



THE STAR

THE NEWSLETTER OF THE
MOUNT CUBA ASTRONOMICAL GROUP
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OUR PROGRAMS ARE HELD THE SECOND TUESDAY OF EACH
MONTH AT 7:30 P.M. UNLESS INDICATED OTHERWISE
MOUNT CUBA ASTRONOMICAL OBSERVATORY

1610 HILLSIDE MILL ROAD

GREENVILLE DE.

FOR DIRECTIONS PLEASE VISIT

www.mountcuba.org

PLEASE SEND ALL PHOTOS AND ARTICLES TO

pestrattonmcag@gmail.com

SEPTEMBERS MEETING:
TUESDAY SEPT. 9TH AT 7:30 p.m.

After a brief business meeting conducted by Dave Groski, we will have two short talks about 20 minutes each followed by some observing - weather permitting.

Scott Jackson will give a short talk about his adventures in the wilds of PA and New York State, hunting for the elusive wild creature -- the dark site location in a state park. Scott will provide you a list of candidates and his success (or lack of) at finding one without getting eaten by a bear!

Speaking of bears, next up is Hank Bouchelle with a short talk on the Harvest Moon and a review of the September Sky Calendar.

FROM THE COMFORTABLE CHAIR:
Hank Bouchelle Co-Chair MCAG

Thus begins the third year of the Mount Cuba Astronomy Group. It has been a lot of fun, and I am looking for even more to come. As time passes and as we grow our numbers of members, participants, and guests we also broaden our horizons and find an increasing number of avenues to explore.

Currently our list of friends include the A.I. DuPont Middle School planetarium, the U Del Department of Physics and Astronomy, several libraries, including one in Maryland, the DE Dept. of Education, and the Delaware Science Teachers Association.

Elsewhere in this issue of *The STAR* is news of an unprecedented effort to assist Delaware teachers, and opportunities for our members, participants and guests to become as involved in astronomy education as they might care to be!

Watch this space!

Phenomena

Hank Bouchelle

Moon Dance

Whether they realize it or not, autumn is the season when people are most likely to notice the Moon. Much of this arises from the circumstances of a full Moon.

Approximately 4.5 billion years ago the Solar System formed from a huge sphere of gas and dust that, as it contracted, became flat as it revolved around its center. The central mass became the Sun, while the planets formed from clumps at varying distances. A consequence of this is that the Solar System is "flat," the way pizza dough becomes pizza crust as it is spun; a yellow bell pepper at the center represents the Sun, pepperoni slices represent the planets, and even the rind around the edge of a pepperoni matches the path of a satellite around the pepperoni planet.

To see the Sun, Moon, or planets we must look along the "surface" of the (Solar System) pizza, as they cross Earth's sky. A kink in this understandable and orderly arrangement arises from the fact that Earth's posture is not 'vertical' or at right angles to its orbital path. To be certain, Earth does not tilt; rather, it is tilted. If we could observe Earth's

axis, we would see that it passes from the South Pole to the North Pole and out almost precisely toward Polaris, the North Star.

As we stand and look at a distant object, we note that as we lean toward it we need to raise our eyes a little: The object appears “higher” in our field of vision. If we lean away, the object appears lower in our field of view.

When Earth’s orbit carries it to the location where the axis appears to lean toward the Sun, it appears higher in our daytime sky. Six months later, the “tilt” is away from the Sun, and it appears lower in our sky. We know that Earth’s tilt is 23.5 degrees, thus a globe’s mount positions it in a way that is not quite vertical. In fact, the Sun’s position at noon can change by $(23.5 \text{ degrees} \times 2 = 47 \text{ degrees})$! If we pay attention, we can see how truly immense is this change.

However, Earth’s posture has another consequence.

The circumstance of a full Moon is that the Moon and Sun are on opposite sides of Earth, and the three form a more or less straight line; and a perfectly straight line in the case of a lunar eclipse. However, for these three objects to form a straight line, the summer full Moon must be low in the night sky since the summer Sun is high in the sky. If Earth is along the line connecting the Sun and Moon, it must be that way. However, in winter the Sun is low in the noon sky, so the Moon must be high in the midnight sky, at the location of the Sun in the summer.

Thus, we do not much notice the Moon in summer. Its path is that of the Sun in winter. It rises relatively late, and sets relatively early. Especially at the June solstice, the nighttime Moon must be low in the sky. When the Sun or Moon are close to the horizon they are dimmed by the additional atmosphere through which their light must pass. The “honeymoon,” in June, as the Moon stays close to the horizon all night, is a perfect time to get away. The crops have been planted and the living is easy.

In contrast, the winter solstice Moon follows the path of the Sun at the summer solstice. At those times, the Moon is particularly bright, and high, and in the sky for all of the long winter night. It provides an additional understanding of Clement Moore’s poem:

*The moon on the breast of the new fallen snow,
Gave the lustre of mid-day to objects below.*

EDITOR’S NOTE:

Beginning with this issue, I will include an article on a specific constellation. During the summer, I became aware that some of the recipients of the STAR are using it as an aid in teaching their students. My heart was warm. After some thought, I felt I should include a topic that may not be well known. I am quite aware that most readers are well versed in the names of constellations and their compositions, what they look like with some imagination and where to look to find them. That may not be the case with all readers. Since they have made the decision to begin a study of Astronomy, what better way than to begin with the constellations.

ASTRONOMICAL TERMS AND NAMES OF THE MONTH:

The primary Mission of the Mt. Cuba Astronomy Group is to increase knowledge and expand awareness of the science of astronomy and related technologies.

While reading the STAR, you may come across various terms and names of objects you may not be familiar with. Therefore, in each edition, we will review terms as well as objects related to Astronomy and related technologies. This will be presented on a level that the general public can comprehend and appreciate. Each term or object chosen will appear in red in the article.

Magnitude of stars.

Brightness of stars is assigned a number beginning with the brightest star starting at about -1 magnitude. Dimmer stars are zero or positive numbers. The larger the number means the dimmer the star is. For example, a star -1 magnitude is brighter than a star 0 magnitude. A star 0 magnitude is brighter than a star 1 magnitude. A star 1 magnitude is brighter than a star 2 magnitude. A star 4 magnitude is brighter than a star 5 magnitude. Magnitude sequence for stars starting with the brightest is -1, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 magnitude, ... etc.

Asteroid

Asteroids are minor planets, especially those of the inner Solar System. The larger ones have also been called planetoids. These terms have historically been applied to any astronomical object orbiting the Sun that did not show the disk of a planet and was not observed to have the characteristics of an active comet, but as minor planets in the outer Solar System were discovered, their volatile-based surfaces were found to resemble comets more closely and so were often distinguished from traditional asteroids.

Spacefaring

To be spacefaring is to be capable of and active in the art of space travel or space transport, the operation of spacecraft or space planes. It involves a knowledge of a variety of topics and development of specialized skills including (but not limited to): aeronautics; astronautics; programs to train astronauts; space weather and forecasting; ship-handling and small craft handling; operation of various equipment; spacecraft design and construction; atmospheric takeoff and reentry; orbital mechanics (aka astrodynamics); communications; engines and rockets; execution of evolutions such as towing, micro-gravity construction, and space docking; cargo handling equipment, dangerous cargoes and cargo storage; spacewalking; dealing with emergencies; survival at space and first aid; fire fighting; life support.

Planisphere – Is a star chart analog computing instrument in the form of two adjustable disks that rotate on a common pivot.

NEO – Near Earth Objects.

MCAG PUBLIC OUTREACH:

SCHOOLS: Hank Bouchellw

Teachers certification and the Mount Cuba Astronomy Group

The Department of Education requires Delaware’s teachers to accumulate 90 contact hours of professional development within each five-year period to retain their teacher certification. Toward this goal, the Delaware Teacher Center recruits workshop hosts, schedules approved activities, publishes a catalog listing the opportunities, and documents teacher completion.

For many years I was responsible for the Colonial School District’s planetarium-based earth/space science and astronomy curricula. I felt that the planetarium was much too powerful teaching tool to sit unused, even in the evenings. Thus, I offered astronomy-related teacher workshops through the Delaware Teacher Center.

I am pleased to announce renewed participation in teacher support and education, and an expansion of public outreach. Teacher workshops have already been scheduled at the A. I. DuPont Middle School planetarium and on the Newark campus of the University of Delaware. In the near future additional workshops will be scheduled in area schools and libraries (including in Kent and Sussex counties) and the MCAO.

All workshops are free and open to the public, space available, and MCAG members are particularly welcome. Guest participants do not need to register for credit.

Workshops/programs will include materials for later reference or inclusion in lesson plans. Events will be listed in the MCAG’s newsletter, The STAR, and elsewhere.

MCAG members, participants, and guests who have an area of interest to share with others are more than welcome to assist as co-hosts. For more information or details about events as they are scheduled, contact Hank Bouchelle, 302-983-7830 or hbouchelle@live.com. Teachers may register for in-service credit by phone: (302) 736-6723 or at jessica.jackson@capital.k12.de.us.

Workshops currently scheduled:

Title: Introducing the Night Sky

Workshop host: Dr. Hank Bouchelle U. of DE; Co-host: Mr. Jerry Hill, A.I. DuPont planetarium

Topics: Earth’s motions The appearance of the skys and Earth’s motions and position

Date(s): Tuesday, Oct 7

Time(s): 4:30 – 6:30 PM

Location: A.I. DuPont Middle School planetarium; 3130 Kennett Pike Wilmington, DE 19807 Title: Everything You Might Be Asked about the Moon

Topics: The Moon’s origin, features, motions and phases

Workshop host: Dr. Hank Bouchelle (UDel)

Date(s): Thurs., October 16 and Thurs., October 23

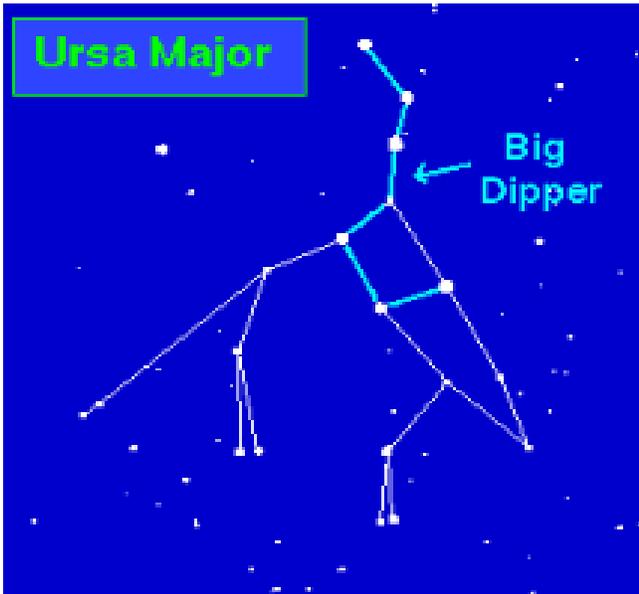
Time(s): 8:00 to 9:20 PM

LIBRARIES: Hank is working on finalization of dates. More later.

CONSTELLATIONS:

Each month, I will have review at least one constellation. This is a new section and is included for the benefit for the new students of Astronomy.

We shall start with Ursa Major or the Great Bear.



Ursa Major (Latin: "Larger Bear"; also known as the Great Bear and Charles' Wain) is a constellation visible throughout the year in most of the northern hemisphere. It can be seen best in the month of April. It is dominated by the widely recognized asterism known as the Big Dipper or the Plough, which is a useful pointer towards the north, and it has mythological significance in numerous world cultures.

The seven brightest stars of Ursa Major form the asterism known as the Big Dipper in the USA and Canada, the Plough in the United Kingdom, the Großer Wagen in Germany & Austria and the Saptarshi in India.

Lets get to know the stars that make up the Big Dipper.

Below is a great example and description of the seven stars or star systems that make up the Big Dipper.

Alkaid – Is second **magnitude** (1.86) Alkaid is the third **brightest** star in the constellation and places number 38 in the list of the brightest stars

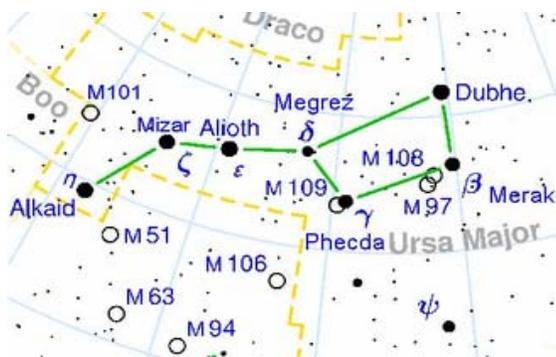
Mizar - Alioth – Is an stellar sextuple system consists of the quadruple system Mizar, with a magnitude 2.23 star and the **binary system** Alcor. Some definitions required. Sextuple system consists of six stars. Quadruple system consists of four stars and **Binary** consists or two stars.

Megrez - A white main-sequence star in the constellation Ursa Major. At 80 light years away, it is the 238th brightest star in the Earth's sky, where it shines at an apparent visual magnitude of 3.32. More in the October STAR on Main Sequence.

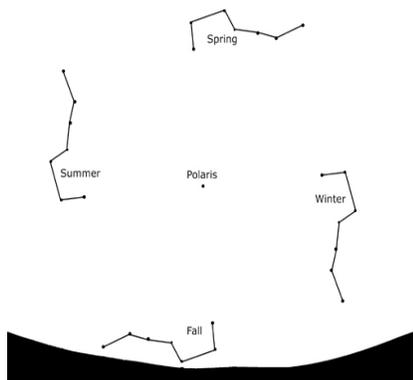
Phecda – A 2.438 magnitude star.

Merak - Merak is a white subgiant star in the constellation Ursa Major. At 80 light years away, it is the 81st brightest star in the Earth's sky, where it shines at an apparent visual magnitude of 2.34. More on white subgiant stars in October.

Dubhe - A yellow giant star in the constellation Ursa Major. At 123 light years away, it is the 37th brightest star in the Earth's sky, where it shines at an apparent visual magnitude of 1.81.

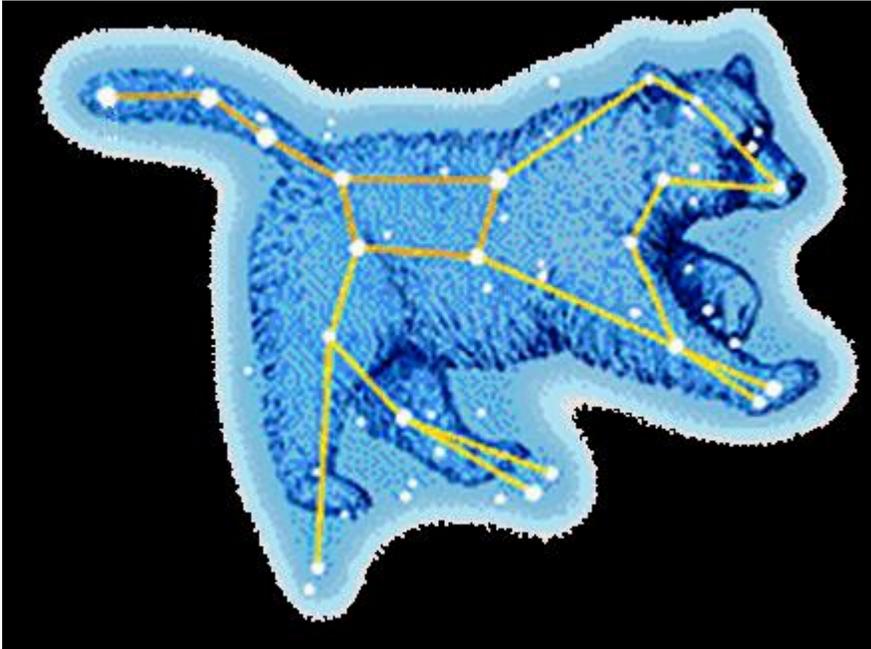


How does one find Ursa Major? First, let's find the Big Dipper. Depending upon the season of the year, the Big Dipper can be found high in the northern sky or low in the northern sky. Just remember the old saying *spring up and fall down*. On spring and summer evenings, the Big Dipper shines highest in the sky. On autumn and winter evenings, the Big Dipper lurks closest to the horizon. The illustration below should help.



Spring is to top, Summer to left, Fall to Bottom and Winter to the right. Polaris (North Star) is in the center.

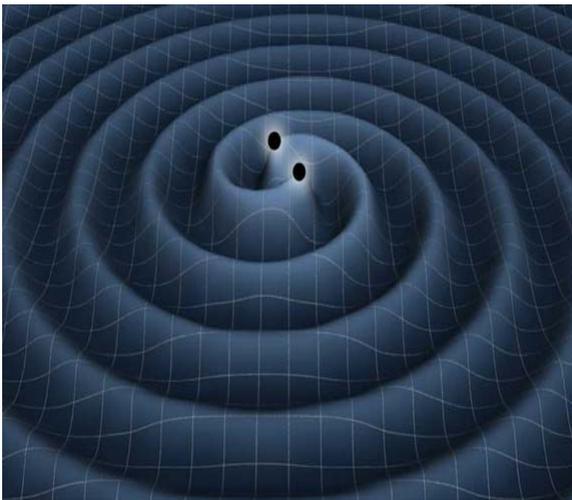
Next, we will complete the Great Bear or Uras Major.



Part of the enjoyment of finding the Constellations is doing it yourself. Most of the time you will be required to use your imagination. Do you see it? Remember, find the Dig Dipper first. What month of the year would you expect to see the Great Bear (Ursa Major) in this position? The first person to contact me by email with the correct answer will receive an all expense paid trip to the next meeting of the MCAG.

Taxes, tags and travel expense not included.

NEWS FROM THE WORLD OF ASTRONOMY:



Physicists Debate Discovery of Gravitational Ripples from the Big Bang

NEW YORK – The physics world was agog in March over the announcement that astronomers had possibly found ripples in space-time from the earliest moments of the universe. But some scientists now question whether the findings may be nothing more than galactic dust.

If the finding of these ripples, or primordial gravitational waves, is confirmed, it would represent the best evidence yet for inflation, the idea that the universe underwent an explosive burst in size in the earliest fractions of a second after the Big Bang. If the findings are discounted, inflation could still be correct, but scientists must provide other evidence.

A panel of well-known cosmologists debated the discovery and the model of cosmic inflation itself at an event here on Friday (May 30) at the World Science Festival, moderated by theoretical physicist Brian Greene of Columbia University in New York

A rapid expansion

One of the panelists, cosmologist Alan Guth of MIT, developed the hypothesis of inflation in 1980 to explain the large-scale structure of the universe. Another panelist, cosmologist Andrei Linde of Stanford University, helped develop the model of inflation.

The Big Bang left behind remnant heat, known as the cosmic microwave background (CMB). Radio astronomer Robert Wilson, who was in the audience, discovered the CMB along with physicist Arno Penzias in 1964. The CMB contains tiny temperature variations, but is remarkably uniform, which might be expected if the universe expanded from a very small region.

If inflation occurred, scientists suspect it might have left an imprint on the CMB, produced by gravitational waves, which would appear as a swirly pattern in the CMB. John Kovac, an astronomer at Harvard University — another of the panelists — and colleagues claimed to have detected this pattern in March using the BICEP2 instrument at the South Pole.

Controversy brewing

But since Kovac's team announced its findings, the results have come under fire from scientists who question whether the team had ruled out other possible sources that would produce the same swirly signature, such as galactic dust. In fact, two independent analyses of the data now suggest it could be accounted for by dust in the Milky Way.

In the panel discussion, Kovac admitted some uncertainty, but defended the findings. "The pattern is not there by random chance," Kovac said. His team has further analyzed their data and feels "very confident" the results were not spurious, he said.

But not everyone took the controversy lightly, including cosmologist Paul Steinhardt of Princeton University, who helped develop the model of inflation but now believes in an

alternative model of the universe that suggests the existence of higher dimensions. Steinhardt took issue with how Kovac's team characterized their findings in March, saying that they were too confident in their statements at the time.

Other groups are also looking for these ripples from the Big Bang, including balloon-based and space-based telescopes. The European Space Agency's Planck satellite is expected to release its own data very soon, possibly in the next three weeks, and should offer strong evidence one way or the other.

Exciting times

Despite having helped develop it, Steinhardt now questions inflation itself. He said the theory was in some ways not falsifiable, which veers closer to the realm of metaphysics.

But inflation is still the most widespread theory for how the universe began, Alan Guth said. Andre Linde compared inflation to democracy, which has been called "the worst form of government there is, except for all the other forms."

As the evening panel concluded, Linde steered the discussion to a more hopeful note, about what it means to be a part of the endeavor to understand the universe in these times.

"There's something very exciting happening right now," he said.

How Will Earth's Leaders Respond to a Real Asteroid Threat?



Now, the United Nations Committee on the Peaceful Uses of Outer Space has taken a step toward combating the **asteroid** threat. A special U.N. action team on near-Earth objects (NEOs) has recommended the creation of an International Asteroid Warning Network

(IAWN), which is designed to gather and analyze NEO data and provide timely warnings to national authorities if a potentially hazardous NEO were to threaten Earth.

A number of components of an IAWN already exist and are working together. Now, the objective is to pool together the expertise of the world's many relevant scientific organizations, to discover and track objects and generate early warnings of potential impacts. [Potentially Dangerous Asteroids (Images)]

Secondly, a Space Mission Planning Advisory Group (SMPAG) has been meeting to plan for the possibility of a future asteroid impact. The group includes representatives of **spacefaring** nations and other pertinent organizations.

One key goal of SMPAG is to promote opportunities for international collaboration on research and techniques for NEO deflection.

Wake-up call

The meteor that exploded over Chelyabinsk, Russia, in February 2013 served as a wake-up call for politicians and the public that Earth is not immune to asteroid strikes, experts say.

It also set the wheels turning on an action plan to address future impacts. In December 2013, the U.N. General Assembly "welcomed, with satisfaction, the recommendations for an international response to the near-Earth object impact threat."

And earlier this year, the Committee on the Peaceful Uses of Outer Space (COPUOS) meeting, held June 11-13 in Vienna, was the scene of noteworthy NEO deliberations.

"A few more agencies joined, and we can now say that we have all major players in the space scene onboard the SMPAG, so that's great progress," said Detlef Koschny, the European Space Agency's NEO segment manager in the Netherlands.

"We have agreed on what to do next," Koschny told Space.com. "Defining criteria on when to start thinking about a possible deflection mission is one of the points. This is not easy."

Those criteria include knowing the location of the impact and an estimate of the expected damage. Researchers would also need to determine the minimum number of people who would have to be in danger for a deflection to be warranted.

"But these things are hard to know," Koschny said. "They depend on the composition of the object, which often is not known, and needs very precise orbit computations. These are things we have started addressing."

As for the IAWN, Koschny said that the major progress is that the relevant people are being made aware that it exists and that they may be part of the network. The first meeting of the steering committee for IAWN took place in January, he said.

NEO report

Taking part in the UN NEO discussions is Tom Jones, a former NASA astronaut and head of the Association of Space Explorers' (ASE) Committee on Near-Earth Objects.

ASE — an international professional organization for people who have been to space — produced a seminal report back in 2008 entitled "Asteroid Threats: A Call for Global Response," prepared by the group's International Panel on Asteroid Threat Mitigation.

ASE's 2008 report was submitted to COPUOS for consideration and subsequent action by the United Nations. The report's goal was to assist the international community in preventing loss of life and property resulting from an **asteroid** impact on Earth.

"Because NEO impacts represent a **global, long-term threat** to the collective welfare of humanity, an international program and set of preparatory measures for action should be established," the authors of the 2008 report wrote.

Encouraging news

In recounting the recent U.N. actions, Jones said that one important development is that NASA has worked with the Pentagon to release space-based observation data from reconnaissance spacecraft that see blazing bolides and fireballs in the Earth's atmosphere.

"Nearly 20 events have been posted to date," Jones told Space.com. NASA's Near Earth Object Observation Program is receiving information on bolide/fireball events "based on analysis of data collected by U.S. government sensors," he added.

Regarding SMPAG, Jones said the June U.N. meetings were productive, and that the second meeting of the group was attended by 27 space agency representatives and observers.

"We heard encouraging news on a number of international NEO exploration missions," Jones said, "some of which include planned demonstrations of NEO-deflection technologies."

Follow-up steps

Jones said he was encouraged by the cooperation displayed at SMPAG to hammer out the "terms of reference" — the operating rules and mission — of SMPAG.

Furthermore, there is enthusiasm for future sessions dealing specifically with the planning of a joint deflection demonstration mission, and various supporting research on preventing an asteroid impact, Jones said.

"Along with the International Asteroid Warning Network, SMPAG shows that the world's space agencies are serious about understanding the **NEO** threat, and in sketching out the rough details of how to deal with an impact," Jones said.

He's also optimistic about the follow-up steps.

"What I hope will come next is the creation of a true joint-mission program to conduct planetary-defense demonstrations, with invitations to all the space agencies to contribute hardware, funding, experiments and firm policy commitments for a launch within 10 years," Jones said.

Credit Leonard David
Space.com

We Could Find Alien Life, but Politicians Don't Have the Will



While alien life can be seen nightly on television and in the movies, it has never been seen in space. Not so much as a microbe, dead or alive, let alone a wrinkle-faced Klingon.

Despite this lack of protoplasmic presence, there are many researchers – sober, sceptical academics – who think that life beyond Earth is rampant. They suggest proof may come within a generation. These scientists support their sunny point of view with a few astronomical facts that were unknown a generation ago.

In particular, and thanks largely to the success of NASA's Kepler space telescope, we can now safely claim that the universe is stuffed with temperate worlds. In the past two

decades, thousands of planets have been discovered around other stars. New ones are turning up at the rate of at least one a day.

More impressive than the tally is their sheer abundance. It seems the majority of stars have planets, implying the existence of a trillion of these small bodies in the Milky Way galaxy alone. A deeper analysis of Kepler data suggests that as many as one in five stars could sport a special kind of planet, one that is the same size as Earth and with similar average temperatures. Such planets, styled as “habitable”, could be swathed by atmospheres and awash in liquid water.

In other words, the Milky Way could be host to tens of billions of Earth’s cousins.

Sterile universe?

It is hard to accept that all these worlds are sterile, a circumstance that would make us, and all the flora and fauna of our planet, a miracle. Miracles have little status in science.

Of course, just because there is a lot of attractive, cosmic real estate doesn’t mean finding inhabitants would be easy. There are only three ways to do that, and they all depend on sophisticated and expensive experiments.

First, we could find life nearby. There is real effort to do that, particularly in our reconnaissance of Mars. So far, most of the search has been indirect: deploying rovers whose job is to locate the best places to dig into the red planet, and possibly uncover either fossilized or extant microbes beneath the sterile surface. These are not attempts to find life. They are attempts to find places where life could be found. Progress is deliberate, and it is sluggish.

Without doubt, Mars remains the favorite bet for biology. Nonetheless, some experts prefer to wager on the moons of Saturn and Jupiter. At least five of these satellites seem to be home to some sloshy environments – mostly liquid water, although in the case of Titan, natural gas.

Again, the type of life that could best thrive on these moons would be microscopic. Sensing its presence might be accomplished in several ways, ranging from simple flyby missions that nab effluvia from natural geysers, to sending elaborate drilling rigs to penetrate the ten miles of ice that separate the surface of Jupiter’s moon Europa from the mammoth seas that lie below.

Sadly much of this reconnaissance hardware is still on the drawing boards, not in space. Progress is slow, mostly because funding is low.

A second scheme for sniffing out evidence of biology is to assay the atmospheres of planets around other stars. This is done using a time-honoured technique of astronomy, spectroscopy – an approach that would allow researchers to learn the composition of an atmosphere at many light-years’ distance. While an experiment to find oxygen or

methane in someone else's air is straightforward to describe, it is hard to do. That is because planets are dim, and the stars they orbit are bright.

Various solutions to this problem have been imagined, including multi-element, orbiting telescopes and giant light blockers, or occultist, in space. It is rocket science, but it is not as hard as curing the common cold. Engineers could build this stuff within a dozen years, but only if they had the money.

The third approach to finding biology beyond Earth is looking beyond microbes for intelligent life by eavesdropping on radio signals or flashing laser lights. More antennae and better receivers could speed up this search, but once again, funding is the limiting factor.

For perspective, consider that the proposed 2015 NASA budget has about US\$2.5 billion for planetary science, astrophysics and continued work on the new James Webb space telescope – categories that encompass all the planetary searches described above and more. That is considerably less than one-thousandth of the total US federal budget. The budgets for SETI, which takes the third approach, are a thousand times less.

So it boils down to this: we don't know for certain that there is life in space, but the circumstances of the universe certainly suggest that this is a plausible idea. Finding it would be extraordinarily exciting, but because the payoff is uncertain, the investments in searching have been modest.

Of course, if you don't ante up, you will never win the jackpot. And that is a question of will.

This article was originally published at [The Conversation](#). The publication contributed the article to Space.com's

WEB SITES OF INTEREST:

EarthSky.org

OTHER MCAG ACTIVITIES:

MCAG Star Party

Woodside Creamery September 6th. All are welcome. Start time about 7 p.m. ish. Bring your scope and enjoy the smiles on the faces of the kids. They have great ice cream as well.

TELESCOPE WORKSHOP:

Due to tight work schedules, we are not certain that a work shop will be held this month. If we can have one, we will send a notice out as soon as we can. Stay tuned.

The Reach and Progress of the Mount Cuba Astronomy Group:

Dr. Hank Bouchelle, MCAG's Co-Chairman, extended the reach of the Mount Cuba Astronomy Group to New England with an astronomical event on June 24, 2014.

Working with David Lloyd and Dave's wife Vickie, Hank conducted a star party at the facilities of the Seawall Motel in Southwest Harbor, Maine. Telescopes were available, but threatening weather and thick clouds made it an indoor event in the motel's spacious office. Hank highlighted useful information found in the June and July 2014 *Abrams Sky Calendar*, which gave the 12 or so attendees information that they could carry to future occasions in good weather, and briefly described the usefulness of a **planisphere. The evening proceeded casually, with topics and questions ranging from the importance of understanding the ecliptic, colors of stars, the nature of meteor showers, the rate of change in the appearance of the Moon, and the nature of stellar red- and blue-shifted light.**

The evening's events were well-received, with the definite feeling that such evenings in the future will be welcomed.

If you know of anyone who is interested in Astronomy or someone who would like to learn more, please do not hesitate to extend an invitation to them to attend our meetings. If they have an interest in joining, our application is below.

Mount Cuba Astronomical Group *Membership Form*

The Mission of the Mt. Cuba Astronomy Group is to increase knowledge and expand awareness of the science of astronomy and related technologies. Benefits include:

Monthly newsletter that includes details about the groups activities and articles on astronomy as well as other related subjects.

Monthly programs on subjects and topics of astronomical interest.

Free or discounted subscriptions to astronomy related publications.

Free registration to MCAG workshops and classes.

Mention Mount Cuba Astronomical Group and receive a 5% discount at Manor Books in New Castle ([http://www.yelp.com/biz/manor-used-books-New Castle](http://www.yelp.com/biz/manor-used-books-New+Castle))



Name _____

Email Address _____

Home Address _____

Phone (optional) _____

Mail to: Carolyn Stankiewicz
Mount Cuba Astronomical Observatory
1610 Hillside Mill Road
Greenville De. 19807