

MONTHLY NEWSLETTER

MESSAGE FROM

THE DIRECTOR

Greetings!

Back in May 2019, we founded the GD Goenka World School's Astronomy Club, with tremendous support from our Respected Director-Principal Ma'am Dr. Neeta Bali, DHM Ms. Shahnaz Banoo Butt, IBDP Coordinator Dr. Manisha Mehta, all the IB teachers, and the students. Today, all the members of the Astronomy Club proudly speak for all that they have learnt and explored, be it from the wonders of physical Astronomy, to the mysteries of black holes.

We started with our very own Solar System - the Sun, Planets, Satellites, Comets, Asteroids and went on as far as the enormous El Gordo. Our classes include lectures, debates, quizzes, interactive games and videos, and brainstorming sessions. In the coming months, we aim to learn more about the mysteries of the universe.

We bring to you the maiden edition of our Astronomy Club's Monthly Newsletter, titled 'The Martian'.

We thank our club members Sumer Kaistha, Rehaan Chibber, Aekum Kamboj, Jeevesh Raj Gupta, Naman Akankshi, Omar Mir, and the Deputy Director Jusjeev Singh for their effort into bringing this magazine to you.

Wishing you Happy Reading! Club Director - Mikul Manocha



RIP TO THIS

DYNAMIC DUO

For seven years, NASA's Van Allen Probes have studied one of the nastiest radiation environments known to humans: the Van Allen radiation belts. They're an extremely important factor to plan for when it comes to satellite missions, crewed trips into deep space.

VIRGIN ORBIT SAYS IT WANTS TO SEND TINY SPACECRAFT

to Mars in 2022

On Wednesday, Virgin Orbit, the satellite-focused tourism company Virgin spinoff Galactic, announced plans to launch three missions to Mars. The company has inked a partnership with Polish satellite company SatRevolution and groups from Polish universities to send three small robotic spacecraft to Mars for science investigations. The missions would be launched by Virgin Orbit's flagship LauncherOne rocket and could start as early as 2022.If it succeeds, Virgin Orbit will be the first commercial company to travel to the Red Planet. It will also mark an unexpected entrance into deep spaceflight for a company whose plans focus on air launches, which have always been considered unsuitable for traveling beyond low Earth orbit.Virgin Orbit has yet to actually fly LauncherOne (it expects to do so later this year), but the plan is for a Boeing altitude and then release it. The rocket would fire its engines in midair and speed off into space.

Air launches require less fuel and shielding than traditional rocket launches, and they can take place virtually anywhere, since they're not restricted by a launch site or weather. But the airplanes struggle to take off with large rockets and large payloads.Going into deep space with one of these air launch systems "is a pretty new idea," says Glenn Lightsey, an aerospace engineer at Georgia Tech.

One of the main reasons such a trip is now feasible is that satellites are getting so small, he says. You can collect the same type of data and imagery you got a generation ago with instruments a fraction of the size. SatRevolution's spacecraft will weigh no more than 110 pounds (50 kilograms), but it will be tasked with imaging Mars and its moon Phobos, studying the Martian atmosphere, and possibly surveying the land for signs of underground water.



Will Pomerantz, the vice president of special projects at Virgin Orbit, says many of the company's customers, encouraged by NASA's Artemis moon program, recently asked whether LauncherOne could be used to send small satellites to the moon. The company started to consider whether it could add an extra booster to the two-stage rocket to achieve the extra push needed to exit Earth's orbit and send small payloads into deep space."We realized we actually do have something quite interesting to offer, and that there's this other nice customer class for us to serve," he says. Pomerantz won't divulge specifics of how the third booster will be made, but options include solid rocket motors and liquid propulsion systems. Lightsey says an added electric propulsion system might also do the trick (although the weaker thrust means a longer journey to Mars, potentially exposing the payload's electronics to harmful amounts of radiation). "There's no perfect solution, but there are different ways to solve the problem," says Lightsey. "It's possible."Even though the company still needs to prove it can make it to orbit at all, it's already considering plans for missions to destinations like Venus, the moon, and nearby asteroids. Pomerantz is especially excited by what this could mean for opening up deep space to communities like Poland "that have long been interested in space, but have never been included in space."

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DESI OPENS ITS 5000 EYES

A new instrument mounted atop a telescope in Arizona aimed its robotic array of 5000 fiber-optic "eyes" at the night sky on October 22 to capture the first images showing its unique view of galaxy light.



COMET, AGAIN

21/Borisov, the interstellar comet currently zipping through our solar system. Our instruments are getting a clearer and more compelling look at the comet with every passing week, as it continues to approach the inner solar system.



SPACE TOURISM

Richard Branson and other billionaires are all in on space tourism. They have founded entire companies dedicated to the idea that humans will enthusiastically plop hundreds of thousands or even millions of dollars down just to spend a few minutes in microgravity and enjoy stunning views of the world from space. Branson's company, Virgin Galactic, had struggled for nearly 15 years to literally get off the ground and prove that it could safely and affordably ferry people into space and back. Finally, last December, the company reached suborbital space and became the first private company to take people into space and back. Virgin Galactic is already reaping the benefits of its recent successes. The company started selling on the New York Stock Exchange on Monday. Although the day ended more or less flat, the company is seeing a 5 to 6 percent overall rise this week, and analysts are seeing this as an encouraging debut, especially for a company that's only gone to space twice. In becoming the first publicly traded space tourism company, Virgin Galactic has found validation in a way that few aerospace companies have--and that certainly no space tourism company besides maybe Blue Origin can flaunt. If Wall Street is taking space tourism seriously, then you can be sure even more money is going to pour into the space industry in the months and years to come.

THE SPOOKIVERSE

The most haunting thing about the universe is how empty it is

In the past century we've seen our ideas about the universe transformed. Not only has the cosmos turned out to be vastly larger than we once suspected, it's also turned out vastly older. Indeed, the very fact that it has turned out to have an age, an origin, an emergence, has been revolutionary.On top of those revelations, we find evidence that all that we see is not all that there is. Specifically, we don't seem to be accounting for all the matter in the cosmos when we look at luminous stars, gas, and dust: Galaxies rotate faster in their outskirts than might be anticipated. Light's path is diverted more strongly than might be expected by mass distorting the fabric of space across the scales of galaxies and clusters of galaxies. Tiny temperature fluctuations of the cosmic microwave background, that think reflect small variations in matter's distribution in the young universe, make the most sense if we invoke an ocean of entirely unseen matter, sculpted by gravity alone, with no other interaction with the forces of nature. This dark matter seems, for now, to be a major constituent of the cosmos, along with an unseen, dark energy – an energy <u>of</u> the vacuum – that appears to be accelerating the swelling growth of space. Altogether this displaces 'ordinary' matter - the protons, neutrons, electrons and other detectable species - into a minority bucket that contains around 5% of the total mass-energy of the universe. Or, in terms of mass alone, some 15% of the cosmos is the stuff we're composed of, the other 85% seems to be dark matter (whatever that actually is).That is pretty strange. But even stranger is how little space all of that ordinary matter takes up. A mathematical parlor trick tells us that all the stars in our galaxy could, in principle (assuming they were all the same size as our Sun, which is a bit of a sleight of hand), be arrayed into a cube that would fit inside the orbit of Neptune. Further trickery tells us that all the stars in the observable universe could fit inside a cube of only 10 light-years on a side.But stars are by no means the most compressed forms of matter. What if we could gather up just the protons and neutrons of the cosmos and pack those together? (Electrons being rather fuzzier quantum objects, whose effective physical size is even harder to be sure of)



The numbers here are very, very approximate. In general, it is estimated that there are of the order of 1080 particles of normal matter in the observable universe (i.e. out to the light travel horizon accessible to us). That is a catch-all number, containing everything. In that sense it is relatively conservative our purposes. protons effective charge radius of around 8.4x10-15 meters, and the physical presence of neutrons seems to be similar we can take this as one measure of size. This observable universe could be gathered up and arrayed into a cube with sides 3.9x1012 meters, or 0.00034 light years, or 21.4 AU.That's almost small enough for the cube to fit inside the orbit of Saturn. (This number is also, not surprisingly, very close to what one gets from using the estimated mean density of normal matter and the estimated proper diameter of the observable universe, which is around 93 billion light years. It's also close to the number obtained using the measured size of neutron stars versus normal stars.)Eliminate the truly empty space of the cosmos and it's amazing how little is left.The bottom line is that we live in a universe that is remarkably devoid of the stuff that makes us. Were it not for our prejudice that our fancy matter, with its electromagnetic interactions and so forth, is somehow special, you might look at the cosmos and think that we are part of a ghostly sprinkling of something entirely otherworldly.



RECOMMENDED Books

THE TROUBLE WITH GRAVITY by Richard Panek

REPUBLIC OF NUMBERS by David Lindsay Roberts

50 THINGS TO SEE IN THE SKY by Sarah Barker



NASA'S FIRST SPACESUIT TO BE WORN FOR ARTEMIS

In an event at the space agency's headquarters here, NASA chief Jim Bridenstine and spacesuit engineers share the first up-close look at two nextgeneration spacesuits designed for for the agency's Artemis program, which aims to land the first woman and the next man on the moon by 2024.



SPACEX'S STARLINK Constellation could Swell

by 30,000 More Satellites

SpaceX's Starlink internet-satellite constellation may end up being even bigger than we thought—a lot bigger.The company already has permission from the U.S. Federal Communications Commission (FCC) to launch up to 12,000 Starlink craft to low Earth orbit. And SpaceX recently filed paperwork with the International Telecommunication Union (ITU) to 30,000 additional Starlink satellites, SpaceNews reported yesterday (Oct. 15). It's unclear how many Starlink satellites SpaceX will actually build and launch, however. Submitting to the ITUa United Nations agency that, among other things, manages the global satellite radio-frequency spectrum—is a preliminary step, as SpaceNews noted. ITU approval would have to be followed by a thumbs-up from the FCC, which regulates interstate communications in the U.S.And there's no guarantee SpaceX will end up launching the already-approved 12,000 satellites. Elon Musk, the company's founder and CEO, said earlier this year that economic viability could come with a constellation of about 1,000 satellites.But still, launching even a fraction of the potential 42,000 Starlink craft would fundamentally change the orbital population. Just 2,000 operational satellites currently circle our planet. and fewer than 9,000 objects have launched since the dawn of the Space Age, in 1957, according to the U.N. Office for Outer Space Affairs.The Starlink constellation is already being assembled. In May, SpaceX launched the first 60 satellites in the network, and the company plans to loft the next few batches of 60 soon, likely before the end of the vear.And SpaceX isn't the only company with megaconstellation ambitions. For example, both Amazon and OneWeb plan to establish big (but not Starlink-big) networks of broadband satellites in low Earth orbit as well.