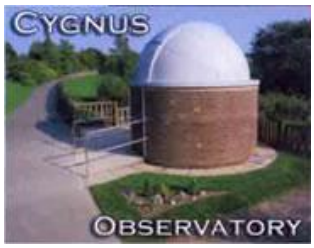
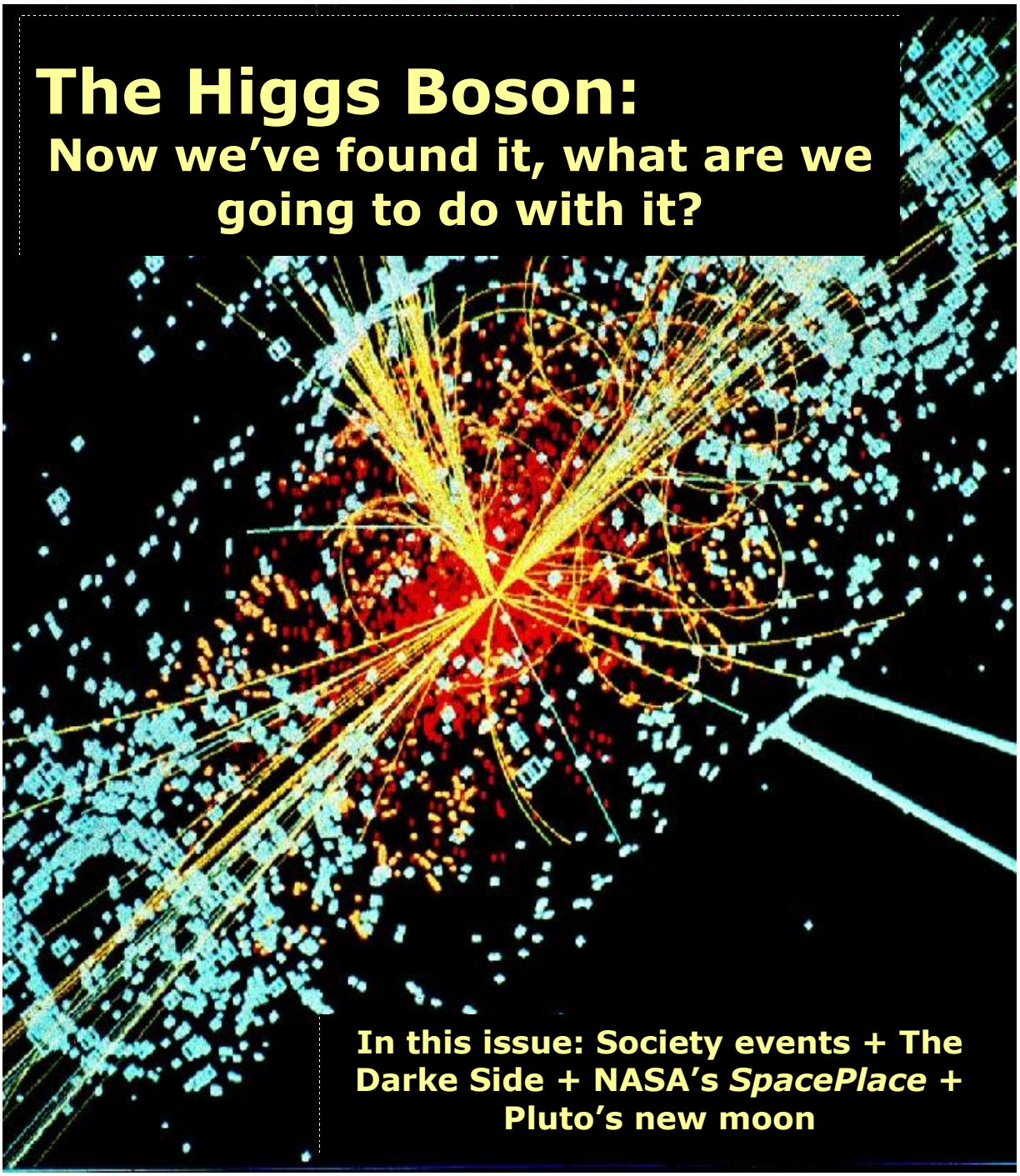
SAS NEWS

Sunderland Astronomical Society



The Higgs Boson:

Now we've found it, what are we going to do with it?



In this issue: Society events + The Darke Side + NASA's *SpacePlace* + Pluto's new moon

July 2012

www.sunderlandastro.com **Registered Charity #1071527**

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Events list

Thursday 02 August: Full Moon
Friday 03 – Sun 19 August: Mariner 9 Martian art exhibit at Spanish City, Whitley Bay. Free entry.
See: http://www.thepixelpalace.org/events/mariner9
Sunday 05 August: Beginner's course, 7pm: The History of Astronomy (£1 charge)
Monday 13 August: Peak of the Perseid Meteor shower
Friday 17 August: New Moon
Friday 31 August: Full Moon
Sunday 02 September: Beginner's course, 7pm: Introduction to Galaxies and cosmology (£1 charge)
Sunday 16 September: New Moon

*** **Summer Schedule** ***
N.B. During June, July and August there will be no workshop or lecture meetings at WWT on Sunday evenings. Normal meetings resume in September.

All Society events
- are free,
- are held in the Washington WWT facilities, and
- evening meetings start at 7:00pm

unless otherwise noted.

Please bring a torch and warm clothing to any night-time observing sessions.
All observing sessions are dependent upon favourable weather and **may be subject to cancellation**.

Editorial

The Summer months are usually a quiet period for our Society, when not a lot happens apart from a spot of solar observing. Given the weather so far this summer, there has been less solar observing than usual – despite this, it seems to have been a busy couple of months since the last meeting of the regular season. The Society trip to Jodrell Bank seemed to have occurred on a good day (no flash flooding) and the beginner's classes are continuing over the summer. While the Venus transit was most definitely a damp squib, the sun itself is becoming more active. I witnessed some good auroral activity last Sunday (15 July) and there's the promise of more to come. Hopefully we will be treated to a bit of blue sky in the rest of the summer and we will get to witness some of these celestial fireworks. Don't forget the Perseid meteors too in August, always a good event if the skies are clear.

I'm pleased to report a few donations of equipment to the Society over the last few weeks, including an 8 inch primary mirror (a good project for the telescope builders in the Society) and a complete 8 inch truss-tube Dobsonian. The Dob is currently with Burnside College, where SAS facebook member Rob Swinney is cultivating a keen group of budding astrophysicists in the Sixth Form. I'll be keeping in touch and look to build further links between SAS and the college. And the donor will be pleased to know that the scope is being used for an educational purpose, as he wished.

On a wider stage, July has seen two potentially big discoveries so far: The seemingly definite discovery of the Higgs Boson, and the observation of a fifth moon of Pluto. The Higgs Boson is a powerful confirmation of the Standard Model of particle physics, with knock on effects for the big bang theory. But the discovery of another piece of rock, only a few miles across, orbiting Pluto may also become a big story. It might just re-open the thorny question of whether Pluto is a proper planet. Of course it is!!

– Dave N., Editor.

SAS Yahoo Forum
The Society's Yahoo group provides a forum for members to exchange ideas, ask questions, and a place to post their pics:
http://tech.groups.yahoo.com/group/SunderlandAstronomicalSociety/

Thank Goodness for Magnetism

By Dr. Tony Phillips

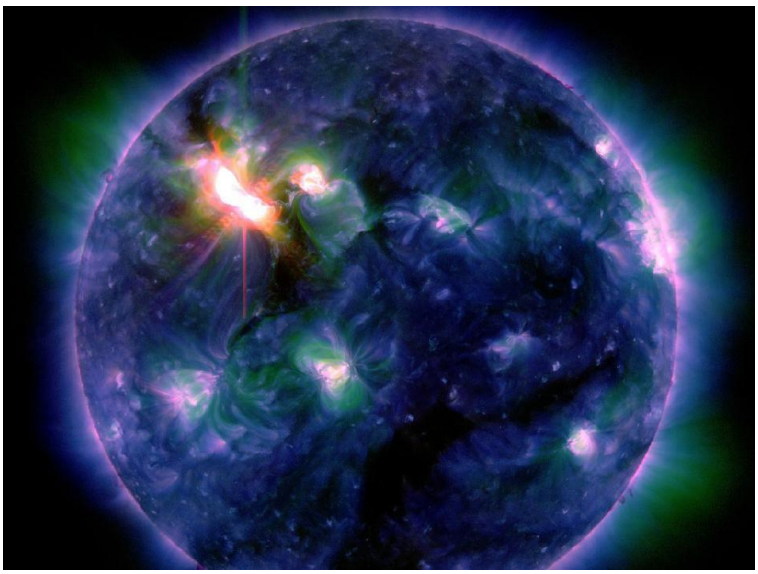
Only 93 million miles from Earth, a certain G-type star is beginning to act up.

Every 11 years or so, the solar cycle brings a period of high solar activity. Giant islands of magnetism—"sunspots"—break through the stellar surface in increasing numbers. Sometimes they erupt like a billion atomic bombs going off at once, producing intense flares of X-rays and UV radiation, and hurling massive clouds of plasma toward Earth.

This is happening right now. Only a few years ago the Sun was in a state of deep quiet, but as 2012 unfolds, the pendulum is swinging. Strong flares are becoming commonplace as sunspots once again pepper the solar disk. Fortunately, Earth is defended from solar storms by a strong, global magnetic field.

In March 2012, those defenses were tested.
At the very beginning of the month, a remarkable sunspot appeared on the Sun's eastern limb. AR1429, as experts called it, was an angry-looking region almost as wide as the planet Jupiter. Almost as soon as it appeared, it began to erupt. During the period March 2nd to 15th, it rotated across the solar disk and fired off more than 50 flares. Three of those eruptions were X-class flares, the most powerful kind.

As the eruptions continued almost non-stop, Earth's magnetic field was buffeted by coronal mass ejections or "CMEs." One of those clouds hit Earth's magnetosphere so hard, our planet's magnetic field was sharply compressed, leaving geosynchronous satellites on the outside looking in. For a while, the spacecraft were directly exposed to solar wind plasma.



Charged particles propelled by the blasts swirled around Earth, producing the strongest radiation storm in almost 10 years. When those particles rained down on the upper atmosphere, they dumped enough energy in three days alone (March 7-10) to power every residence in New York City for two years. Bright auroras circled both poles, and Northern Lights spilled across the Canadian border into the lower 48 states. Luminous sheets of red and green were sighted as far south as Nebraska.
When all was said and done, the defenses held—no harm done.
This wasn't the strongest solar storm in recorded history—not by a long shot. That distinction goes to the Carrington Event of September 1859 when geomagnetic activity set telegraph offices on fire and sparked auroras over Mexico, Florida, and Tahiti. Even with that in mind, however, March 2012 was remarkable
It makes you wonder, what if? What if Earth didn't have a magnetic field to fend off CMEs and deflect the most energetic particles from the Sun.

The answer might lie on Mars. The red planet has no global magnetic field and as a result its atmosphere has been stripped away over time by CMEs and other gusts of solar wind. At least that's what many researchers believe. Today, Mars is a desiccated and apparently lifeless wasteland.

Only 93 million miles from Earth, a G-type star is acting up. Thank goodness for magnetism.

With your inner and outer children, read, watch, and listen in to "Super Star Meets the Plucky Planet," a rhyming and animated conversation between the Sun and Earth, at http://spaceplace.nasa.gov/story-superstar.

This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

Left: Multiple-wavelength view of X5.4 solar flare on March 6, captured by the Solar Dynamics Observatory (SDO) in multiple wavelengths (94, 193, 335 angstroms). Credit: NASA/SDO/AIA

THE DARKE SIDE

Society Update with Chairman Graham Darke

Summer's here (I think)

It's been another busy and exciting year for the Society. Events at Kielder Castle, Winlaton Mill, Whickham, two events at Kilhope in Weardale, our Spring Star Camp at Kielder and not forgetting the memorable nights for Stargazing Live, it's been quite a season! Added to this were the numerous cub and brownie visits to the Cygnus Observatory and has been our most successful year ever. Membership numbers are growing nicely too.

After our astrophotography competition last month, we move onto our Summer Schedule but there will still be plenty going on including the Venus Transit, Summer Benker Night, Summer Trip to Jodrell Bank, Solar Observing sessions, Starbeque and of course the Beginners Courses at the WWT on the first Sunday of each month will continue too. (More details of events going on over the Summer can be found below.)

Please do note that during June, July and August there will be no workshop or lecture meetings at WWT on Sunday evenings. Normal meetings resume in September.

Beginners Classes

The beginners' classes got off to a start on Sunday 6th May. The third session was held at 7.00pm on Sunday 1st July on the topic of the Solar System and its formation; session 4 in August will be on the History of Astronomy, session 5 in September is on Galaxies and Cosmology and the final session in October will be on Telescopes. Do come along to the sessions.

Astrophotography Competition 2012

Congratulations to our winners of this year's astrophotography competition. Dennis Ryles won best deep sky picture for his image of the Horse head Nebula in Orion. The best solar system image was won by Owen Lowry for his shots of the Moon taken with a phone camera. In the beginners sections Michael Tweedy won the category for best deep sky image for his fantastic picture of the Southern Milky Way taken from Mauritius and finally Stephen Carr won best beginner's solar system image for his montage image of the Sun, Mars, Jupiter and Saturn. Terrific efforts by all. I must say that the entries this year were excellent, both in terms of numbers and quality. I look forward to next year.

Transit of Venus 6th June

"Nothing ventured, nothing gained" so they say! A thoroughly British transit was witnessed by all early on the morning of 6th June. Despite the lucky charm of having Look North weather presenter Hannah Bayman in attendance, the stubborn clouds and mist just wouldn't lift in time for the final stages of the transit just after sunrise. There was a really good turn out from the SAS members despite the forecast and we were joined by the Institute of Physics. Although this was the last chance for us all of us to see a transit of Venus, we can look forward to a transit of Mercury in 4 years time which takes place at a more civilised time of day, you'll no doubt be pleased to hear.

Newcastle Green Festival – Leazes Park, Newcastle 12.00pm to 7.00pm Sunday 3rd June

The Society exhibited at this event on Sunday 3rd June. The solar telescope was taken along and despite generally poor weather I am informed that a few gaps in the clouds did allow some observing of prominences.

Stay up to date

Keep up to date with all society developments on the website www.sunderlandastro.com and why not sign up for the news group. Also check out our Facebook and Twitter pages.

Clear Skies,

Left: Jodrell Bank: Society members pictured below the superstructure of the Lowell radio telescope. Photo courtesy of Ken Kirvan.

"…Take a good look at the lineup. Can you identify the man who stole your radio telescope?..."

The Discovery of the Higgs Boson: What does it mean?

Physicists at the world's largest atom smasher announced July 4 that they are more than 99 percent sure they've found a new, and heavy, boson particle, that may be the Higgs boson.

Two experiments at the Large Hadron Collider (LHC) in Geneva, Switzerland, show this new particle has a mass of about 125 GeV, with 1 gigaelectron volt about the mass of a proton. The LHC is the most powerful machine on Earth, capable of producing huge explosions of energy that generate new and exotic particles inside the 17-mile (27 kilometer) loop underneath Switzerland and France.

If the discovery can be confirmed as the Higgs boson, it will have wide wide-reaching implications. Here are five of the biggest.

1. The origin of mass

The Higgs boson has long been thought the key to resolving the mystery of the origin of mass. The Higgs boson is associated with a field, called the Higgs field, theorized to pervade the universe. As other particles travel though this field, they acquire mass much as swimmers moving through a pool get wet, the thinking goes.

"The Higgs mechanism is the thing that allows us to understand how the particles acquire mass," said Joao Guimaraes da Costa, a physicist at Harvard University who is the Standard Model Convener at the LHC's ATLAS experiment. "If there was no such mechanism, then everything would be massless."

If physicists confirm that the detection of the new elementary particle is indeed the Higgs boson, and not an imposter, it would also confirm that the Higgs mechanism for particles to acquire mass is correct. "This discovery bears on the knowledge of how mass comes about at the quantum level, and is the reason we built the LHC. It is an unparalleled achievement," Caltech professor of physics Maria Spiropulu, co-leader of the CMS experiment, said in a statement.

And, it may offer clues to the next mystery down the line, which is why individual particles have the masses that they do. "That could be part of a much larger theory," said Harvard University particle physicist Lisa Randall."Knowing what the Higgs boson is, is the first step of knowing a little more about what that theory could be. It's connected."

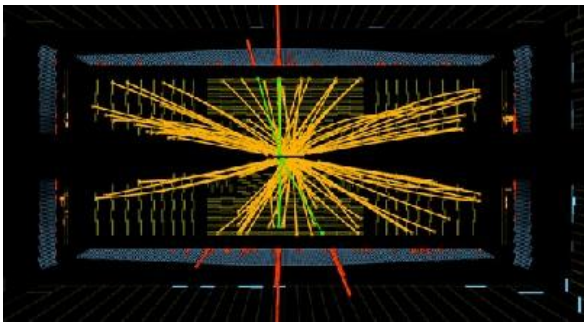
2. The Standard Model

The Standard Model is the reigning theory of particle physics that describes the universe's very small constituents. Every particle predicted by the Standard Model has been discovered — except one: the Higgs boson.

"It's the missing piece in the Standard Model," said Jonas Strandberg, a researcher at CERN working on the ATLAS experiment. "So it would definitely be a confirmation that the theories we have now are right." If the newly detected particle turns out not to be the Higgs boson, it would mean physicists made some assumptions that are wrong, and they'd have to go back to the drawing board.

While the discovery of the Higgs boson would complete the Standard Model, and fulfill all its current predictions, the Standard Model itself isn't thought to be complete. It doesn't encompass gravity (so don't count on catching that fly ball), for example, and leaves out the dark matter thought to make up 98 percent of all matter in the universe.

"The Standard Model describes what we have measured, but we know it doesn't have gravity in it, it doesn't have dark matter," said CERN physicist William Murray, the senior Higgs convener at ATLAS and a physicist at the U.K.'s Science and Technology Facilities Council. "So we're hoping to extend it to include more."



3. The Electroweak Force

A confirmation of the existence of the Higgs boson would also help explain how two of the fundamental forces of the universe — the electromagnetic force that governs interactions between charged particles, and the weak force that's responsible for radioactive decay — can be unified.

Every force in nature is associated with a particle. The particle tied to electromagnetism is the photon, a tiny, massless particle. The weak force is associated with particles called the W and Z bosons, which are very massive.

The Higgs mechanism is thought to be responsible for this.

"If you introduce the Higgs field, the W and Z bosons mix with the field, and through this mixing they acquire mass," Strandberg said. "This explains why the W and Z bosons have mass, and also unifies the electromagnetic and weak forces into the electroweak force."

Though other evidence has helped buffer the union of these two forces, the discovery of the Higgs would seal the deal. "That's already pretty solid," Murray said.

"What we're trying to do now is find really the crowning proof."

4. Supersymmetry

Another theory that would be affected by the discovery of the Higgs is called supersymmetry. This idea posits that every known particle has a "superpartner" particle with slightly different characteristics.

Supersymmetry is attractive because it could help unify some of the other forces of nature, and even offers a candidate for the particle that makes up dark matter. The newly detected particle is in the low-mass range, at 125.3 or so GeV, something that lends credence to supersymmetry.

"If the Higgs boson is found at a low mass, which is the only window still open, this would make supersymmetry a viable theory," Strandberg said."We'd still have to prove supersymmetry exists."

5. Validation of LHC

The Large Hadron Collider is the world's largest particle accelerator. It was built for around $10 billion by the European Organization for Nuclear Research (CERN) to probe higher energies than had ever been reached on Earth. Finding the Higgs boson was touted as one of the machine's biggest goals.

Finding the Higgs would offer major validation for the LHC and for the scientists who've worked on the search for many years.

"This discovery bears on the knowledge of how mass comes about at the quantum level, and is the reason we built the LHC. It is an unparalleled achievement," Spiropulu said in a statement. "More than a generation of scientists has been waiting for this very moment and particle physicists, engineers, and technicians in universities and laboratories around the globe have been working for many decades to arrive at this crucial fork. This is the pivotal moment for us to pause and reflect on the gravity of the discovery, as well as a moment of tremendous intensity to continue the data collection and analyses."

The discovery of the Higgs would also have major implications for scientist Peter Higgs and his colleagues who first proposed the Higgs mechanism in 1964.

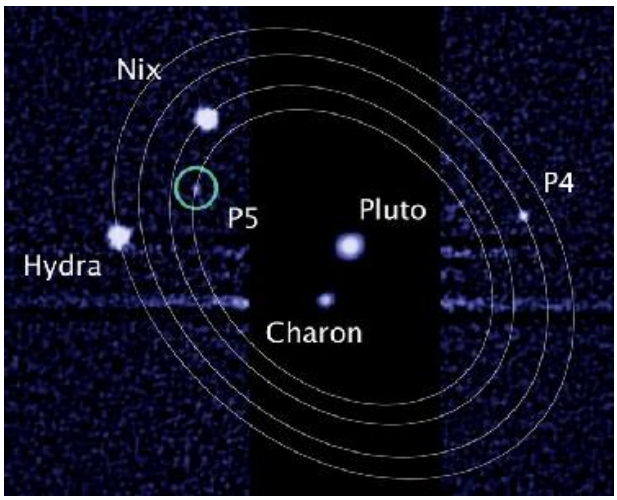
And a Nobel Prize may be another result: "If it is found there are several people who are going to get a Nobel prize," said Vivek Sharma, a physicist at the University of California, San Diego, and the leader of the Higgs search at LHC's CMS experiment.

New moon found orbiting demoted dwarf planet Pluto

A fifth moon has been discovered orbiting former planet Pluto, scientists with the Hubble Space Telescope announced Wednesday -- but it's still not enough to bump the dwarf planet back into the big leagues.

"Just announced: Pluto has some company -- we've discovered a 5th moon using the Hubble Space Telescope!" Alan Stern, of the Southwest Research Institute in Boulder, Colo., announced via Twitter. Stern is principal investigator of NASA's New Horizons spacecraft, which is scheduled to fly by the Pluto system in 2015, according to Space.com. That will be the first mission ever to visit Pluto.

Just don't call it a planet.



In 2006, the International Astronomical Union sent Pluto down to the minor leagues, labeling what had been the ninth planet orbiting our sun a "dwarf planet" instead. In spite of its many moons -- including the new one, tentatively named P5 -- Pluto has more in common with the other icy asteroids and planetoids orbiting with it in the "Kuiper Belt" beyond Neptune, the IAU said, than with Saturn, Uranus and Earth.

"[Pluto's] moons form a series of neatly nested orbits, a bit like Russian dolls," said team lead Mark Showalter of the SETI Institute in Mountain View, California.

So five moons later, Pluto's still not a planet -- though it is a very complex system. Scientists believe the many moons are relics of a collision between Pluto and another large object billions of years ago. P5 joins Charon, Nix, Hydra, and P4 in orbit around the dwarf. It's estimated to be irregular in shape and 6 to 15 miles across. It is in a 58,000-mile-diameter circular orbit around.

"The discovery of so many small moons indirectly tells us that there must be lots of small particles lurking unseen in the Pluto system," said Harold Weaver of the Johns Hopkins University Applied Physics Laboratory.

Or should they be called dwarf moons?