

Elements in Space

The chirps of sparrows. Light traffic noise from three stories below. The beeping of a garbage truck backing up behind my building. My sister's muffled singing from the room next door. Now smells crept in: slightly burnt pancakes and an unnatural flavor of syrup. Suddenly, sunlight burst through the curtain to my right -

"Good evening, Janae." A groggy Cyen stood over me, wiping her eyes and yawning.



'Evening,' I thought. The brain is a funny thing. We're made up of dozens of chemical elements, all moving together in this brilliant, almost flawless, dance. Yet we can be fooled so easily. Evening.

'Evening. Evening? The ship. That's right, I'm on a ship. How long has it been?'

Dr. Cyen Tiss repeated herself.

"How was the sim-alarm? The latest model incorporates smells. It's more of a beta version," she said. I had thought the pancakes didn't smell quite right; my dad is an excellent cook. I missed my dad, but I'll see him after I get back.

Everything was coming back to me. I'm on a ship, headed to the planet Rigel in the Centauri star system. The three of us - Captain Mary Taem is the one in charge - were all in hibernation during the journey so our minds would not be damaged by the intense and often weird physics of traveling across space and time simultaneously. Waking up is the most important part, so the sim-alarm plays familiar sensations to acclimate the brain to reality. I was on Earth just yesterday according to my holowatch, but people on Earth have experienced the entire month of March 2019. In the time that I have known Mary and Cyen, I've learned a lot about time travel and the tech that they brought from 2052.

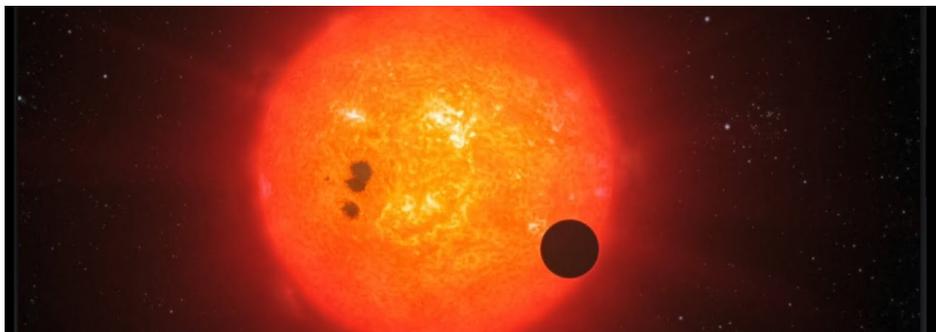
"Let's not waste any time! Get ready for the day and then buckle up. We're set to land in one hour," Mary announced. The Captain did not mess around. One hour means one hour, sometimes less.

Cyen and I retreated to our cabins and quickly got ourselves together. Rigel is a planet with 130% of the gravity of Earth, so we have been working out to make sure our muscles are ready for the extra strain. We are wearing lighter clothing and sunglasses to protect against the intense light of the three-star system.

We will be landing in the twilight area of the planet. Rigel is tidally locked to its sun, which means that one side of the planet is always facing the red dwarf star Proxima Centauri. The other side is always dark, so the entire civilization on the planet lives in the area on the unchanging border between day and night. Crops are grown in the light; homes are built in the dark. Cities are always awake; residential areas are always asleep. Strong winds bring the heat from the bright side to the dark side so it remains a comfortable temperature in the border area.

Rigelians, as these aliens are known, celebrate a new year in the time that Earthlings pass 11 days. Since they do not have days and nights, Rigelians divide their year into 16 “days,” each one lasting about 17 Earth hours. Since there is no day-night cycle, Rigelians did not evolve to need as much extended sleep as Earthlings require. Instead, their brains take small naps throughout the day of a few seconds here, and a few seconds there. I read that somebody can be talking to a Rigelian, and in the middle of a sentence the Rigelian will just pause to take a nap, then finish the sentence!

“Good for you two to finally join me up here,” said the captain without turning around. “It looks like our liaison on Rigel will be *Rightenant* Kent Orus. He will lead us around and answer our questions. This will be a great beginning to the Earth-Rigel scientific partnership, even if most Earthlings have no idea that it’s happening.” The giant holographic countdown reads three minutes and five seconds.



After meeting me on Earth during their climate change mission, Mary and Cyen invited me to be the student representative on this trip. They wanted me to document the Rigelians’ knowledge of Chemistry so we could interpret their advanced chemical technology and exchange it with our advanced knowledge of electronics.

Cyen handed me a tablet; it was my assignment! This was far cooler than anything I did in my junior year, but considering that I was missing my entire summer for this field trip, I was thinking that I had better have something to show for it. On the screen was a partial periodic table, but completely empty:

	1	2		13	14	15	16	17	18
1									
2									
3									
4			Transition Elements						
5									

“As we’re talking to Rt. Orus, he will talk about what they call the elements that make up our universe. Of course, they’re the same elements, it’s just that they have different names. It’s critical that we have this periodic table filled out so we can translate at least these important 34 elements. He’s going to move through them pretty quickly, so you’ll need to keep up. You have taken Chemistry, right?”

“Of course,” I said. I started to feel nervous about my chemical knowledge, but then remembered how my teacher had asked me to tutor other students. Immediately, I felt better. That, and the countdown had gone below 30 seconds.

“Prepare for landing,” Mary stated flatly. She moved slowly to her seat. With just three seconds on the clock and the surface of Rigel quickly approaching, her harness finally surrounded her. I looked at Cyen, and she was perfectly relaxed, shooting me a quick smile. I didn’t feel so confident.

I saw the surface of the planet get closer as we slowed down almost imperceptibly. Then, we fell *beneath* the ground. I saw the landing pad stretch vertically before my very eyes, like when you stretch gum. We stopped falling, then started to rise again towards the surface equally slowly. Thirty seconds later, we were back at the top, level with the slightly purple-skinned Rigelians who were welcoming us.

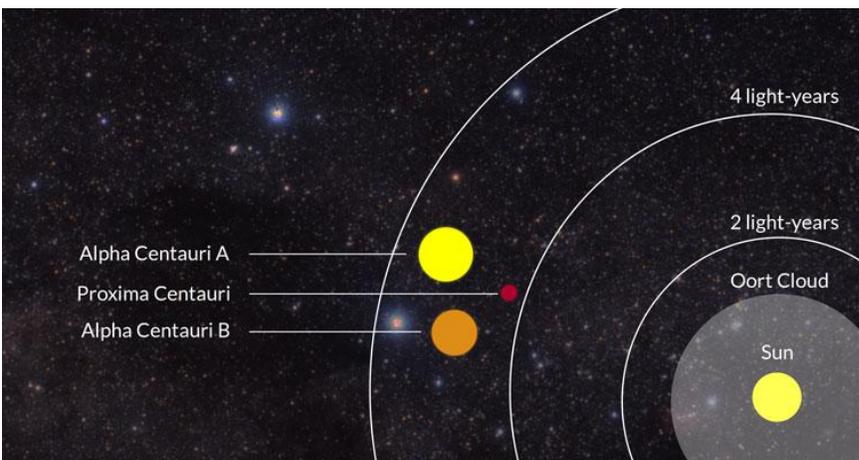
“Let’s go,” said the captain. She was no-nonsense. Dr. Tiss was already out of her harness. As mine slowly released me, I felt the increased gravity in my neck and arms. We stepped out of the ship. As I stepped onto the landing pad, I noticed how bouncy it felt and how easy it was to get accustomed to this new planet.

“Meltium ... M ... e! My name is Kent Orus. You must be Janae. It’s a brilliant pleasure to make your acquaintance.” Rt. Orus greeted me with a firm double handshake, his hands crossed so I could keep my hands straight forward. It was the customary Rigelian greeting, with the two handshakes representing the two stars in the Rigelian sky. We ended the handshake with an upwards “finger-gun” motion to honor what Earthlings call Proxima Centauri, their red dwarf sun.

‘Rigelian dap,’ I thought.

Kent explained that Meltium (symbol ‘Me’) was in group 13 of my periodic table, in the fourth period. Due to its melting point near room temperature, it was used in applications like this landing pad.

“I’ve heard that Earth has a similar amount of Breathium in the atmosphere that we do. About 20% of the atmosphere is Breathium (‘Br’). I’m sorry, here I am talking your ear off and you’ve only just landed. Would you like some nice cool L₂Br?”



Kent handed me a flask of water. “L₂Br,” he had said. I noted on my periodic table what I had learned so far, including this last bit of info.

“What does the L stand for?”

“Lightium. It’s the lightest element. Our first aircraft actually used it, but unfortunately it caught fire in a horrible accident.”

I saw Mary and Cyen being escorted to the main building near where we landed.

“We’re going to meet with them for a bit. Rt. Orus will be a great host for you - I’m sure you’ll learn a lot,” Cyen yelled back at me. Both of them were visibly excited. As for me, I could barely contain

myself. Here I was on this planet, 4.4 light years away from Earth, and I felt as comfortable as if I were back at home. Well, except for the fact that every step was heavy. Even all of that training hadn't prepared me for this!

We were on the light side of the border. It was about 50 degrees Celsius; very hot, but there was a constant wind blowing towards the dark side that was just a kilometer away. As I quickly drank the water, the flask lit up and displayed, "40%."

"You're delighted. The flask is telling you that you need to drink more. The flask is mostly made up of Chipium ('Ch') which is what we use in all of our computer technology, and the blue lit numbers are composed of Hugium ('Hu'), the most massive element on your table. I'm sure you must be overwhelmed. Let's take a seat over here in our garden."

Kent led me over to a jungle of a garden, full of what looked like tiny flying fish in the trees.

Check for Understanding

1. Kent gave Janae some L_2Br and Janae said it was water. What is 'L' and 'Br'?
 2. How do you think you would react to being on this planet? Explain.
 3. So far, Kent has identified five elements: Me, L, Br, Ch, Hu. Make sure they're on your periodic table!
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I looked over to what seemed to be a banana tree. I asked Kent what it was.

"That's a yellowberry tree. We eat those because they have a lot of Violetium ('V'), which when you burn it makes a violet-colored flame. Which is a lot like Burnium ('Bu'); they are in the same group, except Burnium is slightly lighter and it's part of BuP, a common chemical that we use to season our food. In fact, you can also burn Sparkium ('Sp') which is the lightest member of that group. Just don't burn Boomium ('Bo'), the most reactive in that group and on your table - we did that once in the lab, which is why I don't have any eyebrows."



I laughed. Kent was the first Rigelian who I met, so I just assumed they didn't have eyebrows to begin with. One of the flying fish floated past me, much like an Earth butterfly. I held out my hand, and it landed, using its fins to balance and look around. I asked Kent what it was called.

"That's a Bumblesucker. They're very common on the light side since they use the wind currents to travel from tree to tree. Just like everything else that's alive, it's made up of a lot of Livium ('Lv'), which is the most versatile element in the universe. Since Livium has two electron energy levels and four electrons available for bonding, it can form all sorts of compounds. Rigelians even like to wear compressed Livium as jewelry! Take a look."

Kent showed me his huge diamond necklace. On Earth, I couldn't even imagine how much it would cost. I asked him how expensive his necklace was.

"Oh, nothing much. You can find these all over the place. They cost less than the clothes I'm wearing."

I really wanted to continue talking to him about diamonds, and maybe get a souvenir. But I remembered that I was on a mission. I looked up at their sun.

"What do you call your star?"

"That's Sol. In fact, one of our elements is named after it. Before we knew that it was mostly made up of Lightium, all we could detect is that the surface is made out of Solium ('So'), a noble gas found in all stars."

"Sometimes, we call our star Sol, too!" I remembered back to my Spanish class and how it prepared me for science, too. I asked Kent about any moons that Rigel had.

Check for Understanding

4. Kent said that they use BuP as a common seasoning. We call this salt. What are Bu and P?
 5. Diamonds are cheap on Rigel. They are made up of Livium - which element is Livium?
 6. In this section Kent identified six elements: V, Bu, Sp, Bo, Lv, So. Make sure they're on your periodic table!
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"Yes, we have two moons. Both are quite small, and we've visited both. In fact, we found the element Moonium ('Mo') on them with atomic number 34. And when we examined the atmosphere, we knew we couldn't breathe without bringing our own Breathium, but just like Rigel there was a lot of Abundantcium ('Ab') which has 7 protons, 7 neutrons and 7 electrons," Kent said.

We had just travelled through the galaxy to get to this other planet, and now I wanted to know about how Rigelians managed to have such a peaceful and prosperous society. Everyone around looked so happy, and even though I hadn't seen much of the planet yet, I was curious.

"On Earth, we're always concerned about diseases and going to the doctor. Does Rigel have doctors?"

Kent replied, "Of course we do. With our chemical technology, we've managed to eliminate most viruses and harmful bacteria. We still make sure that everyone gets plenty of Bonium ('Bm') to build strong bones and teeth, and also Reactinium ('Re') in common drinks to help protect those teeth. Reactinium is named because it's the most reactive non-metal on your



periodic table. We also make great use of Infectium ('If') which is used to treat cuts and wounds to keep them clean. We use Cannium ('Cn') to make containers to preserve foods - I think I saw some of those on the ship with you. I imagine you Earthlings have similar chemical compounds, since these are pretty basic. Follow me - I'll take you to one of the labs!"

As I stood up, I noticed that I didn't see vehicles around. Everyone walked and did so very happily. Asking Kent about this, he said that all of the cities were built so that everything was walkable. The lab that we were walking to was right on the border between the light and dark areas of the planet, so we started to see signs that were lit up.

Check for Understanding

7. Kent said that they use Bm and Re for good dental health. What are those elements?
 8. What do you think it would be like if you could walk everywhere that you need to go?
 9. In this section Kent identified six elements: Mo, Ab, Bm, Re, If, Cn. Make sure they're on your periodic table!
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"We use Signium ('Si'), Stableium ('Sb'), Supermanium ('Sm') and Hugium in these fluorescent lights. Signium makes the red color, Stableium makes a light-blue color and Supermanium an off-white color."

Kent looked at me trying hard to fill in my periodic table with this new information. He cocked his head over my shoulder and pointed.

"All of those that I mentioned are in the noble gas family, right there in the group you have marked as 18. And the order I mentioned them in is the same order you'll find them, right below Solium."

We walked into the lab. The windows facing the light side of the planet were covered in a plant that looked like ivy you would see on buildings on Earth. The lab was just three rooms wide and climbed for over twenty stories. Kent explained that labs were built this way to take advantage of being on the border between light and dark. You could have a lab on the light side that performed completely different experiments than a lab next door that took advantage of being in the dark.

"Here's where we study Metalloidum ('M') and Poisonium ('Po'). Due to them being metalloids in the fourth period (Poisonium being the more massive of the two), they have unique properties that make them helpful in all sorts of different compounds. In fact, much of our technology depends on these elements, and we're hoping to learn a lot from you about how best to use them."

"I hope we can help you. I can't imagine that we know more than you," I retorted.

“You’d be surprised. One of the first problems we found is that technology sometimes gets too hot and likes to catch on fire. So we’ve been using more Lowigium (‘Lo’), a halogen in period four to help prevent fires from happening. We’ve also started building more spacecraft with Glucinium (‘Gl’) which is found in the second group and second period.”

Kent brought me to a room that was labeled, “Period 3.” An entire lab dedicated to a diverse group of elements? How strange.

“Yes, here we study - and to help you out, the order is from left to right on your periodic table - Burnium, Blue-whitium (‘Bw’), Bauxitium (‘Xi’), Chipium, Bringer-of-lightium (‘Bl’), Stinkium (‘Sk’), Purium (‘P’) and Stableium. It turns out our scientists love to study diverse elements even if it does smell funny when some Stinkium gets released. They have started using Bauxitium to wrap up their lunches, and it might even catch on.”

Check for Understanding

10. The metalloids, M and Po, are special. What makes these metalloids different from other elements?
 11. Si, Sb, and Sm are used in signs. What are those elements, and have you ever seen signs like these?
 12. In this section Kent identified eleven elements: Si, Sb, Sm, M, Po, Lo, Gl, Bw, Xi, Bl, Sk. Make sure they’re on your periodic table!
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I checked my holowatch. It had already been an hour that Kent and I were exploring Rigel. I asked to go to the other building where Mary and Cyen were. On the way, we saw some artwork.

“We love to use our innovative chemical techniques to create works of art. That painting over there which features those darker colors includes Darkbluium (‘Dk’), atomic mass of 115, and Scratchium (‘Sc’), a metal found in group two. Together, they make really stunning works, don’t you think?”

“Yes, those are gorgeous,” I replied. “Do you make any art?”

“Yes, mostly for my children. They love to play with slime, and we have over two thousand varieties. I use things like Notalonium (‘Na’) which has five electrons in the outermost energy level,” he said and then paused. I thought he had forgotten something, then realized he was taking a nap. “Earthium (‘E’) named after your planet with six electrons and Boracium (‘B’) which has three electrons. Well, I must be pretty tired.”

After a few minutes, we reached the building where Mary and Cyen were presenting some of the technology we brought with us, like the holowatches. Kent wished me good luck as he went to the dark side of the planet to get two Earth-hours of sleep. I tuned into the conversation happening with Mary and Cyen as I ate.

