New Horizons ready for close encounter of the Pluto kind

As of March 10, the New Horizons spacecraft was only one Astronomical Unit away from Pluto.

The piano-sized New Horizons has traveled a distance of 32 AU—3 billion miles in its nine-year journey to Pluto. One AU is the average distance between the Earth and the Sun (93 million miles or 148 million kilometers.)

The upcoming five-month long flyby study of Pluto and its five known moons is the first ever spacecraft research of Pluto. Its closest approach is scheduled for July 14, 2015, when New Horizons is expected to get within about 6,000 miles of Pluto.

According to NASA releases, since January its Long-Range Reconnaissance Imager (LORRI) has been taking hundreds of long-distance pictures of Pluto and its moons from a distance of a mere 135 million miles. Until late May, these will appear as little more than bright dots, but scientists can use this data to design

Cont. “New Horizons”

Tombaugh remembered with New Horizons

When the New Horizons spacecraft flies past Pluto in July 2015, it carries with it a bit of Kansas.

In memory of the first American to discover a planet in our solar system, Kansan Clyde Tombaugh, the spacecraft carries a small aluminum canister containing an ounce of Tombaugh’s cremated remains, donated by his family. These remains will fly past Pluto with the New Horizons on July 14, 2015, then past the Kuiper Belt objects, ever outward. New Horizons will eventually leave the solar system and enter interstellar space.

As such, Tombaugh’s remains have become the first to be launched to the stars.

Before he discovered Pluto in 1930, Tombaugh, who was born in Illinois, moved with his family at age 16 to the rural Burdett, in Pawnee County. Graduating from Burdett High School in 1915, he did not have money for college so he studied math and science on his own.

Interested in astronomy, he was self-taught and at age 20 built a telescope from mirrors he ground himself and from parts of farm equipment.

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AAK Foundation welcomes new board member

Our newest board member brings youthful enthusiasm. Shawn Carithers is a 2014 math and aerospace engineering graduate of WSU. Currently, he is a behavior support interventionist for Hutchinson USD 308. Eventually, he hopes to teach secondary math. "I love mathematics. It is true beauty to me how math permeates through many fields. I love to bring this understanding to people," he says.

Born in Cape Canaveral, Florida, and growing up in Hutchinson, he has always been interested in space science. He credits the Kansas Cosmosphere with igniting his passion for it. "[The] real space craft there... really brought the science to me. Listening to the Apollo astronauts speak of their almost-spiritual experiences... further put my existence into perspective and what responsibility we have for our planet and how we need to cooperate to achieve habitation on another." Carithers has worked at the Kansas Cosmosphere for nine years and continues there part-time.

"I hope to [help] grow the network of organizations interested in space and really bring their message to children of all ages, [about] the future of our interstellar endeavors. I am really looking forward to this."

Carithers replaces board member Heather Mull, whom we would like to thank for her two years of dedication and expertise.

“New Horizons” cont. from page

Shawn Carithers

Why Pluto? According to sources at Johns Hopkins University Applied Physics Lab (JHUAPL), a partner with NASA, scientists want to know how does Pluto “fit in” with the rest of the Solar System?

The Solar System has three “zones.” The inner zone, rocky and metallic, includes Earth, Venus, Mercury and Mars. The giant gas and ice planets of Jupiter, Saturn, Uranus, Neptune have thick molecular atmosphere and ices. The third region houses the ice dwarfs of the Kuiper Belt. Pluto being the largest. Ice dwarfs are solid, but much of the mass is icy materials (frozen water, carbon dioxide, molecular nitrogen, methane and carbon monoxide).

冰 dwarf are ancient infant planets that never grew. They are literally the stuff from which larger planets evolved.

Besides conducting active research in observational astronomy in settings like Kitt Peak Observatory in Arizona, Mt. Laguna in California and Chile’s Cerro Tololo Inter-American Observatory, Anthony-Twarog is also known for research on the development and use of new telescope techniques including technology now on the Hubble Space Telescope. She also helped develop a new photometric metallicity (a measurement of all elements in the universe except hydrogen and helium) index, and has uncovered a unique view of the spatial pattern of chemical composition in the Milky Way spiral.

KU physicists active in Large Hadron Collider restart

LAWRENCE — In 2012, scientists using the gargantuan particle accelerator Large Hadron Collider shock the world with observations of a subatomic particle closely resembling the Higgs boson, confirming a linchpin of the Standard Model of physics.

Many scientists from the University of Kansas were among the LHC researchers who achieved this historic breakthrough.

But they accomplished their initial Higgs observations with an atom smasher that was running below its full-potential energy of 14 tera electron Volts. Recently, the overhauled particle accelerator resumed operations with an energy upgrade.

“With the new, higher center of mass energy — almost 14 TeV compared to 8 TeV — a whole new energy region will be waiting for us to discover something,” says Alice Bean, professor of physics and astronomy, who has performed extensive research at the collider.

“Theorists have been waiting for us to find supersymmetric particles, but so far there is no evidence for them. If we continue to not find these, this will also be very interesting.”

Bean said the collider’s Compact Muon Solenoid detector — with a pixel detector developed and built by KU researchers — “will require maintenance and upgrades to operate at the boosted energy levels.

“The pixel detector we are involved with at KU won’t be able to function for too long once the LHC runs on again,” she said in March, previous to its rebooting. “It was never designed to be able to record all the images that will be forthcoming at the higher energy and higher data rates as well.”

So while the LHC was undergoing upgrades, Bean and her colleagues were optimizing a new detector for the LHC’s greater level of operational energy. “We’ve designed a new pixel detector and are building it at KU and elsewhere to replace the current pixel detector in 2017,” she said. “This has been a major focus of our research. The shutdown of the LHC allowed [installation of] some components of this in preparation for the 2017 shutdown when we plan to install the entire upgraded pixel detector. They take several years to build.”

For the time being, KU researchers installed a pilot pixel detector to test its readout system and understand how best to use the device.

“Remember that we are trying to take 40 million pictures per second,” Bean said. “We have to figure out how to throw away most of the data without throwing away interesting stuff that was recorded.” The KU physicists have also been analyzing data from the previous run and preparing to take data at an entirely new energy.

“We have to simulate events in our detector and figure out how the channel for the signals of the physics at the higher energy,” Bean said. “There has been tremendous computer processing of simulations to get ready for this so...we’re ready to go.”
Wichitan “fixes stuff” on the International Space Station

Amanda Premer is excited. She recently finished her first big project since starting to work for NASA at Johnson Space Center in August, 2014.

Since November, the May 2014 Wichita State aerospace engineering graduate, as part of a two-person team, has designed plans for the re-routing of power and data cables in the front of the International Space Station (ISS) to get ready for the new International Docking Adapter(IDA) that will allow commercial space vehicles to dock on the ISS.

On March 10, two of the astronauts, Terry Virts and Butch Wilmore, executed the reconfiguration task. Premer says, “Terry and Butch did a great job. The two IDAs will be flown up on separate SpaceX Dragon spacecraft and installed later this year.”

The native Wichitan, a Goddard High School graduate, says she was not interested in science until high school. “A really great science teacher” piqued her interest, and attendance at the Kansas Cosmosphere and Space Center’s Space Camp helped her see “how cool the space experience is.” While at WSU, she completed six co-op semesters. Three were at Boeing Flight Test Center in Wichita. The last three were at Johnson Space Center in Houston.

The first NASA rotation had to do with attitude determination for the International Space Station. “This has to do with how the ISS is oriented and where it is at in its orbit,” she says. This is one of the flight controller positions at Mission Control.

Her second rotation was in the Engineering Directorate. She worked on developing and testing navigational software for the asteroids. She was part of a contingency jet pack concerning calculation / measurement of the rates of movement, that astronauts wear during a space walk.

Her last tour was back in operations, in the group responsible for mechanisms and maintenance of the ISS. This was her favorite and led to her current position.

As an Operations Support Officer (OSO) in NASA’s Flight Operations Directorate, her specific support group includes about 40-50 people. “We are the group that fixes stuff on the ISS,” she says.

“I like to give an example that the space station is like a home, with plumbing, electrical and a myriad of other things that need preventative and corrective maintenance. We are constantly monitoring the space station and instructing the crew how to do repairs in space.”

One thing Premer enjoyed during her co-op experience was that she was certified in the use and training of tools for the ISS. “I actually got to teach two astronauts how to use some of the tools.” She is currently recertifying in that class.

Though she is comfortable in her new position—and praises the team atmosphere at NASA—she says she found being a newbie frustrating at first, especially in her co-op tours. “Not knowing what you don’t know—you just want to learn, learn, learn. You just have to keep asking questions. Eventually, people start asking you questions, and you know the answers. It’s fulfilling—being the one that knows something.”

Premer says people don’t realize all the different types of space science there are. She tells students to open to all possible realms of science. “Try different kinds of science, even just a little.”

Kansas Space Grant Consortium funding enables education and research

HAYS—At Fort Hays State University, KSGC funding has been used to facilitate high altitude balloon launches on elementary and high school, as well as university-level. FHSU has provided LEGO EV3 Robotics Workshops. Rachel Jones, who took this workshop as part of the Glen Elder Library’s robotics project, e-mailed her appreciation. “We are offering two after-school programs a week, with a total of 24 kids. Last week we had to kick kids out of the library at closing—2 hours after our class ended.”

MANHATTAN—At K-State, electrical and computer engineering researchers are exploring the possibility of building a flat-probe ultrasound system to address long-term injuries in astronauts involved in NASA JSC’s Neutral Buoyancy Lab training sessions. This technology development, if successful, could have applications both within and outside NASA for real-time monitoring of patients.

LAWRENCE—At Haskell Indian Nations University, the KSGC has supplemented funding for an EPA grant to develop efficient economical treatment of community drinking water from surface sources. Communities studied will be the Kickapoo Nation of Kansas and Holton.

WICHITA—Alex Foster of Wichita State University won an award for his presentation at the annual Capitol Graduate Research Summit (CGRS) in Topeka. This event showcases research done at regents universities which provide a direct impact to the state. According to his abstract, Foster’s NASA EPSCoR research concerns the space industry’s shift from centrally to all-electric thrusters and satellites. In his research the implementation of a transfer path from a starting orbit to Geosynchronous Earth Orbit (GEO) is being analyzed to minimize a number of factors: transfer time, fuel expenditure and radiation damage. Considering all of these factors can contribute to an optimum design that enables spacecraft to compete with the current ones, saving millions in launch and operations costs. Because of the Kansas expertise in aerospace, it is in a prime position to attract and facilitate manufacturing and servicing of all-electric spacecraft and launch vehicles.

The Kansas Space Grant Consortium was formed in 1991, one of 52 space grant consortia funded by NASA. The KSGC channels NASA support, mainly to universities, to develop initiatives supporting NASA’s vision for aviation and space education, research and industry. The KSGC also administers the NASA EPSCoR Program in Kansas, which provides research funding in areas historically underserved.

In the early 1950s, he led the Near Earth Satellite Search, a first step in space exploration. The four-year project, which found no natural orbiting satellites of Earth, reassured NASA that rockets could be sent into space without danger of collisions.

At New Mexico State University for almost 20 years, he directed the NMSU photographic Planetary Patrol of Mercury, Venus, Mars, Jupiter and Saturn. By the time he retired the Patrol researchers had confirmed the length of Mercury’s day, the vortex nature of Jupiter’s Red Spot and developed new photographic techniques for the search of small earth satellites.

A few years before his death in 1997, the Smithsonian Institute asked to display his original telescope. Tombaugh said he was still using it. Ever a practical Kansan.

Tombaugh is in the International Space Hall of Fame.

Sources: Kansas Historical Society, Johns Hopkins University Applied Science Laboratory, New Mexico State University Space Museum

Premer sits in Node 2 at the Space Vehicle Mockup Facility at JSC, where astronauts and flight controllers are trained. Photo courtesy Amanda Premer

Cont. “Tombaugh” from page 1

“Kansas Space Grant Consortium is one of 52 space grant consortia funded by NASA.”
INTERSTELLAR R & D

Ad Astra Kansas News

This “Interstellar R&D” feature in the Ad Astra Kansas News twenty-seventh issue continues an enterprise to research and gather information on the most important developments preparatory to humanity’s greatest adventure—voyaging to the stars. Now, at the millennium’s turn, is an appropriate time for grand vision and forward thinking, and there are strong signs of a renaissance in interstellar travel thought and activity. This new feature and newsletter, thus, now set forth to develop a national / international / global clearing center and storehouse of knowledge and know-how for travel to the stars: Ad Astra—Steve Durst, Michelle Gonella

Observation

Galaxy Astrophysics 2014-2015

Human understanding and study of the Milky Way has progressed exponentially since Edwin Hubble’s revolutionary discoveries almost a century ago. This snapshot of significant MW Galaxy observations this past year alone reflects both the pace of Galaxy revelations and the enormity of its still unknowns.

Along with news of extreme stars at the Center of the Galaxy, of the strong role played by magnetism in galaxy evolution, and of the naming “Laniakea” (“immense heaven”) for our Galaxy’s neighboring supercluster, three Galaxy discoveries—each being partially enabled through Hawai’i astronomy resources—invite special comment.

A mysterious gas cloud G2 discovered in 2002 appeared traveling to and destined for destruction by the Galaxy Center supermassive black hole. Instead, its failure to be torn apart amidst flaring and fireworks was confirmed in 2014 from observations by Dr. Andreas Eckart using the Very Large Telescope VLT in Chile and by Dr. Andrea Ghez with the Keck Observatory in Hawaii, both concluded G2 more likely to be a dust-shrouded young star than a coreless dust cloud.

That the Milky Way may be much larger than previously estimated is the conclusion of an international team led by Rensselaer Polytech Institute astrophysicist Dr. Heidi Jo Newberg using data from the Sloan Digital Sky Survey and in collaboration with the National Astronomical Observatories of China.

“What we found is that the disk of the Milky Way isn’t just a disk of stars in a flat plane—it’s corrugated,” extending the known width of our Galaxy from 100,000 light-years in diameter to 150,000, or 50% larger than commonly estimated.

Finally, UST08, ejected by a thermonuclear supernovae to become the fastest unbound star ever observed in the Galaxy, was confirmed this year to be traveling at 1,200 kilometers per second and will eventually leave the Milky Way.

Communication

Fast Radio Bursts (FRB)

Since 2011 there have been eleven instances of FRB detection, prompting a piece in New Scientist entitled, “Is this ET? Mystery of Strange Radio Bursts from Space.”

These FRBs are identified by a powerful burst of radio waves which cover a wide range of radio frequencies, but last only milliseconds. The energy of the bursts has been compared to the amount of energy the Sun releases over a month’s time. To date, almost all of the FRBs have been recorded at the Parkes Radio Telescope in New South Wales, Australia, though some have also been detected at the Arecibo telescope in Puerto Rico.

That they seem to follow a mathematical pattern has sent researchers scrambling to determine whether the origin is from within the Milky Way Galaxy. Utilizing the dispersion measure (DM) which seek to describe the space between the emission and Earth, researchers have come up with numbers that would place the origin at cosmic distances, yet the consistency of the numbers seems to indicate they are, in fact, coming from within our galaxy, as travel through intergalactic dust would tend to randomize the numbers.

Transportation

A Call For Interstellar Propulsion

In the final moments of the March 4, 2015 House of Representatives' discussion of NASA’s Asteroid Redirect Mission (ARM), Texas Representative John Culbertson made a startling and inspirational statement: “I’d encourage you to focus on the development of the next-generation of the rocket propulsion. The fact that we’re still flying rocket engines that have fundamentally been designed by Robert Goddard in the 1920s is just inexcusable.”

Culbertson has long been a proponent of deep space exploration, having stated 10 years ago that he hopes to see the first interstellar missions take place before NASA’s 2058 Centennial. Early April of this year, NASA announced grants of $400,000 to $3.5 million per year for as long as 3 years to develop deep space propulsion technologies. The three winning companies were Ad Astra Rocket Company, Aerojet Rocketdyne and MSNW LLC. These companies are already working on nuclear fusion rockets and electric propulsion systems.

Even more amazing, much work is being done to realize the Star Trek technology known as “warp drive.” Dr. Harold “Sonny” White, Advanced Propulsion Team Lead at NASA, describes warp drive as being similar to a moving walkway, which increases one’s walking speed by the speed of the surface on which you travel. White is currently working experimenting with a toroidal (doughnut-shaped) ring of negative vacuum energy. He hopes to show that a spacecraft with the ring would have the capacity to contract space in front and expand space behind it.

Work he did for the 100 Year Starship Symposium suggests that the previously preclusive amount of negative vacuum energy needed to do this may no longer be a factor when the toroidal shape is utilized. He has designed a warp field interferometer test bed and hopes to generate a micro warp bubble for testing.
The AD ASTRA KANSAS FOUNDATION in cooperation with the Washburn University Department of Physics/ Astronomy is sponsoring the 2015 annual Ad Astra Kansas Day

SPACE CELEBRATION

5:30 to 8:00—
* Astronomy / Telescope displays
* Robotics Demos
* Flight Demos
* Hands-on engineering activities
* Dream Rocket project
* Space suit display
* Launch a paper rocket
* Sky-Q Quizzes
* Drawings for science museum ticket
* Take-aways and more

6:00, 6:30 & 8:30 - Planetarium shows
6:00- HOW are we going to go to the STARS?
6:15 & 7:30 - Coke geyser demo
6:00 - (until it's gone) Space Ice Cream demo
8:00 - "Target Pluto" presentation
9:00 - 10 Crane Observatory open

5:30—10 p.m. Stoffer Science Hall — Washburn University
17th and Washburn, Topeka
Use NORTH entrance / parking lot

FREE-
Fun for all ages
Rain or shine

Thank-you to:
Dr. Barbara Anthony-Twarog, Dr. Les Johnson, Northeast Kansas Amateur Astronomers League, The Foundation for Aeronautic Education, Kansas DOT / American Society of Civil Engineers, Washburn University Chemistry Club, Kansas Children's Discovery Center, Banner Creek Observatory, Space Age Publishing Company, Dream Rocket Project, Wichita Homeschool Kansas BEST Robotics, K-State Dept. of Electrical / Computer Engineering, Kansas Cosmosphere and Space Center

Special Presentations:
"Target Pluto: A Preview of the New Horizons Spacecraft Encounter"—Dr. Barbara Anthony-Twarog, KU Dept. of Physics / Astronomy
"How are we going to go to the Stars?"—Les Johnson, space science author and expert

Cont. “Symbol” from page 1
Students weren't closed to the idea that it might not be a planet, but they felt that with the information we have now, it is not enough to disqualify it,” says Petty.
The petitions, which use the terminology of dwarf planet, are not about proclaiming Pluto a planet, but about solidifying Kansas' connection to it. “Signatures itself will not bring about legislation, but showing this is a popular item does generate interest,” says Trigg. “This will be a two-year project.”

Because of publicity received from this project, Petty's class has had contact with David Aguilar, a New Horizons Pluto Mission team member, an association that may lead to the students receiving update updates from him.

To access the petition or for more info on the project, contact ptrigg@usd374.org or ppetty@usd483.com. Petitions will also be available to sign at AAK Day in Topeka.

Three presentations will be offered by noted science author and NASA technical advisor Dr. Les Johnson in April.

Two of them will be at Wichita State University. One, a scientific presentation, will be at 2 p.m., April 22, at 128 Jabara Hall—“Propellantless propulsion: Propelling spacecraft using the natural environments of space.” The other at WSU will be for the public. “Using space science and technology to help solve energy and environmental problems on Earth” will be at 4 p.m., April 23, at 100 Lindquist Hall. For more info, contact Dr. Nick Solomey at 316-978-3190.

Johnson will also give a presentation geared for all ages at the Ad Astra Day Celebration on April 25 in Topeka. His topic at 6 p.m. at Stoffer Science Hall will be “How are we going to go to the stars? The presentation will be free.

Besides authoring several popular science books, Johnson has appeared on documentaries on The Science Channel, NatGEO and PBS.