Interstellar Clouds

Ari: This is Small Matters – the audio series where we sweat the little things. I'm Ari Daniel.

If someone were to offer to meet me in a dark, deserted parking lot in the middle of the night, I'd probably think twice. But I didn't even bat an eye when Jacob Laas suggested it to me – because that was the whole point of our rendezvous…the darker, the better. And that's because Laas – is a stargazer.

Laas: Just the expanse of the universe is just amazing – almost incomprehensible to what we're used to on our day-to-day lives. And so when I look up, I just take it all in.

Ari: This parking lot is on the campus of Emory University in Atlanta – where Laas is a graduate student in astrochemistry.

Laas: It's a good night. Beautiful here.

Ari: Laas studies the molecules of outer space – and how those molecules may have shaped our galaxy and life itself. But first thing's first – we need to get our eyes on the sky.

<trunk noise>

Laas pops open the trunk to his Jeep to reveal his personal treasure.

Laas: I've had this telescope – I think since I was about 10 now. You know, I convinced my dad into getting it for me.

Ari: This isn't your average handheld telescope. The whole setup weighs a good 70 pounds. It takes Laas 15 minutes to assemble it in the cold night air. First come a hefty tripod… <tripod noise> and mounting platform <more noises>, which secure the actual telescope – a black cylinder the size of a small trash can. <attachment sounds> Finally, Laas screws a couple counterweights into position.

Laas: Alright – so everything's set up.

Ari: Laas spins the telescope effortlessly, the counterweights balancing every turn.

Ari tape: I feel like you're playing an instrument.

Laas: An instrument in the dark.

Ari: To get things started, he swivels the telescope towards the half moon. Even from a couple feet away, I can see moonlight streaming out of the eyepiece.

Laas: Yeah, do you wanna have a look?

Ari tape: I'd love to.

Ari: I stare down the barrel of the telescope, and the cratered, lunar surface fills my view. It's so unbelievably clear and bright.

Ari tape: Wow, it's beautiful.

Laas: Once you have a couple looks at one of these things, it's easy to fall in love with the astronomy.

Ari: But we're not out here tonight to look at the moon, as pretty as it is. We're after something much less obvious. Laas ratchets up the magnification, and swings the telescope towards the bottom of Orion. He scans the constellation slowly until he finds a patch of soft blue mist – something called:

Laas: The Great Orion Nebula.

Ari: And within this nebula, it looks like dark holes have been punched out of the mist. These chunks of darkness are what we're looking for – interstellar clouds – dense accumulations of gas and dust that sit between stars. The reason that Laas studies these clouds, usually with much more powerful telescopes – is because they're the site of some pretty remarkable chemistry.

Laas: The first chemical reaction that takes place in the universe is actually just the formation of molecular hydrogen.

Ari: That is, hydrogen gas, or the stuff that exploded so disastrously on the Hindenburg. And hydrogen gas first gets formed inside these interstellar clouds.

Laas: And so once you get these clouds that start to form more molecular hydrogen, they'll become thick enough that they'll help shield the contents to form more rare molecules.

Ari tape: Shielding from what?

Laas: Cosmic rays…

Ari tape: So molecules have trouble forming in the universe because they're being bombarded by this stuff?

Laas: Yeah, they're constantly being bombarded by particles or photons that otherwise would just rip them apart.

Ari: The interstellar clouds, puffed up with hydrogen gas – provide a kind of protective blanket for other molecules to form, and remain intact.

Laas: You can start to get CO.

Ari tape: Carbon monoxide.

Laas: Yeah, carbon monoxide. Then you start to see methanol.

Ari: The simplest alcohol there is. Gradually, these interstellar clouds get warmer and build up an inventory of molecules. And it's thought that this process may have seeded the early galaxies – over 13 billion years ago – with a set of chemical building blocks that helped to form meteors, and asteroids, and planets. And even, perhaps, molecules tied to the origin of life.

Laas: Well, there's another molecule called glycolaldehyde that is almost a sugar.

Ari: That almost sugar is made inside interstellar clouds too. And it's been shown to give rise to the more complex sugars we see in living organisms today.

Now, this next bit is somewhat speculative, but hear me out. There's some debate as to whether these clouds are the birthplace of comets – we just don't have enough information to be sure. But if it's true, then comets could act as a kind of delivery vehicle for these molecules to get out of the interstellar clouds and end up on planets, like Earth. And since comets are full of ice, we may have interstellar clouds to thank for the watery, life-filled world we see around us.

And this is what captures Laas' imagination –

Laas: That what goes on right in front of us can also occur everywhere else out in the universe that we look at. It's exciting to me to be able to make these connections between these two extremes.

Ari: All you need, says Jacob Laas, is a big telescope to look deep into outer space…and an even bigger amount of ambition, right here on Earth.

<fade up music>

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