# NEWS &NOTES

National Aeronautics and Space Administration

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## FROM THE ACTING CHIEF HISTORIAN

The theme for this issue of *News & Notes* is "Underappreciated Contributions." At an agency working on so many projects across the worlds of human exploration and scientific discovery, many important contributions go unnoticed. At NASA, it's often the big discoveries or monumental first steps that garner most of the attention. But it is the multitude of contributions happening behind the scenes that make any of those notable achievements possible. For Apollo, it was the more than 400,000 employees focusing on every action, every day that provided the platform for the lunar missions. The same has been true ever since, including during the design, development, or operational phases of historic programs such as the Space Shuttle, Hubble Space Telescope, or International Space Station. Today, programs ranging from Artemis to the Nancy Grace Roman Space Telescope are being built upon countless other underappreciated contributions.

Historians and archivists work diligently and deliberately to ensure that these underappreciated contributions are not lost to the ages. This work is doubly important to the larger historical enterprise. On one hand, it is imperative that we provide a full contextualization of the topics we cover to build a usable past. On the other, recognizing these contributions shines a light on the diversity of thought at work in the scientific enterprise. We know that

*continued on next page*

## BION: AN UNDERAPPRECIATED HISTORY IN SPACE BIOLOGY

By James Anderson, Ames Research Center

International collaboration in spaceflight has a history that extends back long before the planning and construction of the International Space Station, which has since achieved more than 20 years of continuous human presence and collaboration in space. Earlier high-profile milestones include the Space Shuttle–Mir program, in which Russian cosmonauts and NASA astronauts conducted joint missions aboard the Russian space station with the Shuttle docked to Mir. That program lasted for about four years in the mid-1990s and included the first Russian cosmonaut to fly aboard a Shuttle and the first NASA astronaut to fly to space in a Soyuz capsule. Roughly 20 years before the Shuttle-Mir milestone, the Apollo-Soyuz Test Project of 1975 resulted in a potent symbol of détente as Soviets and Americans shook hands in orbit during the successful rendezvous and docking of an Apollo Command and Service Module with a Soyuz spacecraft. If any event signals a relaxing of the space race since the launch of Sputnik, Apollo-Soyuz is a strong contender.

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NASA HISTORY DIVISION
OFFICE OF COMMUNICATIONS

*From the Acting Chief Historian (continued)*

if we utilize only the top 1 percent of the archival record, the histories we produce are misleading fragments at best—representations of hegemonic power at worst. In this enterprise, archivists draft more inclusive collection development strategies while historians conduct oral histories, seek out new evidence, ask new questions, and develop more inclusive narratives. Locating "Hidden Figures" isn't about storytelling—it's about gaining a more coherent picture of what really happened in the past.

**"LOCATING "HIDDEN FIGURES" ISN'T ABOUT STORYTELLING—IT'S ABOUT GAINING A MORE COHERENT PICTURE OF WHAT REALLY HAPPENED IN THE PAST."**

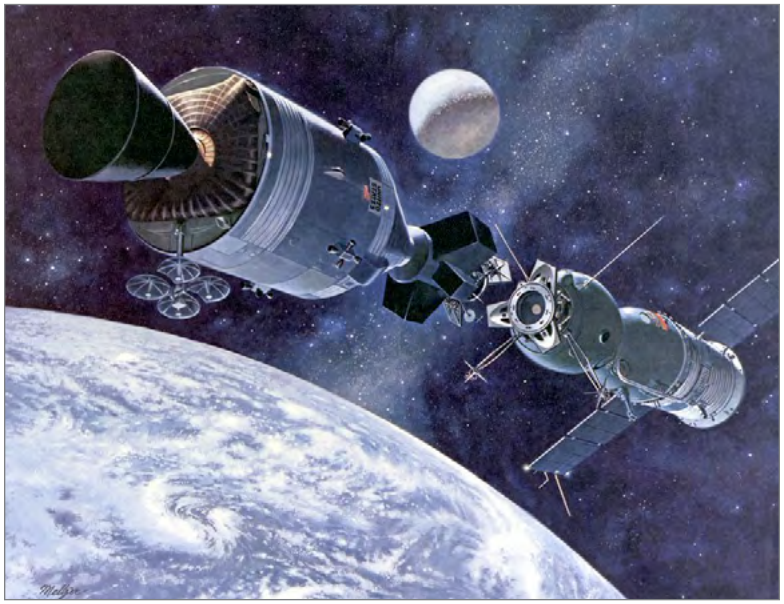
In organizational news, the next step in the transformation of history and archives at the Agency recently occurred with the creation of the NASA History and Information Services Division (H&ISD). This organization represents a consolidation of the history and archival function with libraries and the Freedom of Information Act (FOIA) office. Another key milestone is the selection of longtime NASA Deputy Associate Administrator for Communications Bob Jacobs as Director of the Division. Bob's wealth of experience in telling NASA's story to the world should prove invaluable in helping our organization reach new audiences and stakeholders through new online and social media tools. Having built the Agency's digital media footprint into what it is today, Bob's guidance promises to open new doors to our core public history program without losing our solid academic foundations. Make sure to be on the lookout as we begin developing new, engaging products to share the Agency's history.

Last, but certainly not least, I'd like to note another important transition. Earlier this year, the NASA History Office said goodbye as our longtime master of all trades, Cat Baldwin, embraced a new challenge in her educational and career journey. For those of you lucky enough to have worked with Cat, you'll remember her eye for social media and willingness to do whatever was needed for the betterment of the team. We wish Cat the best in her future pursuits. On a brighter note, we welcomed a new colleague, Michele Ostovar, to the NASA History Office. Michele has a long history working with NASA publications in general and our history publications in particular, including our most recent works, *Not Yet Imagined: A Study of Hubble Space Telescope Operations* and *50 Years of Solar System Exploration: Historical Perspectives*. Michele's incredible talents in editing and graphic design will take our ability to tell the Agency's story to a whole new level. While our mission remains the capture, preservation, and communication of NASA's history, we look forward to collaborating with the archivists, librarians, FOIA officers, and new leadership in the History and Information Services Division and finding new, exciting ways to bring this history to our audiences.

As we move forward to the next stage of our transformational journey, I'm sure we will encounter many new, unforeseen obstacles. I'm also sure there will be surprising new opportunities. But just as space is hard, so is its history.

Brian C. Odom
Acting Chief Historian

*Bion: An Underappreciated History in Space Biology (continued)*



An illustration depicting the Apollo spacecraft rendezvousing with the Soyuz. While the Apollo-Soyuz Test Project of 1975 is perhaps better known as an example of Cold War cooperation in space, Bion 3 launched the same year as part of a series of missions that achieved more than two decades of cooperation in space biology. (Image credit: NASA/Davis Meltzer)

Perhaps less known, but well documented and clearly articulated by historians, are the early moments of contemplation and the examples of diplomatic overtures in the space race for an international lunar mission that President Kennedy made both before and after his 1961 declaration to a joint session of Congress that the United States should commit itself to landing on the Moon. Events such as the Bay of Pigs and the dissolution of the Soviet Union are not simply backdrops to space history. The geopolitical contexts for milestones in spaceflight are unquestionably important, since space endeavors are merely carried out in the literal vacuum of space, not some metaphorical vacuum. Missions of exploration and scientific collaboration always require some level of negotiation within political, cultural, and technical contexts.

While planning for Apollo-Soyuz was under way, an entirely separate and international collaborative effort had been initiated that included American space biologists as well as scientists from a handful of other countries participating in a Soviet (later Russian) program. That program was called Bion, and for more than two decades, from 1973 through 1996, a series of missions launching from Plesetsk Cosmodrome aboard the Bion spacecraft provided investigators with a platform for conducting fundamental space biology research in orbit with organisms ranging from cells, plants, and insects to (eventually) rodents and primates. Of the 11 Bion missions, NASA participated in 9 of them, beginning with Bion 3 in 1975 through Bion 11 in 1996. Roughly half of all the U.S. life sciences experiments that involved nonhuman subjects—more than 100 of them—occurred as a result of the collaboration. Over the course of the program, hundreds of U.S. scientists, bioengineers, and technology developers participated. The Russians provided the spacecraft and launch access to NASA researchers, and NASA researchers brought their scientific and technological expertise into closer coordination with their Russian counterparts.

The bargain that NASA got for space biology research in those years is significant and likely contributed to the longevity of the collaboration as NASA researchers were able to "fly under the radar"—never attracting too much attention as the collaboration required only a modest investment from NASA. NASA and Russia would ultimately fund the program on more equal footing after the breakup of the Soviet Union, but that was late in the program, and space biology research had new platforms aboard the Shuttle and Mir by that time. Bion also served as a sort of programmatic bridge for space biology research, providing a path for space biologists at a time when Apollo had ended and NASA's first substantive attempt at a dedicated space biology program—Project Biosatellite—had generated marginal scientific returns for what came to be a rather expensive program. Project Biosatellite had also suffered from timing and tragedy. The final mission,

A mock-up of a Bion spacecraft on display at the Space Pavilion in Moscow. The central spherical module (similar to the Zenit bus) was adapted from the Vostok spacecraft, a smaller version compared to the Soyuz. (Photo credit: NASA)

Biosatellite 3, returned to Earth less than two weeks before Apollo 11 touched down on the Moon. In an effort to maximize the scientific return of the mission that carried the first primate of the three launches, over-instrumentation was ultimately identified as the likely cause of stress—not spaceflight itself—that led to the loss of the monkey. The loss was not collateral damage in the name of science. It was a programmatic failure that deserved criticism even while providing an opportunity to learn from that failure. NASA would not go on to fund a similar program flying primates, save for its investment in what would become the Bion missions. Meanwhile, a separate development and key component of the Shuttle Program, Spacelab, provided another international collaboration that incorporated space biology. Prototype testing during Spacelab's development further allowed researchers to address problems experienced during Project Biosatellite.

The cadence of the Bion program, launching roughly every two years, also provided opportunities for regularly addressing new questions and applying insights from previous missions. Bion 6 flew the program's first two primates in 1983, with a pair of primates in each subsequent flight joining the usual complement of other experimental packages from participating countries. NASA's involvement in Bion ceased after Bion 11, when postflight anesthesia of the monkey named Multik contributed to the loss of the animal. NASA's exit from the program essentially ended Bion and, for several years, shifted reliance to other model organisms in space biology research.

This history has been investigated to some extent already. The work of Kristen Edwards appeared in the fall 1999 edition of *Quest*, and that work informed much of the chapter on Bion appearing in the book *Animals in Space: From Research Rockets to the Space Shuttle*, by Chris Dubbs and Colin Burgess. Only

> **MANAGERS, RESEARCHERS, ENGINEERS, AND TRANSLATORS ALL CAME TOGETHER TO MAKE THE PROGRAM SUCCEED FOR OVER 20 YEARS, EVEN AS THE GEOPOLITICAL CONTEXT SHIFTED BENEATH THEIR FEET.**

touched upon in these narratives, however, is a focus on the interactions, relationships, and significant collaborations within the international community of space biologists themselves. Managers, researchers, engineers, and translators all came together to make the program succeed for over 20 years, even as the geopolitical context shifted beneath their feet. While Bion was never as publicly visible as cosmonauts and astronauts shaking hands in space, the "soft" diplomacy that prevailed was carried out less by diplomats and more by the like-minded practitioners within the space biology community focusing on common goals.

That is the kind of story that resonates today as governments, nongovernmental organizations (NGOs), industry, and scientific communities across the globe confront the current and future ramifications of climate change. Criticism has been levied against the highest levels of government and industry for inaction in this realm, making even more pressing the need to identify teams that are populated with expertise from across multiple sectors and levels of government, industry, and academia. This element of the cross-disciplinary, international, team-building approach to solving common problems is just one set of lenses through which to take a fresh look at this period of space biology research. NASA is not a monolith in this telling, as NASA-funded research enabled university research laboratories and small businesses to engage in this research. And a window into that historical development and the lessons learned are aspects captured in a manuscript that has been drafted over the years by an American participant in Bion and his coauthor. The NASA History Office is working with the authors on this Bion manuscript, and we are looking forward to encouraging this and related research into what has been an otherwise underappreciated historical development.

Rapid payload recovery during Bion missions was crucial for many of the experiments on board, including the many experiments that had nothing to do with primates. This bio-transporter case had environmental controls to keep bio-specimens stable for transport and distribution to NASA's space biologists and their international collaborators once the specimens had been retrieved from the spacecraft shortly after landing. (Photo credit: NASA/Tom Trower)

# ED SALTZMAN, AN 8-MILE BICYCLE COMMUTE, AND A BOX OF LONG-LOST FILM CANISTERS

By Christian Gelzer, Armstrong Flight Research Center

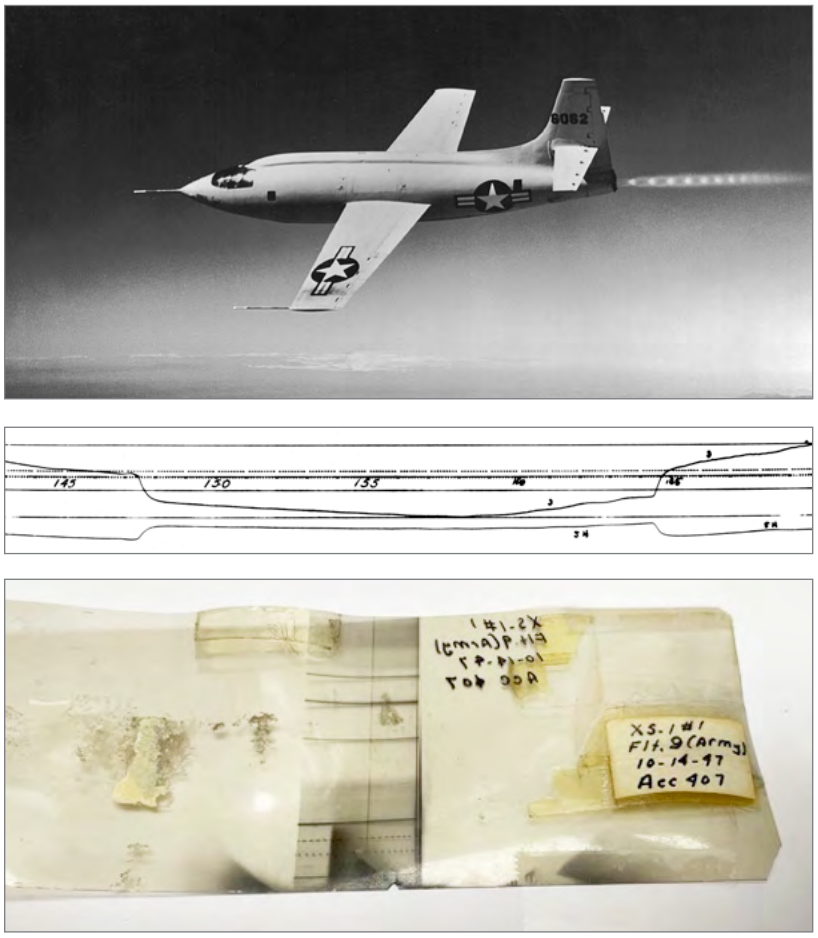
Edwin J. "Ed" Saltzman arrived at the National Advisory Committee for Aeronautics' (NACA's) High Speed Flight Research Station (now Armstrong Flight Research Center) in 1951 with a degree in mechanical engineering and work experience at a U.S. munitions plant in Iowa, his home state. His first work was to calculate the base drag of the Bell X-1 aircraft the Center was still flying, and for much of his career Saltzman continued to work on base drag questions for aircraft, including the X-15 and XB-70.

Edwin Saltzman is pictured at his desk at the Flight Research Center. (Photo credit: NASA)

Living just over 8 miles from Edwards Air Force Base, where the Center is located, Saltzman usually rode his bicycle to work. It was on these rides in the early 1970s, more than a decade after the NACA had transformed into NASA and when the nation was roiled by its first peacetime gas crisis, that he began thinking of ways to lower the aerodynamic drag of long-haul tractor-trailers, improving their efficiency. (This was no coincidence: each approaching semi's bow wave shoved him toward the roadside creosote bushes; then its base low-pressure region sucked him toward the middle of the road.) From his bicycle musings came the aerodynamic truck fairing project involving a highly modified delivery van and two tractor-trailer units. Long-haul trucks and trailers look the way they do today, with fairings front and back as well as side skirts, in large part because of the project's empirical data.


The final configuration of the tractor-trailer with the center modified to reduce its aerodynamic drag. (Photo credit: NASA)

Earlier in his career, in 1960, Saltzman needed material on the F-102 aircraft and recalled boxes of records from the nearest Federal Records Center. Rummaging through the boxes for the F-102 data, he came across a cluster of small-diameter, 4-inch-tall film canisters that he recognized from his work in the 1950s. These were rolls of film from on-board recorders with time histories of different sensors that the computers used to generate plots for aeronautical engineers. Curious, he opened several canisters and glanced at the writing on the masking tape on the film's leaders. He instantly knew what he held: original rolls of film from Chuck Yeager's Mach jump on 14 October 1947—including the one showing the Mach jump itself, long thought to be lost forever. That film was accessioned by the National Air and Space Museum in 1976, and both the Center and the U.S. Air Force received copies.




**Top:** The Bell X-1 rocket-powered experimental aircraft. **Middle:** Segment of film showing the pressure change as Chuck Yeager exceeded Mach 1 (seconds 147.4–164.5). **Bottom:** A rediscovered roll of data film from the first Mach 1 flight. (Photo credits: NASA)

Back in the 1950s, three years after coming to work for the NACA, Ed Saltzman and his wife Lois traveled back to Iowa to see family and friends. His grandfather asked him what he did, and Ed told him he worked on airplanes. Pushed for more detail, he explained that he worked for the NACA (and explained that, too) and what he did for work. His grandfather finished the conversation: "Hah. Sounds like a fly-by-night outfit to me."[1]

Ed Saltzman retired from NASA in 2003, and he and Lois finally moved more than 8 miles from Armstrong Flight Research Center.

The transcript of a 2015 oral history interview with Saltzman is available online.

1 NASA Headquarters NACA Oral History Project Interview with Edwin J. Saltzman. 17 February 2015. *https://historycollection.jsc.nasa.gov/JSCHistoryPortal/history/oral_histories/NACA/SaltzmanEJ_2-17-15.htm.*

# THE FIRST ON-ORBIT MICROGRAVITY EXPERIMENT

By Bob Arrighi, Glenn Research Center


Preparation of a Lewis-designed microgravity experiment in March 1962 to be conducted during Aurora 7 mission. (Photo credit: NASA)

Microgravity research has been a regular component of human spaceflight since the early Space Shuttle flights in the 1980s and is an essential function of the International Space Station today. Decades earlier, however, researchers at NASA's Lewis Research Center (known as Glenn today) designed the nation's first on-orbit microgravity experiment for Scott Carpenter's Mercury-Atlas Aurora 7 mission in May 1962.

The effect of microgravity on humans was one of the primary concerns of the early space program. The biological effects of low gravity were studied by launching a wide range of lifeforms, most famously monkeys, into the upper atmosphere on missiles and by subjecting the Project Mercury astronauts to brief periods of "weightlessness" on aircraft.

Researchers at NASA Lewis, however, were more concerned with how fluids, particularly liquid hydrogen, would behave in space. The Center led the Agency's work on cryogenic propellants that would be used in the Centaur and Saturn upper-stage rockets. In the low-gravity environment of space, liquids would not settle at the bottom of the tank. Instead, the propellants might disperse inside the tank or cling to the walls, making pumping to the combustion chamber difficult.

In 1958, researchers at Lewis began using a 12.5-foot counterweight rig to subject fluids to 1 second of microgravity. The testing ramped up in 1960 and 1961 with the addition of a 79-foot drop tower that produced 2.2 seconds of microgravity, then an AJ-2 Savage aircraft whose parabolic flight pattern could generate roughly 27 seconds of microgravity, and subsequently sounding rockets capable of producing several minutes of low gravity. The Mercury missions planned for early 1962 offered the opportunity to study the effects of microgravity for several hours.

Lewis's initial research revealed that fluids were randomly distributed throughout the tank in microgravity, but the surface tension of a cylindrical baffle in the center of the tank helped stabilize the fluid's position and guide it to an outlet port. The ground-based tests, however, did not provide sufficient time to determine if the liquid would completely flow through the baffle. The researchers were also anxious to examine the effect

Center Director Abe Silverstein shows reporter Helen Waterhouse the Lewis microgravity experiment that was flown that day on the Aurora 7 mission. Cary Nettles (left) and Warren Plohr look on. (Photo credit: NASA)

of spacecraft maneuvers and deceleration on the baffle's performance.

Donald Petrash, Ralph Nussle, and Edward Otto of the Space Experiments Section designed a small glass sphere containing a 1.1-inch cylindrical baffle and filled it 20 percent full with dyed water. The container was encased in a metal frame that could be mounted behind the astronaut so that it could be continuously monitored by the observation camera. The Space Task Group assigned the experiment, along with two other unrelated tests, to the nation's second orbital human spaceflight in the spring of 1962.

Mercury-Atlas 7 lifted off from Cape Canaveral at 7:45 a.m. on 24 May 1962. Five minutes and 26 seconds later, the dyed liquid completely filled the tube as the capsule entered space. The fluid remained in the tube throughout the capsule's nearly 4.5 hours in orbit.

Although the experiment did not require any human interaction, Mission Control asked Carpenter for an update on it as the capsule entered its third and final orbit. Carpenter glanced over his right shoulder and reported, "At this moment, the fluid is all gathered around the standpipe; the standpipe appears to be full and the fluid outside the standpipe is about halfway up." The firing of the retrorockets for reentry caused the liquid to briefly exit the tube, but it returned to the steady-state position until the capsule reentered the atmosphere.

The experiment was a success. Although damaged by seawater during the recovery, the film showed that the dyed liquid completely filled the baffle and remained there throughout the flight. It also revealed that the spacecraft movements and deceleration for reentry did not cause any significant change in the liquid's position.

Although additional studies would be needed to perfect tank and baffle designs, the Aurora 7 experiment was significant in that it confirmed the researchers' prediction that the tube provided sufficient surface tension to accomplish the critical role of controlling fluids in low gravity. Since that first in-space test in 1962, Glenn Research Center has conducted hundreds of microgravity experiments in space to study combustion, biotechnology, materials science, and fluid physics.

The Lewis experiment is visible to the right of astronaut Scott Carpenter's helmet. The film was subsequently water damaged during the capsule recovery. (Photo credit: NASA)

# IMPORTANT CONTRIBUTIONS TO SPACE HABITABILITY FROM THE BEN FRANKLIN

By Brian Odom, Marshall Space Flight Center

Living away from Earth has never been easy. Capturing a bit of the Earth environment for the trip into space is critical no matter how short the mission. But beyond the goal of providing air, water, and food, what other factors should be considered to make human space exploration possible and, to some degree, palatable? What are the long-term effects of space travel both on the physiology and psychology of the crew, and how can these be mitigated? In the early years of the space program, no one knew the answers to these questions or had a good idea of how to get them. What was needed was an isolated laboratory that would combine a harsh environment with a rigorous program of scientific discovery. In the summer of 1969, NASA utilized a now largely forgotten expedition to try to answer its questions.

NASA officials survey the deep-sea research submarine Ben Franklin while docked in July 1969. (Photo credit: NASA)

The undersea laboratory chosen for the mission was the Ben Franklin (also called the PX-15)—a submersible vessel conceived by Swiss oceanographer Dr. Jacques Piccard and designed, built, and operated by the Grumman Aerospace Corporation. Known as the Gulf Stream Drift Mission (GSDM), the 30-day study, supported by the Naval Oceanographic Office, sought to explore the environment of the Gulf Stream as the vessel drifted north at a depth varying between 600 to 2,000 feet. The GSDM gave NASA an opportunity to observe the effects of prolonged isolation on the six-person crew while exploring concerns around psychology and physiology, habitability, microbiology, and maintainability in spacecraft design.

NASA recommended the Ben Franklin as an analog of a space vehicle because the vessel provided the crew with several characteristics of the space environment, including confinement in a closed ecosystem and isolation from normal family and social contacts. As an analog for future space stations, the mission provided an opportunity for the Agency to learn to anticipate challenges faced in long-duration spaceflight, including providing a normal Earth atmosphere in both gaseous composition and pressure; determining approximate size and habitable volume as planned concepts for future space missions; and designing a scientific mission relative to the type of discovery typical of spaceflight.

Habitability studies at NASA were nothing new. The Agency had conducted various ground-based static simulator or chamber studies along these lines from its founding in 1958. What made the Ben Franklin mission different was its ability to move beyond issues such as the effects of confinement, social isolation, deprivation, and cramped space by adding the elements of a meaningful mission, a hostile environment, operational stress, abort difficulty, remote operations, and the sustained motivation that resulted from participating in a real scientific undertaking.

Leading the mission for NASA was Chester "Chet" May, at that time an aerospace engineer in the Mission and Payload Planning Office of Program

Development at Marshall Space Flight Center. The mission would not be May's first experience with space analogs. Before coming to Marshall, May had worked for the Air Force at Wright-Patterson Air Force Base at Dayton, Ohio. There, he conducted tests in the weightless environment produced by the KC-135 aircraft during parabolic flights. Experiments in the KC-135 led to the development of mechanical weightless simulators and produced new space maintenance techniques and astronaut maneuvering units. One example of May's innovative work was a space maintenance experiment testing the minimum reaction characteristics of a space power tool for which he served as principal investigator. The experiment was flown on the Gemini VIII and XI missions.

Interviewed before the mission, May described exactly what stood at the core of the effort, noting that "we are self-contained down here—we have no ties to the surface. So, here we are, away from regular society, away from the actual social environment [in] which each of us normally move. This is one of the things we are interested in in the space program, how does man effectively perform isolated from his normal social environment."[1]

If national attention was important to the mission, the organizers could not have picked a worse spot on the calendar. Overshadowing the Gulf Stream mission was the flight of Apollo 11, which landed on the Moon on 20 July. On 16 July, two days into the journey north from West Palm Beach, Florida, the crew of the Ben Franklin sent a message to the crew of Apollo 11, the text of which read, "We all wish you a fair wind and a following sea, good luck!"

After drifting in the Gulf Stream for 31 days and traveling over 1,400 nautical miles, the Ben Franklin surfaced on Thursday, 14 August 1969. Chet May and the rest of the six-person crew were transported by the United States Coast Guard to Portland, Maine. The trip provided NASA with a wealth of new information about team dynamics, hygiene, health, and

Pictured is an interior view of the Ben Franklin showing the living quarters of the research submarine. (Photo credit: NASA)

provisioning. Some data points were easily predicted, such as the crew's dislike of the available food, and that reading and listening to music proved beneficial. Other findings pointed to more unforeseen but serious issues. The study found that the crew exhibited increased signs of depression during the midpoint of the mission and, as the mission progressed, began to take meals alone, reflecting both a need for privacy and avoidance of conflict. The results of this experiment provided a baseline for human factors in the design and development of subsequent spacecraft.

The experience of the crew aboard the Ben Franklin never garnered many headlines and remains largely forgotten today. However, the lessons learned from that brief excursion along the bottom of the Gulf Stream informed later successes of Skylab, Spacelab, and the International Space Station. As we journey back to the Moon with the Artemis program, it is worthwhile to reconsider just how far we have come since the summer of 1969.

For more information on the Ben Franklin mission, visit: *https://www.nasa.gov/vision/space/preparingtravel/px15.html* and watch the video: *Meanwhile, At the Bottom of the Ocean*, found at *https://images.nasa.gov/details-GSFC_20111012_BF_m10849_Bottom_Ocean.*

1 32934 Grumman Piccard PX-15 Submersible Ben Franklin Gulf Stream Research Mission "Thirty Days Beneath the Sea" film available at *https://www.youtube.com/watch?v=LaNfbOb9ZhY*

# FROM BIPLANES TO SATELLITES: PERCY KEFFER'S 47-YEAR CAREER WITH THE NACA/NASA

By Teresa Hornbuckle, Photo Archives, Langley Research Center

*According to Percy Keffer, he had no claim to fame; he had just been working steadily since 1920.*

Born in Blacksburg, Virginia, on 16 April 1897, Percy R. Keffer moved to Newport News at an early age and attended public schools in that city. Around the age of 16, he started an apprenticeship as a patternmaker in the Newport News Shipbuilding and Dry Dock Company, which he completed in 1917. Back on the Peninsula on a visit in 1920, he read an advertisement in the local paper. It seemed that NACA Langley Memorial Aeronautical Laboratory (LMAL) needed a patternmaker, so Keffer applied and was hired on 21 September 1920, soon after the official dedication of the Laboratory in June of that year. With the entire LMAL staff numbering around 40, he was the only worker of his kind. Keffer worked as a patternmaker at Langley from 1920 to 1941 and was named as superintendent of the Langley carpenter shop in 1941. He ended his career in the Mechanical Services Division as manager of the Model Making Branch. One of the last large projects he participated in before his retirement on 30 December 1967 was the Echo I Communications Research Satellite. His children, Percy R. Keffer, Jr., and Julia Welch, followed in his footsteps, also enjoying careers with NASA.

Percy Keffer in December 1941 (Photo credit: NASA)

Besides his work at the NACA/NASA, Keffer served his community in various ways. He was division chairman for the Laboratory's United Fund Drive Campaign, Community Chest, and March of Dimes. He was known to lead as the volunteer "table hop," earning the nickname "Percy 'Short Order' Keffer," and served as an instructor for apprentices in mechanical drawing and other classes held for students at Langley. In the wider community, Keffer served on the Hampton City Council, on the board of directors for the city's Department of Public Welfare, and as president of the local Kiwanis Club.

**Top:** Percy Keffer at Sphere Making Apparatus. **Bottom:**Workers in the pattern makers' shop manufacture a wing skeleton for a Thomas-Morse MB-3 airplane for pressure distribution studies in flight, June 1922. (Photo credits: NASA)

Percy Keffer passed away in March 1983. His 47-year career at the NACA/NASA granted him a front-row seat to the early years of aerospace history, with hands-on experience working with everything from biplanes to spacecraft.

# THE NASA HYDROGEN FIRE IMAGER

By Jessica Herr, Stennis Space Center

Safety at NASA is never taken for granted, and the Agency continually looks to improve the safety of the employees on site. One invention developed in the early 1990s to improve the safety of employees at Stennis Space Center (SSC) is the NASA Hydrogen Fire Imager.

NASA Stennis engineers devised a way to scan for hydrogen fires as part of rocket engine test programs. The technology fostered the development of FIRESCAPE, a commercial unit to "see" the invisible flames of hydrogen and alcohol fires. (Photo credit: NASA)

Stores of liquid hydrogen are commonplace at SSC, where it is used at test stands to power rockets. Experts at Stennis are proficient in the transportation, storage, system design, training, safety standards, hazard analysis, and testing of hydrogen propellant. The site was once the world's largest user of liquid hydrogen, consuming and storing great amounts for testing Space Shuttle main engines. As hydrogen is a very flammable gas and hydrogen fires are invisible, if a hydrogen leak is believed to be present, it should always be presumed that a flame is also present. The Hydrogen Fire Imager, developed by Heidi L. Barnes of Stennis Space Center and Harvey S. Smith of Lockheed Martin, made it possible for technicians to visually spot a hydrogen flame and immediately respond by shutting down the hydrogen source and extinguishing the hydrogen fire. The imager allows users to see at infrared wavelengths, causing hydrogen fires to appear bright relative to the background light of the Sun. In addition to hydrogen fires, the imager also aids in the detection of alcohol and hydrocarbon fires, which emit light in the same spectral regions.

The Stennis Space Center fire department illustrates how the Hydrogen Fire Imager can be used to see through dense smoke to find a staged victim trapped in a building. (Photo credit: NASA)

This little-known invention has helped many stay safe from invisible threats and has contributed to the Agency's mission success.

# NEWS FROM HEADQUARTERS AND THE CENTERS

## NASA HEADQUARTERS (HQ)

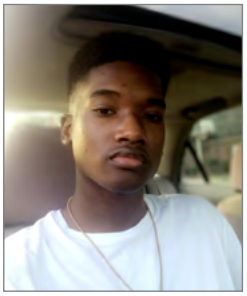
**Washington, DC**

Michele Ostovar is pictured on the California central coast.

With Cat Baldwin's departure from the Headquarters History Office to pursue her education, we are joined by Michele Ostovar, former Publications Specialist with the Communications and Support Services Center at Headquarters, to fill Cat's communications support role. Originally from the Canadian prairies, Michele has bachelor's and master's degrees in paleobotany but left a Ph.D. program at the University of North Carolina at Chapel Hill to pursue other career interests. After working in science publishing for several years, she returned to school to study graphic design, specializing in book design. Since 2015, she has worked with the History Office on the design and production of books in the NASA History Series, the annual President's Report, and *News & Notes*, as well as working on graphic design needs from other offices across the Center. Michele jumped at the chance to join the NASA History team and looks forward to exploring how NASA's history can be communicated more broadly and to a wider audience.

### Headquarters Intern Update

This summer, the NASA Headquarters History Office welcomes four interns, serving from 6 June to 12 August. Sedrick Billups, Priscilla Foreman, Aneka Kazlyna, and Madelyn Pollack, working virtually from their homes, are doing research projects, bolstering NASA History's social media presence, and building professional connections within the Agency.



Sedrick Billups, summer intern

**Sedrick Billups** is a student at the University of West Alabama, majoring in computer information systems and minoring in history. Currently living in Tuscaloosa, he is taking two classes this summer and having a great experience networking and learning during his internship with the History Office.

Priscilla Foreman, summer intern

**Priscilla Foreman** is a rising senior at Rhodes College in Memphis, Tennessee, majoring in history and media studies. Her past projects mainly focused on social history, typically accompanied by a media element such as photo essays, ArcGIS map elements, and videos. She is excited to spend her summer with the talented staff at the NASA History Office and cannot wait to see the fantastic projects that arise from this experience.

**Aneka Kazlyna** is a graduate student at Columbia University, where she studies the history and philosophy of science and technology. She is interested in the history of the physical sciences, especially astronomy. This summer, Aneka is an intern working with both the History Office and Astrobiology Program. She is excited to research historical paradigms that provide context for understanding and communicating the discovery of extraterrestrial life.

Madelyn Pollack, summer intern

**Madelyn Pollack** is a DC area native, hailing from Rockville, Maryland. A rising junior at the University of Maryland, Baltimore County (UMBC), she is majoring in history with minors in public history and Judaic studies and is a member of UMBC's Honors College and Humanities Scholars Program. She is looking forward to engaging in interdisciplinary research that will merge her humanities-based academic background with the many disciplines that contribute to NASA's mission success.

## ARMSTRONG FLIGHT RESEARCH CENTER (AFRC)

### Edwards Air Force Base, California

By Christian Gelzer

Christian Gelzer continues working through readers' comments on his book manuscript about the PRANDTL-D wing aircraft, as well as assisting the Center's video office in creating a set of videos to celebrate the Center's 75th anniversary. There have been more FOIA requests involving him this year than expected. Additionally, he has been interviewing engineers at AFRC performing computational fluid dynamics work on a bell-shaped spanload wing (Prandtl 1933 theory) and has completed a review of a book on ballooning in the U.S. southwest for the New Mexico Historical Review.

Most significantly this quarter, after three years of work trying to finish the task, Christian deaccessioned almost the entire "artifact" collection registered in his name (keeping more than 5 percent of it). Unable to establish provenance or descriptions for nearly all the items, and knowing the building in which they reposed will be leveled soon, he and the Center's Property Office coordinated the final steps to transfer the items for listing with the U.S. General Services Administration (GSA). Christian still has about 20 items in his name, many already on display at the Center and elsewhere, but they will soon be transferred to a colleague in the Exhibits office.

"AFTER THREE YEARS OF WORK TRYING TO FINISH THE TASK, CHRISTIAN DEACCESSIONED ALMOST THE ENTIRE "ARTIFACT" COLLECTION REGISTERED IN HIS NAME."

## JOHNSON SPACE CENTER (JSC)

### Houston, Texas

By John Uri, Jennifer Ross-Nazzal, Sandra Johnson, and Jessica Kelly

Johnson Space Center in Houston and the White Sands Test Facility in Las Cruces, New Mexico, exited NASA's COVID response framework effective 15 May 2022, lifting all previous pandemic-related restrictions. The JSC History Office continues to operate in a hybrid manner, with John Uri, Jennifer Ross-Nazzal, Sandra Johnson, and intern Jessica Kelly dividing their time between on-site work and telework as activities demand.

Jennifer's book *Making Space for Women: Stories from Trailblazing Women of NASA's Johnson Space Center*, published in January 2022 by the Texas A&M University Press, has generated much interest. The book explores how careers for women at JSC have changed over the years, as told by the women themselves through oral histories conducted by the JSC History Office. Jennifer has had the opportunity to speak about her book at several invited venues both inside and outside NASA. Willie Lyles and Nathan Vassberg, Director and Deputy Director of JSC's

Safety and Mission Assurance (S&MA) Directorate, where the History Office resides organizationally, hosted a book signing with Jennifer and invited her to speak about her book at the S&MA control board meeting. Several employee groups at JSC and at NASA's Marshall Space Flight Center in Huntsville, Alabama, invited Jennifer to talk about her book. Sandra chaired a virtual panel sponsored by JSC's Women Excelling in Life and Leadership (WELL) Employee Resource Group that included Jennifer and three women featured in the book.[1] The WELL group also featured *Making Space for Women* in their virtual book club. During Women's History Month, at Space Center Houston, Jennifer and three women featured in the book sat on a panel chaired by JSC Associate Director Donna Shafer. A book signing followed the event. Jennifer presented her book during a NASA Headquarters History Lunchtime Brownbag event, attended by former Chief Historian Roger Launius.

Left to right: Willie Lyles, Jennifer Ross-Nazzal, and Nathan Vassberg during the book signing at JSC's Safety and Mission Assurance Directorate. (Photos courtesy of NASA/John Uri)

Outside NASA, Texas NPR's radio program *The Texas Standard* interviewed Jennifer about her book.

1 A video of the panel discussion is available at *https://www.youtube.com/watch?v=m1T7gRzi790*.



**Top:** The panel discussion at Space Center Houston, with Donna Shafer, Jennifer Ross-Nazzal, Estella Hernández Gillette, Sharon McDougle, and Ginger Kerrick. **Bottom:** Jennifer at the book signing at Space Center Houston. (Photos courtesy of NASA/John Uri)

Texas Women's University (TWU) in Denton, which had sponsored *Making Space for Women* as the inaugural book in the Pioneering Women: Leaders and Trailblazers series, invited Jennifer to speak at a special event. A book signing and reading followed the event. Jennifer appeared on *The Bookmark*, a half-hour television program by Texas A&M University Press in partnership with the local public broadcasting station KAMU in College Station. The episode will air in the autumn of 2022 and then will be available online.

Sandra and Jennifer continue to conduct oral history interviews in person and in the Microsoft Teams environment for projects for JSC's S&MA Directorate and for NASA Headquarters acting Chief Historian Brian Odom. Those interviewed included senior NASA leaders and flight directors at JSC. Sandra and Jennifer continue to process transcripts from already completed interviews to add them to the *JSC History Portal* throughout the year.

Another oral history project under way, sponsored by NASA's Science Mission Directorate, works to capture the history of NASA's Discovery Program in anticipation of its upcoming 30th anniversary. Sandra is conducting interviews in cooperation with historian Erik Conway at the Jet Propulsion Laboratory that will serve as material for a book celebrating the program's anniversary. Sandra has completed 12 interviews with Discovery Program management, project and science managers, and principal investigators involved in the Discovery Program missions.

The JSC History Office continues to elucidate NASA's history through presentations and publications. On the 60th anniversary of John Glenn's Friendship 7 mission, Jennifer gave a plenary talk to the Human Research Program Investigators' Workshop, held in Galveston, Texas. The talk focused on reframing the mission as an international event. Jennifer and Steve Garber, the NASA Historian at Headquarters, are coauthoring a chapter in an upcoming book entitled *Stars in Space: Makers of the United States Space Force*. This project aims to enhance the understanding of character and leadership in military space from the experiences of past space leaders. For the chapter, Jennifer will interview astronauts who have risen to senior leadership positions in the military and had an impact on the service. Jennifer also submitted an invited article about JSC mathematician Josephine Jue to the *Notices of the American Mathematical Society*.

The JSC History Office welcomed Jessica Kelly as our intern for the spring semester; impressed by her outstanding work, we invited her back for the summer semester. Jessica is nearing the completion of her

> **THE JSC HISTORY OFFICE WELCOMED JESSICA KELLY AS OUR INTERN FOR THE SPRING SEMESTER, AND IMPRESSED BY HER OUTSTANDING WORK, WE INVITED HER BACK FOR THE SUMMER SEMESTER.**

master's in library sciences at the University of North Texas, with an expected graduation date of December 2022. Her primary task in our office consists of creating metadata for the existing scanned content of the JSC History Collection using a template created by Goddard Space Flight Center archivists and standards provided by the NASA acting Chief Archivist for ingesting into Archivematica and AtoM. As a second task, Jessica organized and cataloged the History Office library.

The JSC History Office is working with JSC's External Relations Office (ERO) to assist in the celebration of the Center's 60th anniversary. A series of articles about JSC's history are published on the *www.nasa.gov/history* website and on JSC's social media pages. Information about JSC's 60th anniversary can also be found at *JSC's 60th anniversary Sharepoint website* (internal to NASA users). In other work with ERO, we continue to publish articles about poetry in space and commemorating significant historical milestones, such as the 60th anniversary of John Glenn's Friendship 7 mission, the 50th anniversary of Apollo 16, the 40th anniversary of STS-3, and special features for heritage months. Erik Conway and James Anderson, historians at the Jet Propulsion Laboratory and Ames Research Center respectively, provided expert help for several articles relating to missions managed at their respective Centers. The features often highlight less-heralded events and people that nevertheless contributed significantly to various spaceflight endeavors. In March, we reached a significant milestone with the publication of the 450th article since the series began in August 2017.

# OTHER AEROSPACE HISTORY NEWS

## UPDATE FROM THE SMITHSONIAN INSTITUTION'S NATIONAL AIR AND SPACE MUSEUM

By Margaret A. Weitekamp, Curator and Department Chair, Department of Space History

In addition to the usual schedule of scholarly appearances, public outreach, and ongoing exhibit development being carried out by the curators in the Department of Space History at the Smithsonian's National Air and Space Museum, we are excited to announce two new curators in our group. The museum also organized a significant outreach effort around women and girls in science, technology, engineering, and mathematics (STEM) and continues to work toward the reopening of the building on the National Mall in fall 2022.

### Dr. Colleen Anderson

On 16 January 2022, the Department of Space History welcomed Dr. Colleen Anderson as the new curator of Post-1945 Rocketry. She will be working with Senior Curator Michael Neufeld, who retains his purview curating Rocketry Pre-1945.

Dr. Colleen Anderson is the new curator of post-1945 rocketry in the Department of Space History.

Dr. Anderson was most recently a German Academic Exchange Service (DAAD) Postdoctoral Fellow at the Foreign Policy Institute of Johns Hopkins School of Advanced International Studies. She studies the culture and history of Germany, and her research focuses on how science and technology have shaped Germany's roles in the wider world. Her first book-length project, *Undivided Heavens: Outer Space Travel in Divided Germany* (under review), focuses on how East and West Germany's space programs contributed to German efforts at internationalism during the Cold War.

Dr. Anderson earned her Ph.D. in history from Harvard University in 2017. She was a Mellon Postdoctoral Fellow in the Humanities at Stanford University from 2017 to 2020. Her research has been funded by organizations including the American Historical Association and NASA, the Smithsonian, the Berlin Program for Advanced German and European Studies, the DAAD, the American Institute for Contemporary German Studies, and the Central European History Society.

### Dr. Andrew Meade McGee

Dr. Andrew Meade McGee joins the Department of Space History as the curator of the History of Computing.

On 22 May 2022, Dr. Andrew Meade McGee joined the department as the new curator of the History of Computing, including guidance and navigation artifacts, a collection inherited from Dr. Paul Ceruzzi. Dr. McGee was most recently a visiting assistant professor at Carnegie Mellon University, where he also served as the Council on Library and Information Resources Fellow in the History of Science and Computing from 2018 to 2020. In addition, he held the Kluge Fellowship in Digital Studies at the Library of Congress in 2018. He is a historian of the politics, culture, and technology of the 20th-century United States. His book in progress, *Mainframing America*, is a political history of the computer from the 1940s to the 1980s, examining the institutional, intellectual, and governmental policy origins of modern American information society.

Raised in small-town Alabama, Dr. McGee studied history and literature at Harvard (where he was awarded the Reuben E. Brower Prize for Excellence in the Humanities). He then worked in distance education in his home state before pursuing graduate studies at the University of Virginia. There he held

a President's Fellowship; edited the journal *Essays in History*; and was affiliated with the Miller Center of Public Affairs, the Russell Lab environmental history group, and the National Endowment for the Humanities–funded MapScholar research project. He has held national fellowships in technology history (the Tomash Fellowship in the History of Information Technology from the Charles Babbage Institute) and political history (the Dissertation Year Fellowship from the Harry S. Truman Library). Recipient of a History Department teaching prize from the University of Virginia (UVA), he also spent a year as a visiting faculty member at Washington and Lee University. In addition, he has worked as a professional researcher at the Darden School of Business at UVA, overseeing historically focused big data research into U.S. financial crises and the American presidency.

> **"LAUNCHED IN 2021, SALLY'S NIGHT IS AN ANNUAL CELEBRATION INSPIRED BY THE LIFE AND LEGACY OF DR. SALLY K. RIDE, ASTRONAUT, SCIENTIST, EDUCATOR, AND ADVOCATE."**

### Sally's Night

Launched in 2021, Sally's Night is an annual celebration inspired by the life and legacy of Dr. Sally K. Ride, astronaut, scientist, educator, and advocate. Each June, the museum marks the anniversary of Dr. Ride's historic spaceflight by recognizing the contributions of women, past and present, to science, and celebrating how science shines in all our lives.

This year, Sally's Night kicked off with an in-person celebration at Nationals Park on Sunday, 12 June during the Washington Nationals game against the


**Top:** The Sally's Night logo is displayed on the jumbotron at Nationals Park. **Middle:** Families learn about spacesuits and the women who design, manufacture, and maintain them. **Bottom:** Rev. Dr. Bear Ride throws out the first pitch in honor of Sally's Night at Nationals Park. (Photo credits: Jim Preston, National Air and Space Museum)

Milwaukee Brewers. Rev. Dr. Bear Ride, Sally Ride's sister, threw out the first pitch. Videos, fun facts, and trivia on the jumbotron amplified the theme throughout the game. The museum hosted hands-on activities along the concourse in collaboration with Sally Ride Science and Yuri's Night.

The celebration continued through Saturday, 18 June, with a social media campaign. All were encouraged to #ShineLikeSally using the resources on the Sally's Night website (*https://airandspace.si.edu/sallys-night*) and by following the National Air and Space Museum on social media.

The impetus for Sally's Night came from Dr. Emily A. Margolis, the American Women's History Initiative curator who splits her time between the Space History and Aeronautics departments at the museum as well as at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts.

### Museum Reopening Planned for 14 October 2022

The National Air and Space Museum's building on the National Mall has been completely closed since the end of March 2022 in order to allow the construction being done as a part of Revitalization and Transformation to proceed unabated. Construction on the west end of the building is already complete, and new exhibits are being installed in eight galleries, with opening dates scheduled for 14 October 2022. The east end of the building is now completely a construction site, with the repairs and reconstruction that were already done on the west end being carried out on the second half of the building on the National Mall. In addition, plans are being drawn for the Bezos Learning Center that will be added to the building, thanks to a generous donation from Jeff Bezos.

Throughout this whole process, the museum's second facility, the Steven F. Udvar-Hazy Center in Chantilly, Virginia, remains open to the public.

When the museum building on the National Mall reopens to the public in the autumn of 2022, we anticipate that timed tickets will be used to regulate the traffic through the space, especially since only half of the building will be open—with the other half undergoing construction. Information about and photos of the ongoing process can found at *https://airandspace.si.edu/about-transformation*.

## NEW JEROME PEARSON FELLOWSHIP FOR SCHOLARS CONDUCTING AEROSPACE HISTORY RESEARCH

The Linda Hall Library has announced the new Pearson Fellowship that will provide one or two months of funding to a postdoctoral scholar conducting research related to any aspect of aerospace history, including, but not limited to, engineering, physics, astronomy, astrophysics, and other disciplines related to space travel and exploration. The Pearson fellow will conduct research on-site in Kansas City and receive a stipend of $4,200 per month.

Linda Hall Library will be accepting applications for this new research opportunity this fall as part of its 2023–24 application cycle. Learn more about this fellowship at *https://www.lindahall.org/about/news/linda-hall-library-to-offer-new-jerome-pearson-fellowship-for-scholars-conducting-aerospace-history-research*.

**“LINDA HALL LIBRARY WILL BE ACCEPTING APPLICATIONS FOR THIS NEW RESEARCH OPPORTUNITY THIS FALL AS PART OF ITS 2023–24 APPLICATION CYCLE.”**

## UPCOMING MEETINGS

The annual meeting for the Society of American Archivists will be held in Boston, Massachusetts, **20–27 August 2022**. See *https://www2.archivists.org/conference* for more details.

The 73rd International Astronautical Congress will be held in Paris, France, on **18–22 September 2022**. To learn more, visit *https://iac2022.org/*.

A two-day symposium on the History of NASA and the Environment will be held both at Georgetown University, Washington, DC and virtually on **29–30 September 2022**. To learn more, visit *https://www.nasa.gov/centers/marshall/history/call-for-papers-history-of-nasa-and-the-environment-symposium.html*.

The annual meeting of the Oral History Association will be held in Los Angeles, California on **19–22 October 2022**. See *https://www.oralhistory.org/annual-meeting/* for more information.

The annual meeting of the Society for the History of Technology will take place in New Orleans, Louisiana on **10–13 November 2002**. For details, go to *https://www.historyoftechnology.org/*.

The History of Science Society (HSS) will hold its 2022 annual meeting in Chicago, IL from **17–20 November 2022**. Learn more at *https://hssonline.org/page/hss22*.

A joint meeting of the Society for Social Studies of Science (4S) and ESOCITE (Asociación Latinoamericana de Estudios Sociales de la Ciencia y la Tecnología) will take place in Cholula, Mexico from **7–10 December 2022**. See *https://www.4sonline.org/meeting/* for more information.

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**Back Row:** (from the left) John Dawson, Starr Truscott, David Biermann, John Crowley, Floyd Thompson, E.W. Miller, Robert Spencer, E.G. Whitney, Jack Parkinson, Donald Wood;
**Middle:** Carl Bioletti, Abe Silverstein, Jane Adams, Ruth Belle, Wilhelmina Krowl, Catherine Wood, Janie Burroughs, Betty Gilman, Martha Bloom, Ina Hoffman, Amy Zukoff, Vera Sharp, Indie Atkins;
**Seated:** Iris Woodhouse, Eastman Jacobs, Alice Rudeen, Pearl Young, Henry Reid, Virginia Tucker, Margaret Darden. (Photo credit: H.R. Clason, LMAL Photographic Section, 1936)
**Key:** ARC: Ames Research Center, LaRC: Langley Research Center, GRC: Glenn Research Center

# A SNAPSHOT FROM LANGLEY'S 1935–36 WOMEN'S LECTURE SERIES

By Michael Pritz, Librarian, Langley Research Center

During the winter of 1935–36, the 26 women of the Langley Memorial Aeronautical Laboratory (LMAL) were presented with a series of classes arranged by Pearl Young and Henry J.E. Reid. Speakers from branches across the Laboratory addressed a host of topics that surveyed the aeronautical field, including flight, propulsion, engines and cylinders, structures, fuel, and wind tunnels. The lecture series culminated with a group celebration at the Langley Hotel on 24 March 1936.

The invitation that was mailed to the participants leading up to the event was inscribed with a tongue-in-cheek verse penned by Miss Iris Woodhouse:

*The last and final lecture*
*Will be given without question*
*On the twenty-fourth of March*
*Five to six.*

*Chiefs and speakers erudite*
*And the girls, both dumb and bright,*
*Are to gather at the Langley,*
*Just to mix.*

*There will be a little program*
*And perhaps a little "hokum",*
*Just a small informal gathering,*
*Nothing fixed.*

*So please signify acceptance*
*By informing us your presence*
*Will grace the Langley foyer,*
*(Not the Ritz!)*

At the tail end of the party, the ladies presented customized medals of appreciation to their favorite—and in Floyd L. Thompson's case, least favorite—speakers. (Note the large medallion with string held by both Reid and Young in the foreground). A few notable awards highlighted in the event's transcript include the following:

"Mr. Henry J.E. Reid and Ms. Pearl I. Young, a fine example of the teamwork of the NACA. We have therefore decided to award you both a medal: Two-horse team."

"Abe Silverstein, your wind tunnel will be very useful three months hence. For your foresight: Golfer swinging."

"John Parkinson, your talk was the favorite; it was the wettest. Three liquor bottles."

## THE GUY WHO NAMED IT "APOLLO"

**Abe Silverstein** is best known for his efforts in establishing NASA during the early years of the Space Age, when he promoted the use of liquid hydrogen, created Goddard Space Flight Center, and named Project Apollo. (He said that the image of the Greek god "riding his chariot across the Sun was appropriate to the grand scale of the program.") Silverstein got his start at LMAL in 1929 helping design and operate the Full-Scale Tunnel. Before he left in 1943, his staff playfully awarded him a bachelor's degree in "Aeronautical Skullduggery."

## THE ECCENTRIC GENIUS

Aerodynamicist and engineer **Eastman Jacobs** contributed many advancements in aeronautics. As the head of Langley's tunnel section from 1928 to 1939, Jacobs pioneered the systematic, mathematical definition of airfoil profiles and oversaw experimental studies of airfoil shapes, ultimately providing designers with unprecedented data for new airplanes. His team's 1933 report *The Characteristics of 78 Related Airfoil Sections* is regarded as one of the seminal publications from the NACA's early years.

While recognized as a technical genius, Jacobs was also known to be eccentric. In 1938, he initiated the first U.S. experiment to achieve thermonuclear fusion, though further studies were canceled due to the dangerous nature of the work and its lack of focus on aeronautics.

## THE DYNAMIC TRAILBLAZER

**Pearl Young** was the first female professional hired by the NACA when she joined LMAL as a physicist in 1922. In 1929, Young was appointed Langley's first Chief Technical Editor, where she developed guidelines and procedures that vastly improved the quality of the research published at the Laboratory. Young's rigorous system required all prospective documents to first be reviewed by a panel of engineering peers, then vetted by her editorial staff for consistency, logical analysis, and accuracy. In 1943, Young published her *Style Manual*

*for Engineering Authors*, which served as the guiding reference resource for authors NACA-wide.

Famous for their thoroughness and precision, research reports became the rock upon which the NACA built its reputation as one of the world's preeminent aeronautical institutions.

## THE ENGINEER-IN-CHARGE

12 April 1921: It was the age of the Jenny biplane; air mail was the latest sensation; and junior engineer **Henry Reid** had just reported to LMAL for his first day of work. Back then, the Lab, still in the infancy of its research in the fledgling science of aeronautics, consisted of only 40 employees, one small wind tunnel, a flight hangar, and two old converted military barracks sitting on a muddy airfield owned by the U.S. Army. Five years later, Reid was named Engineer-in-Charge.

Dr. Reid grew up with the NACA in the air age and helped guide NASA into the Space Age. When he retired in 1961, he had served as the Director of Langley for all but 10 of its 44 years of existence, watching it grow—through peace and war—to a staff over 3,200 strong operating 40 major research facilities.

## THE ORIGINAL COMPUTER

When she first arrived on the Virginia Peninsula in the summer of 1935, **Virginia Tucker** discovered "a serious woman shortage" at LMAL. In addition to her work as one of Langley's first five human computers, she often traveled to universities and colleges across the south to recruit more women to join the NACA. By 1946, Tucker presided over a vastly expanded department that trained nearly 400 women and placed them into various computing sections across the facility. In her 2010 best-selling book, *Hidden Figures*, Margot Lee Shetterly writes: "Over the course of twelve years, Virginia Tucker had ascended from a subprofessional employee to the most powerful woman at the lab. She had done so much to transform the job of computer from a proto-clerical post into one of the laboratory's most valuable assets."

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