



Greg Smith – editor

**Volume 25, No.6
October 2019**

**Program: Greg Babcock - Stargazing
for Everyone with Binoculars**

**Meeting: October 16 2019
7pm Mark Morris LGIC**

Daughter does it again.



Have you seen these ambient light powered globes that slowly turn as they sit displayed. They come in all the planets and some moons. They come in four and six inch models. This one is a four inch diameter model of the moon.

It was my birthday present from my daughter Christine.

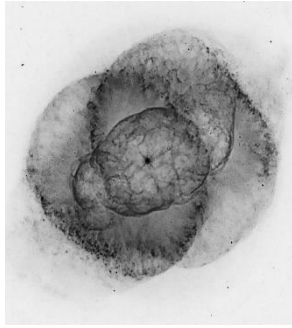
The technology behind them is quite interesting. They use NASA photos stitched together to make a complete map of the moon or planet and put them on a small globe. There is a ¼ inch separation between the globe and the surface of the plastic container that is filled with a heavy liquid that allows the globe to float virtually frictionless. The combination of a liquid in a spherical container magnifies the image so it appears as though it is right next to the acrylic sphere. There is a small weight at the

bottom of the turning globe that keeps it upright. Inside the globe are small light powered cells that run a very small motor. One of the directions for its use is that it is **NOT** to be put in direct sunlight. It can use house lights and or indirect sunlight.

What actually makes the globe turn is the Earth's magnetic field. It runs similar to a compass. How this all comes together, I have no clue. These do have a bit of a steep price, but they are intriguing.

Are you ready for a November morning treat? On November 11 at sunrise, around 7:55am just in time for your morning coffee, the inner planet Mercury will be crossing the face of the sun, just as Venus did several years ago. Mercury will be about a third or more across the sun by then. Hopefully we may have a sunny morning, though doubtful. Get out your solar viewing eclipse glasses and try to find the tiny dot that will be Mercury. At this solar minimum, it may be the only black dot on the face of the sun.

**Every Day is a Star Filled Day
Every Night is a Starry Night**



Is Our Solar System's Mysterious 'Planet 9' Really a Grapefruit-Size Black Hole?

By [Rafi Letzter](#)

It probably isn't a black hole, if it exists at all. But two physicists think we should check to see if it's a black hole anyway.

Here's how it goes:

Far away in the outer reaches of the solar system, past where Neptune, our most distant known planet, orbits, there are a handful of small objects that behave strangely. These "trans-Neptunian objects" (TNOs) cluster together in unusual ways, and they tend to spin around axes that point toward one broad swath of the sky, away from the larger known planets. Also, critically, the TNOs orbit in a different plane than the eight known planets. That suggests that something else is tugging on them with its gravity.

Some astronomers have looked at that strange pattern, run some calculations, and concluded that there must be another planet out there, one that's 10 to 20 times the mass of Earth and following a wonky orbit that carries it many hundreds of times Earth's distance from the sun. It's a bizarre theory, usually called "Planet 9," but one that astronomers take seriously. The hunt for Planet 9 has gone on for years, with astronomers using visual light and infrared telescopes to scan the outermost parts of the solar system.

"The thing that we realized is that the gravity is the important thing," said Jakub Scholtz, a physicist at Durham University in England and one of the two astronomers behind the idea. "It doesn't need to be a planet. The most mundane or maybe the most sane explanation is that it's a planet. But as theoretical physicists, we know that early-universe cosmology can very readily introduce a range of very interesting new theoretical bodies — one of which... is primordial black holes."

Primordial black holes are different

Usually, when we talk about black holes, we mean enormous objects formed when giant stars collapse into themselves, trapping their masses in infinitely dense singularities, surrounded by giant "event horizons" from which no light can escape. But some cosmologists believe that in the first moments of the universe, when everything was hot and dense and rushing away from the Big Bang, and no stars had formed yet, black holes were already emerging.

These primordial ghosts of the universe's creation would have formed when chunks of that early matter were crushed together so tightly that they condensed into singularities.

"That part of the universe is so dense, it just becomes a black hole," Scholtz told Live

Science.

These black holes would be smaller than stellar black holes formed from collapsing massive stars, said James Unwin, a physicist at the University of Chicago and co-author of the paper. And according to some models, they'd be just a handful of times heavier than Earth.

A black hole of that mass wouldn't look like much of anything, Unwin said. Its event horizon would be tiny — about the size of a grapefruit if it's five times the mass of Earth, and the size of a bowling ball at 10 times Earth's mass. But gravity is gravity. If a PBH found its way into our solar system, that black hole would orbit the sun like a planet would, and it would tug on dwarf planets and asteroids just like the theoretical Planet 9 would. There wouldn't be any way to tell the effects of a planet's gravity from that of a primordial black hole of the same mass.

An image from the paper shows the exact scale of the event horizon of the black hole if it's five Earth masses. (Note: It probably won't display at exact scale on your device, but imagine how big it would look if you printed it out so that the white space was exactly as wide as a sheet of paper from your printer.)

The same models that produce primordial black holes, Unwin said, also offer the best explanation for how the Higgs mechanism (thought to imbue mass on all particles) and other basic physics emerged into the universe. So there's good reason to think that these things exist, whether or not any have since ended up in our solar system or any other star system. But no one's ever actually found one.

Black holes bending light

However, there's some recent evidence to suggest that they might really exist, Unwin said.

"I think this is fairly unknown-about in the community," Unwin said, "and we're really trying to bring it to wide attention."

There's an experiment called the Optical Gravitational Lensing Experiment (OGLE) in Poland. It scans the sky for evidence of gravitational "microlensing," places in space where a planet or some other object's gravity has bent the path of a ray of light, causing it to hit Earth. In the cases of the stars studied by OGLE, this light-bending just looks like the star momentarily brightening.

But OGLE has reported something strange, they said. Six times, it has spotted very brief microlensing events, less than 0.3 days long, suggestive of very fast-moving objects between 0.5 Earth masses and 20 Earth masses zipping past stars. This isn't how planets look to OGLE, Unwin said, and there's good reason to suspect that the six objects might be primordial black holes. (Another possibility is very-fast-moving "free floating planets" moving around outside star systems, but current planetary models wouldn't predict that many such planets zooming around the universe.)

If those six objects were small, ancient black holes, Scholtz said, then that means such black holes aren't so rare in the universe. You wouldn't expect them to show up in every star system, he said. And most would float freely through space. But it wouldn't be terribly shocking if our system got lucky and picked one up, he said.

The Planet 9-black hole theory then explains two mysteries: the trans-Neptunian object anomaly and the OGLE anomaly.

"These two things point at the same mass range," Unwin said. "This is the thing that made us quite excited."

"That's the key thing," Scholtz added. "The missing planet is somewhere between maybe five and 20 Earth masses, and the OGLE evidence points somewhere between 0.5 and 20 Earth masses. So this is quite a coincidence."

If the TNO anomaly does actually turn out to be a black hole, Unwin said, that's a huge deal. It would prove the existence of primordial black holes, and nail down a mass range for them that would explain when exactly in the history of the universe they formed -- which would then explain how a great many other bits of physics came into being.

Does that mean either researcher is convinced that there's a black hole in our solar system, or even thinks there's probably one out there? No, they both said. It's possible that the TNO anomaly doesn't really point to a single heavy object, or that the OGLE anomaly is a fluke, or the result of faulty equipment.

Does Planet 9 even exist?

Some astronomers doubt there's anything out there at all.

"I don't know enough about PBHs [primordial black holes] to know how much stock to put in the plausibility of having one in the distant solar system," said Nathan Kaib, an astronomer at the University of Oklahoma who wasn't involved in Unwin and Scholtz's work. "However, I will say that I'm somewhat skeptical of the necessity of Planet 9."

The TNO (trans-Neptunian object) orbital anomaly seems to be real, he said, but this idea of the planet hiding out there beyond the TNOs doesn't explain it that well. And, as he wrote in a paper published July 2 in *The Astronomical Journal*, you'd expect Planet 9 to create other anomalies that haven't turned up in the data.

"This leaves me somewhat skeptical of the existence of the planet, and if the PBH is supposed to produce the same ... effects as the planet, I guess I'd be equally skeptical of it too, but this is pretty independent of the idea of PBHs themselves," Kaib said.

But some astronomers still do think there's a planet out there. And that evidence is strong enough, and the hunt for a planet has gone on long enough, Unwin said, that it's at least worth exploring whether some planet-like object that's not a planet is causing the effect.

One way to check, they suggested in a not-yet-peer-reviewed paper posted online in the preprint server arXiv, is to look for signs of "dark matter annihilation." Theories of PBHs suggest that they'd be surrounded by dense halos of dark matter that could survive partially intact even after billions of years of wandering the universe. And some theories of dark matter suggest that sometimes its particles "annihilate" and turn into gamma-ray photons. We could potentially detect those photons on Earth.

(Such a detection would conclusively solve a third giant physics mystery, for those keeping track : whether dark matter can turn into particles we recognize from the luminous universe.)

Our telescopes may have already picked up those gamma-ray photons, the researchers wrote. So, their next step is to look through data from the Fermi Gamma-ray Space Telescope, which scans wide patches of sky for the particles, to see if they can find any hints of one.

On the off chance the gamma-ray hunt does turn up a tiny black hole, Scholtz said, the possibilities are endless. We could even send a mission there, he said.

"This is potentially an opportunity to play with a real black hole," he said. "How exciting is that?"

Still, no one's betting on it yet.

Minutes of the September Meeting

FOG Minutes, 9-18-19

The club's newest member, Walter Stephaniv was introduced, along with several visitors. Then Dawn Nilson presented a program, called "Dark Matters," about light pollution. She explained how it is harmful to both animals and people and provided tips on ways to reduce it.

During the business meeting, Ted Gruber said that FOG had received a letter of thanks from the Mt. St. Helens Institute, thanking us for our participation in the recent event at the Mt. St. Helens Science and Learning Center. They would like to do it again next year.

We discussed our website costs. An executive decision was made to spend \$128 for two years of website hosting by Weebly, rather than \$96 for one year. The annual domain cost is \$32. Treasurer Steve Powell said that Roy Gawlick has been reimbursed for these payments.

Ted reminded us to check the calendar (on the FOG website) for the upcoming viewing dates. Carolyn Hail was thanked for bringing tonight's snacks. We need people to sign up for snacks in October and November. Ted also gave a Sky Report.

Roy Gawlick gave us an update about planning for this December's Solstice Lantern Walk. He has submitted an application for a permit to the City of Longview. This year's event will be more expensive because porta-potties won't be donated. Greg Smith has researched this issue and found a company that would charge \$390 for three of them. It was moved, seconded and approved to spend up to \$400 on porta-potties. To help cover our costs, Roy has set the participation fee at \$50. He proposed using an app called "Square Up" for receiving these fees electronically. Ted said that we need to get clarification from our insurance carrier about whether donations (rather than just participation fees) are permissible for this event. Four locations (Mercury, Earth, Sacajawea and Neptune) are still available. Roy will try to get 500 "passports" printed. He's also looking into getting a banner that could be displayed near St. Rose church. Chuck Ring will try to rent one or two vans for shuttling people between the ends of the walk. Patricia Ayerza and Bill Sulser agreed to be school coordinators for this event.

Submitted by Steve Powell (subbing for Becky Kent)

☞ **October2019 Meeting** ☞

DATE: **Wednesday October 16**

TIME 7:00 PM

PLACE: Mark Morris LGIC

PROGRAM: Greg Babcock -
**Stargazing for Everyone with
Binoculars**

SNACKS: Greg Smith

DRINKS: ?

2019 FOG Activities and Viewing Schedule

OCT MOON: FULL=13, NEW=27

4>11 Sidewalk Astronomy (Starbuck's, 808 OB Hwy)

16 Club Meeting (MMHS LGIC)

NOV MOON: FULL=12, NEW=26

11 Transit of Mercury (TBA) In progress at sunrise.

20 Club Meeting (MMHS LGIC)

28 Thanksgiving Day

DEC MOON: FULL=12, NEW=26

11>18 Annual Christmas Party (Location TBA)

21 Solstice Lantern Walk (Lake Sacajawea)

**Friends of Galileo
Club Officers** Mark Thorson

PRESIDENT	Ted Gruber
VICE-PRESIDENT/ PROGRAM CHAIR	Mark Thorson
SECRETARY	Becky Kent
TREASURER	Steve Powell
WEBSITE	Ted Gruber
NEWSLETTER ED.	Greg Smith
ALCOR	Tom Meek

**Next Month's
Newsletter Deadline**

The deadline for items in next month's newsletter is:
Wednesday: seven days before next meeting.

Please feel free to send in your thoughts and experiences about your astronomical adventure.

Submit your material by E-mail to:

grlyth@msn.com

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