GRAA NEWSLETTER

P.O. Box 1184, Greenbelt, MD 20768-1184

April 2023   http://GoddardRetirees.org   **39th Year of Publication**

UPCOMING LUNCHEONS: We meet at 11:15 AM on the 2nd Tuesday of each month at the American Legion Post #136 at 6900 Greenbelt Road. **Reservations are required;** please contact graalunch@gmail.com (preferred) or call (410)-709-8889 **before** **Thursday, April 6th**.

April 11	**Dr. Joanne (Joe) Hill-Kittle,** Dept. Dir., Goddard Engineering and Technology Directorate will discuss "**The Future of Goddard Engineering**": major thrust areas, incorporation of Digital Engineering, and pivoting to commercial space capabilities.
May 9	**Dr. Joanna Joiner,** Atmospheric Chemistry and Dynamics Branch, winner of the 2020 William Nordberg Memorial Award, will present a preview of her June pandemic-delayed Nordberg Lecture.

"**The core Flight System (cFS) Software**"
by Elaine Shell, Jonathan Wilmot, and David McComas
March 14, 2023

In 1998 the Engineering Directorate reorganized from projects-focused Divisions and Branches into subsystem discipline-specialty Divisions. This brought Flight Software (FSW) engineers from 6 Branches into one (Code 582, headed by Elaine Shell), with a goal of improved reusability of onboard software products. The FSW Branch created the core FSW System (cFS) while working GSFC mission developments. Elaine introduced Jonathan Wilmot and Dave McComas, retired Senior FSW Engineers in the FSW Branch who championed the cFS from concept to International Standard. And both continue to support the cFS via contract opportunities.

Jonathan explained that the cFS is a reusable software framework with a layered architecture such that the interfaces of new flight computers, operating systems, and special-purpose mission hardware are isolated from the cFS executive and all applications. The Solar Dynamics Observatory and Global Precipitation Measurement mission developments provided situations to mature and test many cFS capabilities, including some valuable mission I&T efficiency features. The software was then refined and validated for Lunar Reconnaissance Orbiter and Magnetospheric MultiScale missions. GSFC has used the cFS for every in-house mission since, saving risk, cost, and schedule for each new mission development. Seeing the success at Goddard, and since Goddard had licensed the software as open source, other organizations including APL, ARC, JSC, MSFC, GRC, KSC, SSC, LaRC, and JPL, started to use cFS for their flight projects, saving NASA funds across agency projects. Then with a wide user

community and a mature product, NASA included the cFS as a requirement in the International Deep Space Interoperability Standards (2020) for use across the Artemis program. Besides the code, cFS comes with a full set of documentation, test tools, life cycle processes and a supportive user community. The cFS Team won the NASA Software of the Year award in 2020.

Dave spoke about the intersection between the cFS being released as open source in 2015 and the National Aeronautics and Space Act tenets to, "promote technology development and contribute to the national technology base". This commitment created many opportunities for Goddard to share its FSW expertise by helping commercial and international organizations adopt the cFS.   In 2014 NASA awarded three contracts under the 'Lunar Cargo Transportation and Landing by Soft Touchdown' (CATALYST) program. All three contractors used the cFS; program-funded civil servants helped transfer knowledge to them. One awardee, Astrobotic, is planning to launch its Peregrine lunar lander this year and if successful it will be the first commercial organization to land on the moon. Since 2013 there has been nearly exponential growth in the number of CubeSats/SmallSats launched and a large increase in the number of countries developing spacecraft. This has created strong demand for the cFS for science and exploration by universities, space agencies, and industry -- for missions ranging from little CubeSats to the Artemis crewed Lunar Gateway with many international partners.

Dave held a hands-on cFS workshop at the Universidad Panamericana in Mexico where the Colibri CubeSat with an instrument from MIT is being developed. This experience inspired him to start a nonprofit called Open STEMware that uses cFS-base projects for Science, Technology, Engineering, and Mathematics education. Goddard has always been exemplary in sharing its science data and expertise. The Engineering Directorate now is doing this with cFS.

SPECIAL NOTICE: The *Goddard Child Development Center* (GCDC) is turning 50 Years Old this year and the Parent Advisory Committee is throwing a party on April 27th. For info and tickets, see:
https://secure.anedot.com/9fdbc39a-4559-42c7-becc-5194bbc9e718/50-yr-celebration-tickets

DIRECTORIES AND NEWSLETTERS: We depend on retirees to furnish their home addresses to be listed in the biennial **GRAA Membership Directories**, which are only available as mailed hardcopies to members. Multi-month *abstracts* **of Newsletters** are also mailed by USPS to our retirees with only mail addresses in our files. These are supported by donations to GRAA, P. O. Box 1184, Greenbelt, MD 20768-1184.

Retirees need to register their email addresses to get our monthly **Newsletters,** which include synopses of the talks, special community announcements, and obituaries. Please send your email address to goddardretirees@gmail.com   Past Newsletters and videos are on our website http://goddardretirees.org.

TREASURER'S REPORT: Jackie Gasch received tax-deductible donations from the following: Thomas White, John Purcell in memory of George Russell, Eloise Tarter, Regina Cody, and Vernon Krueger.

FROM THE GODDARD ARCHIVES: Forty years ago on April 28, 1983, Delta launched GOES F which became GOES 6 that provided weather data till January 1989.

REMEMBERING OUR FORMER COLLEAGUES:

Virginia "Ginny" Zanner, 98, of Washington, DC, passed away on February 28, 2023.
She worked in Code 626 Data Analysis Branch of the Laboratory for Planetary Atmospheres and was also a founding member, technical director, and costume designer for Goddard's MAD theater group. GRAA member.

LeNoir H. Lewis Jr., 90, of Spotsylvania County, passed away on March 10, 2023. Len served in the U.S. Air Force, worked as an FAA air traffic controller, then took a job with Goddard, where he worked for 30 years. GRAA member.

John Edward Moore, 85, of Olney, MD and Naples, Florida, passed away on Sunday, March 19, 2023. Born on July 17, 1937, in Richmond, Virginia, he graduated from Virginia Military Institute and served in the U.S. Army and Army Reserves. His 30-year NASA career started at Goddard Space Flight Center where he was a Resources Manager in Code 268 and Procurement Officer in Code 280B before transferring to NASA Headquarters. GRAA member.

Robert (Bob) Denny Phillips, 86, of Bowie, MD passed away on Sat, March 25, 2023. After getting a BS degree at UMD in 1958, he was one of the pioneers in the newly formed NASA Goddard Space Flight Center. He retired after 30 years as a procurement manager for satellite launch vehicles in Code 280 and then continued to support Goddard as a contractor. GRAA member.