces will be installed without closing the museum to visitors. At the same time, all 23 exhibit galleries will undergo transformation as they get emptied and reimagined, making every staff member part of at least one exhibit team involved in writing scripts, choosing artifacts and images, developing videos and interactive features, and working out floor plans and gallery designs. The first three new space exhibits are in work: "Destination Moon," "Exploring the Planets," and "One World Connected (Planet Earth)." Additionally, there is a strong space component in "A Nation of Speed." More information about these exhibits will become available as they are developed.

"…ALL 23 EXHIBIT GALLERIES WILL UNDERGO TRANSFORMATION AS THEY GET EMPTIED AND REIMAGINED, MAKING EVERY STAFF MEMBER PART OF AT LEAST ONE EXHIBIT TEAM INVOLVED IN WRITING SCRIPTS, CHOOSING ARTIFACTS AND IMAGES, DEVELOPING VIDEOS AND INTERACTIVE FEATURES, AND WORKING OUT FLOOR PLANS AND GALLERY DESIGNS."

### Research

In the scholarly realm, our space historians continue to publish their research and make presentations at conferences. Martin Collins, Jennifer Levasseur, and Margaret Weitekamp went to London to speak at the annual Artefacts conference, jointly organized by NASM, the Science Museum of London, and the Deutsches Museum. They also visited exhibits in various museums and checked up on NASM artifacts on loan there. Paul Ceruzzi presented two research

papers at a conference on early digital computing at the University of Siegen in Germany.

Michael Neufeld gave a talk called "The Difficult Birth of NASA's Pluto Mission" at the joint meeting of the American Astronomical Society Division of Planetary Sciences and the European Planetary Science Congress in Pasadena, California, and at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland.

Matthew Shindell attended the annual meeting of the History of Science Society (HSS), appearing on two panels, delivering one paper, and meeting with fellow members of the HSS Advocacy Committee for history in the federal government.

David DeVorkin chaired a history session at the American Astronomical Society's annual meeting and gave a workshop at the University of Virginia on historical documentation of astronomical instruments. Michael Neufeld, Cathleen Lewis, and Margaret Weitekamp participated in the "NASA in the 'Long' Civil Rights Movement" symposium at NASA's Marshall Space Flight Center.

Among a variety of public talks, Cathleen Lewis presented a Smithsonian Associates program about the International Space Station titled "A Partnership That's Out of This World: Navigating Space Relations." Valerie Neal accompanied a six-day Smithsonian Journeys tour of Iceland as expert lecturer on the Northern Lights; she gave three talks about the aurorae, the solar-terrestrial environment and relationship, and the history of studying these phenomena.

## Recent Publications

The German edition of Paul Ceruzzi's 2012 book, *Computing: A Concise History (Computer: Eine Kurze Geschichte*), was released by the Berlin University Press, making it the fifth translation of this popular book. Martin Collins published "The Global in the 1980s and 1990s: Liquid Modernity, Routines, and the Case of Motorola's Iridium Satellite Communications Venture" in Daniel M. G. Raff and Philip Scranton, eds., *The Emergence of Routines: Entrepreneurship, Organization, and Business History*. The National Geospatial-Intelligence Agency published Jim David's article, "CORONA and the Search for ICBMs," in its *Geospatial Intelligence Review,* and the National Security Archives Web site published his article, "Soviet Missiles and Space Programs in the *President's Daily Briefs*." Also, his article "How Much Detail Do We Need To See? High and Very High Resolution Photography, GAMBIT, and the Manned Orbiting Laboratory" was published online by *Intelligence and National Security*. Teasel Muir-Harmony published an article, "American Foreign Policy and the Space Race," in John Butler, ed., *Oxford Research Encyclopedia of American History*. A popular version of Margaret Weitekamp's scholarly article titled "The Image of Scientists in *The Big Bang Theory*" appeared in *Physics Today*.

## Collections

Newly on display at the Udvar-Hazy Center is the reconstructed Skylab Apollo Telescope Mount (ATM) sunshield and canister, which is suspended directly above the reassembled ATM Spar containing many of the backup solar telescopes that were intended for a successor Skylab mission. Also, the Apollo Command Module Columbia can be seen in the Restoration Shop, where it is being examined, cleaned, and conserved before being installed in a new case and going on a 50th anniversary national tour that begins at Space Center Houston this October. The Smithsonian Digital Projects Office (DPO) commenced 3D scanning of the interior and exterior of Space Shuttle orbiter Discovery, using a variety of devices to develop an extraordinarily high-resolution dataset for multiple uses, including 3D visualization and printing. Cathleen Lewis acquired the spacesuit and support system used by high-altitude parachuting record holder Alan Eustace and led a team that prepared its display at the Udvar-Hazy Center.

## Public Programs

Our What's New in Aerospace monthly programs in the Moving Beyond Earth gallery continue to highlight NASA missions and personalities. Popular recent programs focused on the Solar TErrestrial RElations

Observatory (STEREO) with retired astronaut John Grunsfeld and four solar scientists, on astronaut and author Tom Jones, and on astronaut Jeff Williams. Jennifer Levasseur plans and hosts many of these programs. Likewise, our Smithsonian Stars and Exploring Space lecture series, largely planned and hosted by David DeVorkin, draw leading scientists to talk about news-making missions and discoveries. These free public lectures bring interested audiences into the museum after hours. We also provide live commentary on launches to the International Space Station, docking, and crew returns when they occur during the museum's open hours. The museum continues to host the periodic Space Policy Forum (organized by Teasel Muir-Harmony) and the History Seminar in Contemporary Science and Technology (organized by Tom Lassman), which bring together historians and social scientists in the DC area for stimulating discussions.

Museum visitors leave flower arrangements beside John Glenn's Friendship 7 capsule. (Photo credit: Andres Almeida)

Space History curators just wrapped up work on a six-part documentary series for the Smithsonian Channel that addresses some of the thorniest engineering challenges in aerospace history and the people who worked hard to solve them. Originally called *Engineering Space*, the programs will be broadcast as *America's Secret Space Heroes*, featuring a number of NASA staff, both past and present.

## Personnel News

Dr. Teasel Muir-Harmony joined the Space History Department as a NASM curator in late 2016. She earned her Ph.D. at the Massachusetts Institute of Technology (MIT) in 2014 and served as an associate historian and postdoctoral fellow for two years at the American Institute of Physics.

Dr. Roger D. Launius retired from government service and left the museum at the turn of the new year after a long career with the Air Force, NASA, and NASM. He remains active as an independent historian and consultant.

Dr. Kathryn D. Sullivan is resident at the museum as the 2017 Charles Lindbergh Chair in Aerospace History. She is working on a book about how the idea of servicing spacecraft in orbit became embodied in the Hubble Space Telescope's design and in the specialized extravehicular activity crews who carried out its servicing missions.

Finally, NASM acknowledged with sorrow the deaths of our good friends John Glenn and Gene Cernan by placing floral arrangements and memorial panels near their respective Mercury and Apollo spacecraft. We will miss their visits and their devotion to the museum.

# RECENT PUBLICATIONS

## COMMERCIALLY PUBLISHED WORKS

By Chris Gamble

*Stamping the Earth from Space,* by Renato Dicati (Springer, January 2017). This book presents a historical and philatelic survey of Earth exploration from space. *Stamping the Earth from Space* presents the photographic results obtained by the thousands of satellites launched by the Soviet Union (and later Russia) and the United States and also those of the many missions carried out by the European Space Agency (ESA), individual European countries, Japan, China, India, and the many emerging space nations. It contains almost 1,100 color reproductions of philatelic items. In addition to topical stamps and thematic postal documents, the book provides an extensive review of astrophilatelic items. Prominent space missions are documented through event covers and cards canceled at launch sites, tracking stations, research laboratories, and mission control facilities.

*Explore/Create: My Life in Pursuit of New Frontiers, Hidden Worlds, and the Creative Spark*, by Richard Garriott de Cayeux and David Fisher (William Morrow, January 2017). This is a new memoir from entrepreneur and gaming pioneer Richard Garriott.

*Amazing Stories of the Space Age: True Tales of Nazis in Orbit, Soldiers on the Moon, Orphaned Martian Robots, and Other Fascinating Accounts from the Annals of Spaceflight*, by Rod Pyle (Prometheus Books, January 2017). The unusual and bizarre projects described in this book were not merely flights of fancy dreamed up by space enthusiasts, but actual missions planned by leading aeronautical engineers. Some were designed but not built; others were built but not flown; and a few were flown to failure but little reported. These stories, complemented by photos and illustrations, tell of a time when the race to the Moon outweighed other considerations.

*Routledge Handbook of Space Law*, edited by Ram S. Jakhu and Paul Stephen Dempsey (Routledge, November 2016). This handbook is a reference work providing a comparative overview of space law. The book highlights emerging legal issues and summarizes the existing state of knowledge on a range of topics; it also discusses the gaps and inconsistencies in existing law.

*Next Stop Mars: The Why, How, and When of Human Missions*, by Giancarlo Genta (Springer-Praxis, January 2017). This book covers the possible crewed mission to Mars first discussed in the 1950s, addressing historic and future plans to visit the Red Planet. Considering the environmental, engineering, and design challenges needed for a successful trip, it covers multiple aspects of a possible mission and outpost as presented from other space agencies and private companies.

*Mars One: Hype and Hubris*, by Erik Seedhouse (Springer-Praxis, November 2016). This book dissects the publicity of the Mars One venture. Every aspect of the mission design is examined, from the selection process to the mission architecture.

*The Final Mission: Preserving NASA's Apollo Sites*, by Lisa Westwood, Beth Laura O'Leary, and Milford Wayne Donaldson (University Press of Florida, February 2017). Across the American landscape and on the lunar surface, many facilities and landing sites linked to the Apollo program remain unprotected. This book explores these key locations, reframes the footprints and items left on the Moon as cultural resources, and calls for the urgent preservation of this space heritage.

*The Traveler's Guide to Space: For One-Way Settlers and Round-Trip Tourists*, by Neil F. Comins (Columbia University Press, February 2017). Comins attempts to outline the many technical challenges of space travel in clear language for all readers. He synthesizes key issues and cutting-edge research in astronomy, physics, biology, psychology, and sociology to create a manual for what could be the ultimate voyage.

*Astronaut Corps of Malaysia*, by Captain Faiz Kamaludin (Partridge Singapore, February 2017). On 10 October 2007, a young Malaysian was successfully launched into space, becoming that nation's first *Angkasawan* (astronaut). The Malaysian government had secured a seat on board the three-seater Soyuz capsule before it blasted off from Baikonur Cosmodrome in Kazakhstan. Herein you will find excerpts and short stories from some of the young candidates and like-minded individuals vying for the coveted top spot of Malaysian *Angkasawan*. The top 59 candidates of the astronaut program are now all members of the Astronautical Association of Malaysia, also known as the Astronaut Corps of Malaysia. This is their story on their efforts to become the first Malaysian sent into space.

*Chandra's Cosmos: Dark Matter, Black Holes, and Other Wonders Revealed by NASA's Premier X-Ray Observatory*, by Wallace H. Tucker (Smithsonian Books, March 2017). On 23 July 1999, the Chandra X-ray Observatory, the most powerful x-ray telescope ever built, launched aboard Space Shuttle Columbia. Since then, Chandra has given us a view of the universe that is largely hidden from telescopes sensitive only to visible light. In this book, the author uses a series of short, connected stories to describe the telescope's exploration of the hot, high-energy face of the universe. The book is organized in three parts: "The Big"—covering the cosmic web, dark energy, dark matter, and massive clusters of galaxies; "The Bad"—exploring neutron stars, stellar black holes, and supermassive black holes; and "The Beautiful"—discussing stars, exoplanets, and life. Tucker explores the implications of these observations in a narrative aimed at space buffs and general readers alike.

*Astronaut: 1961 Onwards (All Roles and Nationalities) (Owners' Workshop Manual)*, by Ken McTaggart (Haynes Publishing UK, February 2017). The book begins with early ideas about astronauts as portrayed in science fiction and in films. It goes on to cover the recruitment and application process to become an astronaut with NASA and the European Space Agency, as well as the qualifications and fitness level required for various astronaut roles. The reader is taken through training for different types of astronaut roles (pilot, scientist, payload specialist, spacewalker, Moonwalker, etc.), and the different types of missions are described.

*Apollo in the Age of Aquarius*, by Neil M. Maher (Harvard University Press, March 2017). The summer of 1969 saw two major events: astronauts landing on the Moon for the first time and hippie hordes descending on Woodstock, New York, for a legendary music festival. For the author, the conjunction of these two era-defining events is not entirely coincidental. This book shows how the celestial aspirations of NASA's Apollo space program were tethered to terrestrial concerns, from the civil rights struggle and the antiwar movement to environmentalism, feminism, and the counterculture.

*Worlds Fantastic, Worlds Familiar: A Guided Tour of the Solar System*, by Bonnie J. Buratti (Cambridge University Press, March 2017). Join the author, a planetary astronomer, on a personal tour of NASA's latest discoveries. Moving through the solar system past Mercury, Venus, and Mars; past comets and asteroids; past the moons of the giant planets; past Pluto; and on to exoplanets, the author gives vivid descriptions of landforms that are similar to those found on Earth but are more fantastic. Sulfur-rich volcanoes and lakes on Io, active gullies on Mars, huge ice plumes and tar-like deposits on the moons of Saturn, hydrocarbon rivers and lakes on Titan, and nitrogen glaciers on Pluto are just some of the marvels that await readers.

*Space Shuttle: Developing an Icon 1972–2013*, by Dennis Jenkins (Dennis R. Jenkins, February 2017). During 30 years and 135 missions, the Space Shuttle carried more crewmembers to orbit than all other launch systems from all other countries combined and carried more than 4.5 million pounds of payload to orbit. The Space Shuttle launched a variety of commercial and military satellites, planetary probes to Venus and Jupiter, and three of the four NASA Great Observatories, including the pièce de résistance, the Hubble Space Telescope. This publication is a three-volume set, 1,584 pages long, with more than 2,900 illustrations. The volumes are packaged in a slipcase. Volume 1 is titled *Setting the Stage*; volume 2, *Technical Description*; and volume 3, *The Flight Campaign*.

## Books for Young Readers

*Newsletter contributor Michael Ciancone wishes to thank Chris Gamble and Joni Wilson for their assistance in compiling the below list.*

*Smithsonian Adventures in Space*, by Courtney Acampora (Silver Dolphin Books).

*Apollo 11 Moon Landing: An Interactive Space Exploration Adventure*, by Thomas Adamson (Capstone Press, You Choose: Space series).

*Space Dictionary for Kids: The Everything Guide for Kids Who Love Space*, by Amy Anderson and Brian Anderson (Prufrock Press).

*The Ultimate Book of Space*, by Anne-Sophie Baumann (Twirl).

*Dawn Probe: A Robot Explores the Dwarf Planet Ceres*, by James Bow (PowerKids Press, Robots Exploring Space series).

*New Horizons: A Robot Explores Pluto and the Kuiper Belt*, by James Bow (PowerKids Press, Robots Exploring Space series).

*Space Visual Encyclopedia*, by DK (DK Children).

*Spaceships and Rockets*, by DK (DK Children).

*Destination: Space*, by Christoph Englert (Wide Eyed Editions).

*Voyager Probes: Robots on an Interstellar Mission*, by Robyn Hardyman (PowerKids Press, Robots Exploring Space series).

*Mission to Space*, by John Herrington (White Dog Press).

*Exploring Beyond Our Solar System*, by Patricia Hutchison (Child's World, Wonders of Space series).

*The First Moon Landing*, by Patricia Hutchison (Child's World, Wonders of Space series).

*The Mars Rovers*, by Patricia Hutchison (Child's World, Wonders of Space series).

*Moonwalk: The Story of the Apollo 11 Moon Landing*, by David Jenkins and Adrian Buckley (Circa Press).

*Ask the Astronaut: A Galaxy of Astonishing Answers to Your Questions on Spaceflight*, by Tom Jones (Smithsonian Books).

*Mars Exploration Rovers: An Interactive Space Exploration Adventure*, by Steve Kortenkamp (Capstone Press, You Explore: Space series).

*The Stellar Story of Space Travel*, by Patricia Lakin (Simon Spotlight, History of Fun Stuff series).

*International Space Station: An Interactive Space Exploration Adventure*, by Allison Lassieur (Capstone Press, You Choose: Space series).

*Space Robots*, by Ryan Nagelhout (PowerKids Press, Robots and Robotics series).

*Think Like an Astronaut! How Do Rockets Work?*, by Pfiffikus (Pfiffikus).

*The International Space Station*, by Arnold Ringstad (Child's World, Wonders of Space series).

*Space Missions of the 21st Century*, by Arnold Ringstad (Child's World, Wonders of Space series).

*The Voyager Space Probes*, by Arnold Ringstad (Child's World, Wonders of Space series).

*The Cassini Mission: Robots Exploring Saturn and Its Moon Titan*, by Angela Royston (PowerKids Press, Robots Exploring Space series).

*Rosetta Probe: A Robot's Mission To Catch a Comet*, by Robert Snedden (PowerKids Press, Robots Exploring Space series).

*Mars Probes: Robots Explore the Red Planet*, by Kelly Spence (PowerKids Press, Robots Exploring Space series).

*Space Race: An Interactive Space Exploration Adventure*, by Rebecca Stefoff (Capstone Press, You Choose: Space series).

*Rovers*, by Jenny Fretland VanVoorst (Jump!, Space Explorers series).

*Spacecraft*, by Jenny Fretland VanVoorst (Jump!, Space Explorers series).

*What's It Like in Space? Stories from Astronauts Who've Been There*, by Ariel Waldman (Chronicle Books).

*To Burp or Not To Burp: A Guide to Your Body in Space*, by Dave Williams and Loredana Cunti (Annick Press, Dr. Dave Astronaut series).

*Disclaimer: The History Division wishes to thank volunteers Mike Ciancone and Chris Gamble, who compiled this section for us. Please note that the descriptions have been derived by Chris and Mike from promotional material and do not represent an endorsement by NASA.*

## UPCOMING MEETINGS

The AIAA Aviation and Aeronautics Forum and Exposition (AIAA Aviation 2017) will be held **5–9 June 2017** in Denver, Colorado. Visit *https://www.aiaa-aviation.org* for details.

The Kenneth E. Behring National History Day will be held **11–15 June 2017** in College Park, Maryland. Visit *https://www.nhd.org* for details.

The annual meeting for the Society for Historians of American Foreign Relations (SHAFR) will be held **22–24 June 2017** in Arlington, Virginia. Visit *http://shafr.org/conferences/annual/2017-annual-meeting* for details.

The NASA Langley Centennial Symposium will be held **12–14 July 2017** in Hampton, Virginia. Visit *https://www.nasa.gov/langley/100/events* for details.

The annual meeting of the Society of American Archivists (ARCHIVES 2017) will be held **23–29 July 2017** in Portland, Oregon. Visit *http://www2.archivists.org/am2017* for details.

The Experimental Aircraft Association (EAA) AirVenture Oshkosh will be held **24–30 July 2017** in Oshkosh, Wisconsin. Visit *https://www.eaa.org/en/airventure* for details.

The annual meeting of the Society for the Social Studies of Science (4S) will be held **30 August–2 September 2017** in Boston, Massachusetts. Visit *http://www.4sonline.org/meeting* for details.

AIAA Space 2017 will be held **12–14 September 2017** in Orlando, Florida. Visit *http://www.aiaa-space.org* for details.

The International Astronautical Congress will be held **25–29 September 2017** in Adelaide, Australia. Visit *http://www.iafastro.org/events/iac/iac-2017* for details.

The annual meeting for the Society of the History of Technology will be held **26–29 October 2017** in Philadelphia, Pennsylvania. Visit *http://www.historyoftechnology.org* for more details.

# THE 1970 TOTAL SOLAR ECLIPSE

## 7 MARCH 1970—NASA LIGHTS THE SKY FOR SOLAR ECLIPSE

By Keith Koehler

*Editor's note: The original version of this article can be found online at https://www.nasa.gov/feature/wallops/2017/march-7-1970-nasa-lights-the-sky-for-solar-eclipse.*

As scientists gear up for a total solar eclipse that will cross the nation on 21 August 2017, some are also remembering the eclipse observations from 7 March 1970, gathered during a bout of rapid-fire sounding rocket launches. Known by some as the "eclipse of the century," the 1970 eclipse offered a unique perspective for scientific studies as it was the first time a total eclipse in the United States passed over a permanent rocket launch facility—NASA's Wallops Station (now NASA's Wallops Flight Facility) on the coast of Virginia.

The path of the 1970 eclipse ran nearly the entire East Coast of the United States. At Wallops, the total eclipse lasted just over a minute, ending at 1:38 p.m. EST with 99.9 percent totality.

This pass offered scientists from NASA, four universities, and seven other research organizations a unique way to conduct meteorological, ionospheric, and solar physics experiments using 32 sounding rockets, also known as suborbital rockets.

The public converged on this unpopulated area to not only witness the total solar eclipse, but also to view the rockets that launched before, during, and after the eclipse. In addition, one rocket launched that was not part of the solar eclipse campaign.

An estimated 12,000 to 14,000 people planted themselves across the bay from Wallops Island and the


Thousands of people descended on the eastern shore of Virginia to witness the solar eclipse and the sounding rocket launches. (Photo credit: NASA)

The path of the total solar eclipse of 7 March 1970 ran along the East Coast of the United States. Thirty-two sounding rockets were launched to observe the event. (Photo credit: NASA)

Thirty-two sounding rockets were launched at Wallops to conduct meteorological, ionospheric, and solar physics experiments surrounding the solar eclipse event. (Photo credit: NASA)

surrounding area for the spectacle. They were joined by members of Congress and also NASA's Deputy Associate Administrator for Planning, Dr. Wernher von Braun.

The launch range at Wallops had been used for sub-orbital rocket launchings since 1945 and for orbital missions since 1960, beginning with the Scout rocket. However, pulling off eclipse science missions required more than the established launch infrastructure at the site.

Fourteen additional rocket launchers were installed at the site, bringing the total available for the campaign to 24. While the station had seven permanent radars, an additional six mobile radars were used. Although the launch range was equipped with a telemetry station, five mobile telemetry vans were needed. In addition, the Wallops telemetry ship, the USNS Range Recoverer, was stationed off the Virginia coast.

Eight different launch vehicles were used: Arcas, Nike-Apache, Nike-Cajun, Nike-Tomahawk, Nike-Iroquois, Aerobee 150, Aerobee 170, and Javelin. These vehicles ranged in length from 8 to nearly 50 feet and could carry instruments to anywhere from 39 to almost 500 miles in altitude.

The campaign began on 6 March 1970, at 4:30 a.m., with the launch of a Nike-Cajun rocket carrying instruments to measure Earth's ozone and water vapor. By 2 p.m., an additional three rockets had been launched.

Eclipse day began with the first rocket launch at 9:30 a.m., followed by 24 additional launches that same day. Within the span of just 21 minutes, between 1:26 and 1:47 p.m., 15 rockets were launched, some within seconds of each other.

The following day, 8 March, three more eclipse launches and the non-eclipse rocket launch took place.

Project personnel reported that every rocket launched on time or within seconds of its scheduled flight. Only one experiment failed to return any scientific data.

In addition to the rockets launched at Wallops, two sounding rockets were launched from the White

Sands Missile Range in New Mexico, which was outside the path of the eclipse, to gather comparative data.

A study of the effects of the eclipse was made using radio signals from the Mariner 6 probe, which was 235 million miles from Earth at the time, on the opposite side of the Sun. Six Earth-orbiting satellites also observed the eclipse and its effects. On the ground, NASA-sponsored observations were made from three locations: two in Virginia and one in Mexico.

> **"NONSCIENTISTS, TOO, WILL HAVE THE CHANCE TO OBSERVE A PARTIAL OR TOTAL ECLIPSE, WEATHER PERMITTING, FROM ANY OF THE NATION'S CONTIGUOUS 48 STATES."**

While the 21 August 2017 eclipse may not provide the opportunity for a rocket spectacle such as that provided on 7 March 1970, NASA is gearing up to support a wide range of science observations. The 2017 eclipse will take around an hour and a half to cross from Oregon to South Carolina, providing ample time for repeated measurements across the nation. Satellites, aircraft, weather balloons, and ground-based instruments will gather atmospheric and solar measurements.

Nonscientists, too, will have the chance to observe a partial or total eclipse, weather permitting, from any of the nation's contiguous 48 states.

For information on the August eclipse such as maps showing the eclipse path across the United States, the science being conducted, education materials, activities for the general public, and more, visit *https://eclipse2017.nasa.gov*.

## NASA AND ART: A COLLABORATION COLORED WITH HISTORY

By Hannah Hotovy, NASA History Division Intern

The relationship between the arts and sciences, to some, may resemble that of oil and water. One captures the nature of the universe through objective reason and data, while the other relies on expression of emotion and divergence of perception. At this intersection, however, lies a rich visual history that continues to bring the far reaches of the known universe closer to home.

The earliest movement for collaboration between art and science at NASA came to fruition in the creation of the NASA Art Program in 1962, just four years after the Agency's establishment. After viewing artist Bruce Stevenson's commissioned portrait of Alan Shepard, the first American in space, NASA Administrator James Webb requested that the artist create portraits of every NASA astronaut. He also began to envision all that artists could do for NASA. In a March 1962 memorandum to Hiden T. Cox, NASA's public affairs director, Webb expressed his interest in creating a NASA art program to commemorate both past and future events. At a time when humankind was just beginning to venture into space, Webb recognized the importance of capturing the emotions of exploration, such as excitement and uncertainty, in a way in which history could look back and fully appreciate all that the Agency had achieved.

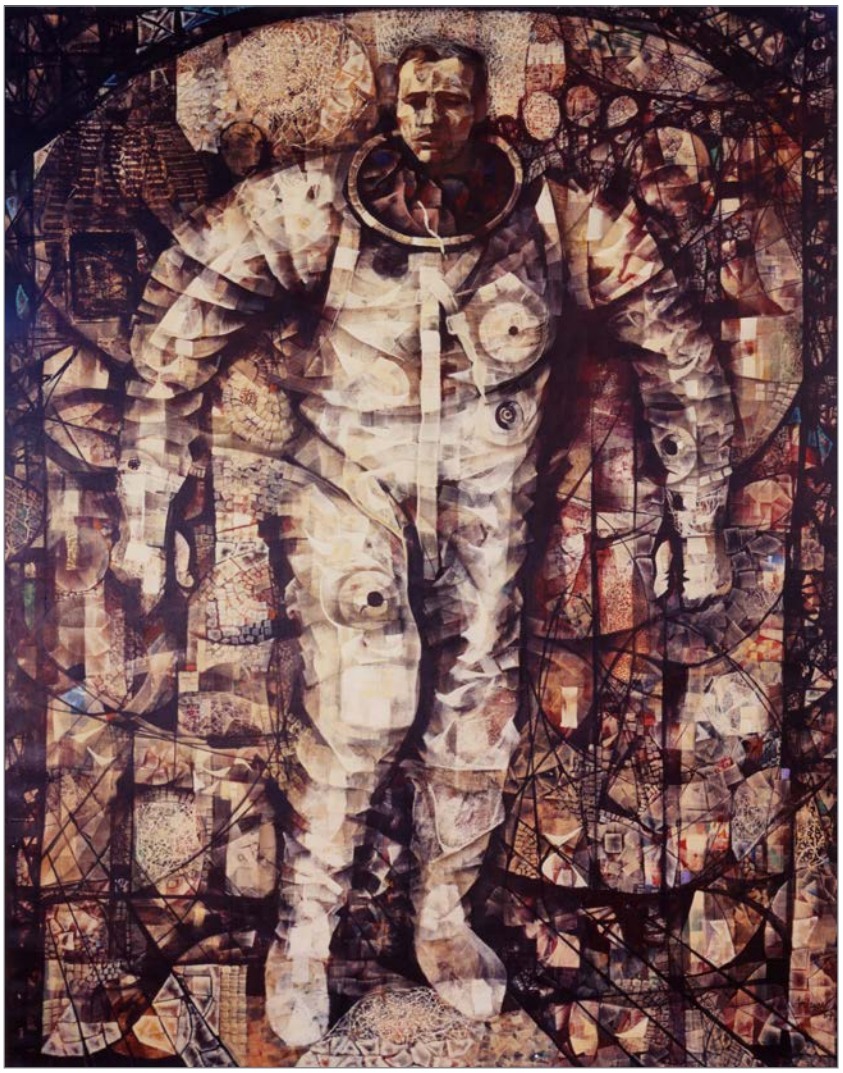
To help get the program off the ground, NASA officials enlisted artist and NASA employee James Dean

to head the program with the assistance of H. Lester Cooke, Curator of Painting at the National Art Gallery. Together, the pair began organizing opportunities for artists to witness history being made firsthand, inviting them to impart their experiences to the public through their works. Though the participants would only be provided with a modest grant of $800, barely enough to cover travel expenses, the program promised an experience unimaginable to the average citizen. In May 1963, the program selected eight artists to capture the final Mercury flight, in which Gordon Cooper completed 22 Earth orbits in his spacecraft, Faith 7. Under Dean and Cooke's leadership, the work done by artists like Robert McCall, Peter Hurd, and Mitchell Jamieson served as the cornerstone for the program and its later artistic collaborations that illustrated the wonder of the ages of Gemini and Apollo. Over the course of its decades-long history, the NASA Art Program continued to attract renowned talents, including Norman Rockwell, Robert Rauschenberg, Andy Warhol, and Annie Leibowitz.

The artwork created through the NASA Art Program shaped the stories of early spaceflight into a popular American mythology, one that inspires a sense of national pride and shared accomplishment. As Dean remarked, "The artists were really missionaries for NASA. I mean, they were carrying the message out like nothing else would."

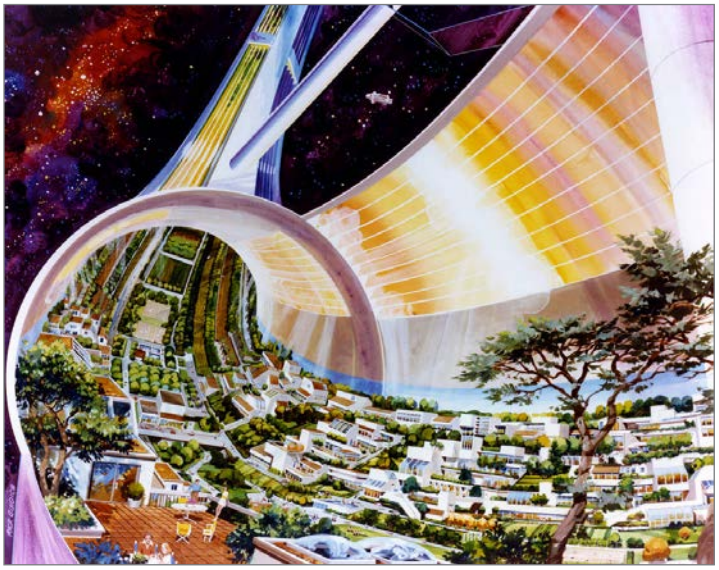
See some selected works from the NASA Art Program on the NASA History Flickr page at *https://www.flickr.com/photos/nasacommons*.

Though the NASA Art Program has been scaled back considerably over the years, the connections formed between science and art continue to act as valuable tools in illustrating NASA's modern explorations and discoveries. Artists and filmmakers work closely with the NASA Jet Propulsion Laboratory, referencing



The *First Steps* painting by Mitchell Jamieson, a former World War II Navy artist, captures the moment astronaut Gordon Cooper emerged from his Faith 7 spacecraft after his 22-orbit mission in 1963. Through paintings, Jamieson documented Cooper's return, from postflight medical examinations to the journey back to Cape Canaveral. (Photo credit: Mitchell Jamieson, courtesy of the Smithsonian National Air and Space Museum)

subject images and mission data, to create scientifically accurate concept art and animations. The resulting works inform viewers about current missions and their progress, like the Cassini mission's Grand Finale (see *https://saturn.jpl.nasa.gov/mission/grand-finale/overview*) as the probe begins its dramatic descent into Saturn. They also help audiences visualize discoveries of the natural universe (like the recently discovered TRAPPIST-1 system exoplanets) far beyond their view.



Three space colony summer studies were conducted at NASA Ames Research Center in the 1970s. A number of artistic renderings of the concepts were made, including this one, which shows a cutaway view of a fictional Toroidal (donut-shaped) Colony. (Artwork: Rick Guidice; photo credit: NASA Ames Research Center)

The TRAPPIST-1 discoveries also supplied content for a visual campaign out of NASA's Jet Propulsion Laboratory that taps into the nostalgia of the science fiction culture and advertising styles of the 1960s. Dubbed Visions of the Future, the project ranges in scope from planetary bodies inside our solar system like the moons of Saturn to distant discoveries like the Kepler and TRAPPIST-1 exoplanets. The visually engaging final product provides a creative imagining of a farsighted age of future exploration while bringing awareness to the promise of current discoveries.

To learn more about Visions of the Future, visit the Exoplanet Travel Bureau at *https://exoplanets.nasa.gov/alien-worlds/exoplanet-travel-bureau*.

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## IMAGE IN NASA HISTORY

In this photograph taken on 5 December 1961, a test subject sits at the controls of Project LOLA (for Lunar Orbit and Landing Approach), a simulator built at Langley to study problems related to landing on the lunar surface. It was a complex project that cost nearly $2 million. In his book *Spaceflight Revolution: NASA Langley Research Center from Sputnik to Apollo* (SP-4308), James Hansen wrote: "This simulator was designed to provide a pilot with a detailed visual encounter with the lunar surface; the machine consisted primarily of a cockpit, a closed-circuit TV system, and four large murals or scale models representing portions of the lunar surface as seen from various altitudes."

Photo credit: NASA Langley Research Center

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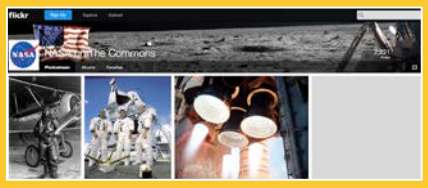


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