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Comet, Asteroid, Planet, or Dwarf?

by Dr. John Boardman

from the November, 2015 issue of Dagon,
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About a decade ago, the International Astronomical Union re-classified the planets and smaller objects which orbit the Sun. A new category was established, "dwarf planets", apparently objects which revolve around the Sun, and are smaller than planets and larger than asteroids. The dividing lines among the categories "planet", "dwarf planet", "asteroid", and other such items can be established by comparing their mean radii. Mercury, the smallest planet, has a radius of 1,516 miles. (The current World Almanac is the most useful reference book I own, but it has not yet caught up with the metric system.) Eris, the largest and most distant dwarf planet thus far discovered, has a radius of 925 miles. Ceres, the first discovered and smallest known dwarf planet, has a radius of 294 miles. (For, comparison, Earth's Moon has a mean radius of 1,079 miles.)

I am not certain that Ceres should be classified with the dwarf planets. All the other known dwarf planets, including Pluto, the first of them to be discovered, are out at the fringes of the Solar System, beyond the orbit of Neptune. But Ceres is in the Asteroid Belt, between the orbits of Mars and Jupiter. These rocky objects probably never collected into a single planet because of tides raised in their material by the gravitational effect of Jupiter, which is more massive than all the other planets combined. But the dwarf planets out at the edge of the Solar System are composed of much lighter material, mainly frozen light gases. (The mean temperature of Pluto is about 50° K, which means that the "snow banks" detected by the New Horizons probe could probably be made of methane or ammonia. The temperature 50° K is the same as -223° C or -370° F.) Since it has the same origin and composition as the other members of the Asteroid Belt, I would prefer to see Ceres regarded not as the smallest dwarf planet but as the largest asteroid.

When the International Astronomical Union "demoted" Pluto from a planet to a dwarf planet, a lot of people seemed to be upset by it. But its great differences from the planets, and its similarity to the other dwarf planets on the outer fringes of the Solar System, compelled the change. I suspect that these objections might be based on the notorious pseudo-science of astrology. The casters of horoscopes have had 85 years to work out the alleged influences of Pluto on their clients, and now they must either abandon it, or decide what are the influences of the other dwarf planets Haumea, Makemake, and Eris.

Special Photo Section: International Astronautical Congress October 2015, Jerusalem, Israel



Academicians gathered to mark the success of the Philae cometary lander (a payload on the Rosetta mission). The numerous 4.6 billion year old organic compounds found continue to encourage astrobiologists.



Johann-Dietrich Woerner, the new Director General of the European Space Agency, shared his vision for space exploration during IAA Academy Day.



Possibly due to unrest and safety concerns, just eight SETI scientists attended this year's annual IAA SETI dinner, at the Jerusalem Crowne Plaza during the October 2015 International Astronautical Congress.



During Academy Day, SETI League executive director emeritus H. Paul Shuch met with International Academy of Astronautics president Madhavan Nair .



SETI League executive director emeritus H. Paul Shuch (right) congratulates Pete Warden on his election to the SETI Permanent Committee of the International Academy of Astronautics. Formerly the director of the NASA Ames Research Center in Mountain View CA, Warden now contributes to SETI science as head of the Breakthru Listen initiative.



This small but intensely engaged group attended the SETI Science and Technology session at the International Astronautical Congress in Jerusalem last October.



Presenters at the 2015 SETI sessions at the Jerusalem IAC included (left to right) Amri Wandel, H. Paul Shuch, Daniela de Paulis, Claudio Maccone, David Duner, and Lori Walton.



For the Billingham Cutting Edge lecture at last October's International Astronautical Congress in Jerusalem, SETI League member Lori Walton presented an historical overview of the International Academy of Astronautics SETI Committee.



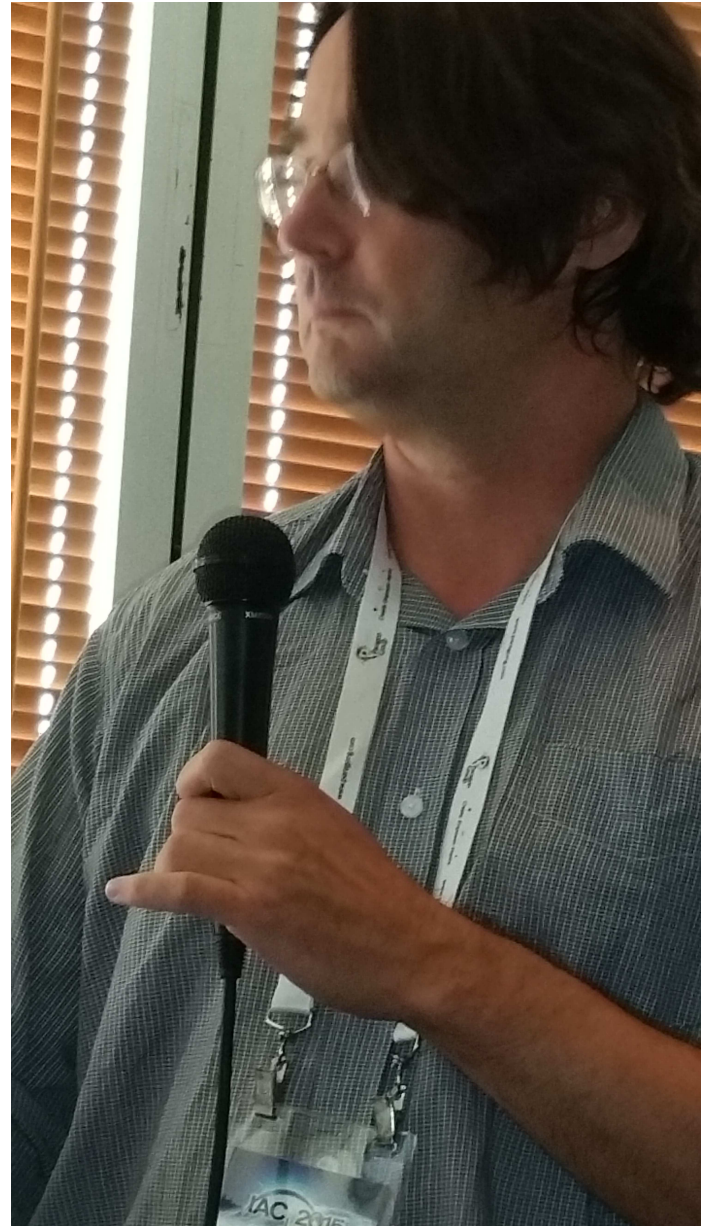
Italian SETI scientist Claudio Maccone gave yet another mathematical presentation at the 2015 International Astronautical Congress in Jerusalem, this one attempting to model the emergence of life on exoplanets.



At the International Astronautical Congress in Jerusalem last October, NASA administrator Charles Bolden and Israel Space Agency director general Menachem Kidron signed a wide-ranging cooperative agreement aimed at facilitating future collaborations between the two agencies in space research and exploration.



Daniela de Paulis, artist in residence at the Dwingeloo radio telescope in the Netherlands, discusses a virtual reality film she is developing showing views of the Earth from space. She plans to capture and analyze the brain waves of subjects experiencing the film.



Swedish historian David Duner spoke about L, the longevity of extraterrestrial civilizations, during the SETI and Society session the International Astronautical Congress in Jerusalem last October.



Prof. Amri Wandel of Hebrew University, Jerusalem, delivers the annual Rudolf Pesek Lecture at IAC 2015.



Two dozen space scientists attended the SETI and Society session at the Jerusalem IAC in October 2015.



During Academy Day, the IAA Climate Change panel represented humanity as astronauts aboard a spacecraft whose life support system is malfunctioning.



Youth carried in the flags of all participating nations to kick off Opening Ceremonies at the 66th International Astronautical Congress in Jerusalem.



Music and dance marked the IAC Opening Ceremonies.



Geologist Lori Walton speaks about SETI searches for large scale technosignatures.



During the International Astronautical Congress in Jerusalem, SETI League executive director emeritus H. Paul Shuch met with Prof. Yang Yuguang of the Beijing Institute of Electronic System Engineering. Dr. Yang serves as Secretary of the IAF Space Transportation Committee.



Italian mathematician Claudio Maccone discusses the use of the realistic KLT to detect transient signals from theorized extraterrestrial spaceships.



At the IAC2015 session on SETI Science and Technology, artist Daniela de Paulis presented an update on the New Horizons (One Earth) message initiative.

Event Horizon

SearchLites readers are apprised of the following conferences and meetings at which SETI-related information will be presented. League members are invited to check our World Wide Web site (www.setileague.org) under *Event Horizon*, or email to us at info@setileague.org, to obtain further details. Members are also encouraged to send in information about upcoming events of which we may be unaware.

February 11 - 15, 2016: AAAS Annual Meeting, Washington, DC.

April 16, 2016, 0000 UTC - 2359 UTC: Sixteenth annual SETI League *Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 17, 2016, 1300 EDT: Twenty Second SETI League *Annual Membership Meeting*, Little Ferry NJ.

May 27 - 30, 2016: *Balticon 50*, Baltimore, MD.

August 17 - 21, 2016: *MidAmeriCon II*, the 74th World Science Fiction Convention. Kansas City, MO.

September 26 - 30, 2016: *67th International Astronautical Congress*, Guadalajara, Mexico.

November 18 - 20, 2016: *Philcon*, Cherry Hill, NJ.

April 15, 2017, 0000 UTC - 2359 UTC: Seventeenth annual SETI League *Ham Radio QSO Party*: 3.551, 7.0309, 7.2039, 14.084, 14.204, 21.306, and 28.408 MHz.

April 16, 2017, 1300 EDT: Twenty Third SETI League *Annual Membership Meeting*, Little Ferry, NJ.

September 25 - 29, 2017: *68th International Astronautical Congress*, Adelaide, Australia.

October 1 - 5, 2018: *69th International Astronautical Congress*, Bremen, Germany ❖



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Guest Editorial:

**A KBO Target for New Horizons
by Paul Gilster**

[Centauri Dreams](#)

What we'll eventually want is a good name. 2014 MU69 is the current designation for the Kuiper Belt Object now selected as the next destination for New Horizons, one of two identified as possibilities, and the one the New Horizons team itself recommended. Thus we have a target — a billion and a half kilometers beyond Pluto/Charon — for the much anticipated extended mission, but whether that mission will actually occur depends upon NASA review processes that are not yet complete. Still, the logic of putting the spacecraft to future use is hard to miss, as John Grunsfeld, chief of the agency's Science Mission Directorate, is the first to note:

“Even as the New Horizon's spacecraft speeds away from Pluto out into the Kuiper Belt, and the data from the exciting encounter with this new world is being streamed back to Earth, we are looking outward to the next destination for this intrepid explorer. While discussions whether to approve this extended mission will take place in the larger context of the planetary science portfolio, we expect it to be much less expensive than the prime mission while still providing new and exciting science.”

We wind up with a situation where action precedes future decision. While the extended mission proposal will not be turned in to NASA until next year, the spacecraft can't delay its preparations for a rendezvous with 2014 MU69 — trajectory changes factor into the equation. New Horizons, as this JHU/APL news release points out, will perform four maneuvers in late October and early November to make the necessary course changes for a January 1, 2019 flyby.

In anticipation of probable work beyond Pluto/Charon, New Horizons has the necessary hydrazine for a KBO intercept, and we'll be able to monitor its communications and data return for years to come. Researchers had their eye on the kind of primitive object out of which dwarf planets

like Pluto themselves may have been made, and the new target fits the bill.

“2014 MU69 is a great choice because it is just the kind of ancient KBO, formed where it orbits now, that the Decadal Survey desired us to fly by,” said New Horizons Principal Investigator Alan Stern, of the Southwest Research Institute (SwRI) in Boulder, Colorado. “Moreover, this KBO costs less fuel to reach [than other candidate targets], leaving more fuel for the flyby, for ancillary science, and greater fuel reserves to protect against the unforeseen.”

As to that new name, 2014 MU69 is already being called PT1, for ‘potential target 1,’ but will want something a bit more muscular, and certainly more poetic. You'll recall how tricky it was to find a KBO for this encounter in the first place (see, for example, New Horizons: Potential KBO Targets Identified). Among those found after the search began in 2011, none were within range of the craft's fuel supply. It took the Hubble Space Telescope to discover, in the summer of 2014, the two prime candidates. And it's easy to understand Alan Stern's enthusiasm. 2014 MU69, at about 45 kilometers across, is ten times bigger than the average comet and a thousand times more massive, even if it's about 1/10,000th the mass of Pluto.

It wasn't that long ago — in August of 1992, to be specific — that David Jewitt and Jane Luu discovered the first trans-Neptunian object beyond Pluto/Charon, one that gave rise to the term ‘cubewano,’ named after the latter part of its designation, (15760) 1992 QB1. Jewitt and Luu liked the name ‘Smiley’ for the KBO, but there is already an asteroid with that name (1613 Smiley), so like 2014 MU69, even the first identified KBO could use a new monicker. Whatever we call it, 2014 MU69 should give us a look at the early days of Solar System formation some 4.6 billion years ago, preserved by distance and the outer system deep freeze.

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