The Celestial Mechanic

The Official Newsletter of the Astronomy Associates of Lawrence

Volume 33 Number 09 SEPTEMBER 2007

Calendar of Events

Monthly Meeting

Friday, Sept. 14, 7:30 PM
1001 Malott Hall

The Antikythera Mechanism

Dr. Barbara Anthony-Twarog
University of Kansas

FALL PUBLIC OBSERVING SCHEDULE

Weather Permitting
Memorial Stadium
Sunday, Sept. 30
8:30-10:00 PM

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INSIDE THIS ISSUE

Report from the Officers on COMING EVENTS:

KU is now in session, so we have begun our usual meeting schedule. As noted on this page and with the poster on pg. 5, our first club meeting is Friday, Sept. 14 and will feature a presentation by Dr. Anthony-Twarog about the amazing device that appears to have been a calculator designed to predict astronomical events/positions—a common thing today with planetarium software available to any computer, but amazing because it appears to have been made with mechanical gears before 100 BC. (No, it wasn't left behind by

(Continued on page 2)

ASTRONOMICAL LEAGUE NEWS

As you should all be aware of by now, if you are members of the Astronomy Associates, you are also members of the Astronomical League, an umbrella organization that is made up of hundreds of individual astronomy clubs around the country. The national headquarters for the organization is based in Kansas City, a tribute to the size and spirit of the Astronomical Society of Kansas City. Some news items from the recent national convention, ALCON 2007, that took place in Portland, Oregon this year, sponsored by the Rose City Astronomers Club, as reported by blogger Kelly Beatty of Sky and Telescope.

"For the past several years I've represented Sky & Telescope at the annual convention of the Astronomical League. This year's ALCon, hosted by the Rose City Astronomers (a great club), took place recently in Portland, Oregon. The League has a long history of recognizing and rewarding talented amateur astronomers, and for me one of the conference's highlights is being able to meet the winners of its annual youth awards.

This year, the League presented its National Young Astronomer Award (NYAA) to Naomi Pequette, a bright and extremely hard-working member of the Denver Astronomical Society. I don't know how she found time to dedicate so much effort to the club's outreach activities and to the Denver Museum of Nature & Science, where she volunteers. But she did — and still managed to conduct research on the protoplanetary disks in the Orion Nebula. The Denver club was relieved to learn that Naomi will still be nearby when she starts college (at the University of Denver) this fall. Read more about Naomi's astronomical adventures on the League's website, http://www.astroleague.org/al/awards/nyaa/win2007/noya07wn.html

It must have been especially tough for League Veep Carroll Iorg and his judges to choose the winner of this year's Jack Horkheimer Award. Sponsored by the widely seen stargazer himself, this award recognizes teens who've made outstanding contributions to their astronomy clubs. First-place winner Carter Smith couldn't attend ALCon, though I'd met him previously at a

(Continued on page 2)

From the Officers, continued

(Continued from page 1)

the aliens who built the pyramids!). There will be the usual refreshments and hopefully lots to talk about, so come by and bring a friend. For observing, our first Sunday public session went well. The weather cooperated and temperatures dropped to a frigid 80°. We had a nice crowd, thanks to the efforts of Kent McDonald, a club member and science teacher at Lawrence High. His students are regular attendees as part of their class work. The next session is Sunday, September 30 from 8:30 PM to 10 PM. So, please make a note of the date and, if you have the time and desire, plan on joining us either as an observer or a participant running a telescope. Having 3-4 people available is a real plus for crowd control.

Beyond our first meeting in Sept., we will have another meeting and speaker on Friday, Oct. 19, probably Prof. Bruce Twarog. The meeting for the evening of Friday, Nov. 16 has been set aside for the annual Cub Scout Astronomy night—an event that requires a serious amount of help and volunteers to handle the sheer number of scouts who take part (please contact Rick for more details), and Prof. Steve Shawl will close out the year with a presentation on Friday, Dec. 07 at our annual holiday meeting with refreshments and door prizes.

If you have any suggestions for talks, speakers, or public events, please feel free to contact us, particularly Rick Heschmeyer (rcjbm@sbcglobal.net), the events coordinator for the club. Hope to see you at the meeting in two weeks and/or observing on Memorial Stadium later this month**.** ALL for now.

(Continued from page 1)

meeting of the International Dark-Sky Association. But second-place winner C. J. Wood was there. Congrats both of them, and to runners up Michael Vincent Hoeger and Colt Longnecker as well.

As rich as our community is with dedicated adults who share their love of the night sky with passion and drive, we need more — far more — young skygazers in our midst. So if you know an up-and-coming high-school-age amateur, encourage him or her to apply for one of the League's youth awards. The deadline for next year's NYAA is January 31st, and for the Horkheimer award it's March 31st.".

Full details on the first through fourth place winners of the Horkheimer Award can be found at http://www.astroleague.org/al/awards/horkhmr/horkhm07.htm. It is an impressive example of what dedicated young people can do with basic amateur equipment and some motivation.

For a means of supplying motivation, the Astronomical League now promotes two days per year as being ASTRONOMY DAY. Most people are familiar with a day in mid-April to mid-May (the date is normally picked to be a Saturday when the moon is near or at first quarter so that the moon and fainter objects are easier to observe, which is why it changes from year to year.) The Astronomical Leagues now recommends a 2nd Astronomy Day for the Fall when the other half of the sky is visible. This year the designated day is Saturday September 15. Astronomy Day is a grass roots movement designed to share the joy of astronomy with the general population - "Bringing Astronomy to the People." On Astronomy Day, thousands of people who have never looked through a telescope will have an opportunity to see first hand what has so many amateur and professional astronomers all excited. Astronomy clubs, science museums, observatories, universities, planetariums, laboratories, libraries, and nature centers host special events and activities to acquaint their population with local astronomical resources and facilities. Many of these events are located at non-astronomical sites; shopping malls, parks, urban centers-truly Bringing Astronomy to the People. It is an astronomical PR event that helps highlight ways the general public can get involved with astronomy - or at least get some of their questions about astronomy answered. Astronomy Week encompasses Astronomy Day starting on the previous Monday and ending on the following Sunday. For more details, especially a list of clubs/events associated with the Fall date, go to http://www.astroleague.org/al/astroday/astrofacts.html

About the Astronomy Associates of Lawrence

The club is open to all people interested in sharing their love for astronomy. Monthly meetings are typically on the second Friday of each month and often feature guest speakers, presentations by club members, and a chance to exchange amateur astronomy tips. Approximately the last Sunday of each month we have an open house on Memorial Stadium. Periodic star parties are scheduled as well. For more information, please contact the club officers:Luis Vargas at lcvargas@ku.edu, Gary Webber at gwebber@ku.edu, our faculty advisor, Prof. Bruce Twarog at btwarog@ku.edu. our events coordinator, Rick Heschmeyer at rcjbm@sbcglobal.net. Because of the flexibility of the schedule due to holidays and alternate events, it is always best to check the Web site for the exact Fridays and Sundays when events are scheduled. The information about AAL can be found at **http://www.ku.edu/~aal.**

Copies of the *Celestial Mechanic* can also be found on the web at
http://www.ku.edu/~aal/celestialmechanic

Could alien life exist in the form of DNA-shaped dust?
NewScientist.com news service, Stephen Battersby

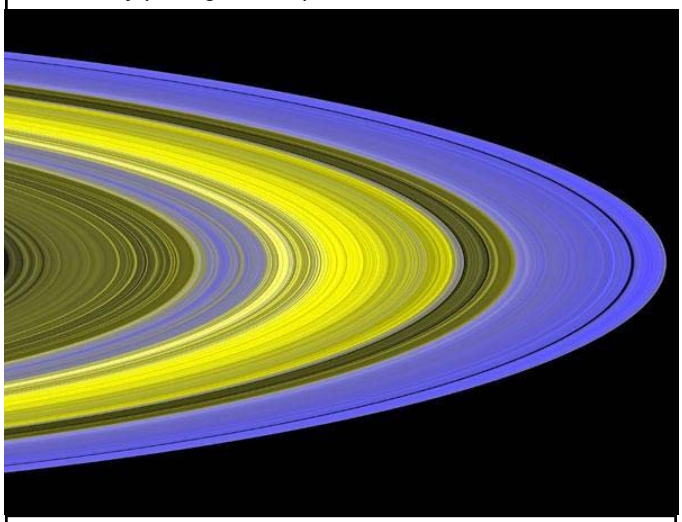
Could alien life exist in the form of dancing specks of dust? According to a new simulation, electrically charged dust can organise itself into DNA-like double helixes that behave in many ways like living organisms, reproducing and passing on information to one another. "This came as a bit of a surprise to us", says Gregor Morfill of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany. He and colleagues have built a computer simulation to model what happens to dust immersed in an ionised gas, or plasma.

The dust grains pick up a negative charge by absorbing electrons from the plasma and then this charged 'nucleus' attracts positive ions, which form a shell around it. It was already known that this system can produce regular arrays of dust called plasma crystals, and some experiments have even generated spiral structures. Now, Morfill's simulation suggests that the dust should sometimes form double helixes. Like DNA, the dust spirals can store information. They do so in the scaffolding of their bodies, as they have two stable states – one with a large diameter and the other with a small one – so a spiral could carry a series of wide and narrow sections.

The specific order of these sections can be copied from one dust spiral to another, like a genetic code. The researchers aren't sure how it happens, but they think each narrow section of spiral creates a permanent vortex of moving dust outside it. So if another spiral drifts alongside it, that vortex pinches the same length into its narrow state. The spirals even feed, in a sense, as they need fresh plasma to survive and grow, suggesting they may compete with one another for food. Since they are also capable of passing on their genetic code, then perhaps they could evolve into more complex structures. But that is very speculative, says Morfill, explaining that the simulation is far too simple to include such complex processes as evolution. "It has a lot of the hallmarks for how we define life at present, but we have not simulated life," Morfill told New Scientist. "To us, they're just a special form of plasma crystal." "It's interesting," says astrobiologist Chris McKay of NASA's Ames Research Center in Moffett Field, California, US.

"Some people have argued that life is a self-organising system [that is out of equilibrium], but you could say that of a hurricane," he told New Scientist. "What these guys have done is one step up from pointing at a hurricane and saying it's a living organism. They argue there's a way this can store information, which is a central feature of life. But it's somewhat disappointing that this is only theoretical work."

"Claiming that something is (or is not) alive is almost pointless because there is no mathematically rigorous definition of life," agrees David Grier of New York University in New York City, US. The team is now setting up an experiment to find out whether real dust spirals exist. It's tricky, because gravity will tend to disrupt the delicate dust structure, but they can get around that to some extent by compressing the dusty plasma, increasing electrical forces within it. To go much further, they will have to find another way to counteract gravity – perhaps by using magnetic fields, or by putting their experiment in free-fall on the International Space Station.



'Plasma crystals' that behave like life could exist in Saturn's rings, where the 'dust' would actually be fine ice grains, and the nourishing plasma would be supplied by the solar wind (Image: NASA/JPL/Space Science Institute)

Alive or not, these dust structures could exist in nature. There are many places in space where small grains of material are immersed in a plasma. "In our solar system, the places most likely to have the right conditions are planetary rings, especially the rings of Saturn and Uranus," says Morfill. There the "dust" would actually be fine ice grains, and the nourishing plasma would be supplied by the solar wind, channelled by planetary magnetic fields. But Grier says the dusty spirals may be difficult to form in space, since they require grains of uniform shape and size: "I cannot imagine this will happen in space on a large enough scale to be observable."

If there are any ice-grain creatures roaming the rings of Saturn, though, the pace of life would be leisurely, because plasma-crystal processes run more than a hundred thousand times more slowly than the biochemistry of Earth. So even if they are alive, there's no need to worry about them possessing malign alien intelligence. They probably won't have had time to evolve very far.

Cosmic Cockroaches

By Dr. Tony Phillips

Cockroaches are supposed to be tough, able to survive anything from a good stomping to a nuclear blast. But roaches are wimps compared to a little molecule that has recently caught the eye of biologists and astronomers—the polycyclic aromatic hydrocarbon. Polycyclic aromatic hydrocarbons (PAHs for short) are ring-shaped molecules made of carbon and hydrogen. "They're all around us," says Achim Tappe of the Harvard Center for Astrophysics. "PAHs are present in mineral oils, coal, tar, tobacco smoke and automobile exhaust." Aromatic, ring-shaped molecules structurally akin to PAHs are found in DNA itself!

That's why Tappe's recent discovery may be so important. "PAHs are so tough, they can survive a supernova."

The story begins a few thousand years ago when a massive star in the Large Magellanic Cloud exploded, blasting nearby star systems and interstellar clouds with hot gas and deadly radiation. The expanding shell, still visible from Earth after all these years and catalogued by astronomers as "N132D," spans 80 light years and has swept up some 600 Suns worth of mass.

Last year "we observed N132D using NASA's Spitzer Space Telescope," says Tappe. Spitzer is an infrared (IR) telescope, and it has a spectrometer onboard sensitive to the IR emissions of PAHs. One look at N132D revealed "PAHs all around the supernova's expanding shell. They appear to be swept up by a shock wave of 8 million degree gas. This is causing some damage to the molecules, but many of the PAHs are surviving."

Astronomers have long known that PAHs are abundant not only on Earth but throughout the cosmos—they've been found in comet dust, meteorites and many cold interstellar clouds—but who knew they were so tough? "This is our first evidence that PAHs can withstand a supernova blast," he says.

Their ability to survive may be key to life on Earth. Many astronomers are convinced that a supernova exploded in our corner of the galaxy 4-to-5 billion years ago just as the solar system was coalescing from primitive interstellar gas. In one scenario of life's origins, PAHs survived and made their way to our planet. It turns out that stacks of PAHs can form in water—think, primordial seas—and provide a scaffold for nucleic acids with architectural properties akin to RNA and DNA. PAHs may be just tough enough for genesis.

Using the IR spectrometer on the Spitzer Space Telescope, scientists found organic molecules in supernova remnant N132D

Cockroaches, eat your hearts out.

Find out about other Spitzer discoveries at

www.spitzer.caltech.edu.

The Astronomy Associates of Lawrence present

The Antikythera Mechanism

Dr. Barbara J. Anthony-Twarog

Professor of Physics & Astronomy

University of Kansas

FRIDAY, SEPTEMBER 14, 2007

7:30 PM, 1001 Malott Hall

University of Kansas

FREE & OPEN TO THE PUBLIC

Supersonic 'rain' pelts planet-forming disc

David Shiga, NewScientist.com

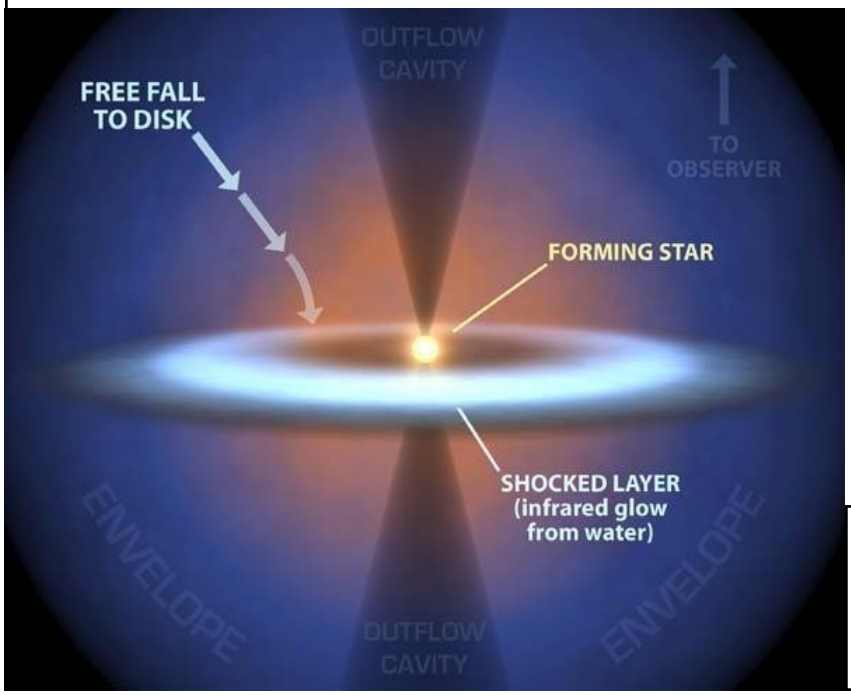
Water from space is 'raining' onto a planet-forming disc at supersonic speeds, new observations from the Spitzer Space Telescope reveal. The unprecedented detail of the observations at this early stage of the disc's formation could help reveal which of two competing theories of planet formation is correct. Planets form when matter clumps together in swirling discs of gas and dust, called protoplanetary discs, around infant stars. But many details of how this works are still not known. For example, some scientists think giant planets can form in just a few thousand years, while others argue it takes millions of years.

Now, astronomers led by Dan Watson of the University of Rochester in New York, US, have gained an unprecedented view of a protoplanetary disc at the young age of just a few hundred thousand years old. They used the Spitzer Space Telescope to examine the spectrum of infrared light coming from the vicinity of an embryonic star called IRAS 4B, which lies about 1000 light years from Earth.

At this very early stage, an outer cocoon of gas and dust called an envelope still surrounds the star and its swirling disc. Previous observations in the microwave portion of the spectrum suggested that this large cocoon is contracting and sending material onto the disc. But the inner region, where the disc meets the cocoon, could not be seen at these wavelengths. The Spitzer observations probe this inner region and reveal infrared light emitted by massive amounts of water vapour – the equivalent of five times the content of the Earth's oceans.

The vapour is too hot to be explained by the embryonic star's radiation alone, suggesting another process must be heating it up. The team believes ice from the cocoon is pelting the disc at a rate faster than the speed of sound there, creating a shock front. "The sonic boom that it endures when it lands on the disc heats it up very efficiently" and vaporises it, Watson told New Scientist. This supersonic shock "has been searched for and theorised about for decades", Watson says. It is a short-lived phenomenon that only occurs during the first few hundred thousand years of the star and disc formation, while the envelope is still feeding the disc. The light emitted as the icy particles hit the disc can be used to learn more about the disc itself at this early stage, which could shed light on how planets form.

Most astronomers believe planets form according to a model known as "core accretion", in which small particles snowball into larger and larger objects over millions of years. A competing idea, called "disc instability", is that turbulence in the disc can cause matter to collapse into planets extremely quickly, producing gas giants such as Jupiter in just a few thousand years. "If you wanted to test between those scenarios, one of the most important places to look would be the stage we're looking at now," Watson says.



Future observations of such young discs could reveal how turbulent the discs are, and thus whether they boast the conditions required for disc instability, he says. "The whole subject of the very beginnings of the development of solar systems is open to study now," Watson says. Donald Brownlee of the University of Washington in Seattle, US, agrees. "It's interesting to have a new peek into a period of history of what appears to be a forming planetary system, potentially at a timescale that we've never seen before," he told New Scientist. "It forms another important clue to how planetary systems form."

Ice-coated dust particles from an outer cocoon fall onto a disc surrounding an embryonic star called IRAS 4B (Illustration: NASA/JPL-Caltech)

An Eye For Cosmic Clues

By Kurt Loft, Tampa Tribune, Fla.

High atop a mountain in the Atacama Desert of Chile, the driest region on Earth, a giant eye will gaze at the heavens. Nearly 100 feet across, it will peer through a crystal clear sky at the wonders of the universe, always focused and never blinking on its perch far from lights, clouds and rain. This remote and desolate place may be inhospitable, but astronomers prize its pristine conditions -- few places in the world offer such an unprecedented field of view. For this reason, scientists next year will break ground on the largest telescope of its kind, one designed to see distant objects through a "peep hole" in the spectrum of light and energy flowing through the cosmos.

If all goes according to plan, the $100 million Cornell Caltech Atacama Telescope will become one of the world's highest observatories, sitting at 18,400 feet on a dormant volcano known as Cerro Chajnantor. The observatory literally is high and dry, away from the clutter of water vapor, says Simon Radford, deputy project manager at the California Institute of Technology in Pasadena.

"In Tampa, there's a lot of humidity, and you can't really see out into space," he says by telephone. "But in the desert or on a high mountain, there's less water in the atmosphere." The telescope will see in a narrow part of the spectrum called the submillimeter wavelength, which astronomers use to study distant objects that don't emit much visible light. But humidity in the air absorbs the radiation from these sources, making them hard to detect. The solution is to go as high as possible.

"Telescopes are being put in increasingly higher and dryer sites," Radford says. "And in Chile, the combination is ideal." But building the observatory will be an engineering challenge. At 3 1/2 miles above sea level, breathing is difficult, so construction could pose health risks. Air pressure at that altitude drops to 7.3 pounds per square inch, and the lungs struggle to draw oxygen from the air.

"It's always a challenge to work at high altitude because workers are prone to mistakes," Radford says. Without portable air tanks, telescope workers would lose 15 percent to 20 percent of blood oxygen, leading to an altitude sickness known as hypoxia. "So we are paying a lot of attention to the design of the telescope to simplify assembly and construction," says project engineer Tom Sebring. "At this altitude, we will require all the workers and staff to use [supplemental] oxygen."

The Atacama Desert of northern Chile is a rainless region and considered the driest area on the planet. The Andes and coastal mountains block the desert from incoming clouds, which rise, cool and condense outside the mountain ranges. Vegetation is almost nonexistent. Geologists say the terrain is not unlike that found on Mars. "The Atacama Desert is very dry, and some areas haven't seen rain in recorded history," Sebring says. "It's a fabulous place." Once completed, in six years, the observatory will be self-contained with its own oxygen-rich atmosphere. However, only a few people will work there. Instead, observations will be made remotely, with much of the hardware controlled robotically.

The telescope won't "see" light from stars and planets like your average optical variety. It will operate in a part of the spectrum -- the microwave region -- that is invisible to the human eye. By focusing its bank of 210 segmented mirrors on relatively cool cosmic objects, scientists expect the telescope to offer a wealth of new clues about the evolution of the universe, formation of stars and interstellar matter, and how distant planets came to be.

UCLA Astronomers Observe Star's 'Chemical Fingerprint'

By Richard Procter, The California Aggie (UC-Davis)

Earth may not be alone after all, announced University of California-Los Angeles astronomers Aug. 16. In a research paper to be published in an upcoming issue of Astrophysics Journal, they announced that they have observed the "chemical fingerprint" of a burned-out star some 150 light years away (or 1 quadrillion miles). Scientists observing GD 362, the white dwarf star in question, say an asteroid recently "contaminated" the atmosphere of the star. By contaminated, experts mean that the asteroid was probably pulled into the star and ripped apart by the immense gravitational forces. By analyzing the chemical makeup of the atmosphere of the white dwarf, which now has elements of the asteroid in it, researchers were able to determine that the composition of the star system was very similar to the inner planets of Earth's solar system. This discovery has given clues as to what our solar system will look like when the sun dies, as well as making it a distinct possibility that there are other earthlike planets elsewhere in the galaxy.

'Big Bang' Researcher Dies

By Dan Higgins, Albany Times Union, N.Y.

Ralph A. Alpher, a former Union College physicist whose groundbreaking theories on the origin of the universe correctly predicted evidence of the Big Bang, died Sunday in Austin, Tex., according to his son, Dr. Victor Alpher, of Austin. Alpher died after a long illness, but family members did not reveal the cause of death. He was 86.

Alpher was honored by President Bush on July 27 with the National Medal of Science Award for his groundbreaking work in nucleosynthesis, which is developing a model that would explain the Big Bang as the event that created the universe. Alpher taught at Union from 1986 to 2004 and was director of the Dudley Observatory. He also spent more than 30 years at the General Electric Research and Development Center in Niskayuna. In 1948, as a young doctoral student, he devised a mathematical model for the creation of the universe and predicted the discovery of cosmic background radiation to support the Big Bang theory. Hundreds of people attended his dissertation defense at George Washington University. But the work of Alpher and his colleagues went largely unrecognized. In 1965, two radio astronomers in New Jersey who were tuning their equipment stumbled on proof of Alpher's background radiation and were eventually awarded the Nobel Prize.

In 2004, when a student at Emory University in Atlanta doing research for "Background," her one-act play about Alpher's life, asked if he would have done anything differently, Alpher replied, "I would have worked harder to get the credit I deserved." While the Nobel Prize eluded Alpher, he collected other honors, including the National Medal of Science, which is the nation's highest science honor. Alpher had been in failing health since breaking his hip in February. When a nurse told him of the honor, he smiled, his son Victor recalled. Victor Alpher attended a July 27 White House ceremony to receive his father's medal. The citation reads in part: "For his unprecedented work in the areas of nucleosynthesis, for the prediction that universe expansion leaves behind background radiation, and for providing the model for the Big Bang theory."

Hubble Teams with Google to Bring the Cosmos Down to Earth

Imagine cruising the heavens from your desktop and seeing all the spectacular images from NASA's Hubble Space Telescope. Exploding stars and faraway galaxies are just a mouse click away through Sky in Google Earth. Sky in Google Earth is produced by Google, the company that hosts the popular Internet search engine, through a partnership with the Space Telescope Science Institute in Baltimore, the science operations center for Hubble. To access the new feature, users will need to download the newest version of Google Earth, available free of charge.

With Sky in Google Earth, you can travel across the vastness of the night sky, making tour stops at all the popular Hubble images. Though these celestial objects are far away from Earth, you can reach them in a few seconds with Sky in Google Earth. "You have seen the Hubble images of objects such as the Eagle Nebula, the so-called pillars of creation," said Carol Christian, an astronomer at the Space Telescope Science Institute and one of the developers of the Sky in Google Earth project. "With Sky in Google Earth you can see where the objects are located in space, including the constellations in which they reside. Then you can discover other cool objects in nearby regions of the sky. And you don't have to know anything about astronomy to use the program."

Travelers can begin their celestial tour by selecting "Switch to Sky" from the "view" drop-down menu in Google Earth. From here, an object, such as the Eagle Nebula, or even a category, such as colliding galaxies, can be selected from a menu. You will first get a view of the sky showing the constellations surrounding your selected object. As you zoom in, the constellations disappear and your chosen object emerges from the background. The image is set within a background of real stars and galaxies taken by two powerful visible-light surveys of the heavens, the Digitized Sky Survey and the Sloan Digital Sky Survey. The Digitized Sky Survey comprises photographic surveys of nearly the entire sky and contains about a million objects. The Sloan survey comprises images of hundreds of millions of much fainter objects and covers more than a quarter of the sky. "This is a fun program for amateur astronomers, scientists, educators, and the public to explore space," Christian said. "It is like having the heavens at your fingertips, or your own planetarium." Pretty pictures aren't the only part of this versatile program. Click on the icon of the HubbleSite logo and information on the object taken from the Institute press release or photo caption will appear. Sky in Google Earth also will provide links to the Hubble news database and other Hubble information, including the Hubble Heritage project.

About 125 Hubble images, spanning the life of the telescope, are currently included in Sky in Google Earth. Over the telescope's lifetime these images have been meticulously prepared for the public in collaboration between the Institute's science visualization experts in its Office of Public Outreach, and the worldwide community of astronomers who use Hubble. The images have become iconic all over the world; gracing the covers of science journals, record albums, and pop culture, and even making cameo appearances in Hollywood science fiction movies. Christian and her co-developer, Space Telescope Science Institute astronomer Alberto Conti, plan to add the public images from 2007, as well as color images of all of the archived data from Hubble's Advanced Camera for Surveys. Newly released Hubble pictures will be added to the Sky in Google Earth program as soon as they are issued, Conti said. To add even more interest and adventure, Conti and Christian hope to help other observatories, such as the National Optical Astronomy Observatory and other NASA missions, add their images to Sky in Google Earth.

Claim of Martian Life Called 'Bogus'

By Ker Than, Space.com

Martian soil analyzed 30 years ago by NASA's Viking landers might contain life, according to a controversial new study that one scientist called "bogus."

The dry, freezing Martian surface could be home to microbes whose cells are filled with a mixture of hydrogen peroxide and water, said Joop Houtkooper of the University of Giessen, Germany. But other scientists are skeptical of his results, which is the latest in a long series of contentious claims about what the Viking landers might or could have found. Houtkooper reanalyzed data from the Gas Exchange (GEx) experiment carried out by the robotic landers in the 1970s and speculates the martian soil contained detectable amounts of life.

"It comes out to a little more than one part per thousand by weight, comparable to what is found in some permafrost in Antarctica," Houtkooper said. Norman Pace, a microbiologist at the University of Colorado, is skeptical of the new claims. "It sounds bogus to me," Pace told *SPACE.com*. "I don't consider the chemical results to be particularly credible in light of the harsh conditions that Mars offers." The findings were presented by Houtkooper at the European Planetary Science Congress in Potsdam, Germany this week and are detailed in a recent issue of the *International Journal of Astrobiology*.

Alien chemistry

The GEx experiment detected rises in oxygen and carbon dioxide gas in soil samples collected on the martian surface. "If we assume these gases were produced during the breakdown of organic material together with hydrogen peroxide solution, we can calculate the masses needed to produce the volume of gas measured," Houtkooper explained.

Houtkooper and his colleague Dirk Schulze-Makuch from Washington State University speculate that an organism based on hydrogen peroxide and water could survive the harsh martian climate, in which temperatures rarely rise above freezing and can reach -238 degrees Fahrenheit (-150 degrees Celsius) at the poles. The hydrogen peroxide would act like antifreeze for the cell, preventing its insides from crystallizing due to the cold.

Hydrogen peroxide-water solutions also tend to attract water, so the alien organisms could scavenge water molecules from the Martian atmosphere, the thinking goes. However, if such creatures were exposed to too much water or atmospheres with high humidity, they could theoretically die through over-hydration. The researchers think this could account for the anomalous GEx results. The experiment exposed samples to water vapor which might have killed any hydrogen peroxide-water microbes died. The resulting breakdown of their cells would release oxygen and their organic compounds would react with the hydrogen peroxide to release carbon dioxide, water vapor and traces of nitrogen.

Houtkooper thinks the microbes could be detected by NASA's Phoenix lander, which launched on Aug. 4 and will arrive at Mars next May. While rare, terrestrial organisms are known to use hydrogen-peroxide. The bombardier beetle, *Brachinus Crepitans*, uses a 25 percent solution of hydrogen peroxide to shoot steam into the face of pursuing predators. No one suspects there are any beetles on Mars. But most experts have yet to rule out the possibility of microbial life.

"There does not appear to be any basic reason why hydrogen peroxide could not be used by living systems," Houtkooper said. "While organisms on Earth have found it advantageous to include salt in their intracellular fluids, hydrogen peroxide may have been more suitable for organisms adapting to the cold, dry environment of Mars."

Not likely

But Pace, the University of Colorado microbiologist, thinks there is one very important reason why hydrogen peroxide life is unlikely. "Hydrogen peroxide inside cells is deadly in terrestrial kinds of cells," Pace said. "In fact, that's one way that our cells combat bacteria, by producing hydrogen peroxide locally." For Pace and many other scientists, the definitive experiment performed by the Viking landers was the gas chromatography mass spectrometry (GC-MS) test, which was capable of identifying substances by their chemical makeup. That test failed to turn up evidence of organic compounds. "That's the interesting experiment. Everything else can be explained chemically," Pace said.

Some scientists have speculated the oxygen results from the GEx test came from peroxide-containing iron in the martian soil.

Celestial Mechanic SEPTEMBER 2007

AAL

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