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The Official Magazine of the University Of St Andrews Astronomical Society

astro^{soc}

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From the President's Pen

I once heard someone say that astronomers hated summer because not only do they have to stay up late to do any observing, but it's so warm that there are too many clouds to see anything properly anyway. I think the opposite is true. There seem to be far less clouds around on summer nights than winter ones, and it's much more pleasant to sit around under the stars with only a blanket and some hot chocolate than three shirts, two jumpers, a hoodie, a coat, scarf, hat, two pairs of gloves, earmuffs, four pairs of socks AND a couple of blankets...And anyway, not only does staying up late in summer not feel late at all, but I think it's worth it to have a higher chance of a clear night.

Speaking of observing, the Napier building has conspired against us this year. Every time we organise observing, it rains, or we get there and the telescope is broken, or the fuses have gone (again) etc. And now exams are approaching the poor observing directors will be so stressed out we probably won't be able to go! So I'm sorry that we haven't been observing very much, but hopefully you understand. We did try!

I wish you all good luck with your exams, and hope you have a relaxing summer.

Emily



Solar Flares and Planetary Migration

The vast majority of exoplanets found have been large gas giants, close to their parent star, with orbital periods of only a few days. Our gas giants, however, are orders of magnitude more distant from the sun than typical exoplanets are from their stars. Why is our Solar system so different to – what appears to be – the Galactic norm? In recent years, astronomers have come close to finding an explanation to this puzzle.

In 2003, the star formation in the Orion Nebula was observed for nine days with NASA's Chandra X-ray space telescope. It was studying the solar flares of the young stars that had not begun the nuclear fusion of Hydrogen in their cores. By studying the flares insights could be gained into the nature of the young star's magnetic fields, and how they are generated.

For the brightest flares observed, the physical lengths of the flares were measured. The results were astounding; a few of the flares were 10 Million kilometers long – about 18 stellar radii from the star. In comparison, the sun's flares are about only 1 solar radius in length. Most of the flares, however, were much shorter and like the sun's.

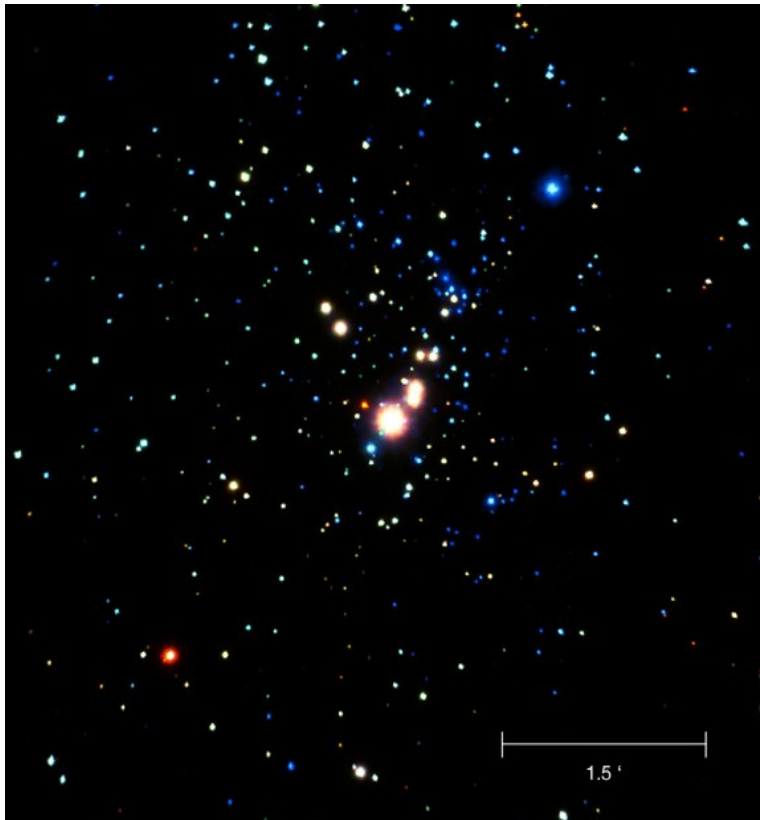
At this stage in the stars' lives the stars are surrounded by a disk of material within which the cores of gas giants are forming. At this point, rocky planets have not begun to form yet. The giant flares are long enough to reach the inner edge of the disks, and hence interact with the disks.

Right away this solves one long standing mystery. The origin of small inclusions in meteorites called chondrules has puzzled scientists for years. Chondrules are small beads of minerals that have appeared to have been flash melted. These large flares can explain their formation as the flares would violently heat the disk, causing any minerals to melt and stick together into globules. These globules will then cool down and solidify into chondrules.

Another affect that the flares would have on the disk is that the violent heating, followed by a gradual cooling would induce turbulence in the disk. This turbulence can explain why our solar system is the way it is today.

In a disk with no turbulence, the motion of a young planet through the disk material will induce a density wave, which would in turn cause the planet to spiral inwards towards its star. The inwards spiral would take at most only a few million years to complete. This would result in a future system with gas giants close to their parent stars. With flare-induced turbulence however, the inward migration is less likely to take place as the turbulence breaks up the density wave. This would yield a system similar to our solar system, with gas giants far away from their star.

From this it can be deduced that the sun was one of the few stars that exhibited large flares in its youth. Hopefully with further observations more mysteries about the solar system's origins and planet formation can be solved.



The image obtained from the observation



An artist's impression of a young star with its disk



Protoplanetary disks in the Orion Nebula by Hubble

Star Struck?



Tell Nicky & Cat!

Trying to find the 7 sisters

Dear Nicky and Cat,

Recently I have been on a quest to locate the seven sisters, but this has proved more difficult than I originally thought. The exact location has eluded me and my fellow amateur astronomers. It has gotten to the point where my friends aren't coming to see me anymore as I have nothing to entertain them with when I take them down to the observatory. Please help, Nicky and Cat??

James S, Aberdeen.

Dear James,

The trouble you are facing is something many amateurs have experienced so you are by no means alone! The seven sisters, also known as the Pleiades, are something you should definitely become familiar with as there is a lot to learn from observing them.

Our solution for you is this, get yourself to the Napier building on a clear night and use the telescope's self-navigation system to directly focus on these lovely sisters.

Hope this helps James, don't be afraid to get in touch again if you have sister problems.

Nicky and Cat!

Handling a 'Scope

Dear Nicky and Cat,

I'm an amateur astronomer who's very interested in learning the basics about handling a telescope. I'm having trouble with remembering which buttons to push and which handles to pull. Can you give me a to-do list that I should keep in mind when I'm in that situation??

Please help me,

Ciara O, Ireland

Dear Ciara,

Thank you for this question, which we have actually received from several astronomers. A telescope is much easier to handle than you are anticipating, you just need to follow a few simple rules.

1. Select your target, and make sure it's a good one, nice and bright!
2. Open the front door and make sure you leave it open!! You don't want to get locked in that dark room all by yourself!
3. Remove the cable from the rope and place it in the right socket. Switch on the plug.

4. Press the switch and open the roof.
5. Remove the cable from the plug, pressing gently on the sides to release the pins. Replace the cable.
6. Don't forget to remove the telescope caps!
7. Switch on the telescope and its adjoining computer system. Align the telescope to your desired location, and you're done.

So Ciara, go have some fun!

Nicky and Cat 😊



Perseus-The Science-y side



Located just below Cassiopeia (which nearly everyone knows how to find), Perseus is the 24th biggest constellation in the night sky, although it's most visible after 10pm in November and December so we've unfortunately missed it's peak this year. This constellation has so many amazing features, it really is worth looking at closely.

For starters, a small band of the Milky Way runs right through the centre of Perseus, making it a lovely sight through binoculars. And while you've got them out, check out The Double Cluster (NGC 869 and NGC 884), two open clusters right next to each other between the top of Perseus and Cassiopeia. Then there's M34, another open cluster that's 1400 light years away, but you'll find this one just above Medusa's head.

The star Algol (aka Beta Persei) is an eclipsing binary star with a period of 2 days 21 hours, whose magnitude drops by 1.3 every time the fainter star passes it's brighter host, which lasts 10 hours. The brightest star in the constellation, Alpha Persei, is a white supergiant that belongs to the loose cluster of stars called Melotte 20 that lies 550 light years away. This is also visible with binoculars.

So next winter don't forget to get those binoculars out and go open cluster spotting in Perseus!

Perseus-the mythological side

Perseus was, like most Greek heroes, an offspring of Zeus and a mortal woman, in this case Danae. Danae's father, Acrisius, King of Argos, had been told by an oracle that unless he was willing to kill Danae, one day his grandson would kill him. Since he could not kill his only daughter he locked her in a dungeon so that she would never have chance to have a child. Unfortunately, Zeus had already caught sight of Danae and visited her in her cell in a shower of golden rain. When Acrisius found Danae with the baby Perseus he dared not kill them outright for fear of the gods so instead he locked them in a wooden ark and cast it out onto the sea. Luckily both Danae and Perseus survived and were washed up on the island of Seriphos, where Perseus grew up.

When Perseus was a young man the king of Seriphos, Polydectes, decided to take Danae as his wife though she was unwilling, and with Perseus there to protect her, Polydectes could not force her. In order to get rid of Perseus Polydectes organised a wedding with another young woman and asked each of his subjects to get him a horse as a wedding present. Perseus, having no money, could not do this but instead boasted that he would get an present much better than this for Polydectes. On hearing this Polydectes ordered Perseus to bring back the head of Medusa, knowing that this would get rid of Perseus for good.

Medusa was one of the three Gorgon sisters who were infamous monsters who could turn people to stone if they caught sight of the Gorgons' faces. At once Perseus set out to find them and as he came near the island where he lived he was greeted by Hermes, messenger of the gods. Hermes told him that if he was to succeed in his task he would have to find the Nymphs of the North with Hermes' help. Thus they travelled to the Land of Hyperboria, beyond the north wind where the sun always shined and there was continuous celebration. Once there, Perseus was given winged sandals, a magic silver bag that would expand to whatever size was needed and a helmet of darkness created by Hades that would make the wearer invisible.

Once he arrived in the Gorgons' cave he donned the helmet of darkness and made sure to only look at the Gorgons through their reflection in his shield. With Athena's help he cut off Medusa's head and upon her death Pegasus leapt fully formed from her body, which henceforth became Perseus' steed. Placing Medusa's head into the magic bag Perseus set back off to Seriphos. On the way, as he was rounding the coast of Philistia he saw Andromeda, chained to a rock as a sacrifice for a sea monster that was terrorizing her father's coast. Instantly falling in love with her Perseus killed the monster and took Andromeda to be his wife.

Returning to Seriphos Perseus found that his mother, Danae, had had to flee her home because of Polydectes anger at her refusal to marry him. Heading straight to Polydectes' palace Perseus announced that he had returned with the marriage gift Polydectes had sent him to get. When all he received was scorn Perseus removed

the head of Medusa from his bag and turned the king and all his followers to stone, with the circle of boulders they become still visible at Seriphos.

Perseus then returned to Argos to reconcile with his grandfather but though Acrisius fled later, when Perseus participated in some athletic games his discus went wide, hitting Acrisius who was in the audience and killing him instantly, thus showing that fate cannot be avoided. Perseus went on to become a great king and a well known hero, which is why he was gifted with a place in the sky and is still well known today!

Reference: <http://www.johnpratt.com/items/astronomy/myths/perseus.html>



Perseus by Benvenuto Cellini, Loggia dei Lanzi, Florence, Italy

Astronomy Word-search!

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      R G E F N E
    T Q R Z R O
  C N C E S R A P R T A B A X B J T S L J
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    W Z R V T P D R S D U I P E N B F D
      A W O O A U O E E S P T T D F W
        W N P R M E N H X H I Y W S
          R S A B T N R P M I T L
            X E N L R E S C A S U F E Q
              B P U L A M H T C S O P T R
                K Y U S A P C T B A O A T L T C
                  H P S I X X E   B R M U O A K
                    S O T G T Z R   D V E Q H S M
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ANTIMATTER
COMET
GRAVITY
INFRARED
JUPITER
METEOR
PARALLAX
PARSEC
PHOTOSPHERE
PLASMA
QUASAR
REDSHIFT
STAR
SUNSPOT
SUPERNOVA
UMBRA



Daniel López
Observatorio del Teide, IAC

Contributors

Many thanks to all those who contributed articles, namely, Emily Ramsden, Joe Llama, Nicky Agius, Catherine Braine, Gordon Gibb.

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