



Capitol Skies

The Newsletter of the Madison Astronomical Society

November/December 2006

Pluto is a Planet (The IAU is Goofy)

by Wynn Wacker

I originally wrote an article commending the International Astronomical Union on what promised to be their intelligent solution to defining a planet. That was before the final vote resulted in what is destined to be one of the one of the poorest scientific definitions in the 21st Century. The details of how the original definition was arrived at, and what happened in the voting, is detailed in an article by Owen Gingrich, chairman of the IAU committee in charge of recommending a definition, in the November issue of *Sky & Telescope*. The situation is a rare one, in the history of astronomy, and I can't resist to opportunity to comment on it from my own perspective.

Astronomy has gone for a long time without a technical definition of a planet. The imperative to have one arose from a bureaucratic, not technical, need. The question arose as to which IAU committee was responsible for naming the Kuiper Belt object 2003 UB₃₁₃ (informally called Xena). If it was a planet, it would go to one committee, otherwise it would go to another committee. Otherwise, it would be given a designation by the Minor Planets Center and forwarded to a different IAU committee for approval. The dilemma placed the IAU squarely in the middle of a controversy about the status of Pluto which had

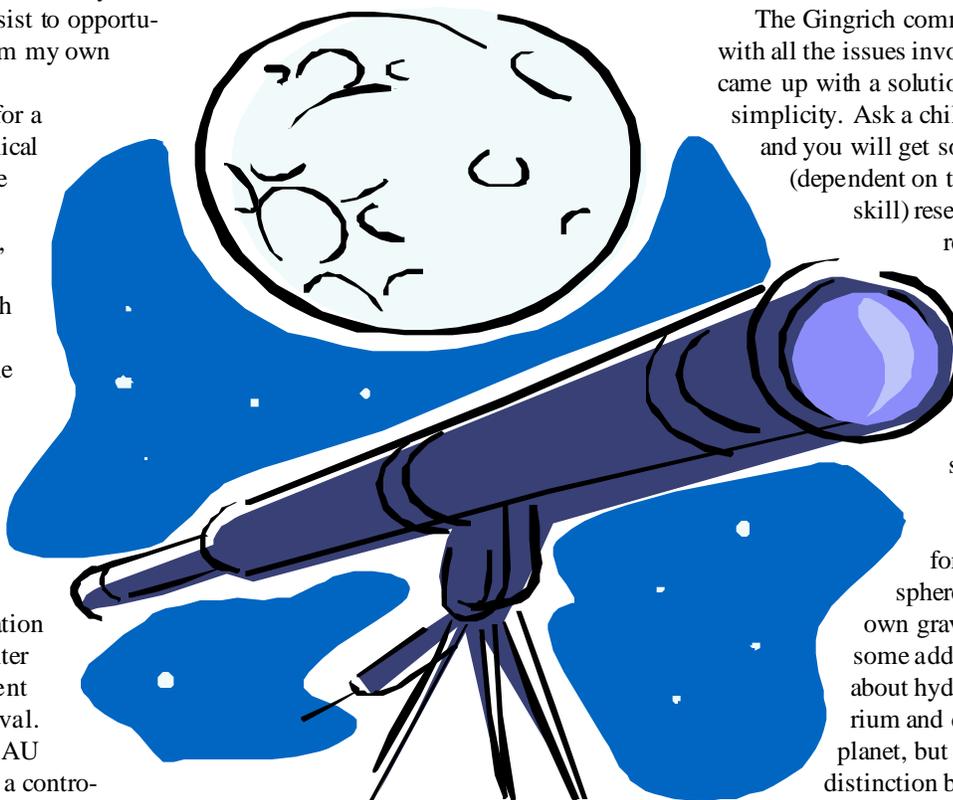
been going since the small size of Pluto became apparent in the decades following its discovery, and which has gained in intensity with recent theories about planetary formation.

My take on the problem is influenced by my background in biology. Although dilemmas like this are rare in astronomy, they are the heart and soul of taxonomic classification in biology. And, just as in the current astronomical controversy, there are usually two opposing camps, known colloquially as the Splitters and the Lumpers. The Splitters emphasize the

differences, wanting to form new a new species, genus, or family to formalize the distinctions among living things. The Lumpers emphasize the similarities and try to expand the current classifications to include a wider variety of members. Species now has a functional definition, but although DNA technology has clarified the evolutionary relationships between the higher taxa, it has not resolved these two conflicting tendencies. I personally lean toward the Lumpers, preferring to emphasize similarity over diversity. (It's also a heck of a lot easier to memorize fewer taxa).

The Gingrich committee wrestled with all the issues involved and finally came up with a solution inspired in its simplicity. Ask a child to draw a planet and you will get something that (dependent on the level of artistic skill) resembles a circle and represents a sphere.

The committee decided that the essence of a planet is that it is a non-stellar object orbiting a star which is not a moon but which is large enough to form itself into a sphere by the force of its own gravity. There were some additional details about hydrostatic equilibrium and defining a double planet, but the essential distinction between planet and



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non-planet could be demonstrated in one minute with a lump of modeling clay. Data on the orbit and a single image of the object (or simply reliable data on the object's mass) would be enough to determine if it is a planet. And the classification would be as useful for extrasolar planets as it is in our own solar system. The solar system would have three new planets, the Kuiper Belt objects Sedna and Xena, and the large asteroid Ceres (which had been termed a planet when it was first discovered).

The proposal recognized the differences between the Kuiper Belt planets and the more classical variety by terming them Plutons, while Ceres was recognized as a Dwarf Planet. However, all were planets, just as asteroids are asteroids whether C-type, S-type, or M-type, or whether they're Trojans or part of the Vesta family.

What happened? Some dynamicists, astronomers working to understand and model the formation of the solar system, felt that the straightforward structuralist approach to the definition ignored their

contributions. After rejecting several attempts at compromise, less than a tenth of the attendees voted in a definition which requires a planet to "have cleared the neighborhood around its orbit" of debris. This definition is explicitly limited to our own solar system. After all, how could we know if those objects orbiting distant stars have cleared their orbits. It's also implicitly limited to the current moment in time. Early in solar system history, the classical planets would not have had time to clear their orbits, even if their masses were essentially the same as their current values. And the definition is fuzzy at best, since the Earth has orbit-crossing asteroids such as Apophis, and most of the other classical planets do as well. Objects like Pluto are classified as Dwarf Planets, which in an unfathomable twist of logic, are not planets under the definition. All other objects (asteroids, comets, meteoroids) fall in a third category,

With all respect to dynamicists, how much do we really know about solar system formation? I recall how we knew in the 1960's that planetary systems would resemble our own, with close-

orbiting terrestrial-type planets and more distant gas giants. Then came the discovery of the extrasolar short-period "hot jupiters". Within a few weeks of the IAU vote the Smithsonian Center of Astrophysics announced the discovery of HAT-P-1, a "hot jupiter" orbiting a component of ADS16402 which 24% larger than predicted by theory, making it one-quarter the density of water. Even if we have confidence in the theories describing the formation of our own solar system, does it make sense to create a definition so limited in space and time? It's contrary to the whole historical thrust of astronomy and physics.

Unlike theology, science is not restricted to dogma, and the poor decision of a few IAU members can be reduced in future. In the meanwhile, some professional astronomers may be forced to live with the bad terminology, but we are not. I urge everyone to continue to refer to Pluto and the "plutons" as planets and ignore the IAU. We are not constrained to conform to bad science. Regardless of the ultimate classification system for planetary bodies, it is clear that a fraction of the IAU membership has gas giant egos and dwarf intellects.

The Brief History of the Minor Planet Project

By Matt Mills

Astrometry is a branch of astronomy that deals with the positions of stars and other celestial bodies, their distances and movements. The Madison Astronomical Society's first astrometric observations were submitted by Greg Sellek from the Yanna Research Station in 2001. Greg submitted a total of eighty minor planet astrometric measurements that year which were accepted by the Minor Planet Center. The Minor Planet Center, under the auspices of the IAU, is the official organization in charge of collecting observational data for minor planets (asteroids) and comets and calculating their orbits, and publishing this information.

From 2001 to 2005 Greg Sellek submitted a total of 267 astrometric measurements from the Yanna Research

Station which were accepted by the Minor Planet Center. No small feat in itself. But the truly interesting story is that of how real science was performed from the Yanna Research Station.

I am not sure who had the original idea to measure asteroids at YRS first. Greg certainly lead the effort. But like many improvements at YRS "Doc" Greiner had a big hand in the success. Possibly Doc planted the seed and Greg brought it to fruition. In any event it was a collaboration between the two.

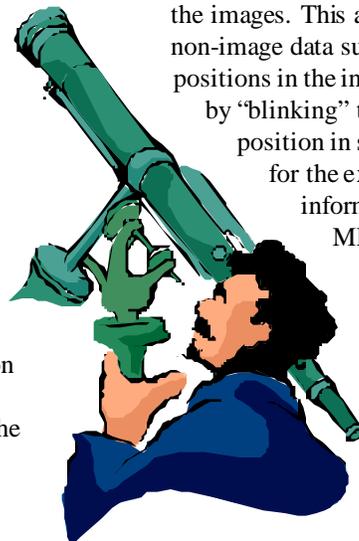
With Doc's CCD camera the ST-7 and the DocG, Greg was able to capture an asteroid's movement in three successive

frames. Greg next plate solved the images which added the World Coordinate System positions to the FITS or Flexible Image Transport System file format of the images. This allowed for additional non-image data such as star catalog positions in the information header. Thus

by "blinking" the images the exact position in space can be determined for the exact time of night. This information is valuable to the

MPC to determine the asteroid's ephemeris (orbit). Greg's successful effort gave YRS its Observatory Code 927 just like the big observatories.

Long nights in frigid winter weather and humid insect



infested summer weather followed at YRS. Equipment failures and technical glitches were the norm but Greg with his computer network background and with his Doc's electrical engineering and Meade LX200 expertise, met every problem and solved them all.

Both men began to make big improvements to the infra-structure at YRS. A new dome with motors was added to the DocG II, cables were laid to the club house from the DocG II and new software became available. Doc Greiner donated the majority and MAS members supplied the manpower to make it happen. The result was remote operation of the telescope, CCD camera and the dome from inside the YRS clubhouse. No more bug bites or frost bit fingers for

Greg and his team.

Mark Hanson purchased a research grade CCD camera, the ST-9, which was used to image asteroids at much deeper magnitudes. Mark also lent his LX200 16" to the effort which was housed in the DocG II dome for several months.

Greg spent long hours training MAS members and giving presentations on astrometry and the remote operation of the DocG II for astrophotography. He sacrificed his scope time for others to promote science and the use of our observatory code designation.

The Minor Planet Project has moved off site from the Yanna Research Station to the Greiner Research Observatory. YRS was too limited by lack of broadband internet

and restrictions to continue at the site.

But that does not mean that science can not be done at YRS. The groundwork has been laid and the infra-structure is still there (I checked). All that is necessary is interest and a little motivation. The last submission to the MPC was in 2005.

There are many other scientific areas to explore at YRS. Here is a short list of more ideas:

- Exo-planet Search
- Variable Star
- Sun Spot and SID Imaging
- Supernovae Search
- Photometry
- All-Sky Meteor Detection
- Eclipsing Binary
- Occultation Timing
- Spectrophotometry

East is a Big Bird Part III: Accuracy vs. Utility in Celestial Navigation

by Don Martin

We learned in previous installments that Puluwat navigation is a dead reckoning system dependent upon features of sea and sky specific to its geographical location. We also learned that it is a system precise in most of its features, but also possesses ambiguities that create concerns with its accuracy for open ocean voyaging in terms of Western perceptions. This is because we have a mind set that requires a high degree of accuracy in navigational systems for open water sailing; thus we tend to view the Puluwatan system, regardless of its accuracy in most areas, as failing the test as an acceptable form of navigation. After all, one negative negates the whole in our view.

But in doing so we wear the blinders of cultural bias that limits our understanding and appreciation of the cultural environment and utilitarian needs that Puluwatan navigation meets.

To overcome our cultural bias we need to see how this vagueness, as perceived in Western terms, is reconciled with the reality of the sailing

environment on Puluwat, and the easiest way is to reconcile this question of ambiguity is to see how Gladwin dealt with it.

In his monograph, Gladwin notes that he struggled with this vagueness issue until he recognized that he could not burden Puluwat cultural perspectives and methods with the ones he brought with him from his Western point of view. For instance, in terms of accuracy between the vague northern and southern extremes of the star compass compared to its far more accurate central parts, Gladwin's first impression was disbelief that such sloppy and vague aspects could exist in an otherwise precise system. However, when he pressed the Puluwat navigators for the same consistency and rigor for all parts of the star compass the more confused both he and the Puluwat navigators became.

It was not until his instructional voyage to Pulusuk and back that Gladwin realized the dilemma was created because the expectations he placed on the system compared to their expectations was very different. "I took it for granted that a star

'compass' which formed the heart of a demonstrably accurate system of navigation must itself necessarily be accurate, and therefore I assumed equally accurate, in all its parts."

During the return to Puluwat from Pulusuk Gladwin realized that the Puluwat navigators, when maintaining a course based on the Dipper, were not steering a course toward a point of light, but instead sailing into a part of the heavens. He then extrapolated this to all courses based on the northern and southern star compass steering's and realized that it was not necessary to set a course on a discrete point, but instead towards a general area or part of the heavens. Thus Gladwin found that in both the northern and southern skies the configuration of the stars is sufficiently distinctive that a navigator can estimate a course with considerable ease and accuracy.

But is the Puluwat system accurate enough? What Gladwin finally came to understand was that for the north-south

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trips there were no passages greater than 60 miles, and it was at this point that he realized the significance of the fact that the Central Caroline's, strung out on a long east-west axis of islands, do not contain any really long north-south passages that need to be negotiated. The longest voyage in the customary Puluwat repertoire is between Pulap and Ulul, almost sixty miles, where, as with all north-south voyages, reefs stretch for miles to the sides of each destination, acting as screens that help prevent canoes from straying off course and sailing out into the vastness of the Pacific, with the dire consequences that await any sailing canoe lost at sea.

It turns out that the only truly risky north-south passage is the 60-mile trip between Losap and Namoluk, south of Truk, but this is far from home and is made only by the most experienced navigators. Even this 60 miles is less than half the 130 mile east-west trip between Puluwat and little Satawal alone in the ocean.

So as it turns out, the sectors wherein the star compass is least accurate are those where the least accuracy is needed, while the sectors where the greatest accuracy is required is where the Puluwat system is, in fact, at its most accurate. Add to this that the patterns of the stars near each of the poles lend themselves so well to steering by the shape of the sky rather than to a point, and it becomes evident why Puluwat navigators are unconcerned with, almost unaware of, the inconsistency which troubled Gladwin between the ambiguity of the polar regions and the precision of the system to east and west.

Once Gladwin understood the cultural

relativism involved he was able to discern that a Puluwatan navigator requires only two qualities of his star compass: that it is systematic enough to be explained and taught, and it is accurate enough to guide him to those destinations he needs to reach but gains nothing by being more precise or accurate than necessary. Gladwin notes that it was this second point that was the critical one and the one he was slow to recognize because, from his Western perspective, it was difficult to reconcile that the Puluwat system of navigation did not embrace the same need for absolute accuracy. In other words, the Puluwat navigators do not see the need to go beyond what is necessary for them to be successful in pursuit of their needs, and that the relentless pursuit of perfection is not a cultural value in terms of navigation between islands within their cultural milieu.

Therefore, Puluwatan navigators feel no intellectual, nor see any pragmatic need, to maintain uniform standards of precision throughout their directional system since it easily satisfies all of their requirements for both safety and utility. To them it is as logical of a construct as our Western system is to us.

The stars, the sun, waves, and currents, these are the tools upon which the Puluwatan navigator must rely to keep steady his direction when traveling from one island to the next, even when out of sight of land. But waves and currents can only hold a course first defined by other means; whereas stars can and whenever possible do furnish a primary heading. As long as there is a navigation star in sight the navigator can set his course upon it and go forward with a light heart and a minimum of

attention and effort. If he is on a reach he must compensate for the sideways drift of his canoe, expressed in a slightly upwind angle of attack, or keep watch on his steersman if running with the wind, but these come almost without thinking to a man whose life is the sea.

The Puluwat navigation system when expertly used, that is, with skilled judgment and straightforward knowledge, and under reasonable conditions is more than sufficiently accurate. However, the Puluwat navigator, being a conservative individual, conducts voyages with all possible reserves of safety. In particular he takes advantage of every bit of his training and experience to establish a positive fix of position. The most common are passages over reefs while sightings of islands are also used, but it is more usual, if the island is to be passed close enough to see it, to stop overnight. This offers a chance to visit, to get fresh supplies, and to enjoy the warmth of welcome, which is one of the rewards of travel in this part of the world.

So while both Western and Puluwat navigation methods differ in their respective degrees of accuracy and in their applicability, one to worldwide use and the other limited to a very specific geographical sphere, both have in common the utilitarian purpose of safely transporting people and goods from one port to another, and when either system fails it is most likely due to human failure or oversight; for regardless of which system is used, if the established rules and procedures are followed, the chances of tragedy are greatly reduced to chance occurrences which one can never wholly predict or guard against.

Calendar of Events

- November 10 MAS monthly meeting at Space Place (2300 S. Park St., in the Villager Mall). Business meeting 7:00 pm, main meeting 7:30; Guest speaker TBA.
- November 15 MMSD Planetarium Monthly Program: *Solar System Update*. An update on current events in solar system exploration; Pluto's demotion, Mars Rovers still going, Cassini at Saturn, and more. Programs at 6:30 and 7:45. Admission \$2.00 per ticket. Memorial High School, 201 S. Gammon.
- December 8 MAS monthly meeting at Space Place (2300 S. Park St., in the Villager Mall). Annual holiday party.
- December 20 MMSD Planetarium Monthly Program: *Season of Light*. Explore the astronomy behind various seasonal celebrations. Programs at 6:30 and 7:45. Admission \$2.00 per ticket. Memorial High School, 201 S. Gammon.

Notes From Your Treasurer

by Mary Ellestad

A really big Thank You from me to everyone who has sent in their payments for dues and subscriptions. I just sent in the subscription renewals so those endless notices should stop coming. If you haven't yet renewed your dues, we wish you would consider staying on as a MAS member. Just so you know, this will be the last newsletter before I update the membership list.

There was some discussion related to the budget at the last meeting but it seems to be pretty well balanced now. All I will have for the next meeting is the final version for your approval. I will also

remember to bring in the Astronomy Calendars that many of you want every year (\$10 as before). They make great gifts and you'll want to get yours now because in February I discount them to \$20.

At the last meeting, there was also a suggestion that we could have a garage/rummage sale in the spring/early summer to benefit MAS. That might be fun - Worth considering? - Anyone interested? - Where could we have it? Tim and I certainly have some good stuff to donate. Hope to see you at the November meeting and at our December treats and talk-fest.

2007 Observer's Handbook

Now is the time to place your order for the 2007 Observer's Handbook, *the world's most useful astronomical reference, published annually since 1911 by the Royal Astronomical Society of Canada*. Below is the description of the book from the publisher. Following is ordering information.

Observer's Handbook 2007. Editor: Patrick Kelly. The Royal Astronomical Society of Canada. 292 pages, soft cover.

The *Observer's Handbook* is a guide published annually by The Royal Astronomical Society of Canada. Through its long tradition and the expertise of more than 40 contributors, the *Observer's Handbook* has come to be regarded as the standard North American reference for data on the sky. The material in the Handbook is of interest to professional and amateur astronomers, scientists, teachers at all levels, students, science writers, campers, scout and guide leaders, as well as interested general readers. The *Observer's Handbook* is an integral part of many astronomy courses

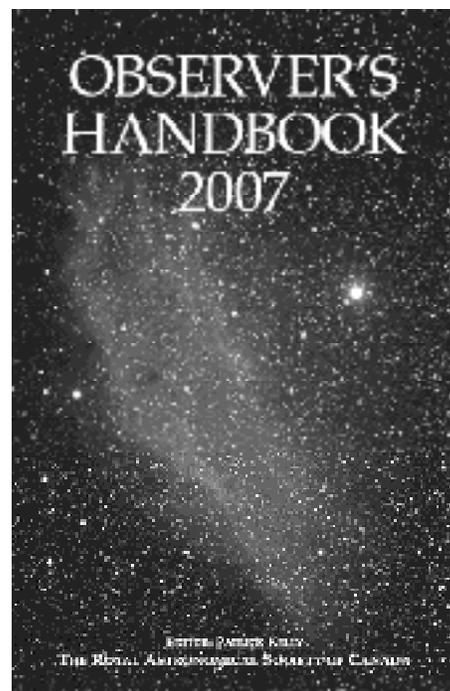
at the secondary and university levels, and it should be on the reference shelf of every library.

ORDERING INFORMATION:

Normal price per individual copy, including shipping, is \$31.95. By ordering as a group, **we pay only \$18.95** per copy.

To order your copy, send a check in the amount of \$18.95 for each copy made out to: Neil Robinson, 5646 Lake Mendota Drive, Madison, WI 53705. The order for MAS will be placed on November 13th, so all orders **MUST BE RECEIVED** prior to that date. If you are mailing your order to me and it is close to the deadline, please phone or email to let me know. 238-4429, neilandtanya@mailbag.com

PLEASE NOTE: Books *will not* be mailed out to individuals (unless you make special arrangements to mail me a pre-paid envelope.) You must pick up your copy at an MAS meeting, or make other arrangements to pick it up. The savings is largely by virtue of avoiding shipping charges.



The *Observer's Handbook* contains:

Sections dealing with astronomical events which occur during the current year, e.g. times of sunrise and sunset, moonrise and moonset (for latitudes 20 to 62 degrees N), eclipses, location of the planets and bright asteroids, returns of periodic comets, times of meteor showers, predictions of occultations by the Moon and by asteroids, the orbital positions of the brighter satellites of both Jupiter and Saturn, and predictions of the cycles of many variable stars. There is a 28-page section called "The Sky Month by Month" which gives an extensive listing of events.

Sections dealing with astronomical data and other information which do not vary from year to year, e.g. orbital and physical data on the planets and their satellites, astronomical and physical constants, some optical properties of telescopes and binoculars, information on filters for astronomical observing, light pollution and sky transparency, a description of the various systems of specifying time, information on the Sun including sunspots and aurorae, information on the Gegenschein and zodiacal light, and much more.



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Madison Astronomical Society members are active in sharing the pleasures of astronomy with the public, acting as a resource for students and teachers, and exchanging information at Society meetings which occur monthly. The Society continues to pursue its original goal to "promote the science of astronomy and to educate the public in the wonders of the universe."

For more information about the Society, please contact one of the officers listed at left or visit us on the web at:

www.madisonastro.org

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