NEWS &NOTES

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FROM THE CHIEF HISTORIAN

Welcome to our annual year-end "theme" edition of NASA History *News and Notes*. This December we are turning our attention to the 2017 Langley Research Center (LaRC) centennial. As you will see in the accompanying articles, the National Advisory Committee for Aeronautics' (NACA's) first research laboratory not only made major breakthroughs in aeronautics research but also had major impacts on the culture of the organization that would become the National Aeronautics and Space Administration (NASA) in 1958. It is little wonder that LaRC will devote 2017 to telling this story in so many ways. We hope that you will enjoy this small contribution to that effort and that you will continue to follow the story throughout 2017.

If you have read the last two editions of *News and Notes*, you may be wondering about the latest developments regarding the history program at Johnson Space Center (JSC). I am delighted to say that the end of the calendar year brings with it a happy conclusion. As you will read elsewhere in this issue, JSC has moved its history program to the Knowledge and Quality Management Systems Office, part of the Office of Safety and Mission Assurance, and has added a civil servant manager, John Uri, to the team. John, Jennifer Ross-Nazzal,

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THE LANGLEY CENTENNIAL: AN APPRECIATION

INTRODUCTION

By Bill Barry

On 17 July 2017, NASA will mark 100 years since the groundbreaking ceremony at what was then the National Advisory Committee for Aeronautics' (NACA) Langley Memorial Aeronautical Laboratory. This legendary facility almost did not come into existence in the first place. The creation of the NACA had been tacked onto the Naval Appropriations Act, passed in 1915, and the wording about NACA research facilities was unclear. This was a result of the strong opinions both for and against the idea of a government-owned aeronautics research laboratory. The very next year, after intense lobbying by Charles Walcott, Smithsonian Secretary and Chairman of the Executive Committee of the NACA, Congress voted in favor of adding $85,000 to the NACA budget for the purpose of building a research facility. (The previous year, the entire NACA budget was $5,000.) Among those opposed to an NACA laboratory was President Woodrow Wilson. Despite his opposition, the funding was included in the budget, and work began almost immediately to find a location. By the end of 1916, the U.S. Army and the NACA had agreed on a parcel of land near Hampton, Virginia, for a joint aeronautical research area. The site was named in honor of Walcott's predecessor as Smithsonian Secretary, Samuel Pierpoint Langley.

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From the Chief Historian (continued)

and Sandra Johnson have already moved into a new temporary office space while they await renovations that will give them a permanent home in the JSC Headquarters building in the new year. In another positive development, NASA's Science Mission Directorate has begun an effort to capture more oral histories, and we are directing that work to our oral history experts at JSC. So they will have a new home and plenty of new work in 2017. While all of these changes reflect the strong support within NASA for our history work, I would also like to acknowledge the significant positive impact of the several historical professional societies, advocacy groups, and individuals who made their concerns known in letters, calls, and e-mails to NASA senior management. Although those of you who have worked in government may be cringing because you know that many well-meaning interventions of this sort can backfire, I have to say that the measured tones and positive approaches of the interventions were very helpful. My thanks to all of you!

While we are on the subject of professional societies, let me congratulate the winners of the fellowships that we sponsor in cooperation with the American Historical Association (AHA), the History of Science Society (HSS), and the Society for the History of Technology (SHOT). You can read more about the 2016–17 fellows inside this edition. Although these fellowships offer relatively modest stipends, the work they sponsor has had a significant cumulative impact on the field of aerospace history since my predecessor Sylvia Kraemer initiated the AHA Fellowship in Aerospace History 30 years ago. About a decade ago, then–Chief Historian Steve Dick expanded the fellowship participation effort to include HSS and SHOT. The list of fellows over the past 30 years reads like a who's who in the aerospace history field. Budgets may be tight, but to my mind, the fellowships are a critical priority because they are what I like to call our seed corn. We continue to consider ways to make the fellowships even more effective, but our commitment to encouraging excellent historians to work in this field is a strategic investment that has paid huge dividends.

Finally, a few words about forthcoming events. The 20th Century Fox movie *Hidden Figures* opens in some theaters on 25 December and more widely on 6 January 2017. It is based on the new (and outstanding) book of the same name by Margot Lee Shetterly. The movie is not a historical documentary, but it is true to the struggles of the main characters—the African American women who worked as "computers" at LaRC in the early days of the space program. NASA agreed to cooperate with the movie's production team to help make the film as credible and accurate as possible because it tells an important story about our past that also illuminates our future. I was one of many NASA folks who dug up vintage photographs and manuals, provided feedback, and answered countless questions from the production team. The dedication of the 20th Century Fox team to being as historically accurate as possible (within the bounds of telling a great story in a feature film) was mind-boggling. I think you'll enjoy it. Another important, and related, thing coming in 2017 that you may enjoy is the symposium "NASA and the 'Long' Civil Rights Movement." The symposium is being hosted by the University of Alabama in Huntsville (UAH) from 16 to 17 March 2017. Our own Brian Odom, historian at Marshall Space Flight Center, is one of the organizers of this event. He and Dr. Stephen Waring of UAH have put together a great program of papers (and I don't say that only because I am one of the presenters). The symposium will take a wide perspective on the struggle for civil rights and is fortuitously timed to build on the interest in the topic that will be generated by the book and movie *Hidden Figures*. The year 2017 is already shaping up to be an exciting one for the NASA history program.

But, as we come to the end of 2016, let me offer my best wishes to you and yours for the holiday season. Until next time….

Godspeed,

William P. Barry
Chief Historian

The Langley Centennial: An Appreciation (continued)

Ironically, Langley's most famous, or infamous, accomplishment in aeronautics was the failure of his Aerodrome—an unpiloted, unpowered aircraft built for the U.S. Army. Having flown a scale model in 1895, Langley convinced the Army to invest $100,000 in developing a full-sized, piloted version. Sadly, both tests of the Aerodrome in late 1903 were very public failures. (The Wright brothers were to succeed, in private, just nine days after Langley's second failure.) Langley died a broken man two years later. But thanks to the advocacy of his devoted successor, Langley's name not only would live on but would be the name with the longest legacy in aeronautical research facilities.

The pathbreaking successes of the NACA in the 1920s and 1930s were the result of work done at Langley. To a considerable extent, the facilities, methods, tools, and culture of aeronautical research were created or extended by the staff at the lab. Not surprisingly, when the demands of World War II mandated an expansion of NACA facilities and efforts, Langley was both the model and the source of experienced staff. Referred to in those years as the "Mother" lab, Langley populated first Ames Aeronautical Laboratory and then the Aircraft Engine Research Laboratory (AERL, later renamed Lewis Research Center, now Glenn Research Center). But as you look across NASA now, the role of Langley in influencing facilities (and the culture there) is not limited to these three traditional aeronautics centers. Near the end of World War II, Langley also set up a facility for the Pilotless Aircraft Research Division (now Wallops Flight Facility) at Wallops Island in Virginia. Although staff from Ames were the first NACA personnel to conduct flight tests at what is now Edwards Air Force Base, the first permanent NACA personnel assigned there were a group from Langley who supported the X-1 test program. What is now the Armstrong Flight Research Center also began with Langley personnel. Moreover, the leader of the postwar Pilotless Aircraft Research Division, Bob Gilruth, would also lead the Space Task Group at Langley when it was formed. Gilruth would, a few years later, take the rapidly growing Space Task Group to Houston to create what we now know as Johnson Space Center. Even NASA's first spaceflight center has a link to the Mother lab. Although the staff of Goddard Space Flight Center was largely formed from the team at the Naval Research Laboratory that had worked on Project Vanguard, the Center's first Director, Harry J. Goett, was a Langley alumnus. He came to Goddard from Ames Research Center, but he started his NACA career in 1936 at Langley. In all, five of the nine other NASA Centers have a creation story rooted in one way or another in Langley.

> **"…I THINK [OF] LANGLEY AS THE MOTHER CENTER ALWAYS—LANGLEY WAS FIRST, AMES WAS SECOND, AND LEWIS WAS THIRD. SO THEY ALWAYS SORT OF THOUGHT OF US AS THEIR KIDS…."**
>
> **– Jack Boyd, 3 October 2005**
>
> ***http://www.jsc.nasa.gov/history/oral_histories/NACA/BoydJW_10-3-05.htm***

In the contributions that follow from our colleagues at Ames, Glenn, and Stennis Space Center, you'll get a picture of how the ever-present Langley lab has influenced our Agency over the last century in a variety of ways. This is an important and all-too-often overlooked legacy that we will carry forward into the next century.

THE LANGLEY DIASPORA AND THE ORIGINS OF NASA AMES RESEARCH CENTER

By Jack Boyd and Glenn Bugos

The balance between competition and cooperation among NASA Centers is part of what makes the Agency so efficient and effective, as is the willingness of NASA people to go where the work needs to be done.

The Langley Memorial Aeronautical Laboratory was only 22 years old in 1939, when Congress funded the construction of a second National Advisory Committee for Aeronautics (NACA) laboratory to be built on the West Coast—the Ames Aeronautical Laboratory (now NASA Ames Research Center). A few months later, Congress funded the construction of the Aircraft Engine Research Laboratory (AERL) in Cleveland, now the NASA Glenn Research Center. Early staff of these two new laboratories came from Langley, and for many years, they referred to Langley as the "Mother Lab."

Smith DeFrance had joined Langley as employee number 63 in July 1922, when the lab was five years old. He designed the 30- by 60-foot full-scale wind tunnel at Langley, which, when opened in 1931, was the largest wind tunnel ever built. Soon, DeFrance rose to the post of assistant chief of aeronautics at Langley and was asked in the fall of 1939 to begin sketching plans for the new Ames laboratory. DeFrance traveled to Moffett Field to assess whether it was a suitable place for an NACA laboratory in terms of the terrain, water and electrical resources, access to culture, and suitable houses for the staff. Langley staff knew the history of the nearby Jamestown settlement, where British pioneers first built an outpost on American soil. The letters from DeFrance back to Langley had that same tone—convincing folk back home to uproot themselves to build a permanent home on a wild frontier.

> **"THE RESEARCH INCREASED GREATLY, AND SO DID THE STAFF. THE STAFF AT LANGLEY, I DON'T REMEMBER HOW MANY THOUSANDS THERE WERE, MAYBE A COUPLE THOUSAND, BUT IT GOT UP TO 6,000 I THINK."**
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> **– Jane Hess, 2 April 2014 on Pearl Harbor's effect on Langley**
>
> ***http://www.jsc.nasa.gov/history/oral_histories/NACA/HessJS_4-2-14.htm***

Some at Langley were excited to go. Russell Robinson, a Stanford University–educated engineer at Langley (where he designed and managed the 8-foot high-speed tunnel) who served as a liaison to NACA Headquarters, started an NACA western office in southern California to survey how the existing laboratory had helped California aircraft manufacturers and what the expanded NACA might do better. Every so often, he traveled north to take measurements at Moffett Field for the folks back at Langley.

Work on the Ames lab began in earnest on 29 January 1940, when John Parson and Ferril Nickle arrived from Langley. Like Robinson, Parson had also studied at Stanford with William Durand, one of the founding members of the NACA main committee. Parson served his entire career as DeFrance's technical assistant, first in the operations of the full-scale tunnel at Langley and then as DeFrance's associate director at Ames until they retired. It was Parson who determined if the designs drawn at Langley made sense in the California terrain.

Otherwise, the earliest Ames staff members were administrative. Nickle was a procurement specialist. A month later, Edward "Ray" Sharp arrived from Langley, a specialist in contractual and budget issues. Sharp returned to Langley that fall, which was itself rife with construction, to answer aeronautical questions of the coming war. A year later, Sharp left to build and run the AERL. Administrative assistant

The year 1940 saw rapid movement among NACA staff. Smith DeFrance, recently departed Langley assistant chief of aeronautics and recently arrived Engineer-in-Charge of the NACA Ames Aeronautical Laboratory, presents a departing gift to Ray Sharp. Sharp spent eight months at Ames after arriving from Langley, and he was on his way to building the new laboratory in Cleveland. On Sharp's right is Helen St. Davies, and on his left is Mannie Poole, both key in bringing NACA Langley processes to Ames. Half of the people behind him had just arrived from Langley, including Harvey Allen, the tall fellow in the top left with the impish smile, who actively recruited to Ames a number of NACA engineers.

Mannie Poole arrived from Langley in March and managed the flow of mail back and forth between Virginia and California.

DeFrance kept his design staff as long as possible at Langley, where they had established relationships to help them tackle the engineering challenges of the new tunnels. By June, he let them go west. For those going by train, the trip was four days. Most drove their cars out, and that road trip across America could take two weeks. DeFrance himself arrived in August 1940. That month, the first Ames staff photo showed 51 people, 23 of whom had come from Langley. The rest were local hires, either machinists from the local fruit-processing industries or aeronautical engineers fresh from their degrees at Stanford or the University of California.

DeFrance himself selected every Langley person who transferred to Ames, but it is not clear that he recruited them. DeFrance did recruit Helen Davies to serve as his administrative assistant, and she shared his style—no nonsense, maximum efficiency, and a passion for safety. Most of the other ex-Langleyites were inspired by the pioneering spirit of Harvey Allen. Later at Ames, Harvey developed the blunt-body concept,

> **THERE WAS A LOT OF BRILLIANCE AT LANGLEY. LANGLEY WAS THE RESEARCH CENTER. EVEN WHEN THE OTHER CENTERS WERE CREATED, THEY HAD DIFFERENT RESPONSIBILITIES. BUT WE HAD THE RESPONSIBILITY TO DO THE RESEARCH.**
>
> – Jane Hess, 2 April 2014
>
> *http://www.jsc.nasa.gov/history/oral_histories/NACA/HessJS_4-2-14.htm*

and later still, he served as Ames Director—but in 1939, he was a recognized aerodynamics genius and iconoclast. He had grown up in Palo Alto, California; attended Stanford; and joined Langley because it was on the cutting edge of aerodynamics. No one was more excited about an NACA laboratory on the San Francisco Peninsula than he was, and he recruited fervently among his friends. Walter Vincent, another Stanford graduate, joined him, as did Carlton Boletti, Lew Rodert, Charlie Frick, Harry Goett, and Manley Hood. The NACA workforce was already young, but this group was younger still and excited at the immense opportunity to both build and use the new tunnels.

DeFrance's group at Langley also began the design of facilities for the AERL in Cleveland, while the rest of the Langley staff focused on their work in aeronautics. Indeed, even after they transferred to Ames, several of the former Langley engineers continued to design facilities for the AERL. As the research programs matured at each lab, the staff peer-reviewed one another's work before it was printed as NACA publications. Management and researchers from all three labs met at the yearly NACA Inspections, where they jockeyed to see who could gain the stage to present their latest NACA research to the attending aerospace firms, academia, and military services.

The earliest staff of the NACA High-Speed Flight Station (later Dryden Flight Research Center and now Armstrong Flight Research Center) in 1946 also came largely from Langley. When NASA formed in October 1958, Langley was still the largest among the NACA labs. Langley staff again dispersed to staff the laboratories built for the new NASA space missions—notably at the Manned Spacecraft Center (now Johnson Space Center) in Houston and the Goddard Space Flight Center in Maryland. Over the decades, a rich spirit of collaboration and rivalry endured between the new NASA Centers.

One prime example of collaboration in aeronautics was NASA's intercenter High-Alpha Research Program, which started as a cooperative activity between Langley, Ames, Dryden, and Lewis and ran from 1987 to 1996. Alpha stood for "angle-of-attack," and the program investigated ways of controlling flight, providing exceptional maneuverability, and avoiding loss of control or dangerous spins as military fighters performed maneuvers at the edge of the flight envelope during close-in dogfights. The effort was initiated at Langley by Joe Chambers, Bill Gilbert, and the staff of their full-scale wind tunnel—which had been designed and managed by DeFrance more than 60 years earlier. Multidisciplinary teams of NASA engineers from the four participating Centers investigated three ways of controlling high-alpha flight: thrust vectoring of the engines, modifications to the flight controls, and the use of actuated forebody strakes. Ames technicians modified a mothballed Blue Angels F/A-18 for tests in the Ames National Full-Scale Aeronautics Facility, where Langley and Ames engineers worked side by side, notably on an analysis of nose strake controls.

Meanwhile, researchers Lou Schiff at Ames and Jim Thomas of Langley did computational fluid dynamics analyses of on- and off-body flows for the F/A-18 at high angles of attack. They correlated their results with flight test data from an extensive series of 385 flights at Dryden Flight Research Center in another highly instrumented F/A-18 known as the High Alpha Research Vehicle (HARV), which was modified for each phase of the research effort. Test pilots Bill

An ex-F/A-18 Blue Angels airframe, provided to NASA by the U.S. Navy as a result of the advocacy of Langley's Joe Chambers, being prepared at Ames for an extensive series of wind tunnel tests as part of the High Alpha Research Program. A special F/A-18 High Alpha Research Vehicle flown at NASA's Dryden Flight Research Center (now Armstrong) is now on display at the Virginia Air and Space Center in Hampton, Virginia, and the F/A-18 airframe used in the Ames wind tunnel tests is now at the Moffett Field Museum.

Dana and Ed Schneider led the test flights and were joined by pilots from other NASA Centers and the military services.

One of the enduring cultural characteristics of the Langley diaspora that made the High Alpha Research Program so successful was the balance of respect and cooperation. The engineers involved knew each other, they understood the value of collaboration to get the best results from NASA funds, and they double-checked everything because they knew their work would be checked by the leading experts in the field—their peers at the other NASA Centers. Because of this highly effective program, NASA research significantly expanded flight envelopes for recent fighters—such as the F-22 Raptor—in the American military fleet.

GLENN'S LANGLEY LEGACY

By Bob Arrighi

"[On 15 December 1941] a few shivering, startled Southerners from Langley, the vanguard of those in the Power Plants Division transferring to Cleveland, arrived in the biggest snowstorm in years," recalled former receptionist Mary Louise Gosney. This vanguard was the first large group of NACA employees to relocate from the Langley Memorial Aeronautical Laboratory to the new Aircraft Engine Research Laboratory (AERL).[1] As construction of the AERL proceeded over the next two years, larger factions

1 The AERL was renamed the Flight Propulsion Laboratory in 1947, the Lewis Flight Propulsion Laboratory in 1948, the NASA Lewis Research Center in 1958, and the NASA John H. Glenn Research Center in 1999.

followed suit. Langley employees not only designed and constructed the AERL but formed the core of the Laboratory's leadership and research staff for three decades.

> **"I THINK EVERY COUPLE OF YEARS, WE WOULD HAVE AN NACA AERODYNAMICS NATIONAL MEETING, AND EACH CENTER WOULD PREPARE ITS BEST PEOPLE AND PAPERS, AND SEND THEM. WE WOULD GET TOGETHER AND PRESENT OUR PAPERS AND SHARE THE RESULTS AND TALK ABOUT IT AND SAY, 'WELL, THAT'S PRETTY GOOD, BUT I THINK WE CAN DO BETTER. WE'LL TRY.'"**
>
> – Richard "Pete" Petersen, 3 October 2005, on friendly competition between Ames and Langley
>
> *http://www.jsc.nasa.gov/history/oral_histories/NACA/PetersonVL_10-3-05.pdf*

For the newcomers, the mid-December snowstorm was a dramatic change from Virginia, where temperatures had reached 60 degrees Fahrenheit just days before. The challenge of acclimation to the northern climate, however, paled in comparison to the tumult resulting from Japan's attack on Pearl Harbor and the Philippines just eight days before. The United States was now involved in World War II on two fronts, and there was a new urgency to get the NACA's new engine research laboratory operational. The military was relying on the AERL to resolve a host of propulsion issues for its aircraft.

Nearly a year beforehand, in January 1941, Langley construction engineer Charles Herrmann had relocated to Cleveland with Helen Ford, an administrative assistant from NACA Headquarters. From a 19th-century farmhouse on the barren AERL site, they managed the construction contracting and inspections. Meanwhile, in a room above Langley's Structural Research Laboratory, a team of civil engineers designed the AERL's test facilities and other structures. In August 1941, the NACA decided to transfer the Chief of Langley's Construction Division, Edward Raymond Sharp, to Cleveland to expedite the work.

The Langley arrivals of December 1941, which included inspectors, engineers, draftsmen, mechanics, and administrative staff, were stationed in temporary offices inside the aircraft hangar—the only completed building. Sharp negotiated a key contract with a new construction company in the ensuing weeks that provided a breakthrough in the work. The first test facility was operational in May 1942. One after another, the other buildings and facilities were completed during the following year, and the former Langley staff left the hangar for their permanent offices.

In the fall of 1942, units of the Langley engine research staff began transferring to Cleveland. What had been modest-size sections in Langley's Power Plants Division were expanded to full divisions in Cleveland. These divisions, led by experienced Langley engineers, included Addison Rothrock's Fuels and Lubrication Division, Benjamin Pinkel's Thermodynamics Division, Ernest Whitney's Engine Installation Division, Charles Moore's Engine Research Division, Oscar Schey's Supercharger Division, and Joseph Vensel's Flight Research Division.

In a somewhat surprising move, the NACA assigned construction manager Ray Sharp the responsibility for running the laboratory on a permanent basis. At Langley and Ames, technically skilled engineers performed that task. Sharp, who had a law degree but no formal scientific or engineering background, was assisted by Executive Engineers Carlton Kemper and Addison Rothrock. Sharp managed the day-to-day activities, while Rothrock and Kemper supervised the research. In 1949, Abe Silverstein, who had helped

design and operate Langley's Full Scale Wind Tunnel, became Chief of Research.

Although the AERL was continually hiring new researchers in the 1940s and 1950s, the ex-Langley personnel provided the laboratory's backbone. With the arrival of the newcomers, more and more of the Langley veterans moved into the management ranks. Nearly all of the division chiefs and upper-management positions during the NACA era were occupied by former Langley people.

The relatively small size of the AERL staff and the fact that many of them were new to northeast Ohio resulted in a close community. Everyone knew nearly everyone else, families were started, and lifelong friendships formed. Sharp and his wife Vera were parental figures who looked after the employees and participated in the staff dances, sporting events, and other social activities.

The transition from the NACA to NASA in 1958 brought a number of changes to the organization, including the transfer of Silverstein and a number of other key Lewis employees to Headquarters and Langley's Space Task Group. There was also a shift from the NACA's mostly in-house research to NASA's management of external development contracts. The new space agency also dramatically increased the size of its staff in the early 1960s. Silverstein, who replaced Sharp as Director in 1961, knew the importance of camaraderie and successfully encouraged the older NACA veterans to interact socially with the new recruits.

As NASA's budgets decreased in the late 1960s and early 1970s, the era of Langley's influence on Lewis came to a close. To reduce its payroll, NASA began to offer employees incentives to retire. The Langley expatriates—many of whom had over 30 years of service—ebbed away during the final years of the Apollo program. The Center struggled for nearly a decade to redefine itself and its culture.

Langley's legacy is still visible at the Center today in its inductees into the Glenn Hall of Fame, a historic district containing the original facilities, and the campus's lack of sidewalk plots or tree lawns. The Southerners had not anticipated the need to plow snow when designing the laboratory.

LANGLEY'S STENNIS CONNECTION

By Jessica Herr

In his May 1961 address before a joint session of Congress, President John F. Kennedy said, "I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the Earth."[2] Meanwhile, researchers at Langley Research Center (LaRC) and other NASA Centers were brainstorming how the United States was going to get a human on the Moon and back home again. LaRC already had been working on a solution with Project Mercury years earlier. Using that Center's knowledge and research, NASA successfully sent Alan Shepard to space for a 15-minute suborbital flight in the Mercury capsule Freedom 7. Many ideas were considered for putting humans on the Moon, but the choice came down to three basic plans: a direct ascent to the Moon and return to Earth without an orbital rendezvous around Earth or the Moon; an Earth Orbital Rendezvous (EOR) with a launch to the Moon from Earth orbit after the major components of the launch were assembled in orbit around Earth; or a Lunar Orbital Rendezvous (LOR) that involved going to the Moon, landing, returning to the ship, and then returning to Earth. The LOR was the solution that Langley researchers proposed. After months of research and debate, the LOR was approved and the Saturn V rocket was chosen as the launch vehicle. The Saturn V rocket engine, and all other rocket engines in the Apollo and Space Shuttle programs, would be tested in Hancock County, Mississippi, at the National Space Technology Laboratories (NSTL—now called the John C. Stennis Space Center).

2 John F. Kennedy, excerpt from the "Special Message to the Congress on Urgent National Needs," 25 May 1961, available at *https://www.nasa.gov/vision/space/features/jfk_speech_text.html* (accessed 18 November 2016).

Shown are NACA VIPs at Langley Memorial Aeronautical Laboratory in 1939. Bottom row: Walter Reiser, Elton Miller, Orville Wright, Starr Truscutt, Addison Rothrock, Eastman Jacobs, and George M. Lewis. Top row: Gus Crowley, Ernie Johnson, Carlton Kemper, H. J. E. Reid, Smith DeFrance, and Theodore Theodorsen.

In the 1970s, LaRC continued working with NSTL in studies of space applications and the development of environmental instrumentation and sensing equipment. Interested in matters having to do with pollution of the environment, Langley sought information and research from NSTL and the facilities that were housed there, including the Earth Resources Laboratory, the Gulf Coast Hydroscience Center, the Atchafalaya Land and Water Management Study being conducted by the U.S. Fish and Wildlife Service, the National Pesticides Monitoring Laboratory, and the Oceanographic Instrumentation Center.

In the 1980s, President Ronald Reagan instituted a short-lived program called the National Aero-Space Plane (NASP), also known as the Orient Express. The program was never fully realized and closed about 10 years after it was announced, but the program brought new light and ideas to NASA's research on supersonic and hypersonic vehicles. In the short time that NASP was active, LaRC and SSC worked jointly on researching and developing the engines that would take people on a supersonic flight. The plan was neither monetarily feasible nor physically practical for the potential passengers riding in the plane, so the project was canceled, but the ingenuity was there.

SSC, working with LaRC over the last 50 years, has seen tremendous leaps forward in research and development and will continue to benefit during the current journey to Mars and beyond.

NEWS FROM HEADQUARTERS AND THE CENTERS

NASA HEADQUARTERS

Washington, DC

History Division

By Bill Barry

As I write this, the transition season (which will be in full swing by the time you read it) has already begun. Our Associate Administrator for Communications, David Weaver, left NASA for a job with the Air Line Pilots Association (ALPA) in October. He was a great boss and a strong supporter of the history program. While we will all miss his skill and his ability to make things happen, this is part of the natural cycle of government—as political appointees move on with the change from one administration to the next, new ones will eventually take their places to help shepherd the new President's policies into action. But I'd be remiss if I didn't sing David's praises a bit for the way he has brought the history team into Agency planning. We now have a process in place to identify significant anniversary events and prepare for them well in advance. This will serve us all well in the coming years as we approach the 60th anniversary of NASA (October 2018) and the 50th anniversary of the Apollo 11 landing on the Moon (July 2019). With David now on to a new challenge, the senior civil servant in the Office of Communications, Bob Jacobs, is the Acting Associate Administrator. We don't anticipate any other major changes until the new President's team is in place sometime after the inauguration in late January 2017.

Although we are also short an editor (since Yvette Smith moved to a position on the NASA social media team this summer), we have still managed to keep the flow of publications going. In September, we released an update to our 1997 chronology of spacewalks. Volume 2 of *Walking to Olympus*, by Julie Ta (a former History Division intern) and Robert Treviño, picks up where the original volume left off and gives a short synopsis of every spacewalk from 1997 through 2011. This fall, we have also been wrapping up the copyediting work on *Making the Invisible Visible*, a monograph on the management of the Spitzer Space Telescope project by Renee Rotner. This book should go to print soon. The third volume of *The Wind and Beyond*, our documentary history of aerodynamics in America, went to our copy editors in July and has been keeping them busy since. It is a huge and complicated book to produce, so it will take a while to get the manuscript ready for the printer. Nonetheless, we expect to see it finished in the new year. Also in copyediting, for publication early next year, is a monograph on how NASA has sought advice on science projects. *Science Advice to NASA: Conflict, Consensus, Partnership, Leadership*, by Joe Alexander, will look at the Space Science Board, various other advisory committees, and NASA's own efforts to manage the advice process with the goal of identifying both what makes advice more effective and other lessons learned for the future.

Interns Bob Collom (graduate student at American University) and Nick Russo (senior at the University of Rhode Island) have done a great job since their arrival late this summer. They may have gotten started with a few more obituaries than they would have liked, but their work on our social media output this fall has been phenomenal. Metrics on followers and impact are all up. If you haven't checked out our Flickr site (NASA on the Commons) lately, you should drop by. Bob and Nick have added an amazing number of new and interesting images to our online repository of great images from NACA and NASA history. You can see them all at ***https://www.flickr.com/photos/nasacommons***. Guiding our interns to great performance (again) has been Andres Almeida. Andres manages to juggle wrangling interns, putting this newsletter together, cracking the whip on the annual President's Report, and trying to teach us all a few words of Spanish—all without breaking a sweat. He gets a lot of help with intern care and feeding from "mom-in-residence" Nadine Andreassen. (Though by the time you read this, we will have changed her title to "grandma-in-residence.")

Looking ahead into 2017, we are delighted that our colleagues at the Jet Propulsion Laboratory (JPL) have agreed to host our history and archives program review meeting this coming May. This is our annual event for historians and archivists from across NASA to get together for two days and discuss our mutual concerns. We haven't had a program review on the West Coast since Ames Research Center hosted us in 2009. Having just celebrated (on Halloween 2016) the 80th anniversary of the first rocket test by the team that would become JPL, we are really looking forward to holding our discussions in a place that has contributed so much to aerospace history. Between the program review in May and the Langley centennial celebrations throughout the year, we expect 2017 to be another busy year for the Headquarters history team.

Historical Reference Collection (HRC)

One thing that we are hoping will happen before the program review is approval to hire a replacement for Jane Odom as Chief Archivist. As you may remember, Jane retired at the end of May. Unfortunately, NASA Headquarters is under a hiring freeze, and we haven't been allowed to backfill that position yet. There are indications that we'll be able to advertise for that position in the near future. So if you are an experienced archivist, you might want to polish up your résumé. When the position is advertised, we'll let you know on our LISTSERV and our social media accounts, but the application will have to be submitted through ***https://www.usajobs.gov***. So keep an eye out there. In the meantime, Steve Garber continues to juggle his regular job as well as archival issues. Fortunately for him, Colin Fries and Liz Suckow need very little supervision, and they have a very large backlog of archival work to keep them busy. Between adding to and maintaining our reference collection, Colin and Liz continue to answer the nonstop flow of historical questions and help visiting researchers. I will note with some pride that the first person mentioned by name in the acknowledgments section of Margot Lee Shetterly's landmark book *Hidden Figures* is none other than our own Colin Fries.

AMES RESEARCH CENTER (ARC)

Moffett Field, California

By Glenn Bugos and Jack Boyd

Jack Boyd was inducted into the Academy of AOE (Aerospace and Ocean Engineering) Excellence of his alma mater, Virginia Polytechnic Institute and State University (Virginia Tech), as part of the celebrations of the 90th anniversary of aeronautical engineering at the university. He joins other NASA luminaries and Hokies like Chris Kraft and Paul Holloway.

Glenn Bugos presented a talk on the enduring significance of the biological experiment package on the Viking Lander, shifting the usual focus from its place in the historical trajectory of astrobiology and looking instead at how it served as a scientific precursor mission to the exploration of Mars. He presented it as part of the Viking 40th anniversary events at NASA Langley Research Center on 19 July 2016 and then at the American Institute of Aeronautics and Astronautics SPACE and Astronautics Forum and Exposition (AIAA SPACE 2016) in Long Beach in September. It was published as *The Viking Biological Experiment at 40 Years* (AIAA 2016-5286).

Irv Statler, working with Bob Ormiston, has launched a project to collect and publish memoirs of all those active in the founding years of the Army-NASA joint agreement on fundamental research in rotorcraft. They have identified many people involved in the early years of the Army aeromechanics research laboratories at Ames, Langley, AERL, and Fort Eustis. Anyone who has not yet been contacted and would like to contribute should contact Irv.

We bid good-bye to Dolores Beasley, who, after nine eventful years at Ames, is retiring as Director of Strategic Communications and Education. Dolores also spent six years in public affairs at NASA Headquarters and three at NASA's Goddard Space Flight Center. The daughter of eminent African American historian Edward Beasley, Dolores was attuned to how history can illuminate current issues within the Agency. She was a big supporter of the Ames History Office and an

Shown here is Dolores Beasley, who is retiring as Director of Strategic Communications and Education at NASA Ames.

Ames Deputy Director Tom Edwards (left) and Aviation Safety Reporting System Director Linda Connell hold a plaque commemorating 40 years of NASA Ames and Federal Aviation Administration partnership.

The 36-percent scale model of the Space Shuttle orbiter, which underwent 250 hours of tests in the 40- by 80-foot wind tunnel at NASA Ames, now resides at the western end of Shenandoah Plaza, Moffett Field's historic district.

advocate for celebrating anniversary events that draw attention to our legacy. Onward!

The staff of the Aviation Safety Reporting System (ASRS)—a partnership of the Federal Aviation Administration and Ames—celebrated the partnership's 40th anniversary with an open house at their offices south of Ames. ASRS director Linda Connell, who has served with ASRS for 18 of those years, led the celebration. Ames Deputy Director Tom Edwards introduced a video greeting by NASA Administrator Charles Bolden, and both Edwards and Connell talked about the importance of the ASRS in making American airspace safer. Since 1976, pilots, air traffic controllers, and all others working on the front lines of aviation have voluntarily and confidentially submitted to ASRS more than 1.6 million incident reports on safety concerns, which ASRS staff have analyzed to issue more than 6,200 safety alerts. The ASRS has become the world's largest repository of incident reports on aviation human factors and has become a model for incident reporting in aviation agencies around the world, as well as for incident reporting in a wide variety of high-risk industries.

The 36-percent scale model of the Space Shuttle orbiter—44 feet long and weighing 25 tons—was renovated and installed at perhaps the most visible spot on Moffett Field. The model was built in 1975 from steel covered with fiberglass epoxy and underwent 250 hours of tests in the 40- by 80-foot wind tunnel

to validate its landing characteristics and study the aerodynamic effects of its thermal protection systems. Once tests were done, the model toured the world, including a stop at the Paris Air Show, and spent time at NASA's Marshall Space Flight Center. It was then displayed near the former Ames Visitor Center, but it needed to be moved for a widening of R. T. Jones Road to handle increased traffic to the northern end of the Ames campus. Former Deputy Center Director Lew Braxton had grown up on Air Force bases around the world, where mounted aircraft often greeted visitors. Lew developed a plan to move the Shuttle model to the western end of Shenandoah Plaza, Moffett Field's historic district. The Ames Plant Engineering Branch repaired and painted it. Now, everyone driving onto Moffett Field or the Ames campus sees it; it serves as a reminder of Ames's legacy in supporting NASA's human spaceflight missions.

Reference Collection

By April Gage and Danielle Lopez

This quarter, the Ames archivists were invited to attend a weekend symposium at the University of California, Berkeley, entitled "Framing the Infinite: The Social Science of Space and Cosmology," organized by the university's Center for Science, Technology, Medicine, and Society. April Gage spoke on the archives panel with Megan Prelinger of San Francisco's Prelinger Library. April's presentation, entitled "Scientific Collections at NASA Ames Research Center," provided a guided tour through collections in the History Office archives and explored the significance of relationship-building between researchers and archivists in the cultivation of mutually informative partnerships.

Greg Schmidt, Deputy Director of NASA's Solar System Exploration Research Virtual Institute (SSERVI), and Pascal Lee, planetary scientist for the Mars and SETI Institutes, organized a space art exhibition to coincide with two events held at Ames this summer: the Third International Conference on the Exploration of Phobos and Deimos and the NASA Exploration Science Forum. Entitled "Near-Earth Worlds," the space art exhibit displayed works featuring asteroids and Martian scenes by a wide range of artists from the International Association of Astronomical Artists, including Lee himself. Some scientists from Ames loaned paintings from their personal collections for the show, which was open to the public as well as event attendees.

The History Office archivists coordinated with Schmidt and Lee to feature a Chesley Bonestell

From left, Planetary Scientist Pascal Lee (Mars and SETI Institutes), SSERVI Deputy Director Greg Schmidt, and Ames History Office Archivist April Gage pose in front of *Pittsburgh at L-2* by Chesley Bonestell. (Photo credit: Danielle K. Lopez)

Shown here is *Pittsburgh at L-2* by Chesley Bonestell. Oil on board, 1976. In this painting by Chesley Bonestell, a 270-foot machine with international markings is docked at a near-Earth asteroid to conduct mineral mining operations. Three astronauts float in acrobatic formation at one end of the station, and others perform tasks on the surface of the asteroid, while a red-and-white spaceship approaches. The planet Earth is visible in the distance. (Image credit: NASA Ames History Office Artifact Collection, ART1387.518)

painting entitled *Pittsburgh at L-2*. The item, which was commissioned by Ames in the mid-1970s, depicts mineral mining operations at a near-Earth asteroid.

Chesley Bonestell (1888–1986) is widely considered the father of space art. His paintings appeared on the covers of popular magazines and science fiction novels, as well as in movies such as the 1953 production of *War of the Worlds*. These works fascinated the general public and helped popularize the idea of human space travel. Bonestell was also a distinguished architectural painter, scientific illustrator, and science fiction writer. The many honors bestowed on him include a crater on Mars, an asteroid, and a cocktail (brandy and white vermouth) all bearing his name. Other achievements include membership in the International Space Hall of Fame and Science Fiction Hall of Fame, the 1951 International Fantasy Award, a Special Achievement Hugo Award, and a bronze medal from the International Planetary Society.

Pittsburgh at L-2 will also be featured in Doug Stewart's upcoming documentary film about Bonestell entitled *Chesley Bonestell: A Brush with the Future*.

ARMSTRONG FLIGHT RESEARCH CENTER (AFRC)

Edwards Air Force Base, California

By Christian Gelzer

In September, Christian Gelzer was the luncheon speaker at the National Space Biomedical Research Institute's (NSBRI's) annual meeting in Houston, Texas. His topic was the development of reaction control systems and the human-machine interaction. He also addressed an audience at Edwards Air Force Base in California about the history of NASA's Armstrong Flight Research Center that month and spoke at Scaled Composites in October, presenting a history of AFRC's past and present activities.

Christian again hosted a summer intern, Christy Ailman, who worked on revising a manuscript on the Controlled Impact Demonstration. This was a Federal Aviation Administration–sponsored project that the Agency hoped would validate a fuel additive that would prevent post-crash fires. Christy hopes to have the manuscript ready for peer review before next summer.

Christian is also working with a part-time hire to develop a box-level catalog of the history reference collection so that the Center can make a decision about what to do with the collection. The building in which the collection resides (with cataloged material in Lektrievers and boxes) is slated for demolition in 2017. The Center needs to reduce its footprint as well as its costs associated with storage. His preference—and what he is advocating—is to digitize the collection.

NASA Armstrong Celebrates 70 Years of Flight Research and Testing

By Cam Martin

On 30 September 2016, NASA's Armstrong Flight Research Center observed its 70th anniversary. The Center's origins date back to 1946, when 13 NACA engineers and support staff arrived in California's Mojave Desert on a quest for supersonic flight data obtained with the first purpose-built research aircraft, the Bell X-1—the first aircraft to be designated with an "X" for "experimental." The date was commemorated in Congressman Steve Knight's Congressional Record congratulations:

The Honorable Steve Knight of California in the House of Representatives

28 September 2016

MR. KNIGHT. Mr. Speaker, I rise today to celebrate and honor the 70th anniversary of NASA Armstrong Flight Research Center, which was founded on September 30, 1946.

In 1946 a group of officials from NASA's predecessor organization, the NACA, set up an operations base for our nation's effort in the race to achieve supersonic manned flight. A year later, on October 14, 1947, Air Force

Captain Chuck Yeager became the first pilot to break the sound barrier in the experimental Bell X-1 aircraft. This achievement, one of many incredible "firsts" in our history, inaugurated a national legacy of excellence in aerospace that defines American power today.

More X-planes followed the X-1, each building on our understanding of flight and projecting U.S. power further into air and space. Twenty years after Yeager, my father, Pete Knight, flew the X-15 at Mach 6.7. Even today that flight holds the world record for aircraft speed. What we learned from the X-programs was critical to our journey to the Moon and paved the way for the Space Shuttle.

Today NASA Armstrong continues to play an important role in the advancement of American aeronautics. It is pursuing a new generation of X-planes that will validate technology for faster, cleaner, quieter, and safer air travel over the next ten years. These bold programs are not only an exciting next step for our nation's legacy in aviation pioneering, but a necessary one, to renew our technological and competitive edge in aviation for the 21st Century.

I congratulate the men and women of NASA Armstrong on their outstanding achievements over the past 70 years. Their unfailing pursuit of useful knowledge in atmospheric flight and airborne science is essential to the American scientific enterprise, as well as our engagement with [the] international science community, the competitiveness of our private sector air and space companies, and our military's edge over potential adversaries. On behalf of the 25th Congressional District of California, I would again like to thank the NASA Armstrong team for all they do for our country.[1]

1 This portion of the Congressional Record for the 114th Congress, 2nd session, can be found at *http://knight.house.gov/uploadedfiles/congressional_record_statement_-_nasa_armstrong.pdf* (accessed 18 November 2016).

As part of the anniversary festivities, Cam Martin gave an hourlong auditorium lecture tracing the operational legacy of the "Round One" X-Planes (X-1, D-558-1, D-558-2, X-3, X-4, X-5, XF-92), the role of Dr. Hugh L. Dryden in making the Center a permanent NACA installation, Neil Armstrong's flight experience with the early X-planes, and the work of Walter Williams as he progressed from NACA project engineer on the Bell X-1 to NASA's Mercury Flight Operations Director for the spaceflights of astronauts Alan Shepard, Gus Grissom, and John Glenn. NASA's early operational experience with piloted rocket-powered flight, pressure suits, telemetry, and control rooms traces back to the "Round One" X-Planes and the people who conducted high-altitude flight research with them. A video showcasing 70 years of NACA/NASA research at Edwards Air Force Base premiered on NASA TV and remains available on YouTube.

GLENN RESEARCH CENTER (GRC)

Cleveland, Ohio

By Anne Mills

Glenn Research Center wrapped up its year of 75th anniversary events with some special recognition of our retirees. On 10 August, over 100 retirees and their guests gathered at GRC for a retiree reunion. The day consisted of several briefings by current researchers, who provided some insight into current projects, including the Spacecraft Fire Experiment (SAFFIRE), the Space Communications and Navigation (SCaN) test bed, and a tech-transfer success story integrating flywheel technology into heart pumps. The retirees then gathered with current employees for a Center-wide picnic, where they were able to reminisce and reconnect.

During the 2015 NACA centennial, GRC established a hall of fame and inducted its first class of members. To further celebrate our 75th anniversary, our second class of inductees was honored in an induction ceremony on 14 September. Nine distinguished individuals were recognized as luminaries and leaders of Center success:

Hall of fame honorees pose for a group photo. Standing, from left to right, are Dr. R. Lynn Bondurant, Andrew Stofan, Dr. Julian Earls, Bruce Banks (representing Dr. Harold Kaufman), and Joel and Sheldon Gordon (representing Sanford Gordon). Sitting, from left to right, are Judy Szabo (representing Steve Szabo), Dr. Lonnie Reid, Dr. Eli Reshotko, and Molly Nesham (representing Bonnie McBride). (Photo credit: Glenn Research Center/Rami Daud)

- **Dr. R. Lynn Bondurant,** science, technology, engineering, and mathematics (STEM) advocate and inspiring educator
- **Dr. Julian M. Earls,** former Center Director and health physics leader
- **Sanford Gordon and Bonnie J. McBride,** developers of industry transforming chemical equilibrium codes
- **Dr. Harold Kaufman,** trailblazer of ion propulsion
- **Dr. Lonnie Reid,** leader in compression research
- **Dr. Eli Reshotko,** luminary of boundary layer theory and research
- **Andrew Stofan,** former Center Director and champion of Center revitalization
- **Steve Szabo, Jr.,** leader in program management

We were fortunate to have most honorees and their families present for the ceremony. Each honoree was presented with a plaque, a duplicate of which will be permanently on display in our Employee Services Building. More detailed information about each of this year's inductees is available at *http://www.nasa.gov/feature/nasa-glenn-inducts-new-class-into-hall-of-fame*.

We are pleased to announce the release of two new resources developed by GRC archivist Robert Arrighi (ATS, LLC) that tell the history of the Plum Brook Rocket Systems Area. The Rocket Systems Area was a series of small facilities that were essential to the early development of liquid-hydrogen propulsion systems. This work was completed as part of a historic mitigation project in partnership with our Historic Preservation Office, and it is key to understanding the larger history of the Saturn and Centaur upper-stage rockets, as well as other developmental rocket programs in the 1960s.

The book is titled *NASA's Hydrogen Outpost: The Rocket Systems Area at Plum Brook Station* (NASA SP-2016-628) and will be available through the NASA Technical Report Server (NTRS). The Rocket Systems Area Web site features a full history of each facility making up the site, primary source documents, photographs, and a research chronology. The site is located at *http://pbhistoryrsa.grc.nasa.gov*.

JOHNSON SPACE CENTER (JSC)

Houston, Texas

By John Uri

I am very excited to join the NASA History team as the new Johnson Space Center History Office Manager and thrilled to be working with Jennifer Ross-Nazzal and Sandra Johnson. In addition to acquiring new management, the History Office is relocating both organizationally and physically. The organizational change, effective 1 October 2016, saw the transfer of the History Office from the Information Resources Directorate to the Knowledge and Quality Systems Management Office within the Safety and Mission Assurance Directorate, with the Manager reporting directly to the JSC Chief Knowledge Officer, Jim Rostohar. This new arrangement will allow the History Office to leverage the resources and assets of a larger knowledge-management team. As for the physical relocation, that is a bit more complicated. Jennifer and Sandra have relocated to temporary office

space, where I have joined them, with the ultimate end game of moving all of us on-site into Building 1, the JSC main administration building, once office space there is built in early 2017. Physical proximity to Knowledge Management team members will no doubt be an added asset, as will the higher visibility of being on-site. I have spent the first few weeks on the job learning names and phone numbers, as well as all the great work that has been done by this office to date. I look forward to meeting, even if initially only via electronic media, as many members of the Agency's history team as possible in the near future. If you have any questions or helpful suggestions, please feel free to contact me at 281-244-8213 and at *john.j.uri@nasa.gov*.

> **"THE RESULTING ORION ORAL HISTORY PROJECT INCLUDES 20 INTERVIEWS WITH 14 INDIVIDUALS WHO HAVE CONTRIBUTED SIGNIFICANTLY TO THE SUCCESS OF THE ORION PROGRAM."**

Early in 2016, the Orion Program contacted the History Office about the possibility of a limited oral history project. After an agreement on the focus of the interviews and the subjects, the history team dedicated the summer to the task. The resulting Orion Oral History Project includes 20 interviews with 14 individuals who have contributed significantly to the success of the Orion Program. The oral history sessions reflect experiences and insight on topics such as the early days of the Constellation Program and its subsequent cancellation, the development of the Orion Program and spacecraft, and the challenges encountered in working toward the first successful launch of Exploration Flight Test 1 (EFT-1) on 5 December 2014. The interview transcripts are available online on the JSC History Portal (*http://www.jsc.nasa.gov/history*), along with all the other oral history projects that the team has finalized since 1997.

In September, JSC historian Jennifer Ross-Nazzal attended the Human Factors and Performance Team meeting "Piloting Spacecraft: Guidance and Control of Human Space Vehicles" at the National Space Biomedical Research Institute (NSBRI) in Houston. The workshop included speakers from across the Agency, universities, and the aerospace industry, who spoke on a variety of topics. Dr. Christian Gelzer, historian for Armstrong Flight Research Center, presented the luncheon address. The NSBRI meeting gave Christian and Jennifer an opportunity to discuss history matters and snap a few photos with Apollo 7 crewmember Walt Cunningham.

The JSC History Office was invited by the NASA Alumni League's JSC Chapter to present an overview of the office during their First Thursday meeting on 6 October 2016. During the well-attended meeting, John Uri reviewed the latest administrative changes to the History Office, as outlined above. Jennifer Ross-Nazzal highlighted the services provided by the History Office to numerous customers and shared an extensive list of publications, presentations, and other products resulting from work done by the History Office. Sandra Johnson outlined the cradle-to-grave process of the JSC Oral History Project, citing the latest statistics of 941 individuals interviewed over 1,195 sessions, resulting in 1,049 transcripts available online covering multiple programs and organizations. She also reviewed the contents of the JSC History Portal. During the ensuing question-and-answer and discussion session, the Alumni League was pleased with the new direction of the JSC History Office and was impressed with the amount of work that is being accomplished and fully supported a continuing working relationship between the two organizations.

In November, the National Trust for Historic Preservation held its annual meeting in Houston, Texas. Jennifer Ross-Nazzal and our Center Historic Preservation Officer, Sandra Tetley, will be presenting two workshops on the restoration of the Mission

Operations Control Room (MOCR), a National Historic Landmark (NHL), to how it looked in July 1969, as well as holding a Power Session. Workshop participants will tour the MOCR, learn about the restoration plans, and hear from former flight directors. They will also see the Center's other NHL, the Space Environment Simulation Laboratory. The 30-minute Power Session will be open to all conference attendees and will summarize the restoration efforts thus far.

LANGLEY RESEARCH CENTER (LARC)

Hampton, Virginia

By Gail Langevin

Langley Research Center has been preparing for its centennial and celebrating with pre-centennial events for the past few years. The Center dates its beginning from the groundbreaking of the first NACA Langley administration and research building on 17 July 1917. In 2017, the celebration will culminate with events for employees and the public.

The celebration began in 2015 with the NACA centennial. Dr. Roger Launius, Dr. Tom Crouch, and Dr. James Anderson of the Smithsonian Institution's National Air and Space Museum presented a history panel that looked at aspects of NACA Langley and its contributions to advancing aviation. Two presentations and question-and-answer sessions were given, one set for employees and one for the public. Langley's very first Hall of Honor class was inducted in 2015. Nineteen former employees from the NACA era were honored. Their stories are a cross-section of Langley's best accomplishments. The Hall of Honor inductees advanced wind tunnel development, research instrumentation, airfoil research, the quantification of aircraft handling qualities, aerodynamics research, transonic flight, and the very beginning of American crewed spaceflight. One inductee led the Center from the age of biplanes to the Space Age, and another was the first woman to be hired to conduct research.

In 2016, we celebrated the 40th anniversary of the Viking Mission to Mars with a history panel and daylong symposium. The history panel featured NASA historians Dr. Bill Barry, Dr. Erik Conway, and Dr. Glenn Bugos, joined by Dr. Roger Launius from the Smithsonian Institution. The panel was presented for both employees and the public. We were thrilled when C-SPAN decided to record the panel for later broadcast on their American History TV weekend program. You can watch it at ***http://go.nasa.gov/2gYC3Kh***. We also celebrated the 10-year anniversary of the Earth-observing satellite Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) and our partnership with the French Space Agency, Centre National d'Études Spatiales (CNES). The Langley-led mission also partnered with Ball Aerospace & Technologies for the instruments and payload integration. CALIPSO continues to provide a new insight into the role that clouds and atmospheric aerosols play in regulating Earth's weather. While most of Langley's early history involves accomplishments in aeronautics, these celebrations were a reminder of Langley's contributions to NASA's space and science goals.

A new computational facility is under construction at Langley and is scheduled for completion in 2017. As part of the ongoing centennial celebration, a building-naming ceremony was held on 5 May 2016, the 55th anniversary of Alan Shepard's historic spaceflight, when he became the first American in space. The building will be named the Katherine G. Johnson Computational Research Facility. Katherine Johnson, a Langley "human computer," computed the trajectory of Shepard's flight before the common use of electronic computers. Johnson celebrated her 98th birthday this year, and she and her family joined in the building-naming celebration.

The story of Katherine Johnson's career is the subject of the nonfiction book *Hidden Figures*, by Margot Lee Shetterly, which was published in September. Shetterly also tells the stories of NACA-era Langley computers Dorothy Vaughan and Mary Jackson, as well as the experiences of several other women who were computers at the time. The book brings to light the little-known story of the women, many of them African American, who performed thousands of calculations

NASA Langley Deputy Director Clayton Turner presents Katherine Johnson with a replica of the plaque that will be placed in the lobby of the Katherine G. Johnson Computational Research Facility.

to turn raw research and theoretical data into usable data. The accuracy of their work is directly reflected in the Center's accomplishments. 20th Century Fox Studios produced a film based on the book, which is expected to be in theaters nationwide January 2017.

Langley history author Joe Chambers is at work on a centennial book that will tell Langley's story through the years with photographs from our photo archive. The book is expected to be complete in spring 2017. Also in production is a centennial documentary film that is being produced in-house. Smithsonian historians Dr. Tom Crouch and Dr. Roger Launius will be featured in the film, along with former Langley historian and current Massachusetts Institute of Technology (MIT) Museum Director Dr. Deborah Douglas and meteorologist Dr. J. Marshall Shepherd of the University of Georgia. Additional plans include an employee picnic, a technical symposium, a second class of Langley Hall of Honor inductees, and the opening of a time capsule. The time capsule was buried in 1992 during Langley's 75th anniversary and will be reburied with additional items during the centennial year. The final part of the celebration will be an open house for the public in 2017. During the open house, buildings will be open for tours and will feature a look at Langley's past, present, and future.

Planning for the centennial events has provided an opportunity for many who have joined the planning teams to learn about Langley's 100 years of contributions to the nation's goals in aeronautics, space, and atmospheric science. Many times, the difficulty has been in choosing which stories to tell and which contributions to feature. Even as we at Langley pause to reflect on the accomplishments of those who came before us, we continue their work in making aircraft safer and more environmentally friendly, in studying our home planet, and in making the Journey to Mars a reality.

MARSHALL SPACE FLIGHT CENTER (MSFC)

Huntsville, Alabama

By Brian Odom and Jordan Whetstone

The Marshall History Office recently teamed up with Marshall's Office of Diversity and Equal Opportunity and the U.S. Space & Rocket Center in Huntsville, Alabama, to develop a panel discussion marking the 24 September grand opening of the National Museum of African American History and Culture in Washington, DC. The panel, entitled "African-American Voices from Marshall Space Flight Center," included four former and current Marshall employees and was moderated by Gerald L. Vines, director of the STEM Knowledge Center at Alabama A&M University. Included on the panel were Dr. Donald Frazier, Dr. Ruth Jones, Lewis Wooten, and Markeeva Morgan. Dr. Frazier retired from Marshall after holding the offices of Chief Scientist for Physical Chemistry and Deputy Chief Technologist. Dr. Jones currently serves as Mishap Investigative Specialist at the NASA Safety Center in Huntsville and is the second African American woman to earn a Ph.D. in physics in the state of Alabama. Lewis Wooten is the director of the Mission Operations Laboratory at Marshall and

In this photo, Alabama State Representative Laura Hall, center, cuts a ceremonial ribbon at the U.S. Space & Rocket Center in Huntsville on 24 September in celebration of the opening of the Smithsonian Institution's National Museum of African American History and Culture in Washington, DC. She is joined by participants of the "African-American Voices from Marshall Space Flight Center" panel discussion held earlier in the day. From left are Gerald Vines, Markeeva Morgan, Dr. Ruth Jones, Dr. Donald Frazier, Lewis Wooten, and Loucious Hires, director of Marshall's Office of Diversity and Equal Opportunity. (Photo credit: NASA)

previously served as payload operations director for the Spacelab missions and flight director of the Chandra X-ray Observatory. Markeeva Morgan is currently the Core Stage Avionics Hardware Manager for NASA's Space Launch System. The panel discussed the importance of STEM education in the African American community, as well as the significance of the opening of a museum dedicated to African American history and culture. The event also included a ribbon-cutting and remarks by Alabama State Representative Laura Hall.

The History Office has also started the process of updating its Web site. One of the first important updates to the site was the development of a page devoted to Power to Explore oral history interviews. These interviews were conducted in the late 1980s and early 1990s during research for the book *Power to Explore: A History of Marshall Space Flight Center, 1960–1990*, by Andrew J. Dunar and Stephen Waring. The interviews were conducted with Marshall managers whose time in service represented the years from the Saturn program to the Shuttle era, and the discussions cover diverse topics in between. According to Waring, a major goal of the interviews was to "get the perspectives of older Marshall retirees while they remained in good health" and "preserving memories of the Marshall Space Flight Center." These interviews can be found at *http://www.nasa.gov/centers/marshall/history/power_to_explore.html*.

Over the last few months, several archival collections have been processed, one of which is the Uwe Hueter Papers. The German-born Hueter, as the son of an original member of Dr. Wernher von Braun's rocket team, moved with von Braun to the United States in 1945. Hueter graduated from the University of Alabama with a degree in mechanical engineering and began work at Marshall in 1960, where one of his first assignments was working on a sound-suppression system for Saturn V testing. Later, he worked on the Skylab Apollo Telescope Mount (ATM), Spacelab, and the International Space Station. The Uwe Hueter Papers contain unique photographs of the ATM during its development from 1969 to 1971, as well as technical memoranda pertaining to the ATM.

In September, the History Office continued the process of transcribing and editing oral history interviews with members of the Chandra X-ray Observatory team. Among the subjects of those edited interviews are Dr. Martin Weisskopf, project scientist for Chandra; Dr. Harvey Tananbaum, former director of the Chandra X-ray Center; Dr. Roger Brissenden, manager of the Chandra X-ray Center and former flight director of the Chandra mission; Lewis Wooten, former operations manager for Chandra; and Dr. Belinda Wilkes, current director of the Chandra X-ray Center. Each interview provides great insight into the development of the observatory from its proposal in the late 1970s to launch and "first light" in 1999. These interviews are part of the Chandra Oral History Project and will eventually be posted on the Marshall Oral Histories Web page.

OTHER AEROSPACE HISTORY NEWS

NATIONAL AIR AND SPACE MUSEUM (NASM)

By Valerie Neal and Jennifer Levasseur

Harvard astronomer David Charbonneau delivered the fourth and final lecture in the 2016 Exploring Space series; his topic was "How To Find an Inhabited Exoplanet." He argued for an armada of ground-based and space-based missions, including the Giant Magellan Telescope in Chile (with Smithsonian involvement) and the Transiting Exoplanet Survey Satellite (TESS).

Cathy Lewis led a nine-day Smithsonian Journey to Moscow and Star City in Russia, as well as Baikonur, Kazakhstan, where the tour group witnessed a Soyuz launch carrying crew to the International Space Station. During the tour, she presented several lectures and narrated visits to training and simulation facilities, museums, and monuments related to the history of the Soviet/Russian space program.

David DeVorkin led a weeklong "Northern Lights" Smithsonian Journey to Iceland and presented lectures on the nature of aurorae and research methods for studying the Sun, solar wind, magnetosphere, and Sun-Earth connection.

NASM curator Cathy Lewis and conservator Lisa Young traveled to London to install William Anders's Apollo 8 spacesuit at the Victoria and Albert Museum for their "Revolutions" exhibition.

The Smithsonian Digital Projects Office (DPO) team spent a week completing the first phase of high-resolution 3D digital scanning of the Space Shuttle orbiter Discovery. Three more weeks of scanning are scheduled during the fall and winter to accumulate the multilevel data that will constitute a digital model of the vehicle. Discovery is the largest artifact yet attempted for this process. This project follows the successful scanning and modeling of the Wright 1903 Flyer and the Apollo 11 Command Module Columbia.

Michael Neufeld presented a paper titled "The Difficult Birth of NASA's Pluto Mission" at the combined meeting of the American Astronomical Society/Planetary Sciences Division and European Planetary Science Conference in Pasadena, California. He then gave the talk as a colloquium at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland.

Margaret Weitekamp participated in a panel discussion at TIFF Bell Lightbox, the year-round cultural organization that supports the Toronto International Film Festival. The event in Toronto, titled "Trek Talks: Space, Diplomacy and the United Federation of Planets," featured a moderated discussion between Weitekamp, Canadian Space Agency astronaut Jeremy Hansen, and *Star Trek* screenwriter and director Nicholas Meyer about *Star Trek*'s depictions of diplomacy. She also participated in two presentations at "Mission: New York," a *Star Trek* convention held in New York City, and a number of other events related to the 50th anniversary of the debut of the original *Star Trek* television series. The Smithsonian Channel aired a 2-hour televised documentary entitled "Building *Star Trek*" that featured Weitekamp, conservator Malcolm Collum, and the studio model of the starship Enterprise.

Three NASM Space History curators presented papers at the annual Artefacts conference, hosted this year from 2 to 4 October 2016 by the Science Museum in London. Artefacts is jointly organized by NASM, the Science Museum, and the Deutsches Museum (Munich). NASM presenters included Martin Collins, who gave the opening keynote address, titled "The Problem of the 'Self': Museums, Materiality, Imaginaries…and Other Stuff (Users! Artefacts!)." Jennifer Levasseur discussed "When Seconds Count: Astronaut Personal Timekeeping Devices" as part of a panel on questioning everyday objects, and Margaret Weitekamp presented "Teaching Visitors To Think Like Historians: The Boeing Milestones of Flight Hall at the Smithsonian's National Air and Space Museum" as part of a session on museum users as historians.

2017 FELLOWS SELECTED

By Andres Almeida

Michelle Grisé, a doctoral candidate at Yale University, is the recipient of this year's NASA Fellowship in the History of Space Technology offered by the Society for the History of Technology (SHOT). Her dissertation, a transnational project drawing on work in archives from Washington to Moscow to Islamabad, examines the evolving role of scientific development in Pakistan's national development and national security planning between 1947 and 1990. The history of Pakistan's space program, the Space and Upper Atmosphere Research Commission (SUPARCO), is central to this narrative. Michelle received her J.D. from the University of Michigan Law School and her A.B., with honors, from the University of Chicago.

Brian Conway, a doctoral candidate at Stony Brook University, is the recipient of this year's History of Science Society (HSS) Fellowship in the History of Space Science. Brian is a Cold War historian with an emphasis on diplomacy, strategy, and decolonization. His dissertation, "Bread and Bombers: US Military Bases in Morocco, 1948–1964," builds a narrative concerning the negotiations for American air and naval bases in Morocco during the 1950s and '60s. This work also forms a subset known informally as "base studies": the examination of the strategic, economic, cultural, diplomatic, and other aspects of military bases on other nations' soil. Brian has a B.A. in history from Providence College (1994) and an M.A. from Queens College (2010). He would like to relocate to Washington, DC, and finish his Ph.D. while working in the field of American foreign relations and diplomacy.

Greg Eghigian, associate professor of modern history and former director of the Science, Technology, and Society Program at Pennsylvania State University, is the recipient of this year's NASA-supported Fellowship in Aerospace History offered by the American History Association. Greg will work on his upcoming book, *After the Flying Saucers Arrived: A History of the Rise and Fall of the UFO and Alien Contact Phenomenon*.

The book will be the first to contextualize the rise and fall of unidentified flying object (UFO) and alien reports as a global phenomenon, arguing that Cold War–era reports of UFO and alien contact originated from more complex cultural concerns and developments than previously believed. *After the Flying Saucers Arrived* will be the first English-language monograph on extraterrestrial contact by an academic historian since 1975. Greg received his Ph.D. in 1993 from the University of Chicago.

"THE BOOK WILL BE THE FIRST TO CONTEXTUALIZE THE RISE AND FALL OF UNIDENTIFIED FLYING OBJECT (UFO) AND ALIEN REPORTS AS A GLOBAL PHENOMENON, ARGUING THAT COLD WAR–ERA REPORTS OF UFO AND ALIEN CONTACT ORIGINATED FROM MORE COMPLEX CULTURAL CONCERNS AND DEVELOPMENTS THAN PREVIOUSLY BELIEVED."

AMERICAN ASTRONAUTICAL SOCIETY (AAS) HISTORY COMMITTEE

By Michael Ciancone, Chair

New Members

The AAS History Committee welcomes Rob Godwin to its ranks.

Ordway Award

The AAS Ordway Selection Panel has considered the pool of nominees for the 2016 Ordway Award for Sustained Excellence in Spaceflight History. The Ordway Award is named in memory of Frederick I. Ordway III (1927–2014), human spaceflight advocate and chronicler of the history of rocketry and space travel. The award recognizes exceptional, sustained efforts to inform and educate on spaceflight and its history through one or more media, such as 1) writing, editing, or publishing; 2) preparing and/or presenting exhibits; or 3) producing for distribution through film, television, art, or other nonprint media. The award is managed by the History Committee of the AAS. The recipients of the 2016 Ordway Award are as follows:

Chuck Lundquist (Archivist)
Toni Myers (Audiovisual)
Pat Rawlings (Artist)
Frank Winter (Author)

Emme Award for Astronautical Literature

The AAS Emme Selection Panel, chaired by Don Elder, has been busy this past summer reviewing titles submitted for consideration. After careful consideration, the panel has selected the following recipient of the 2015 Emme Award: Monique Laney, for *German Rocketeers in the Heart of Dixie: Making Sense of the Nazi Past During the Civil Rights Era* (Yale University Press).

MUSEUM OF ART & HISTORY (MOAH)

By Cam Martin

A 70th anniversary exhibition of NASA aerospace art was on display from 13 August to 2 October 2016 at MOAH in Lancaster, California, to celebrate the establishment of what would become NASA's Armstrong Flight Research Center.

Armstrong's Cam Martin served as the museum's guest curator for "NASA Flight Research: Probing the Sky" and gave an hourlong lecture highlighting the high-speed flight research legacy of the 1946 NACA Muroc Flight Test Unit.

"NASA Flight Research: Probing the Sky"

In late 1946, 13 engineers and staff from the NACA Langley Memorial Aeronautical Laboratory in Virginia

arrived at Muroc Army Airfield to establish what is now known as NASA's Armstrong Flight Research Center (AFRC), participating in the first NACA transonic and supersonic research flights by the Navy's Douglas D-558-1 Skystreak and the Air Force's legendary Bell X-1 rocket plane. Just a year later, on 14 October 1947, Chuck Yeager flew his rocket-powered Bell X-1 over Muroc Dry Lake (now Rogers Dry Lake), making the first supersonic flight in aviation history. Today, AFRC is the primary hub of atmospheric flight research and operations in the United States, housing some of the most advanced aircraft in the world. Critical to carrying out missions of space exploration and aeronautical research and development, the Center continues to accelerate advances and make important discoveries in the fields of science, technology, operations, and testing. The Center also houses a fleet of piloted and robotic environmental science aircraft that support new developments in the fields of astrophysics and Earth science, fulfilling NASA's goals of enhancing education, knowledge, innovation, economic vitality, and stewardship of Earth.

"Probing the Sky" featured artwork and sculptures borrowed from the Center's collection, detailing the people and hardware that make up the vibrant history of aviation innovation in southern California. Featured works included exhibiting artist Robert Schaar's painted portraits of the NACA/NASA pilots inducted into the Aerospace Walk of Honor on Lancaster Boulevard, as well as various paintings, drawings, and sculptures by artists known for their work in and about the aerospace industry. Schaar is a highly regarded portrait painter who is one of an elite group of artists composing the NASA Art Program; his work was included in NASA's "Visions of Flight" program, viewed in museums worldwide. Schaar's "Walk of Honor" portraits feature test pilots whose aviation careers were marked by significant achievements beyond one accomplishment. Dr. Robert T. McCall's "The Apollo Story" is a suite of five original cold stone lithographs depicting the legacy of the Apollo Moon-landing program. The display incorporated many individual fine art paintings of classic early X-planes such as the Bell X-1, the Douglas Skystreak and Skyrocket, the Douglas X-3 Stiletto, and the Northrop X-4 Bantam. Shown together, these works formed a vivid retelling of some of the most significant figures and achievements in aeronautics.

MOAH is located at 665 West Lancaster Boulevard, Lancaster, California 93534.

THE FINAL COUNTDOWN: EUROPE IN THE AGE OF SPACE

By Constanze Seifert, Freie Universität Berlin, *c.seifert@fu-berlin.de*

After half a decade of intense work, the Emmy Noether Research Group called "The Future in the Stars: European Astroculture and Extraterrestrial Life in the Twentieth Century" at Freie Universität Berlin organized their final conference. "Futuring the Stars: Europe in the Age of Space" was a three-day event organized by Alexander Geppert, Jana Bruggmann, and Tilmann Siebeneichner from 17 to 19 March 2016.[1] In 2010, the group set out to investigate the cultural history of outer space between the 1920s and the 1970s in order to gain a new perspective on the history of 20th-century Europe. The final conference featured 13 presentations that examined the ways in which outer space has been used in different, competing visions of the future. The group members and invited guests, many of whom had already taken part in earlier symposia, recalled their collective work on the historicizing of outer space.[2]

1 A more comprehensive version of this article can be found at ***http://www.hsozkult.de/conferencereport/id/tagungsberichte-6621***; for a detailed program and abstracts of all presentations, please consult ***http://www.geschkult.fu-berlin.de/futuring.***

2 Friederike Mehl, "Berlin Symposium on Outer Space and the End of Utopia in the 1970s," *NASA History News & Notes* 29, nos. 2–3 (2012): 1–15; Katja Rippert, "The Sonic Dimension of Outer Space, 1940–1980," *NASA History News & Notes* 30, no. 2 (2013): 17–20; Tom Reichard, "Battlefield Cosmos: The Militarization of Space, 1942–1990," *NASA History News & Notes* 31, no. 3 (2014): 20–21.

Shown is a group of "Futuring the Stars: Europe in the Space Age" presenters and participants. (Photo credit: Bernd Wannenmacher, Freie Universität Berlin, 18 March 2016)

In his introduction, Alexander Geppert (New York/Shanghai) presented the group's main findings and achievements. Having previously coined the umbrella term "astroculture" to analyze and mark interconnections between space-related products and their cultural significance, the conference revisited ongoing questions and challenges behind the conceptualization and periodization of the Space Age and the exploration of outer space in science and fiction. The selection of presentations was intended to address different case studies of political, cultural, technological, and transcendental aspects of space thought and spaceflight.

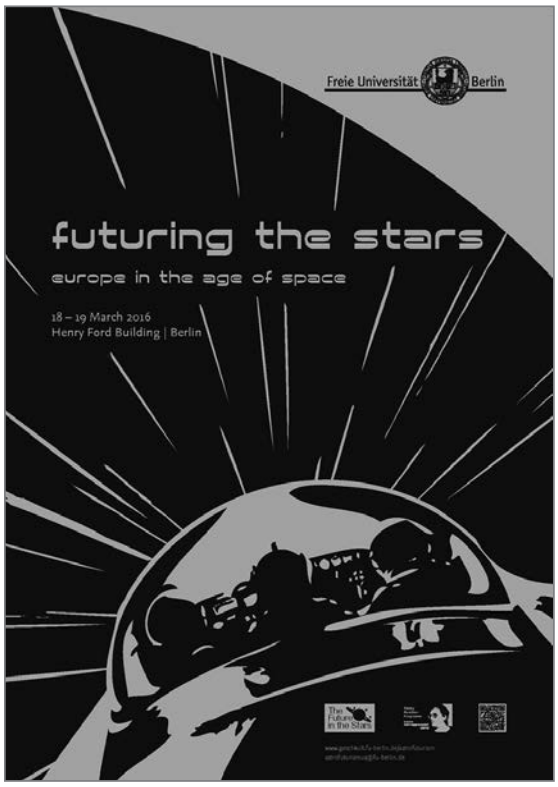
Investigations of the history of astrocultural places and the belief in technological progress were combined with questions regarding the visual history of the imagination and exploration of outer space on the conference's first day. Correlating with the "Raketenrummel," Katherine Boyce-Jacino (Baltimore) drew attention to the history of planetaria and the desire for a cosmic experience in the Weimar Republic. In contrast, Philipp Aumann (Peenemünde) encouraged critical reflection about the belief in technological innovation and the mythologization of the "Heeresversuchsanstalt Peenemünde" as the birthplace of space travel. Following the institutionalization of space research in West Germany after 1945, Daniel Brandau (Berlin) showed how rocketry had lost its utopian characteristics by 1960. Subsequently, Robert Poole (Preston, England) emphasized the influence of space advocates like Arthur C. Clarke in encouraging public enthusiasm for space programs. Bringing the first day to a close, Jana Bruggmann (Berlin) and Natalija Majsova (Ljubljana, Slovenia) compared the influence of iconic space imagery on the rise of global self-awareness, focusing on the visual history of outer space from the 1880s to the 1990s.

The conference's second day provided insight into the public reception of European and American space

projects. Ralf Bülow (Berlin) illustrated the spirit of the Space Age in West German television, recalling the first German space documentaries and the 1960s TV series *Raumpatrouille: Die phantastischen Abenteuer des Raumschiffes Orion*. Shifting the gaze toward the post-Apollo period, Tilmann Siebeneichner (Berlin) analyzed media coverage of the first Spacelab flights in the 1980s, showing how contemporary hopes for international cooperation collided with the American Strategic Defense Initiative (SDI). A concluding presentation drew attention to a new perspective on outer space history. Thore Bjørnvig (Copenhagen) provoked much debate with his concept of "outer space religion" as an interpretative tool for studying astroculture and different ways of extraterrestrial encountering.

Seeing the making of a globally imagined community and the planetization of Earth, a global consciousness concept coined in 1946 by Pierre Teilhard de Chardin, as a direct consequence of the classical Space Age, Geppert argued for a more global view of astroculture, space thought, and spaceflight. Bringing astroculture and the historiographies of the modern era together, Martin Collins (Washington, DC) suggested a more spatial and temporal demarcation. A concluding panel discussion examined the conceptualization and potential characteristics of a European Space Age from the interwar years through the post-Apollo period. This led to different perspectives and periodizations concerning the "transatlantic century" (especially by Molly Nolan, New York). Michael J. Neufeld (Washington, DC) drew attention to the ongoing expansion of space infrastructure and the "New Space Age," while Dirk van Laak (Gießen, Germany) emphasized the lack of public support and enthusiasm in Europe since the 1970s because a future in the stars could not prove its necessity to everyday life.

"Futuring the Stars" was an extraordinary end to an exciting project and uncovered new research directions, like the need for more close readings from other geopolitical areas and movements, as well as further studies about the rise of space powers in Asia. The group created a community of interdisciplinary scholars who contributed to de-exoticizing the study of outer



Pictured is a "Futuring the Stars: Europe in the Space Age" conference poster. (Artwork by Goesta Roever, Freie Universität Berlin)

space and integrating it into mainstream historiography. In addition to the due-to-be-reissued *Imagining Outer Space*, two forthcoming volumes will address astroculture during the conflict-ridden 1970s and its dystopian and "violent" dimension, thus completing a trilogy that documents the research group's efforts and research interest over the past half decade.[3] Their last symposium revealed an atmosphere of gratitude and strong mutual support among the participants.

3 Alexander C. T. Geppert, ed., *Imagining Outer Space: European Astroculture in the Twentieth Century* (Basingstoke, U.K.: Palgrave Macmillan, 2012); idem, ed., *Limiting Outer Space: Astroculture After Apollo* (London: Palgrave Macmillan, 2017); Alexander C. T. Geppert, Daniel Brandau, and Tilmann Siebeneichner, eds., *Militarizing Outer Space: Astroculture and Dystopia* (London: Palgrave Macmillan, 2017).

RECENT PUBLICATIONS

COMMERCIALLY PUBLISHED WORKS

By Chris Gamble

In the Footsteps of Columbus: European Missions to the International Space Station, by John O'Sullivan (Springer-Praxis, June 2016). The European Space Agency (ESA) has a long history of cooperating with NASA in human spaceflight; for example, the ESA developed the Spacelab module that was sometimes carried in the Space Shuttle's payload bay. This book tells of the development of the ESA's Columbus microgravity science laboratory on the International Space Station and the European astronauts who work in it.

The International Atlas of Mars Exploration: Volume 2, 2004 to 2014: From Spirit to Curiosity, by Philip J. Stooke (Cambridge University Press, May 2016). Beginning with the 2004 landing of the Spirit and Opportunity rovers in 2004 and concluding with the end of the Curiosity mission in 2014, this second volume of *The International Atlas of Mars Exploration* serves as a reference source on Mars and its moons, combining scientific and historical data with detailed illustrations to provide a thorough analysis of 21st-century Mars mission proposals, spacecraft operations, landing site selections, and surface locations.

The Future of Human Space Exploration, by Giovanni Bignami and Andrea Sommariva (Palgrave Macmillan, August 2016). This book analyzes the move toward planet hopping, which sees human outposts moving across the planetary dimensions, from the Moon to near-Earth asteroids and Mars. It critically assesses the intention to exploit space resources and how successful these missions will be for humanity.

Mars: Making Contact, by Rod Pyle (Andre Deutsch, Ltd., September 2016). This book offers a visually stunning insider's look at how Mars has been explored and the challenges facing future missions. The book discusses the many challenges faced, from the design of the spacecraft to the physical and psychological impact of space travel on the human body.

The Illustrated Encyclopedia of Space & Space Exploration: Discovering the Secrets of the Universe, edited by Giles Sparrow (Amber Books, July 2016). From the creation of the solar system to the Moon landings, and from the chances of life on other planets to how stars shine, this book investigates the cosmos and humankind's efforts to understand it. Every spread is filled with artwork, photographs, data tables, and explanations of the workings of the stars and planets, moons, rockets, and satellites.

All These Worlds Are Yours: The Scientific Search for Alien Life, by Jon Willis (Yale University Press, August 2016). Long before space travel was possible, the idea of life beyond Earth transfixed humans. In this fascinating book, astronomer Jon Willis explores the science of astrobiology and the possibility of locating other life in our own galaxy.

NASA Saturn V Manual, by David Woods (Haynes Publishing, August 2016). Few launch vehicles are as iconic and distinctive as NASA's behemoth rocket, the Saturn V, and none left such a lasting impression on those who watched it ascend. Developed with the specific purpose to send humans to the Moon, it pushed rocketry to new scales. Woods's *Saturn V Manual* tells the story of how each of the vehicle's three stages worked: Boeing's S-IC first stage with a power output as great as the United Kingdom's peak electricity consumption; North American Aviation's troubled S-II second stage; and McDonnell Douglas's workhorse S-IVB third stage, with its instrument unit brain—as much a spacecraft as a rocket.

The Ethics of Space Exploration, edited by Tony Milligan and James Schwartz (Springer, July 2016). This book aims to contribute significantly to the understanding of issues of value (including the

ultimate value of space-related activities), which repeatedly emerge in interdisciplinary discussions on space and society. One of the volume's aims is to promote a more robust and theoretically informed approach to the ethical dimension of discussions on space and society.

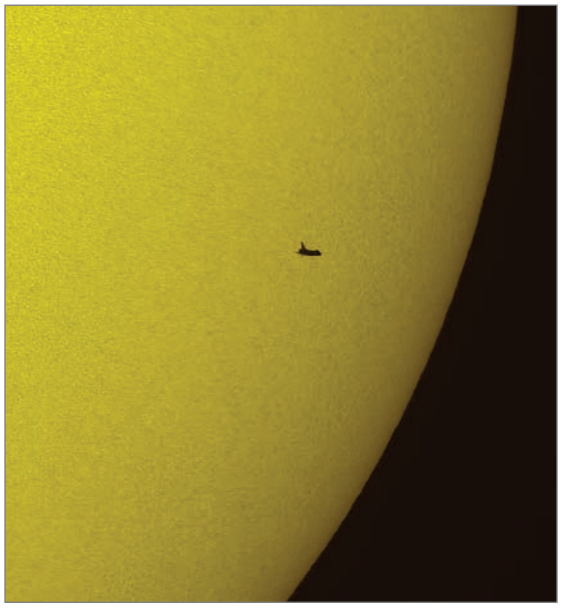
Principles of Nuclear Rocket Propulsion, by William J. Emrich, Jr. (Butterworth-Heinemann, August 2016). This book provides an understanding of the physical principles underlying the design and operation of nuclear fission–based rocket engines. Most of the book's emphasis is on nuclear thermal rocket engines, wherein the energy of a nuclear reactor is used to heat a propellant to high temperatures and then expel it through a nozzle to produce thrust. Emrich also touches upon other concepts, such as the nuclear pulse rocket, wherein the force of externally detonated nuclear explosions is used to accelerate a spacecraft.

Historical Guide to NASA and the Space Program, by Ann Beardsley (Rowman & Littlefield Publishers, August 2016). This book contains a chronology, an introduction, appendices, and an extensive bibliography. The dictionary section has over 500 cross-referenced entries on space missions, astronauts, technical terms, satellites, Space Shuttles, and the International Space Station. This book is an excellent access point for students, researchers, and anyone wanting to know more about NASA and space exploration.

Eyes on the Sky: A Spectrum of Telescopes, by Francis Graham-Smith (Oxford University Press, August 2016). Four centuries ago, Galileo first turned his telescope to look up at the night sky. His discoveries opened the cosmos, revealing the geometry and dynamics of the solar system. Today's telescopic equipment, stretching over the whole spectrum from visible light to radio and millimeter astronomy, through infrared to ultraviolet, including x rays and gamma rays, has again transformed our understanding of the whole universe. In this book, the author explains how this technology can be engaged to give us a more in-depth picture of the nature of the universe. Looking at both ground-based telescopes and telescopes on spacecraft, he analyzes their major discoveries, from planets and pulsars to cosmology.

Spaceman, by Mike Massimino (Crown Archetype, October 2016). Many children dream of becoming astronauts when they grow up, but when a six-year-old Mike Massimino saw Neil Armstrong walk on the Moon, he knew what he wanted to do when he became an adult. Eventually, he applied to NASA's astronaut corps, but NASA rejected him. After he applied again, they turned him down because of his poor eyesight. For the next year, he trained his eyes to work better until finally, after applying for the third time, NASA accepted him, beginning Massimino's 18-year career as an astronaut. In this memoir, he reveals the hard work, camaraderie, and sheer guts involved in the life of an astronaut. He vividly describes what it is like to strap yourself into the Space Shuttle and blast off into space, along with the sensation of walking in space, as he did when he completed a mission to service the Hubble Space Telescope. He also talks movingly about how it felt to step into the Space Shuttle again after the Columbia accident.

Hidden Figures: The Story of the African-American Women Who Helped Win the Space Race, by Margot Lee Shetterly (William Morrow, September 2016). Set against the backdrop of the Jim Crow South and the civil rights movement, *Hidden Figures* recalls NASA's groundbreaking successes through the experiences of five courageous, intelligent, determined, and patriotic women: Dorothy Vaughan, Mary Jackson, Katherine Johnson, Christine Darden, and Gloria Champine. Drawing on oral histories, personal recollections, interviews with NASA executives and engineers, archival documents, correspondence, and reporting from the era, *Hidden Figures* interweaves a rich history of scientific achievement and technological innovation with the intimate stories of five women whose work forever changed the world—and whose lives show how out of one of America's most painful histories came one of its proudest moments. This American story will also be told in a soon-to-be-released feature film.



In this tightly cropped image, the NASA space shuttle Atlantis is seen in silhouette during solar transit, Tuesday, May 12, 2009, from Florida. This image was made before Atlantis and the crew of STS-125 had grappled the Hubble Space Telescope. Photo Credit: (NASA/Thierry Legault)

Placing Outer Space: An Earthly Ethnography of Other Worlds (Experimental Futures), by Lisa Messeri (Duke University Press Books, September 2016). In this book, Lisa Messeri traces how the place-making practices of planetary scientists transform the void of space into a cosmos filled with worlds that can be known and explored. Creating simulations on Earth of the terrain of planets and other celestial bodies is central to the daily practices and professional identities of the astronomers, geologists, and computer scientists Messeri studies. She takes readers to the Mars Society's Mars Desert Research Station, showing how scientists transform Earth into a Martian place and use the Utah desert to create narratives of Martian exploration. At NASA Ames Research Center, she traces how scientists inscribe senses of place within digital maps of Mars. Messeri also joins scientists at Chile's Cerro Tololo Inter-American Observatory and in MIT's labs as they discover exoplanets and combine telescopic data with their planetary imagination to capture both a planet's past and future and what it would be like to visit and live there.

StarTalk: Everything You Ever Need To Know About Space Travel, Sci-Fi, the Human Race, the Universe, and Beyond, edited by Neil deGrasse Tyson, Jeffrey Simons, and Charles Liu (National Geographic, September 2016). This beautifully illustrated companion to celebrated scientist Neil deGrasse Tyson's popular podcast and National Geographic Channel TV show is an eye-opening journey for anyone curious about the complexities of our universe. Tyson's pioneering, provocative book will take the greatest hits from the airwaves to the page in one smart, richly illustrated compendium. Featuring vivid photography, thought-provoking sidebars, enlightening facts, and fun quotes from science and entertainment luminaries like Bill Nye and Dan Aykroyd, *StarTalk* reimagines science's most challenging topics—from how the brain works to the physics of comic book superheroes.

Blueprint for a Battlestar: Scientific Explanations Behind Sci-Fi's Greatest Inventions, by Rod Pyle (Sterling, October 2016). From transporters to fully functioning androids, science fiction expands our imaginations, spurring us to think about what the future might hold. But what would it take to bring this fictional technology to fruition? Here, in an irresistible analysis, is the real science behind 25 inventions from the most popular sci-fi movies and TV series. Rob Pyle explains and dissects each concept—including time machines, warp drives, cyborgs, nanomachines, lightsabers, jet packs, exoskeletons, cloaking devices, and more—featuring 75 specially commissioned blueprint-style illustrations, as well as a center gatefold.

Sigma 7—The Six Mercury Orbits of Walter M. Schirra, Jr., by Colin Burgess (Springer-Praxis, June 2016). Colin Burgess offers a comprehensive yet personal look at the 1962 orbital mission of Wally Schirra aboard the spacecraft Sigma 7. The book, which explores the astronaut's life and accomplishments, continues the Pioneers in Early Spaceflight series, the volumes of which form an excellent record of Project Mercury's groundbreaking early phase of the Space Age.

How To Make a Spaceship: A Band of Renegades, an Epic Race, and the Birth of Private Space Flight, by Julian Guthrie (Penguin Press, September 2016). Julian Guthrie thought she knew about obsessive pursuits, but the XPRIZE race spurred another level of drama, sacrifice, and technical wizardry. With Peter Diamandis' cooperation, Guthrie had access to all of the players—from Richard Branson and John Carmack to Burt Rutan—and has melded their stories into a spellbinding narrative, a combination of "Rocket Boys" (Homer Hickam) and *The New New Thing* (Michael Lewis). In the end, as Diamandis dreamed, the result was not just a victory for one team; it was the foundation for a new industry, including SpaceX, Virgin Galactic, Blue Origin, and others. Today, Scaled Composites' SpaceShipOne hangs in the Smithsonian Institution's Air and Space Museum, above the Apollo 11 capsule and next to Charles Lindbergh's Spirit of St. Louis plane.

Waiting for Contact: The Search for Extraterrestrial Intelligence, by Lawrence Squeri (University Press of Florida, October 2016). *Waiting for Contact* tells the story of the Search for Extraterrestrial Intelligence (SETI) movement, which emerged in 1959 as new technological developments turned what once was speculation into science: astronomers began using radio telescopes to listen for messages from space. Boosted by support from Frank Drake, Philip Morrison, and Carl Sagan, the SETI movement gained followers and continues to capture imaginations today.

Project Apollo: The Early Years, 1961–1967, by Eugen Reichl (Schiffer, September 2016). This volume, part of the America in Space Series, covers the early years of the Apollo program (1961–67). In a very short time, NASA developed the mighty Saturn rockets and the Apollo Command and Service Module and Lunar Module. This breathtaking development came at a cost, however: in 1967, astronauts Virgil Grissom, Roger Chaffee, and Edward White lost their lives during a test on the launch pad. Ten months after the catastrophe, however, the Saturn V, America's Moon rocket, made its triumphal uncrewed maiden flight. After that, just 20 more months would pass before humans set foot on another celestial body for the first time.

TIME Mission to Mars: Our Journey Continues, by the editors of *TIME* (*TIME*, September 2016). *TIME*'s special edition takes you inside the science and the debate of getting to Mars. This edition explores how American astronaut Scott Kelly spent a year on the International Space Station to measure the effects of prolonged space travel, the exciting technology being developed to make the journey to Mars, and conceptual plans for establishing a permanent settlement on the Red Planet.

LIFE The Great Space Race: How the U.S. Beat the Russians to the Moon, by the editors of *LIFE* (*LIFE*, September 2016). *The Great Space Race* is an epic drama filled with triumphs and tragedies, both technological and deeply human, that riveted the United States even as it seemed that the fate of the free world (perhaps even the world itself) hung in the balance. The book features rarely seen, exclusive photographs, reflecting *LIFE*'s insider access to the astronauts, their families, and their missions.

The Art of Flight, by John Watkinson (American Institute of Aeronautics and Astronautics, September 2016). In *The Art of Flight*, part of the Library of Flight series, John Watkinson chronicles the disciplines and major technologies that allow heavier-than-air machines to take flight. He explains how airplanes actually fly via a qualitative understanding of the underlying process, rather than a heavy reliance on mathematics. After providing historical and technical background, the author in turn examines aerodynamics, the power plant, flight information, control, performance, surface effect, and more. *The Art of Flight* will appeal to the technically minded reader who seeks a reflective, thoughtful introduction to the concepts that allow flight.

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

UPCOMING MEETINGS

The annual meeting of the American Historical Association (AHA) will be held **5–8 January 2017** in Denver, Colorado. Visit *https://www.historians.org* for details.

The American Institute for Aeronautics and Astronautics (AIAA) Science and Technology Forum and Exposition (AIAA SciTech 2017) will be held **9–13 January 2017** in Grapevine, Texas. Visit *https://www.aiaa-scitech.org* for details.

The 55th American Astronautical Society (AAS) Robert H. Goddard Memorial Symposium will be held **7–9 March 2017** in Greenbelt, Maryland. Visit *http://astronautical.org/events/goddard* for details.

The "NASA in the 'Long' Civil Rights Movement Symposium" will be held **16–17 March 2017** at the University of Alabama in Huntsville. Visit *https://www.nasa.gov/centers/marshall/history/call-for-papers-nasa-in-the-long-civil-rights-movement-symposium-university-of-alabama.html* for details.

The International Astronautical Federation (IAF) Spring Meetings will be held **21–23 March 2017** in Paris, France. Visit *http://www.iafastro.org* for details.

The annual meeting of the Organization of American Historians (OAH) will be held **6–9 April 2017** in New Orleans, Louisiana. Visit *http://www.oah.org* for details.

The annual meeting of the National Council on Public History (NCPH) will be held **19–22 April 2017** in Indianapolis, Indiana. Visit *http://ncph.org* for details.

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

The Kenneth E. Behring National History Day (NHD) Contest will be held **11–15 June 2017** in College Park, Maryland. Visit *https://nhd.org/kenneth-e-behring-national-contest* for details.

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

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

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OBITUARIES

FORMER NASA ASTRONAUT AND SPACE MEDICINE PIONEER DUANE GRAVELINE DIES

By intern Robert Collom

NASA and the space medicine community lost a true pioneer on 5 September 2016 with the passing of Duane Edgar Graveline, M.D., M.P.H., at the age of 85.

After medical school, Dr. Graveline completed an aerospace medicine residency at the U.S. Air Force School of Aerospace Medicine in San Antonio in 1960. He began his career with NASA after service as an Air Force flight surgeon; graduate studies at the Johns Hopkins School of Hygiene and Public Health; and work as a researcher at the Aerospace Medical Research Laboratory, where he studied the effects of weightlessness on the human body. Graveline's research interest set the stage for the development and use of the Lower Body Negative Pressure device used on Mir and the International Space Station. Graveline was the author of 15 publications on the microgravity environment, which included original work on the deconditioning of astronauts after prolonged stays in space.

Duane Edgar Graveline

"GRAVELINE WAS THE AUTHOR OF 15 PUBLICATIONS ON THE MICROGRAVITY ENVIRONMENT, WHICH INCLUDED ORIGINAL WORK ON THE DECONDITIONING OF ASTRONAUTS AFTER PROLONGED STAYS IN SPACE."

Starting in July 1962, Graveline served on the flight control team for both the Mercury and Gemini programs. During this time, he was assigned as a medical monitor for every mission up until his own selection as an astronaut. In 1965, Graveline was selected from a pool of over 1,400 applicants as one of six scientist-astronauts in the fourth astronaut selection group. That summer, Graveline began supersonic jet training at Williams Air Force Base in Arizona.

Several months later, Graveline resigned from NASA and the astronaut program for personal reasons. He returned to his home state of Vermont and entered private medical practice. At the dawn of the Space Shuttle flights, Graveline served as the Director of Medical Operations at Kennedy Space Center (KSC) for the first four Space Shuttle launches. From 2003 to 2005, he served as space medicine consultant to KSC in the area of cosmic radiation based on his research at the Brookhaven National Laboratory.

Graveline is among only a handful of selected astronauts who never flew in space. He is also the only

astronaut so far to hail from Vermont. Graveline's passion for space and space medicine leaves a legacy for NASA and the space medicine community.

APOLLO-ERA HERO JOHN "JACK" GARMAN DIES

By intern Nicholas Russo

The space community lost a hero from the Apollo era when John "Jack" Garman passed away on 20 September 2016 at the age of 72. He had held many positions at NASA, wrapping up his 34-year career in 2000 as the Chief Information Officer for NASA's Johnson Space Center.

While Garman made numerous contributions to NASA during his long career, as well as after his retirement as a contractor and consultant, he will be forever renowned by the Agency for his pivotal calls on 20 July 1969. Just three years after being hired by Johnson Space Center in 1966, the 25-year-old Garman found himself making a key decision during the incredibly intense descent of the Apollo 11 Lunar Module, Eagle, to the surface of the Moon. Minutes before landing, Neil Armstrong and Buzz Aldrin were surprised by a computer alarm that they had never seen in their training. What did a 1202 alarm mean? (The unspoken question: should they abort the landing?) The alarm question came directly from Eagle to Steve Bales, guidance officer at Mission Control. Bales immediately called to Garman, who was working in the "back room" supporting him. In preparation for the landing, Garman had made a list of all of the computer alarms, and he knew immediately that a 1202 was just a warning that the guidance computer was temporarily overloading. The landing could continue. Garman's preparation and clarity under pressure prevented an abort. Armstrong and Aldrin made history that day.

"…HE WILL BE FOREVER RENOWNED BY THE AGENCY FOR HIS PIVOTAL CALLS ON JULY 20, 1969. … 25-YEAR-OLD JACK GARMAN FOUND HIMSELF MAKING A KEY DECISION DURING THE INCREDIBLY INTENSE DESCENT OF THE APOLLO 11 LUNAR MODULE, EAGLE, TO THE SURFACE OF THE MOON."

Jack Garman receives an award from Chris Kraft, director of flight operations in Mission Control, for his role in the Apollo 11 mission.

Garman was born near Chicago, Illinois, and graduated from the University of Michigan in 1966 with a bachelor's degree in engineering physics. Hired directly out of college by NASA to work in the Flight Support Division at the Manned Spacecraft Center (renamed Johnson Space Center in 1973), he worked there until 1986. He spent two years at NASA Headquarters in Washington, DC, as the Director of Information Systems Services for the Space Station Program. In 1988, he returned to Johnson Space Center; he was named Chief Information Officer in 1994. In 2000, he retired from NASA and spent the next 10 years as a contractor still supporting NASA. Garman's most notable accomplishment may have happened early in his career, but his lifelong dedication to NASA is an inspiration to all of us who follow in his footsteps.

IMAGE IN NASA HISTORY

A 1-inch scale model of a typical supersonic airplane design is examined before being installed for sonic boom studies in the 4-foot supersonic tunnel at NASA's Langley Research Center ca. 1960. Pressure measurements are made in the tunnel up to 50 inches away from the model, simulating altitudes of up to 40,000 feet. (Photo credit: NASA)

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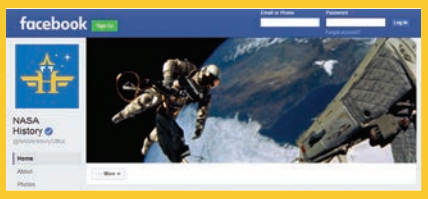

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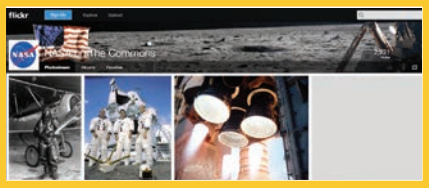

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