

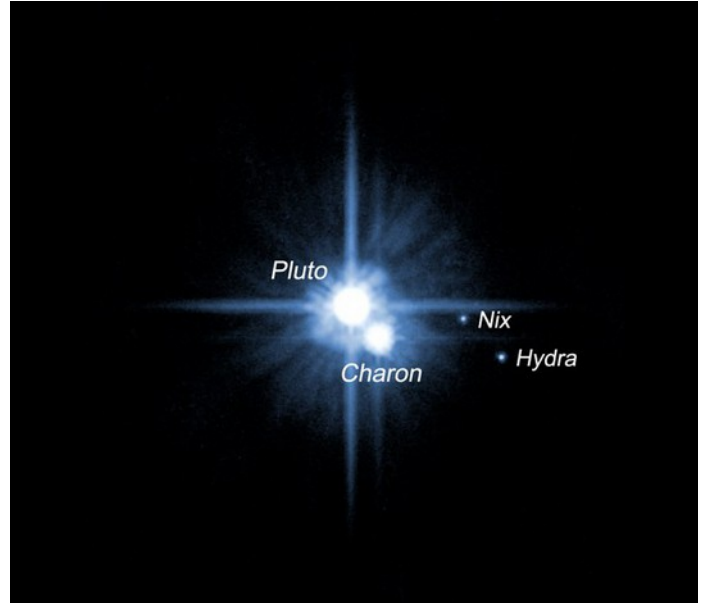


Events:

General Meeting : No meeting this month so we can adjourn to Anza for our annual Star-B-Q. Read the announcement here.

Regular meeting returns in August with a report on the New Horizons encounter with the Dwarf Planet Pluto by JPL speaker and SDAA member Jerry Hilburn.

For the latest on Star Parties, check the [web page](#).



[Nix and Hydra](#)

[Mutchler \(STScI\)](#), [A. Stern \(SwRI\)](#), and the [HST Pluto Companion Search Team](#), [ESA](#), [NASA](#)

WHAT'S INSIDE THIS MONTH:

Star-B-Q

**A Note from the Publisher
Looking Up**

by Curtis Croulet

**No Surprise! Earth's Strongest Gravity
Lies Atop The Highest Mountains
by Ethan Siegel**

Send newsletter submissions to Mark DiVecchio (markd@silogic.com) by the 20th of the month for the next month's issue.

Like us on [Facebook](#)

General information:

Subscription to the TVA is included in the annual \$25 membership (regular members) donation (\$9 student; \$35 family).

President: Mark Baker 951-691-0101

(shknbk13@hotmail.com)

Vice President & [Facebook](#): Tim Deardorff 951-775-1036

(tim-deardorff@yahoo.com)

Past President: John Garrett 951-609-3021

(garrjohn@gmail.com)

Treasurer: Curtis Croulet (calypte@verizon.net)

Secretary: Deborah Cheong (geedeb@gmail.com)

Club Librarian: Bob Leffler 951-541-5400

(bojleffler@msn.com)

Star Party Coordinator and Outreach: Deborah Cheong
(geedeb@gmail.com)

Address renewals or other correspondence to:
Temecula Valley Astronomers
PO Box 1292
Murrieta, CA 92564

Mailing List: tvastronomers@googlegroups.com

Website: <http://www.temeculavalleyastronomers.com/>



Cosmic Comments – July/2015 by President Mark Baker

Mark is taking a break this month to concentrate on the Star-B-Q.

Star-B-Q

Don't forget our upcoming, world famous Star-B-Q on Saturday, 11 July 2015 at the O's place in Anza. Details to follow by email but now is a great time to start planning to be there, as well as what you'd like to bring to share with a bunch of voracious astronomers... Protein and related fixings will be provided, so any side dish, salad, dessert, etc. is more than welcome. Did I mention dessert?? Plenty of ice chests provided so bring along your favorite beverage as well...Have a scope?? Bring it along!! No scope?? No problem...we will have plenty of all types and sizes...This is always a huge success and this year, with the addition of live entertainment, is already shaping up to a great one... hope to see you all there!!!

Mark Baker

A Note from the Publisher

It has come to my attention that hundreds of future newsletter articles have been secretly hidden in the brains of several dozen members of the Temecula Valley Astronomers.

These articles cover the range of "What I did last summer" to mathematical thesis that require a large computer (or at least an iPad) to understand.

I'm asking that if you are in possession of one of these hidden articles, run, don't walk, to your nearest keyboard and start typing.

The Publisher



Looking Up – July 2015

by Curtis Croulet

Full Moon is July 1 at 7:20 pm; **Last Quarter Moon** is July 8 at 1:24 pm; **New Moon** is July 15 at 6:24 pm; **First Quarter Moon** is July 24 at 9:04 am; and a **second Full Moon** is July 31 at 3:43 am.

Mercury is in the morning sky as July begins. It rapidly dives toward the horizon, reaching superior conjunction on Jul 23.

Venus reached greatest elongation (angular distance from the Sun) on June 6. **Venus** and **Jupiter** are only 0.3 deg apart on June 30 and 0.60 deg apart on July 1. Both planets plunge toward the dusk horizon, with **Jupiter** sprinting ahead for a few days. But **Venus** actually catches up to **Jupiter** by July 31. **Venus** will reach inferior conjunction with the Sun on August 15. As high as **Venus** is after sunset as I write this in mid-June, it'll be gone from the evening sky within two months.

Mars is now low in the morning sky. It rises only a short time before sunrise.

Saturn is in northwestern Scorpius, ideally placed for evening viewing. The rings are nearly as wide open as they can be.

Uranus is a post-midnight object for most of July. It rises around 1 am on July 1 and as early as 11 pm on July 31. **Uranus** is in Pisces.

Neptune rises shortly after 11 pm at the beginning of July and shortly after 9 pm by the end of the month. **Neptune** is in Aquarius.

Pluto is in Sagittarius, which is up most of the civilized hours of the night. At mag 15, **Pluto** looks like a very dim star. It's beyond the reach of most amateur telescopes smaller than about 12-inch aperture. Maybe a 10 or 11-inch will show it. The July issue of *Sky & Telescope*, on pp.52-53, has a detailed chart of Pluto's positions throughout the coming months. More about **Pluto** below.

There are no bright and distinctive meteor showers in July. Looking ahead, the Perseids will peak on the morning of August 13, and they will have little interference from the Moon.

Let's look up.

July 2015 is Pluto's special month. The New Horizons spacecraft, launched January 19, 2006, from Cape Canaveral, will fly by Pluto on July 14, 2015. After 9-1/2 years, New Horizons' most important observations will be concentrated into a 48-hour period. New Horizons then will continue forever into the cosmos. We will get a good view of only one hemisphere each of Pluto and its moon, Charon.



As so often in science, the Pluto's discovery in 1930 resulted from a combination of perseverance and sheer luck. William Herschel discovered Uranus in 1781. In the following decades, Uranus was seen to deviate slightly from its predicted orbit, suggesting the existence of another planet. John Couch Adams and Urbain Jean-Jacques Le Verrier independently calculated the proposed planet's position. Adams was unable to interest Britain's Astronomer Royal, George Airy, into searching for the predicted planet until it was too late. But Le Verrier was able to recruit Johann Galle at the Berlin Observatory. Galle quickly discovered the planet, soon named Neptune, in 1846. But Neptune didn't entirely account for the measured perturbations in Uranus's motions. In the following decades various astronomers predicted one or more additional planets. Percival Lowell, founder of Lowell Observatory in Flagstaff, AZ, calculated the position of a hypothesized Planet X. Although Lowell died in 1916, his calculations were the basis of Clyde Tombaugh's successful search at Lowell Observatory in 1930. Tombaugh used a new 13-inch astrograph, a telescope specifically designed for wide-field astrophotography. Within a few days of commencing his search, Tombaugh found the predicted planet. Astronomers quickly found the new planet on older photographs, including some taken previously at Lowell Observatory. Pluto was found to have a tilted orbit that sometimes came within Neptune's orbit. Milton Humason at Mt. Wilson Observatory, using the 60-inch reflector, came close to discovering Pluto in 1919. He used positions calculated by William H. Pickering. An unfortunate bit of fluff on one photographic plate and the proximity of overwhelmingly bright stars on another plate obscured Pluto and thus foiled Humason's attempted discovery.

Although the astronomical world hailed the discovery of the new planet, astronomers quickly calculated that the 15th magnitude dot found by Tombaugh couldn't possibly account for deviations in Uranus and Neptune orbits. Within a month of its discovery, the new planet was named Pluto. From then on, Pluto's estimated size and mass shrank every year. When I was discovering astronomy in the mid-1950s, one of my books pegged Pluto's diameter as somewhere between the diameters of Mercury and Venus. When Pluto's moon Charon was discovered in 1978, simple application of Newton's laws shrank Pluto's mass to less than 1% that of Earth. Pluto's diameter is about 1441 miles. What about the orbital deviations of Uranus and Neptune? Pluto was too small to affect them much. When Voyager 2 passed Neptune in 1989, Neptune was found to be 0.5% less massive than previously believed. When Neptune's corrected mass was entered into the equations, the deviations vanished. There are no additional massive planets beyond Neptune. There is no "Planet X." We still have to answer the question of Pluto's status. Is Pluto a planet or not? In the early 2000s Caltech's Mike Brown discovered small objects in the outer reaches of the Solar System, well beyond Neptune's orbit. One of these objects turned out to be about the size of Pluto. The new object was eventually named Eris. When the International Astronomical Union met in Prague in 2006, they were presented with a proposal from a special committee that would have added three planets to the nine then recognized. The new planets were to be Ceres (the largest asteroid), Pluto's moon Charon (Pluto and Charon were treated as a double planet), and Eris. But a group of astronomers called "orbital dynamicists" objected. When the dust settled, the few remaining attendees at the Prague convention voted to create the new category of "dwarf planet." Ceres, Eris, and Pluto were dumped into the dwarf planets. Paradoxically, under the IAU's definition, dwarf planets aren't planets. Don't ask me to explain it or justify it.



Pluto's status has spilled into popular culture. In 2007 the New Mexico state legislature officially declared Pluto to be a planet. Clyde Tombaugh, Pluto's discoverer, just happened to be living in New Mexico. If you're driving between Animas and El Paso, don't call Pluto a "dwarf planet." If you visit Lowell Observatory in Flagstaff, AZ, you'll see abundant references to Lowell's role in the discovery of Pluto. You may even get to see the telescope Tombaugh used to discover Pluto. But absolutely nowhere will you find any reference to Pluto not being a planet. At Lowell Observatory, it's still 1930.

Clear skies.



No Surprise! Earth's Strongest Gravity Lies Atop The Highest Mountains

By Ethan Siegel

Courtesy of [NASA's Space Place](#)

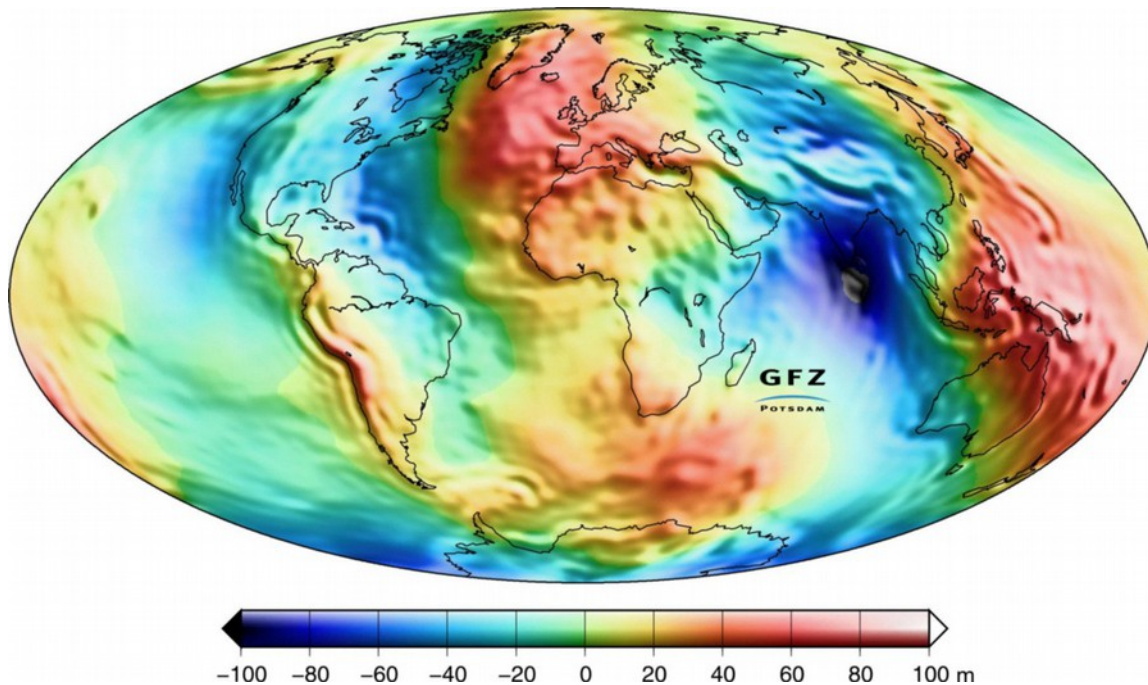


Image credit: NASA / GRACE mission / Christoph Reigber, et al. (2005): An Earth gravity field model complete to degree and order 150 from GRACE: EIGEN-GRACE02S, Journal of Geodynamics 39(1),1–10. Reds indicate greater gravitational anomalies; blues are smaller ones.

Put more mass beneath your feet and feel the downward acceleration due to gravity increase. Newton's law of universal gravitation may have been superseded by Einstein's, but it still describes the gravitational force and acceleration here on Earth to remarkable precision. The acceleration you experience is directly proportional to the amount of mass you "see," but inversely proportional to the distance from you to that mass squared.

The denser the mass beneath your feet, the stronger the gravitational force, and when you are closer to such a mass, the force is even greater. At higher elevations or even higher altitudes, you'd expect your gravitational force to drop as you move farther from Earth's center. You'd probably also expect that downward acceleration to be greater if you stood atop a large mountain than if you flew tens of thousands of feet above a flat ocean, with nothing but ultra-light air and liquid water beneath you for all those miles. In fact this is true, but not just due to



the mountain's extra mass!

Earth is built like a layer-cake, with the less dense atmosphere, ocean, and crust floating atop the denser mantle, which in turn floats atop the outer and inner cores of our planet. An iceberg's buoyancy is enough to lift only about one tenth of it above the sea, with the other nine tenths below the surface. Similarly, each and every mountain range has a corresponding "invisible mountain" that dips deep into the mantle. Beneath the ocean floor, Earth's crust might be only three to six miles thick, but it can exceed 40 miles in thickness around major mountain ranges like the Himalayas and the Andes. It's where one of Earth's tectonic plates subducts beneath another that we see the largest gravitational anomalies: another confirmation of the theory of continental drift.

A combination of instruments aboard NASA's Gravity Recovery and Climate Experiment (GRACE) satellites, including the SuperSTAR accelerometer, the K-band ranging system and the onboard GPS receiver, have enabled the construction of the most accurate map of Earth's gravitational field ever: to accelerations of nanometers per second squared. While the mountaintops may be farther from Earth's center than any other point, the extra mass of the mountains and their roots – minus the mass of the displaced mantle – accounts for the true gravitational accelerations we actually see. It's only by the grace of these satellites that we can measure this to such accuracy and confirm what was first conjectured in the 1800s: that the full layer-cake structure of Earth must be accounted for to explain the gravity we experience on our world!





Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers July 2015

The TVA is a member club of [The Astronomical League](#).

