

Featured Stories



Georgiy Tyulin (left) and Sergey Korolev, 1946, during the Soviet effort to recover German missile technology.

The Soviet Missile Program, Part I: Sergey Korolev, from Amateur Rocketeer through the Gulag to Chief Designer

By Erik Conway

The origins of the space age are complicated. In earlier history columns, I've told largely the U.S. story, tracing JPL's own development as a place to develop rocket motors, first for airplanes and then for short-range ballistic missiles. I've also written about other parallel rocket efforts — the American Rocket Society's early launches, and of course the Verein für Raumschiffahrt, the club that launched Wernher von Braun into leadership of Nazi Germany's ballistic missile program. His A-4 became the basis for both American and Soviet missile programs after WWII, serving as an important training object for engineers in both nations.

But it wasn't von Braun who inaugurated the space age. That honor belongs to Sergey Korolev, a Soviet engineer who worked tirelessly during the 1950s to marshal the technical, human, and financial resources necessary to orbit the world's first satellite in the face of a bureaucracy that wanted missiles above all. He accomplished it despite having once been declared an enemy of the state, convicted of being a member of an anti-Soviet organization and "wrecking" the work of his technical institute, and sentenced to hard labor in the Kolyma death camp.

Korolev and the Group for the Investigation of Reactive Engines and Reactive Flight

Korolev was born Dec. 30, 1906, in Zhitomir, Ukraine. He became interested in aeronautics at an early age, joining a glider club in Odessa when he was 17, and later attending Moscow Higher Technical School. He completed a mechanical engineering degree in 1930, and after working for a few months in aircraft engine design, was transferred to the Central Aerohydrodynamics Institute in Moscow. There, he became involved with an amateur rocketry group. This was the Group for the Investigation of Reactive Engines and Reactive Flight (GIRD), initially led by Fridrikh Tsander.

The club drew the attention of the Soviet Union's Society for the Promotion of Defense, Aviation, and Chemical Production, an agency devoted to developing technical skills in Soviet youth (today, we'd call it a STEM education organization). This gave GIRD some level of official sanction and support.

In May 1932, Tsander stepped down as the group's leader due to poor health, and Korolev became its head. He reorganized the group, placing development of a liquid-fueled rocket under another engineer named Mikhail Tikhonravov. Tikhonravov's rocket was built during early 1933, and after two failed launch attempts, lifted off Aug. 17, 1933. This was two years before JPL's founders met.

GIRD's little missile drew military interest. Late in 1933, Korolev's group merged with an existing military rocketry group, forming the Reactive Scientific-Research Institute. Korolev and Tikhonravov worked on a variety of small rocket motors for gliders and rocket planes with another engineer, Valentin Glushko — perhaps an even bigger enthusiast for space than they were — until 1937.

The Great Purge

The Soviet Union's leader in the 1930s, General Secretary Josef Stalin, was a dictator who maintained order in his government through the use of an expansive secret police organization. After a failed assassination attempt against him late in 1934, Stalin conceived a plan to purge the U.S.S.R. of the remaining influence of another of the Soviet Union's founders, Leon Trotsky, who was exiled in 1929. This Great Purge was launched late in 1936 and ran through late 1938. There's uncertainty over how many people were executed during this effort, but numbers range from 700,000 to 900,000.

The Reactive Scientific-Research Institute's sponsor in the military, the strategist Marshal Mikhail Tukhachevskiy, came under suspicion in May 1937 for "having been part of an anti-Soviet Trotskyite conspiracy." He was executed, along with his mother, sister, and two brothers, in early June. Every organization in his former command was put under surveillance. In the research institute's case, a politically ambitious communications specialist began providing "evidence" against other members of the institute, including Korolev and Glushko. Both were arrested, though issued dramatically different sentences. After a confession was tortured out of him, Korolev was given 10 years at hard labor in the Kolyma camp in the Siberian Arctic, where prisoners rarely survived a single year. Glushko was given eight years imprisonment within the sharashka, a network of prisons specifically for the Soviet intellectual elite.

Korolev arrived at the camp in August 1939 and was put to work in the camp's gold mine. His rescue came about because he was friends with the famed Soviet aviator Valentina Grizodubova, and she worked with Korolev's mother to get him a new trial. They received the new trial order after he left Moscow but before he arrived at Kolyma. The Soviets didn't keep very careful track of those sent to the death camps, so he wasn't located and sent back to Moscow until December. He had to find his own way

though the Siberian winter back to Moscow. Those few months left him, and his health, permanently scarred. At his new trial in 1940, he was convicted of a lesser charge — “saboteur of military technology” — and sentenced to a Moscow prison instead.

He wasn't there long. The aircraft designer Andrey Tupolev had also been arrested in the Great Purge, but Stalin needed Tupolev's talents. He had Tupolev make a list of imprisoned engineers whom he'd need for a new aircraft design bureau, and moved them all to a special sharashka outside Moscow. Korolev, who'd been a student of Tupolev's during college, was on the list. From 1940 to 1942, he worked under Tupolev on a crash program to develop the Tu-2 bomber.

In late 1942, with the bomber in very successful operation against the German Army, he was moved again to a sharashka focused on rocket engines. He joined Glushko in doing exactly what JPL's founders had accomplished earlier the same year in Pasadena: developing a liquid-fueled jet-assisted take-off motor. Korolev and Glushko succeeded in 1944. A decree that June freed the entire sharashka. A year later, Korolev was given a colonel's commission in the Red Army.

The German Contribution to Soviet Rocketry

In February 1945, the U.S., Great Britain, France, and the Soviet Union agreed to a partitioning of Europe that placed Peenemünde, the experimental test facility that hosted Wernher von Braun's missile engineers, and the Mittelwerk, where the A-4 missile was produced, within the Soviet zone of occupation. While the formal German surrender took place on May 8, 1945, von Braun and many of his associates were already in U.S. custody. They had quite intentionally moved west in order to surrender to U.S. forces in April, and turned themselves over on May 2. The U.S. Army had also captured the Mittelwerk in April, and before turning it over to the Soviets in July, had largely stripped it of missiles, parts, and documents.

In September 1945, Korolev and Glushko were sent to Soviet-occupied East Germany to do what JPL's Theodore von Karman and Qian Xuesen had done in May — inspect the Peenemünde A-4 facility, the Mittelwerk, and interview the remaining engineers and technicians to learn about the missile. But they were far too late. The Soviets were only able to recover some partial A-4s from the Mittelwerk, some production tooling, and a small number of technicians and engineers who hadn't wanted to leave Germany. In fact, they were all forcibly relocated to the Moscow area in October 1946, with their families — about 495 people.

As was true about the U.S., the U.S.S.R.'s goal was to reconstruct enough missiles to do flight testing, developing their own expertise in the process. They were only able to cobble together about a dozen A-4s to fly and were able to make parts to complete a few more; in parallel, they also developed a copy with somewhat greater range known as the R-1. Korolev led this effort both in Germany and after its move to Moscow..

In July 1947, a test site was chosen for the restored A-4s and the new R-1s near Volgograd, informally known as Kapustin Yar. The first restored A-4 flew Oct. 18, 1947, about a year after the first flight of a restored A-4 at White Sands Proving Ground in New Mexico. The first R-1 launch was nearly a year later, in September 1948. Like the U.S., the Soviets flew various kinds of scientific instruments on their missiles to explore the upper atmosphere.

It's worth remarking on one big difference between the Soviet and American missile programs: The U.S. relied heavily on von Braun's engineers in its Army missile programs of the 1950s, even allowing them to run major programs; the Soviets did not. They used the Germans brought to the U.S.S.R. as consultants while learning to design and make the hardware themselves. Korolev didn't trust them, and of course he worked within a paranoid regime that had good reason not to trust its former enemies. In early 1948, that regime decided to relocate the Germans to an island in Lake Seliger, about 380 km northeast of Moscow. This effectively isolated them, and while they completed a few more missile designs at the request of

Korolev's superiors, none were built. Late in 1951, they were allowed to return to the German Democratic Republic, also known as East Germany, and most did so in early 1952.

German hardware provided a base the Soviets built on. But Korolev and his superiors consistently favored developing their own missile designs, using their own people, developing their own skills and expertise in the process.

By 1953, Korolev had been made Chief Designer of Special Design Bureau 1 (OKB-1) of the Scientific-Research Institute 88, where he was responsible for the development of both short and long-range ballistic missiles. It's from this platform he would lead the development of the U.S.S.R.'s first intercontinental ballistic missile and acquire the influence, resources, and personnel to make the U.S.S.R. the world's first space-faring nation – an era we'll explore in Part 2 of this installment.

For further reading:

1. Asif Siddiqi, "The Soviet Union and the Space Race, 1945-1974" NASA SP-2000-4408, 2000, pg. Available at <https://www.nasa.gov/wp-content/uploads/2023/06/sp-4408.pdf?emrc=797dd2>
 2. Michael J. Neufeld, "Von Braun: Dreamer of Space, Engineer of War" (NY: Knopf, 2007).
 3. James Harford, "Korolev: How One Man Masterminded the Soviet Drive to Beat America to the Moon" (NY: Wiley, 1999).
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Left to right: Jonathan Moges, Tunde Demuren, and Devin Johnson

Black History Month: A Spotlight on B.E.S.T. Leaders

To commemorate Black History Month, members of JPL's Black Excellence Strategic Team (B.E.S.T.) — Tunde Demuren, Jonathan Moges, and Devin Johnson — discuss the highlights of being a part of the JPL community, what drives them in their career goals, and how the employee resource group has been a vital part of the Lab's culture over the years.

Answers have been edited for length and clarity.

Tunde Demuren

Mission Planning and Spacecraft Operations Systems Engineer for Europa Clipper

Joined JPL in 2020

B.E.S.T. Event Coordinator

What have been some of your favorite projects to work on?

Taking part in the NISAR mission scenario test in the mission planning operations role. This project was particularly illuminating, as it gave me my first real experience of day-in-the-life mission operations. Another one was working on the schedule for the Flight System Characterization subphase of Europa Clipper. FSC is the period immediately after launch, where several key, one-time activities must occur to assess the health and safety of the spacecraft and meet objectives that will have a significant factor in the overall success of the mission.



What is your favorite thing about the work you do? Why do you do it?

That I am not constrained to one subject matter. The interdisciplinary nature of mission planning allows me to build knowledge in a wide range of areas and maintain a higher level perspective on the project. I'm surrounded by a lot of brilliant minds, which makes it easy to not only learn, but also work together to find solutions to the unique challenges we face in developing end-to-end space missions. Learning and collaboration are ingrained here.

How would you describe the people and culture of your team and/or JPL?

Pretty much everyone I've worked with at JPL has been incredibly supportive and patient. I started working here fully remote during the height of the pandemic, which could have made it easy to feel isolated. Despite this physical separation, I always felt that support was available to me, as my colleagues went above and beyond to help me get up to speed on things.

How would you describe your overall professional purpose at JPL and what drives you in your career?

I see my purpose at JPL as supporting the pursuit of science in near and deep space in any way I can. Right now, that is from the role of a mission planner where I must maintain a higher level perspective to drive mission success. However, I am also always willing to try out something new, with the intention of becoming a more well-rounded engineer capable of solving a wide range of problems.

As a member of B.E.S.T., how have you felt supported in your professional development at JPL?

B.E.S.T. has provided a source of inspiration and mentorship, as I've had no shortage of role models, as we have many immensely talented black engineers here. This has helped me to see what is possible for my own career here. ERGs like B.E.S.T. are immensely important, because not only do they provide a sense of community for groups that often aren't in the majority, they also create greater visibility for these underrepresented groups, further normalizing our place in these spaces.

Jonathan Moges

Data Scientist

Joined JPL in 2015

B.E.S.T. President

What drives you in your career at JPL?

Contributing to something larger than myself and being challenged by my work. I am inspired by our collective pursuit of innovation, working towards goals that extend beyond the ordinary, and pushing the boundaries of what is possible. I am passionate about contributing to JPL's success both in my role as a data scientist and through B.E.S.T. JPL's values resonate deeply with me, and it is satisfying to contribute to the broader positive impact on JPL.



What has been your biggest challenge, professional or personal, and how did you overcome it?

My biggest professional challenge was my career transition to being a data scientist. I was a financial analyst and the learning curve was steep, requiring a deep dive into programming languages, statistical modeling, and machine learning algorithms. Fortunately, graduate school prepared me for this transition

and the shift from a predominantly business-focused mindset to a more technical and data-centric approach demanded a recalibration of my problem-solving methodologies. Effective communication and collaboration were integral as I worked to bridge the gap between my financial acumen and the technical intricacies of the data science domain. Overcoming this transition required not only an investment in acquiring new skills but also a willingness to embrace ambiguity and learn from setbacks.

How has B.E.S.T. supported you and your professional development at JPL?

Networking within B.E.S.T. has proven to be a powerful tool for my professional growth. Connecting with individuals from various backgrounds and career stages has broadened my perspective and opened doors to collaboration and mentorship opportunities. These networks serve as a source of guidance, advice, and support, enhancing my ability to navigate complex challenges.

Why are employee resource groups like B.E.S.T. important?

I believe ERGs are important because they serve as a platform for building a sense of community and belonging among employees. I've heard JPL compared to a small town and this analogy underscores the importance of an ERG. The feeling of being new to a project, role, or organization can be like moving to a new town. Whether someone is a new employee or more seasoned at JPL, having a sense of community and staying connected to others is incredibly important and ERGs ease this transition. ERGs allow us to share perspectives, celebrate cultural differences, and raise awareness about issues that matter to our communities. From a professional development perspective, ERGs provide opportunities for skill-building, mentorship, and career advancement. Through ERGs, people can take on leadership roles, enhance skills, and contribute meaningfully to JPL's success.

Is there an individual from history who most inspires you?

Congressman John Lewis. He is most well-known for the term "good trouble," as well as having an unparalleled dedication to justice, relentless pursuit of civil rights, and unwavering commitment to equality. He exemplified the qualities of a true leader — one who not only advocates for change but actively participates in the transformation they seek. His life was a testament to resilience and courage, as he fearlessly marched for justice, faced adversity, and fought for the rights of others. His legacy encourages me to lead with purpose, to champion inclusivity, and to stand firm in the face of challenges.

Devin Johnson

Instrument Operations Systems Engineer for SWOT, Sentinel-6A, Sentinel-6B, CRISTAL, and Europa Clipper
Joined JPL in 2021
B.E.S.T. Event Coordinator

What was your path to JPL and when did you join?

I first started at JPL as a remote intern in 2021, after a long 3 years of applying to no avail. I was working in 312I (Internal Build Mission Project Systems Engineering) as a project systems engineering intern for Europa Clipper, and I was so amazed by everything I learned in just three short months and the people I met. My mentor that summer, Winston Jackson, helped me realize what I wanted out of a career and how to get there at JPL.



Through searching JPL Space for all the various organizations and work we do, I found the Instrument Operations Group, got an interview a couple of months later, and now here I am.

How would you describe what drives you in your career at JPL?

I am most excited by the societal value and impact of what we do here at JPL. Not only do I get to work on missions like Clipper searching for worlds that can support life for humanity's future endeavors, but I also get to work on groundbreaking Earth missions such as SWOT, measuring the first-ever global survey of Earth's surface water for the first time and making an impact on how we live in the present. Having the opportunity to support such discoveries and scientific and societal advancements is more than enough to make me want to come in and give my best every day.

Is there an individual from history who most inspires you?

I appreciate every single person who has had a hand in fighting for rights and equality for all in our society, no matter how big or small of an impact they made. However, I do feel especially moved by those who were able to use their artistic and athletic talents – and the fame that came with it – to fight for their people. Throughout history, Black people with these talents would sometimes be regarded as “different” or “better” than the rest of the Black community just because they could entertain. But it was these artists and athletes who used their positions of influence to progress the civil rights movement, when they could have just taken their money and fame and ignored the struggles of those around them, that I admire. This includes icons like boxer Muhammad Ali, singer Sam Cooke, poet Maya Angelou, and many more.

What advice would you give other professionals and students interested in a similar career?

I would tell anyone who wants to work in any position at JPL or NASA in general to let curiosity lead their lives. When it comes down to it, that is why we do the work that we do. We are curious about what lies in and beyond our solar system. We are curious about what surrounds our planet and how that affects the way we live. We are curious to see what we can learn about our environment, and what we can do to further humankind. When you live your life striving to learn more about your intrigues and passions, it leads you to places where you not only work to find answers, but also to discover more questions.

What has been your biggest challenge, professional or personal, and how did you overcome it?

My biggest challenge has probably been transitioning into the workplace, both professionally and personally. As a young engineer starting my career in a city across the country from where I grew up [in NYC] for my entire life, it took a lot of adjusting. I was navigating how to perform to the best of my ability in a position like operations, which isn't something I learned directly in school, while also attempting to build a community outside of work. I didn't know many people and this was also before the mandate to come back on Lab was implemented. However, as time went on, my project teams and B.E.S.T. were extremely helpful in getting me adjusted to JPL, and I learned to not be afraid to ask questions – that was the only way I would actually learn. As for growing my personal community, I realized that all it really took was time.

How has B.E.S.T. supported you and your professional development at JPL?

Ever since I started at JPL as an intern, B.E.S.T. welcomed me with open arms and smiling faces. Although JPL is a pretty diverse place, especially compared to many other companies in the aerospace industry, I didn't know this when I first began. B.E.S.T. members allowed me to start feeling comfortable as a person and as an engineer at JPL, which helped me get over the initial awkward [hurdle] of being a new employee in the workplace. As a board member now, I want to help our members with their professional development through networking, seminars, workshops, and any other way we can support each other.



Members of the Yue Opera Troupe perform during the Lunar New Year celebration on Feb. 8 on Building 301's patio.

JPLers Commemorate Lunar New Year

By Christian Hill

JPL's Asian American Council celebrated its 30th anniversary as an employee resource group by ringing in the Lunar New Year on Feb. 8 at Building 301's patio, while adapting an ancient tradition to acknowledge colleagues no longer at JPL.

This year's event welcomed more than 150 attendees who enjoyed traditional Lunar New Year dishes provided by local Filipino-prepared food market Chaaste in Pasadena; a raffle that included traditional red envelope prizes; and performances by the Yue Opera Troupe, erhu and pipa musicians, and the Jazz Propulsion Band.

Also in attendance: Executive Council members including JPL Director Laurie Leshin, Deputy Director Larry James, JPL Associate Director for Strategic Integration Dave Gallagher, incoming Deputy Director Leslie Livesay, and Acting Chief Scientist Susan Owen.

"I am happy to be among you on what is a sad week," Leshin told the audience. "I appreciate that we are keeping this celebration going. It's a celebration of future potential, and I think that's something we all really need right now — to lean on tradition, lean on our past, and support one another through a time that is incredibly challenging."

AAC Vice Chairs Joan Tubungbanua and Christine Chen also spoke, describing the history and traditions around the upcoming Year of the Dragon, which symbolizes power, nobleness, honor, luck and success.

By fateful coincidence, the event fell one day after JPL experienced layoffs in response to significant budget cuts. It was a circumstance for which the holiday has an apt tradition.

"Typically, on Lunar New Year's Eve, families gather and leave a place at the table for family members who aren't able to attend," said AAC Chair Shayena Khandker.

"We had a lot of empty chairs today, and we remember them and are thinking of them."

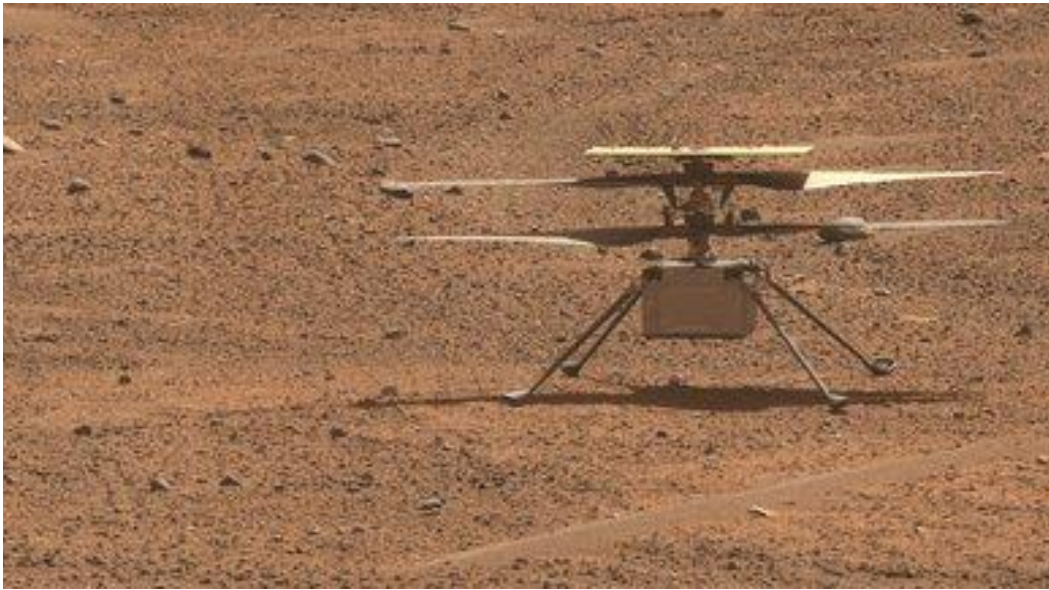


JPL Chinese Club Holds Annual Skit

During the Lunar New Year festivities, the JPL Chinese club held their annual skit. The group of language students and JPL native speaking mentors have been written and produced a skit for the Chinese Lunar New Year event every year since 2010.

This year's skit combined themes from the "Barbie" movie and "Long Nian" – year of the dragon. This year, Taiwanese award-winning actress and singer Grace Gua Ah-leh performed in the club's skit.

Events



Von Karman Lecture Series – The Mavericks of Ingenuity: How NASA Extended the Mission of the First Mars Helicopter

Thursday, March 21
5 to 6 p.m.

[Watch live on YouTube](#)

Join Chief Pilots Havard Grip and Martin Cacan as they share how Ingenuity's team used resourcefulness and creativity to move beyond the helicopter's initial mission, transforming the rotorcraft from a successful tech demo into an invaluable scientific scouting tool for the Perseverance Rover – and how Ingenuity opens a world of possibilities for future exploration.

The Ingenuity Helicopter first took to the Martian skies on April 19, 2021, proving for the first time that powered, controlled flight was possible on another world. Designed as a technology demonstration that would perform up to five experimental test flights over a span of 30 days, the Mars helicopter surpassed expectations repeatedly, only recently completing its mission after having logged an incredible 72 flights over nearly three years.

Speakers:

- **Havard F. Grip**, Aerodynamics, Flight Control Lead, and Chief Pilot (Flights 1-37)

- **Martin Cacan**, Guidance and Control Analyst, Pilot (Flights 15-37), Guidance, Navigation, Control Lead, and Chief Pilot (Flights 38-72)

Host: Greg Ivan Smith, Office of Communications and Education

Co-Host: Sarah Marcotte, Mars Public Engagement

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

50+ Years:

Martin A. Slade III, Section 332K, 52 years

Passings

Passings must be submitted through Human Resources, which coordinates with the family of the deceased.

John Mark Phillips passed away on Jan. 30, 2024, at 72 years of age. He worked at JPL for 32 years, most recently in the Project Support Office Launch Approval Engineering. He retired in February 2022. Mark attended college at the Ohio State University, where he earned a Bachelor's degree in Biology, and was a trained Radiation Protection Officer. By the mid-1980's, he was Manager of the Health Physics Office for EG&G Florida, the company implementing the Radiation Protection Programs for launch and range activities at NASA's Kennedy Space Center and the U. S. Air Force's Cape Canaveral Air Station. In 1990 he joined JPL, beginning work on the nuclear safety and launch approval engineering effort for the Cassini Saturn orbiter and its RTG power system. Over the next 30 years, he continued his work as an engineer and line manager in support of a range of NASA missions with applications of nuclear power including the Galileo Jupiter Orbiter's Earth flyby (1992), ULYSSES (1990), Mars Pathfinder (1996), Cassini's launch (1997) and later Earth flyby (1999), the twin Mars Exploration Rovers (2003), the Pluto New Horizons spacecraft (2006), the MSL Curiosity Rover (2011), and the Mars 2020 Perseverance Rover. Mark was instrumental in developing, integrating and advancing the Radiological Contingency Response preparations for all of these NASA/JPL missions in the unlikely case of a launch accident. Mark also served on JPL's Radiation Safety Committee for over 25 years and was a critical contributor to the development of JPL processes, JPL RULES! and on-line tools that help ensure JPL's compliance with Federal and State requirements and international guidelines involving environmental protection, safety and contingency planning relevant to the use of space nuclear power sources. Mark is survived by his wife Kathleen M. Bergstrom; sons Justin M. Phillips and C. Brandin Adams; daughter Sheena Marie Hemkin; and grandchildren Ryder, Kaylee, Logan, Julian, and Arielle.

-This obituary was written and submitted by the Phillips family.

Michael Stoloff passed away on Jan. 20, 2024, at 74 years of age. Stoloff worked at JPL for 36 years, most recently in the Deep Space Network organization. He was an engineer and worked on tracking most of all Mars rovers. Additionally, he worked on collaborative projects with ESA, ISRO, and other countries' space organizations. Stoloff is survived by his wife Shirley Roberts and son Zachary Stoloff.

Personnel Appointments

Star Tracks is a monthly series highlighting recent personnel appointments on Lab.

Brett J. Buckland: Group Supervisor of 393D Telemetry and Tracking Data Services on Jan. 1.

Umaa D. Rebbapragada: Group Supervisor of 398J Machine Learning and Instrument Autonomy on Jan. 15.

Joseph D. Vacchione: Group Supervisor 337B of Spacecraft Antennas on Jan. 15.

Rebecca S. Wilkinson: Deputy Division Manager of 2400 Office of Contracts Management on Jan. 15.