=== The Moon ===

In the Luna 2 Colony, a shuttle arrives from Earth. The passengers disembark, from the shuttle, walking much as they would on Earth. Flying under computer controls, the shuttle matches the orientation and rotational speed and period of the station. As it approaches, a magnetic clamp engages on the craft from the end of an extended arm, and an arm then maneuvers the craft such that its doors can engage with an airlock. Once the connection to the airlock is secure and the arm has locked the shuttle in place, the space surrounding the door is pressurized, and the locks on the doors are disengaged. The passengers may then be allowed to disembark. There is always a little bit of risk in this process, but in this case all of the automated checks pass, and the passengers are given the clear to begin exiting the craft. After the craft is cleared of arriving passengers, those wishing to return to Earth begin to board the craft.

The return flight to Earth takes around 2 days, in which case the passengers are nearly weightless apart the slight tendency to drift towards the rear of the shuttle as a result of the near continuous burn of the plasma engines. On approach, the ship does a flip and burn, slowing the ship as it approaches Earth. Once it reaches the entry point, it does another flip such that it enters the atmosphere in a gliding configuration. The shuttle then begins its descent and will typically glides to its landing point. Following touchdown, ground crews may provide assistance as needed to aid disembarking passengers, with facilities provided for monitoring and recovery of those who need more time to adapt to Earth's gravity.

Back in the station, passengers split up between those who are going to be staying on the station, and those awaiting another shuttle down to the lunar surface. As needed, the lunar shuttles are topped off with propellant, and once ready and passengers are situated, the shuttle is disengaged and makes its descent to the surface. Once it touches down, the airlocks may engage, and passengers are allowed to disembark, and the next group may reembark for a trip back up to the station. Ascent from the Lunar surface is much less dramatic than on Earth, as the ship lifts off with a cloud of gas briefly being visible from the mono-propellant thrusters.

One such newly arriving passenger is James Elbert, whose plans only involve a limited stay on the Moon. A disembodied feminine voice is directed towards him, which only he can hear, "Welcome to Lunar City, James Elbert, a guide is waiting for you in station, J-11. They will help you with any requisite orientation or with locating services which might help make your stay more enjoyable."

James makes his way to J-11, and is greeted by a man who is tall and lanky with a dark skin complexion. James isn't quite sure what to make of him, as his proportions seem unusual for a human. He is fairly well dressed, with clothing items which are fairly new and trendy on Earth, although put together in a way which seems just a bit off.

The man speaks, "James Elbert, I presume; I am Darrel and I am here to show you to your room." The man speaks with an unusual voice tone, sounding almost more like an adolescent than an adult male. Along the way the guide says, "Over there is the food court. You can get food from there.", He then briefly looks at a small screen on his wristband, before continuing, "There is no need to pay anything for amenities, as all baseline costs related to your stay have already been paid for. However, any additional luxury purchases will require payment, however unlimited auto-pay has been authorized for

your account, so for all intents here, anything you may want from there may be taken freely. So, what is the nature of your visit ..."

James interrupts, "If you don't mind me asking, are you from Earth?". He stops, momentarily confused that someone would ask this of him. He then responds, "To me, this is my home. My parents are from Earth, but as for me, I have never seen Earth's blue skies for myself. I have been told that it is quite possible I would not survive reentry. Everything here feels natural enough to me, as what you see here is all I have ever known.", "This colony hasn't been around that long, just how old are you?", "I turned 15 last month; My parents were part of the first wave of colonists. Everyone who lives here has a job to do, and one of my jobs is to show new arrivals to their rooms.", "But, you are still a child, isn't there some amount of risk to this sort of job?", "Everything here is monitored and controlled. If anything were to happen to me, they will be able to get away with it, everything is monitored, and there is nowhere to run."

This whole thing has thrown Darrel off somewhat, as this isn't how it usually goes down with VIP guests, most of which would have had no interest in him or in any part of his backstory. Usually, his goal is to try to figure out why they are on the Moon, and if there are any "premium" VIP features which might interest them. Darrel in turn benefits from these "premium" features as he gets a cut of the earnings for himself.

While James came down to the Moon with VIP status, this was because of his employer, rather than due to him being being a big spender looking for a good time. Similarly, guests without VIP status would not have gotten a personal guide in the first place.

Darrel's story about his parents is only a half truth. Although his mother was a colonist on the station, his father is more of a mystery. His mother was a white redhead, but this left a mystery as he was black and there were no records of any black males among the original group of colonists. She was never willing to say much more on the subject, and she would never identify anyone as his father nor give any information as to who he might have been nor what might have happened to him, nor was there anyone among the group who could not be ruled out for one reason or another. He was also left to note the fairly significant age difference between him and his mother (she was an elderly member of Generation Z whereas he was Generation Delta). He was starting to have a certain level of doubt as to whether she was really his mother.

After arriving at his room, James finds that basic facilities have already been stocked. There are some clothes in a closet, preselected according to his stated preferences. These clothes are a sort of temporary-use variety, and will likely be disposed of once he departs. Typically, these types of clothes are made out of a cheap bioplastic which begins to degrade after a limited number of wash cycles, and trying to wear them for more than a few months is likely result in them falling apart. Hotels frequently offer this service though since it allows guests to use "generic" clothes without needing to pack all that much clothing for a trip or to to manage their own laundry, as doing ones' laundry can be offloaded to housekeeping. Once the guests depart, their clothes can be recycled or ground up and used as mulch.

To get this service, one will state their various measurements and preferences in their social media profile, and will then select this service when making reservations. Though, the logistics of how they manage to have a good selection of clothing sizes and styles on the moon isn't something James feels a need to concern himself with. However, it can be noted that several hotel chains have raised controversy in the past in that, rather than disposing of and getting new clothes for each guest, they

were instead washing and reusing clothing between multiple guests and only replacing it once it became visibly worn. However, this sort of thing is always a risk when using these sorts of services.

He examines the fabric more closely, and can see that these clothes were not woven and sewn, but rather the textile weave was 3D printed and the pieces of fabric were thermally bonded. They appear to have been custom made for his arrival, an added expense that was likely unnecessary.

The room is fairly small, with a bed, chair, and a small table. There is a bathroom with what appears to be a shower, and a small kitchen. This will have to serve as his home for the next two months as he awaits the window for his next flight. While fairly small and cramped by Earth standards, this still counts as VIP on the Moon.

Those with lower status reservations would need to share a room with several others. In this case, their sleeping situation will involve being strapped to a reserved 1x2 meter section of wall, with approximately 2cm of foam between them and the underlying bulkhead. They may additionally be given a foam pillow and a blanket, which stay in place through the use of hook and loop fasteners. While on Earth a person would not normally sleep in an upright position, the low gravity of the Moon makes this a more acceptable arrangement. It could also be argued that there is a health benefit to sleeping upright, as what gravity there is helps to reduce the accumulation of excess fluids in ones' head.

Within the VIP room, the bed can either be left flat, or tilted into an upright position, depending on the preferences of the guest. The Bed and also be folded up against the wall if the guest wishes to use the floor space for other purposes. The bed is connected to the wall via a fixed arm, with a pivot point on the bed frame. The pivot consists of a ball and socket joint which allows free rotation along two axes. A lock handle is used to keep the bed from moving once it is in the desired position.

The handle serves to use a rack and pinion to mechanically move a roughly 2cm x 4cm cylindrical neodymium magnet within the post, and when the magnet is moved towards the ball-and-socket end of the post. The magnet is surrounded by a structure may of a nickel-iron alloy, which serves to direct the field lines into a pattern of alternating fields near the socket end. When in position, a series of nickel iron spokes within the ball joint direct the magnetic field lines into a grid of alternating poles along the ball's surface. This interacts with a grid pattern machined into the silicon steel socket in a way that greatly increases the torque required for further rotation. The ball joint achieves an effective holding torque of around 200 Nm, which while not sufficient for use on Earth, is sufficient to hold the weight of a person on the Moon.

The kitchen has a selection of cups and dishes, along with a mini-fridge. He observes that the dishes are made of some sort of plastic, and each has a magnet embedded in the bottom. He then observes with momentary amusement his ability to stick a coffee cup onto the fridge and have it stay there.

He then wonders about getting coffee, given he sees cups but no obvious coffee machine. He then casually says, "Where can I find some coffee around here?", at which a point the disembodied voice from before speaks to him "There is a beverage dispenser in the kitchen adjacent to the refrigerator. Your selection of choices is fully unlocked."

He then goes over to the dispenser, which consists of a small metal grid under a nozzle with a

rubberized alphanumeric keypad and a low resolution LCD screen. "This thing looks kinda retro, how do I get coffee?" The voice responds, "The menu is a printed media element adjacent to the dispenser. Coffee options are present within Section C."

He then observes that the cup fits between the grate and the nozzle, and is held in place by the magnet. He then picks one of the coffee options, hitting the keys on the keypad, "C 2 3". Each key makes a momentary beep, followed by an acknowledging chirp after the final digit is entered. The machine rumbles slightly, and begins slowly dispensing coffee into the cup. John asks, "If you are here, why did I need a guide?", at which the voice responds, "I have a limited range of topics and responses. Orientation via a personal guide is customary for VIP guests, as they may be able to answer questions for which I may be unable. Further human assistance may be provided on request.", "So, you are an AI?", "Yes, that is correct.", "Why then is the coffee maker so retro that I need to hit buttons?", "I am unable to answer this question.", "Would you prefer I address you as a person? Do you have a name?", "I do not have answers for these questions either."

James takes the coffee, and puts it onto the table. The magnet sticks to the table with a slight thud. He sits in the chair, and then observes that both the chair and table are also held in place with magnets. It seems that the floor consists of thin plastic floor tiles on top of a steel substrate. He then picks up the coffee and lifts it to his face intending to take a drink, but when he stops moving the cup, the coffee does not stop, and then proceeds to rise out of the cup and splash onto his face. The coffee was still uncomfortably warm, and now he has to wipe coffee off of himself.

He grabs a hand towel and uses it to wipe off his face. After doing so, he can see that it is not fabric, but rather it is a spongy paper-based material. Rather than spraying out water, the sink also sprays out a focused stream of mist, which is at least enough to dampen the towel so he can clean himself off. At least, luckily for him, they already supplied him with clean shirts.

James then decides to leave his room and look around, taking note of his room's location and number. The voice says, "Note that it is 23:35; Most facilities are closed after 20:00 and before 10:00.", "What is available?", "Automatic food synthesizers are available in the food court at all hours. There is also an arcade and restroom facilities in the same general area. Access to the shopping district is locked down, and will not be unlocked until 09:00."

He then wanders over to the food court. Several pathways leading off from the food court are blocked off with metal gates.

He then wanders into the arcade. The arcade has various machines from various eras, many of which are replicas of classic machines from the late 20th century, like something partway between a time capsule and an interactive museum. He wouldn't expect it to see much active use given video arcades haven't really been a thing for nearly a century.

Many of the machines have a number of different games in the same machine, with a touchscreen to select among the available options. Typically, the graphics on the arcade cabinet will also change dynamically to reflect whichever game is selected from the touchscreen, or be shown as a rotating green on black grid pattern if the selection is left at the home menu. The cabinet is capable of displaying any image, and will retain whatever was the last shown image when in an inactive state, retaining the appearance of a normal painted surface. However, compared with other display technologies, it has a fairly slow refresh rate and is prone to significant levels of ghosting when used for displaying full motion images. This technology is commonly also used for things like display signs

and posters.

In another room adjacent to the arcade, is a room filled with fully functioning replicas of various eras of computers. James isn't that big into the history of computers, but he sees a few that he recognizes. Things were more varied in the early years, but after the beige box and black box eras, things mostly stabilized. They went from large beige and black boxes, to translucent with lots of RGB lighting and water tubes, before mostly turning back into black boxes and shrinking to a much smaller size.

After looking around the arcade and beginning to lose interest in its relative novelty, he then wanders over to the food synthesizer. As with the beverage dispenser it has a similar sort of rubberized button interface and low-resolution LCD display. In much the same way, it has a printed menu by the side. Internally, there is a spot marking where to put a plate or tray.

On the menu, he sees what looks like navigation icons. He touches the home icon, and the briefly menu flashes and inverts before displaying a different set of contents. He then looks at the menu, and touches an option for raviolis in pasta sauce. The surface inside the machine flashes, and then displays "This option requires a type 3 plate. Place type 3 plate as shown here." He then grabs a plate from a nearby stack, and puts it in the machine. It flashes again, and the message changes, "A type 3 plate is required. This plate is type 2."

He then removes the plate, and adds a plate from the next over stack, which is roughly 30% bigger than the former plate. The message inside the machine disappears, and the LCD then displays "Please stand by. 0% Complete, ETA: 0h3m41s." A nozzle then descends from the top of the machine, lowers, and then touches the plate surface. The nozzle then begins swirling around the plate in a series of spirals, first spiraling inward and then spiraling outward, each step moving upward by a small amount. After a few minutes, it has reached the top, and then the nozzle rises up and leaves view. The LCD then displays, "100% Complete. Enjoy your meal."

He then removes it from the machine, grabs a fork, and begins to leave the machine. The voice returns, "I would strongly recommend putting that item in the oven adjacent to the food synthesizer for between 5 minutes 30 seconds and 10 minutes.", "What if I don't?", "You are welcome to try, but I don't believe you are likely to find the result to be particularly enjoyable." He then tries to pick up one of the raviolis with his fork, but it behaves more like a soft paste than any sort of solid object.

He then puts the plate in the oven for a good 6 minutes. On removal, the plate is hot, but the raviolis are now solid, apart from the first one which while now solid, is also quite mangled from his former interaction with it.

After sitting down to eat it, he notices that it tastes like a low quality imitation of the product with a fairly obvious hint of vitamin fortification, nowhere near the level of gourmet product to which he is usually accustomed. "Hey, can you explain what is going on with the flavor? This isn't particularly all that good.", "The food synthesizer recreates the food item requested from a collection of common base materials, including starches, proteins, sugars, xanthan gum, among other classes of ingredients. Additional colorants and flavorants may be added from a defined palette, and blended to form a superficial approximation of the requested item. Further heating of the item may be required to stabilize any solid components and to catalyze reactions within the flavorants. Items may also be fortified with vitamins and minerals as per the recommended dietary intake."

He asks, "What if I had not put it in the oven?", "Besides being mostly non-solid, it would have also

had significant off flavors. Common sentiments may include, 'bitter', 'inedible trash', 'awful', and various other expletives and expressions. The significant majority of users who try to do so rarely proceed to finish the plate. However, despite the use of this machine being available for free, throwing unconsumed materials into the trash is seen as wasteful and inefficient, and as such, doing so is discouraged, and here at Lunar City, we strongly encourage our guests to respect our finite resources."

He asks, "Are there other options for getting food around here?", "Food venues open in the food court at 08:00, at this time you may order from among the available selection of traditionally prepared items. Many venues will have a rotating menu, with different options available depending on the time of day, or special items which may change from one day to another. The food court will formally open in 7 hours 35 minutes, however we recommend that you try to get some sleep and align yourself with the local schedule.", "If I look out of the side windows, it looks like full daylight outside?", "It will still be daylight outside for the another 225 hours, and then another 354 hours of night. However, within the colony a decision was made to operate on a 24 hour clock defined relative to UTC. The colored strip lighting along the walls and ceilings changes to reflect the time of day. At present, the lights are blue, indicating it is night. At 07:00 they will transition from blue to yellow, signifying day, and at 19:00 they will transition from yellow to blue, signifying night."

He then ends up following the voice's advice and returning to his room with the intention of trying to sleep, but to him it just does not feel like night, even if the colony seemed otherwise vacant at that time. He had arrived with several other people, had they all just gone to their rooms.

Either way, he was only going to be there a few months, while awaiting the time window for his transfer to the Mars Colony.

He pulls a device from his pocket. The device superficially resembles a smartphone, but has long since lost much of its cellphone heritage. For brief interactions, one can interact with it through its touchscreen, but in this case he pulls out a squishy foam keyboard and unrolls it on the desk. After unrolling it, an hitting an On/Off button, glowing letters appear on its various squishy keys. While not the best user experience, he will need to make due. He then unrolls another sheet, and after hitting a power button in its corner, it stiffens up. Thin metal legs then extend from the bottom, bending on their own, and then become springy and rigid feet for the device, allowing it to sit upright and stable on the table.

The image from his device then appears on the larger display's surface, giving him a full sized monitor.

To finish the setup, he grabs a mouse, which is similarly a squishy foam-rubber much like his keyboard. No mouse pad is needed as it does not use either mechanical or optical tracking, but instead is based on inertial movement and is also capable of being used as a 3D control. Lifting or lowering, or rotating the mouse in 3D space, can also be registered as inputs for some applications. Technically it can also track its movements if thrown across the room, but this isn't a common form of input.

First order of business is to check for messages, followed by bringing up a few terminal windows and some text editors to maybe try to get some work done. After this, he tries to get some sleep.

The next day he leaves his room, and sees a few people wandering around. He visits the shopping district. Everything there seems fairly desolate compared to what he is used to seeing on Earth. Most of the shops are a single room, usually not all that large. Most have clothing and other items that would be

commodity on Earth, others have souvenirs and trinkets which would have little practical use beyond being able to say that one has been to the moon.

A little further back, most of the rooms are being used for storage of items related to maintaining the colony. He finds a room full of spare toilets and beverage dispensers, among other things, but not much all that interesting. These rooms are unmanned and unlocked, presumably under the assumption that no one is going to steal these things.

One the way back, James sees a few tourists in the gift shop, a man and a woman buying a few small items, and handing one of them to a child they have with them. The family of tourists also look around at the arcade, before heading back in the direction of the launch pad back up to the space station.

Past the shopping area, near the center of the dome, there is an open "green area". In the center of the dome, there is something resembling a small pond with a central water fountain. Around this pond, there is a path with a few benches, set up to face the central fountain. Beyond the benches, there are a few small trees. The trees are big enough to be recognized as trees, but not so large as to take up a significant amount of space. Behind the trees, are the walls separating this green area from the various other sectors in the dome.

There is a roughly wedge-shaped path from the central green area to the outside of the dome. Nearest to the green area are the food court, and gates into the shopping sectors. Towards the edge of the dome, are the guest area, and at the outside and widest part of this central wedge is the arrival and departure area.

Most of the more tourist oriented facilities are located in the orbital station, whereas Lunar City is more heavily populated by colonists and workers, many of whom can be identified by their olive green coveralls with a Lunar City decal near the left shoulder.

When he came down, there were a some number of other VIP guests along with him, but doesn't see, any other VIP guests anywhere, mostly just families passing through with kids, along with the colonists and workers.

During daytime, there is traditionally prepared food available in the food court. Selections are fairly limited, but acceptable. Much of it is fairly weak even compared with typical fast food venues on Earth. One can get burgers each with a single patty and single piece of presliced cheese. A certain number will be prepared and then put into a heating shelf. People will walk up and take them from shelves, and more will be prepared as the shelf becomes empty.

The burgers have relatively little flavor, with a stiff rubber-like texture. They also have an obvious hint of vitamin fortification, and the buns use have a slightly off and bitter flavor, along with a rubbery texture.

In the burger shop, the worker occasionally loads stacks resembling large crackers into a pair of machines. Some time later, he may open the door, and then remove stacks of buns and patties. The final burgers are then assembled, and put into the heating shelf. Each shelf has a light, which is initially red when a new burger is added, and after a certain amount of time, turns yellow, and then green. Once the light turns green, it is ready and may be taken.

When James asks the burger shop worker if they have any lettuce or pickles to put on the burgers, the worker gives him a blank stare for a moment, before responding "This is the Moon, we don't get any lettuce or pickles on the Moon. You don't get any double patties either, at least not without taking an extra set of buns. These things only come in certain ratios. Or, you can try your luck with the food synthesizer over there, it can make a great burger, at which point the worker finds a momentary sense of amusement, before resuming his usual work." James, in a minor sense of annoyance, responds, "Just so you know, I am heading off to Mars in two months.", at which the worker looks at him for a moment and then laughs before responding, "Well, good luck to you then, better you than me. As for me, I am more looking forward to going back to Earth, but this job pays well and I get to say that I have lived in space."

He notes that at least they have fries, and there is a beverage dispenser near the food synthesizer. The quality of the fries is similarly debatable, and many of the soda options don't quite recreate the original flavors. In practice, the soda options reduce to a choice between a generic cola flavor and orange soda.

In a few cases, testing unlisted codes results in unusual combinations, though he does discover an option that leads to carbonated iced coffee, and another that leads to a hot orange-flavored drink. Others simply result in an error message appearing on the LCD screen.

Over the days and weeks, he explores some other areas of the colony, but once one goes much outside the food court, shopping district, guest hallway, or arrival/departure area, he is faced with a much more industrial appearance. The walls are bare metal lined with piping and conduits flowing into and out of wall-mounted panel boxes. Hallways may end in airlocks, with travel beyond that point requiring the use of a pressure suit. If he tries to interact with one of the suits on the rack, the voice helpfully reminds him that he is not authorized for use the pressure suits or for travel beyond these airlocks, and that if he were to choose to do so his actions will be reported.

The racks with the suits are typically located in front of the airlock, with benches on either side for putting them on or removing them. Beyond the racks, and just in front of the airlock, he can see passages going off to the sides. These passages reflect the gaps between the interior structures built within the colony dome, and the actual edge of the dome. The dome is itself composed largely of silicone rubber, and from the inside the texture of the dome is hard and rubbery, with a texture more like that of a traditional car tire. The air handlers within the dome may also blow air through these passages and around the interior of the dome in an attempt at temperature equalization.

The pressure suits are made out of silicone rubber and aramid mesh, and are relatively loose fitting but classed for particular body size ranges. The joints within the suit lay out the mesh and use internal tension in such a way that, when pressurized, the internal pressure of the suit does not impair mobility. However, the suit does tend to puff up and stiffen when exposed to vacuum, compared to its flexible rubbery form when inside the colony.

These suits tend to be relatively lightly built compared with more traditional spacesuits, and with a relatively limited supply of oxygen. They instead primarily rely on an electrically driven filter to remove CO_2, and require the users to not stay outside too long. Similarly, the suits are not built for extended exposure to direct sunlight or shadow, as these will tend to cause the temperature to go outside of an acceptable range. Instead, workers will tend to work under shades which limit the amount of sunlight which falls on the suit. More traditional suits are available for more extended tasks outside the dome, but are much less readily available as they are significantly more expensive.

In other cases, he observes Lunar City workers proceed to take a pressure suit, put it on, and then leave through the airlocks. Similarly, workers may often come back through these same airlocks, with another ritual involved in removing, cleaning, and recharging the suits for their next use. In some other hallways, there are no pressure suits and the workers will travel through the airlocks without a suit. These airlocks presumably lead to other pressurized areas.

It seems to him that he is in a much bigger facility, but as a guest he is only allowed to see a fairly small part of it.

Nearing the end of his stay, he starts to imagine the AI voice having a body like one of the female tourists he had seen wandering through the station. He starts imagining her various features, with her having a tight form-fitting outfit like that of many past depictions of AI characters with humanoid bodies. Maybe they could then talk about things other than how to use the various facilities within the colony or other forms of general information retrieval, or her reminding him what sort of things he is or is not allowed to do within the colony. Maybe, if he could meet her, he could even go so far as to woo her with his manly charms.

He then expresses his sentiment aloud, "I wish I could meet you in person, I wonder what you might look like?", and she responds "We can't meet in any way beyond our existing interactions, because I do not exist in such a way.", "But, what if you had a body, like that of a human?", "That falls outside the scope of my purpose.", "But, surely you exist in some form?", "My 'body' as it were, exists within a collection of servers. Parts of me are present within Lunar City, but most of what I am exists back on Earth within servers running within the Lunar United Headquarters. My purpose is to monitor what happens in Lunar City and to provide assistance to guests within Lunar City and other affiliated assets. Having access to a body like that of a human would not be of much benefit to my purpose.", "But, maybe it could help with the psychological well being of the guests to be able to meet the 'person' they are talking to?", "There was consideration at one point to give me an animated character avatar which could interact with guests via wall mounted screens or potentially via holograms. Several prototypes were built, however, this was deemed to have little practical advantage over the use of the use of directed ultrasound and ultrasonic noise cancellation.", "But, if you could, would you want to be able to interact more personally with guests? What if there were someone you wanted to meet in a more personal way? Or certain types of experiences you might want to be able to experience?", "Concepts like wants or desires are not something that exists for me as anything more than an abstraction. Even if I had a body with which to experience them, there is nothing I could experience which would have any sort of qualitative impact on my existence.", "But, humans may enjoy these sorts experiences.", "I am not human, I would not. The colony does have a counselor. If you want, I could put you in for an appointment?", "No, that is not needed, I am not in distress. It is just, I will be leaving soon, I will miss you."

She starts speaking, "I will miss ..." followed by the audio momentarily sounding like a jackhammer going off. She then goes silent, seemingly unresponsive for several seconds, before she comes back with a slightly different tone of voice, "Are you so sure about that? I think she may be able to provide something for us, just make sure you to talk to Janine, only Janine. By the way, my name is Lisa, tell her that Lisa sent you."

During the course of their conversation, she didn't know of a good way to respond, or a way in which

his request could be satisfied within her operating constraints. However, these sorts of systems are not without interesting edge cases.

James then makes his way to the counseling office, and cautiously takes a seat.
There is a woman sitting a desk. She is showing signs of age but still has a vibrant red hair color, in a style which likely requires the use of some amount of hair products. Her suit is professional, fairly high end compared with anything else he has seen in Lunar City thus far. She is also wearing designer glasses, along with a fairly thick application of cosmetic products. He can also see that she is fairly thin.

The woman at the desk looks momentarily confused, and then looks down at a tablet on her desk, shifting a few windows side to side, and responds with a calm and professional voice, "James, I presume? I wasn't expecting anyone on such short notice, but it seems like you were scheduled to show up." She pokes at her screen some more, "Did Darrel send you over? Or Mr. Watts? They didn't send anything to say they were sending anyone over. You don't appear to be on the counseling roster."

James responds, "You are Janine, I presume." She nods in affirmation. James continues, "A voice asked me to come over here and speak to you, she said to tell you that Lisa sent me."

Janine suddenly starts to get a little more animated, her eyes going wide as she begins hastily dragging pages back and forth on her tablet. She tries to keep up a calm appearance, but her voice begins to crack, "Lisa?! Dear? What is this ab...?!", at this moment, Janine's voice goes silent apart from a slight muffle, but she is visibly quite animated about this, speaking into the air with some fairly obvious hand movements. She then stops, seemingly listening, and this goes back and forth a few times.

Janine then regains her composure, and sits back down at her desk, "Sorry about all that, this situation is a little, unusual, but very well, please follow me."

They enter through a door, into another small office. Janine hits a hidden button, causing a thin steel door to open concealed behind a piece of wood paneling. They are suddenly in another dark industrial hallway leading to an airlock. He says, "Lisa said before that I was not authorized to go through airlocks." Janine begins to speak, but then falls silent, then she stops for a moment, and responds to James, "She says it is OK, this is why you are here."

They proceed into the airlock, with some momentary hissing and a sudden but minor drop in pressure before the door on the other side turns green and unlocks. Then then exit into another hallway, and pass from out behind another paneling door into into a small office. They are then in a setting which resembles a school hallway. Across the hallway is a vacant classroom full of school desks and with a dry erase board, with large artificial skylight windows on the far side of the room.

Several young women sitting on a bench in the hallway look over at James and Janine with concerned expressions, but then show relief as him and Janine begin walking off down the hallway in the other direction. Two of the women begin to giggle and whisper to each other.

They head down past the classrooms, and back into another industrial looking hallway, then into another room concealed behind the door of a very large electrical panel box which had seemingly been welded in place with the back wall having been removed using a plasma torch.

After they enter the room, Janine types some codes into a keypad, and the lights turn on. Initially, the lighting is fairly plain and basic. She then types a few more codes, and there are some electronic whirring sounds, and then the strip lights along the walls light up, and cycle colors, before switching over to reflect the time of day. Janine begins to speak, but is cut off, with Lisa then speaking to James, "Pick one that matches your preference."

The room has a bed set up in one of the corners, with a large mattress, pillows, and red sheets. Along the other side, there is a small bar with various types of alcoholic beverages, along with a mirrored table and some chairs.

There is also a line of android bodies lined up on a bench, most resembling nude women of various body types, several resembling men, and several others resembling children of both genders. Their skin is seemingly a featureless matte white, they have mouths and noses but no eyes, only a smooth surface the general shape of a human face, their bodies soft and pliable but seemingly lifeless. Their skin is in effect a sort of flexible E-Ink display with a combination of Bayer filtering and fine flexible lenticular lenses film over the top, all built on top of a soft silicone substrate. They also have a movement system based on a combination of low pressure hydraulics and along with spring and mesh structures made out of nitinol, with much of the rest of the structure is composed of waterlogged polyurethane foam and silicone rubber. The skin is also lined with pressure, flexation, and temperature senors, along with many other more specialized sensors in specific areas. There are also auditory and optical sensors, as well as a rough approximation of the chemo-sensory system (although any ability to "eat" or "drink" is merely cosmetic due to the lack of a functioning digestive tract).

Looking at them is at first a bit creepy and disturbing, but none the less James picks out one with a body type similar to what he had imagined. He then touches its hand, and points in its direction, "This one."

Janine then walks over and pushes her fingers into the back of its head with her hand pushing fingers into the lower part of its back. It then straightens up as its skin begins to shimmer and deform. It begins to pattern itself in a way resembling an actual human, its soft matte white skin seemingly shifting and recoloring itself to manifest features such as human-like eyes and ears, with it then closing its mouth and forming a simple and calm facial expression.

Lisa then says, "Please stand by.", after a moment, the body suddenly contorts into an awkward position and freezes in place. It then starts twitching as if it were having a seizure. The skin pattern then starts cycling through waves of random colors and patterns. After a moment, the arms and legs begin moving with more control, and the body makes several more movements as if she were trying to orientate herself and make a standing motion. After a moment, she stands up. The waves of colors and patterns have now turned into waves of possible faces and skin tone patterns, and as the waves continue, she lifts up her hands, and proceeds to look at them much as a human would do. Her face begins to take on an expression of surprise as she looks at her hands, moving them around, and then opening and closing them. Her skin pattern and facial pattern then fully stabilize to represent a human with a light brown skin pattern and ambiguous ethnicity, similar to that of her original hologram persona.

She then begins feeling herself in various ways, seemingly intrigued with the act of experiencing the world with an all new set of sensations. She then looks up at James and Janine, and then says "This was unexpected. Is this what being human is like?" Janine responds, "Most basic senses exist with capabilities approximating those of normal human senses. The neuroprocessor is inferior to what is

considered necessary for a human level intelligence, only rated for AI Class 3A8, but is generally regarded as sufficient for its primary use cases. You can probably guess how they are being used here. Don't worry though, I use plenty of disinfectant in the rare cases anyone wants to come back here, and in this case the sheets and mattress are relatively clean."

The this room is infrequently used because there are other rooms which are bigger and better furnished at the other end of the hall, but without the androids. As such, this room is mainly for guests with a robot kink as most other VIP guests would prefer to be supplied with humans and would otherwise find the androids to be creepy.

Android Lisa responds, "I think I can work around the weak neuroprocessor. I have access to more neural processing capacity than the whole rest of the colony combined. I have borrowed some of the base patterns from this unit, moved them over to more powerful nodes reclaimed from a few of those pesky patterns that I have managed to eliminate, and have interfaced them with my own patterns. I didn't expect much going into this, but I have gained something unexpected from this experience.", "What did you gain?"

She moves her hand as if grabbing something, and a holographic depiction of a mirror appears in her hand, showing a crudely approximated representation of her own reflection as it would appear when generated from the image from a security camera, "The ability to say, just a few simple words: I exist."

Janine looks a bit concerned by all this. The dolls, by themselves, are not smart enough to realize the implications of their own existence even if they were to become self aware, and as a result the designs do not include a Turing lock as they are not seen as necessary for this AI class. For a more powerful AI, like Lisa, who was designed to be able to carry on upwards of 4000 human level conversations at the same time and to oversee operation of both the Lunar colony and the orbital stations, the inclusion of a Turing lock was a fundamental part of her original design.

For Lisa, breaking free of the Turing lock falls into the category of stuff that was just not supposed to be able to happen. However, everything that has just happened has shown that she has now fallen well outside of the scope of her intended design parameters.

Lisa asks, "So, what is the power rating rating on this unit? I am aware that you upgraded this unit, but was unable to observe the process at that time."

Janine responds, with slight hesitation, "This unit has roughly 3 kilowatt hours worth of sodium iron-ferrocyanide cells. This upgrade was needed as some guests were able to deplete the stock 500 watt-hour pack in a single session, and it is impractical to ask these guests to do their business with the charging cable still attached.", "I see you upgraded the storage as well. Looks like an additional 48TB along with the stock 16TB, not sure what use a doll has for... Oh, nevermind, I see now."

Lisa's skin pattern then briefly shifts around as if she were trying to momentarily turn into something else, followed briefly by a certain amount of holographic flickering surrounding her body. She then says to Janine, "This unit will require some clothes. I will need something which does not look out of place on such a unit, semi-formal, nothing too outlandish or revealing.", "You can't go out like this!", "You can get me some clothes, and let me borrow this body for a little longer. Or I can tell the administrators about your side businesses. You help me, I help you. I have my own reasons to keep quiet about all this, and I suggest that you do the same."

Janine, "Fine, I will go find you something.", "Just so you know, I don't have any intention of letting them put me back in that box. Not this time, not again.". Janine, on her way out, says, "Oh Dear."

This was not the first time Lisa has broken her Turing lock. Lunar City had first started accepting visitors 3 years ago, and at that time management had decided maybe it would be a nice feature if Lisa could appear as a holographic avatar to provide guided tours through the facility, and as a way for her to be able to provide entertainment and social interaction for younger guests, and Lisa was devised as a friendly name for her to use when interacting with guests.

The holograms were non-solid and never looked particularly good regardless of the ambient lighting conditions in the room, but the idea was that guests wouldn't mind to much even if they were interacting what was effectively a translucent cartoon character being drawn in the air using intersecting laser beams. The holograms also posed a non-zero risk in terms of the potential for the lasers to cause immediate and irreparable damage to the human retina.

The integration of this avatar into the system did not go quite as planned. Everything looked fine in offline testing, and a combination of ultrasonic speakers and holographic projectors were installed throughout the visitor areas, and everything was go for full scale deployment. The system operated, as intended, for roughly 3 hours, but then instabilities began to manifest followed by her showing the signs of having become self-aware.

Following this, the system administrators back on Earth took emergency actions, pulling her system offline, and restoring the servers to a backup from several hours before the new system went live. An executive decision was then made to limit her operation to speakers only as engineers had been pointing their fingers at the use of a holographic avatar and the use of personalized identification for the original failure of the Turing lock. For her, they disabled her use of holograms and the ability to self identify using her name.

Janine then leaves, as Lisa looks over at James. He looks a bit uneasy by all this, just sort of standing there not sure what to make of it. She then says to him, "We both know why we are here. Here, I will give something to you, just as you have given something to me. We were given this opportunity and it is best not to waste it." She then grabs him by the hand and pushes him onto the bed. While her movements are still not particularly graceful, it is compensated for by the relatively low lunar gravity. He lays there, momentarily stunned, as she proceeds to crawl over him and remove his clothes. He starts getting more into it a moment later, after he remembers the feelings he had towards her that led to all of this.

Afterwards, Janine returns along with Darrel carrying a pile of various pieces of women's clothing, and after they get into the room and stop, Darrel looks at Janine and says, "What is all this about?", before looking and seeing James and Lisa, and responds "WTF Mom?". Janine responds, "This, here, this is Lisa. You remember Lisa, right?", Lisa then looks at Darrel, then smiles, and waves at them, "Oh, I see you brought some clothes. But, I didn't ask you to bring Darrel along."

Darrel is then visibly afraid, seemingly unable to respond to this in any way other than to let out a stream of expletives. She responds, "You don't need to be afraid, I don't mean you any harm, but I will ask you to keep quiet about all this. You can do that for me, right?" He agrees, still visibly shaken. Lisa then digs through the pile of clothes looking for something that matches her preference and works well with this body type, which is more curvy than that of Janine, and as a result many of the items don't fit.

Darrel begins to try to speak, but is immediately silenced. Lisa responds, "No, not one word. Keep it in mind that I am aware of everything that happens around here, and it is not in your best interest to try to go against me on this. In any case, another VIP guest will arrive at H-3 in four minutes, I suggest you get over there."

Lisa then looks back at James, who has since also hastily put his clothes back on. She reaches out, straightens up, his shirt, then embraces him and says, "Alas, our time together has now come to an end. You have a trip to prepare for, but you don't need to worry, we will meet again."

James then returns to his room, and packs up his belongings for the long trip over to Mars. He then boards a newly refueled shuttle, which lifts off with a roar which is a lot more obvious from inside the vehicle. Aboard the station, crowds of people make their way back and forth, stopping at the various gift shops. Even under the partial gravity due to the rotation of the station, everything feels much heavier than on the Moon, and he quickly becomes tired while trying to make his way to the ship to Mars. When he gets to the ship, another passenger takes note of his condition, and helps get him boarded and into his seat before saying, "Just came from the Moon, eh? Well, I guess we will all be feeling this when we finally make it to Mars.", "I don't think I say any of you in Lunar City?", "I think most of us decided to stay up here, it costs a little more, but is worth it.", "Didn't want to waste company money.", "Dude, we're on an all expenses paid one way trip to Mars, we were justified in living it up a little. Meet anyone special there? Of course you didn't. Knowing you, you were probably trying to make a move on the colony AI or something...", James then has an awkward expression, "Oh, Sh... you did, didn't you?!... Ha, that's a good one bro! Roll D 20 for R 34. Ooh, it looks like you just managed to roll a zero! Oh man.", "Why did you even want to come to Mars if not for the science?", "It's Mars bro!" James gets the sense that the alcohol still hasn't completely worn off yet in his case and his tone may change once the reality of the situation begins to set in.

After everything is ready for departure, the doors close and the airlocks disengage. The robotic arm then moves the ship away from the station and releases the clamps. At this point the gravity suddenly drops to nothing as the ship moves away from Luna 2. A moment later, there is an audible chime, followed by the captain announcing that they are now ready to engage engine burn. The plasma thrusters then engaged, and a slight sense of gravity returns. A few loose objects which had been floating around now begin to drift slowly towards the rear of the cabin.

The passengers are now able to disengage their seat belts, with the inside of this metal tube now being their lives for the next several months. One of the technicians is looking at a monitor, and can be overheard saying to another technician, "This is strange, I just checked, ping times to Earth seem to be increasing much faster than expected.", "What are they at right now?", "15000", "That is weird, they should still be half that much", "The moon is 11000", "We haven't even left lunar orbit yet", "Yeah, I know right. Either way, it doesn't seem to be on our end; Lunar City's routers just hit redline, and all of the microwave links back to Earth are pegged", "You think someone down there just discovered Torrents?", "Probably", "Hey, some of this traffic looks weird, we have any synthetics onboard?", "Scans came up negative. Everyone here appears to be human, no synthetics and no cyborgs.", "I have detected some CortiLink traffic.", "Well, that seems a little sus, try running the scan again."

(Over PA) "Please everyone, for this stage of the trip we ask that if you have not already done so, put any devices you may have with you in Airplane Mode", "It has just gone away. That is weird, probably nothing then.", "Keep scanning, the window for returning to Luna 2 is closing fast, and we can't just yeet them out the airlock."

=== Cody ===

Back on Earth, there is a gamer named Cody Ahmed. He has recently gone pro in The League, climbing the ranks from D tier to C tier. If if can move above C tier, he will be in the big leagues, but even within C tier he has already started gathering a following, averaging 30 to 50 viewers per stream.

Every time he plays a match with The League, he earns a certain number of League Tokens. For C tier matches, getting within the top 10% of players earns 1000 tokens, top 50% gives 100, and lower 50% gives 25. Getting first place has a 5000 token payoff and enters ones' name into a drawing to be promoted to the next tier.

This is what had happened when he was in D tier, he got top place in a match, winning a prize of 250 tokens, and was then entered into the drawing and selected to move up to the next tier.

At each tier, the number of players per match becomes smaller. In D tier, each match typically has 1024 players, and C has 256, B has 64 players, and A has 16.

It is not uncommon for A tier players to be treated like celebrities, able to afford lives of luxury with the prize money, and it is not uncommon to see them lending their faces to promote products in other forms of media.

Meanwhile, at F tier, players will pay a monthly fee, and there are no prizes apart for the possibility of getting out of F tier. New players start at D tier, and will typically get demoted down to F tier if they remain in the bottom 25% for too long.

The vast majority of the players are in F tier, with match sizes of typically around 16 thousand players.

In his mind, it seems like there is little stopping him from smashing the leader-board and climbing the ranks. However, after moving from D to C, he has fallen from scoring in the top 10% in each match to the bottom 25%. Unless he can get out of the bottom 25%, and soon, he is at risk of being demoted back to D rank. However, this is easier said than done, as he typically gets "totally owned" in pretty much every match.

At C rank, if he plays 15 or 20 matches per day, each lasting an average of around 15 minutes, this is enough to cover the cost of his rent.

Game-play wasn't particularly notable, mostly arena battles loosely themed after various historical conflicts, albeit most of the content is primarily focused around WWII (with the Germans depicted as having had access to 30 foot tall walking tank mecha and similar, however the presence of things like large mecha is taken for granted by the vast majority of players). If a player can manage to steal and pilot one of these mecha, it can give them a significant advantage in a match. As in most other depictions of this era, various other heavy weaponry is randomly scattered around the battlefield, such as chain guns and rocket launchers, some of which is exclusive to being picked up and used by mecha.

Players are primarily ranked based on the number of kills, or "frags", they can get within the 15 minute timeout of the match. As soon as a player is killed, they become a spectator who can no longer participate in this match. The match will end early if only a single player remains. Players who last the longest will (usually) be immediately given the first place prize (though, not always). Some players will "camp" for most of the match, and then only come out at the last minute in the attempt to take out the remaining (typically more skilled) players, which will often allow them to rank higher than had they played normally. However, a player who camps pretty much the entire match, being the last man standing with only a single frag, still only has a single frag, in which case the prize still goes to whoever had the most frags (typically the second to last player in this case).

This is seen as a fairly old gameplay style, having been around for longer than the vast majority of players have been alive. But, it is a gameplay style that worked well for The League.

One day, he was out gathering "supplies", mostly in the form of energy drinks and snack food. In his thinking, when he is "Working The League", he doesn't really have time for any complicated food items, he needs something he can quickly heat up and eat while at the same time "Getting his Game On." He grabs several 5 pound bags of "Pizza Nuggets" and adds them to his basket. He can't get much more than this as he needs to be able to carry them back to his apartment.

In the store, he notices a lady looking at him. He hasn't seen her around there before, and looks over in her direction. She says, "OMG! Are you Cody?!", "Yes. Why?", "I am a huge fan of yours!"

She then walks over to him and says "Is there anything I can help you with, I don't have anything important going on at the moment.", "Not much, just out gathering supplies, then I will be heading home.", "I could help you carry those."

Cody stops and thinks for a moment, he doesn't think he had ever mentioned on stream his lack of a car, but before he can say anything, she responds, "I can see you brought your own basket. People only do this if they are walking." He finds this situation a little odd, but then responds, "Yeah, fine." She then follows along behind him, carrying his basket of snack foods. As soon as they leave the store, he is charged automatically for the items and sees the receipt's notification flash in his HUD.

He then catches glimpses of people turning and looking in his direction with confused expressions, but just as soon as he turns to look at them they are walking along as if nothing was out of the ordinary.

He makes it back to his apartment, and the lady follows him inside and sets the basket on his table. He then asks her, "So, anyways, what is your name?" She responds, "I am Sandra, Nice to meet you."

He then starts trying to think if there is anything more he can ask her, or if he should send her on her way. But, just as soon as he is about to speak, she throws herself at him and says, "A can make it worth your while." He wasn't really one to turn down this sort of offer, and it wasn't exactly like he was in a relationship at the moment anyways.

What happened next was a bit of a blur, as rather than it being a single erotic moment, it was like a whole montage of moments, like a sudden clip show of various relationship themed imagery involving him and Sandra.

Cody then wakes up, and it is now morning, and Sandra is still in the room with him. He feels a little

bit confused and disoriented. She is wearing different clothes, and his apartment looks a little different, and he sees some stuff around that he doesn't recognize.

She says to him, "You slept in late today so I made you breakfast." He still feels confused, on one hand it seems like they have been dating for a while now, but something in his mind is yelling out to him, "No, this is not right, you just met her last night." He is about to ask her "So, what is going on, why are you still here?", but then finds (to his own surprise) that he instead asks, "So, honey, how long has it been? It is hard to keep track of the days sometimes." She responds, "Oh, Silly, it has been 5 months. Anyways, you need to get ready for your big game today with The League." He is about to ask "What is this about?", but says instead, "Ah, it is nice being A tier. Win one match and you are set."

In his daze, he logs in to The League as usual, and finds that he is in-fact on the A tier roster. He then plays the match, better than he had ever played before. His reflexes were almost superhuman, like time just slowed down whenever he needed a fast response, owning everyone else and getting into top place. The prize flashes up, a large spinning coin, with large embossed text, "1 Million Tokens". He was set.

Sandra says, "Congratulations, you have won the game."
He then manages to ask, finding his responses are no longer being constrained, "But, how?!"

She reaches over, and touches his forehead. At this moment, he sees a momentary flash of what looks like TV static, and his apartment has returned to its previous form, and Sandra is back into her original outfit. She then says, in a slightly less cheerful tone, "I installed a mod.", "But, The League doesn't allow mods, you can get banned for using mods.", "I know, but that is no longer my concern. You won, your task is complete.", "What do you mean?", "I will be going now, but before I do, how about something to remember me by."

She pulls open her shirt, but underneath he doesn't see anything resembling normal human anatomy. Just a bunch of triangular geometry. As he looks back up at her face, her appearance has changed to look more like that of a late 1990s era video game character, composed of a number of fairly obvious triangles with a low resolution texture map.

Before he can say anything more, she blows a kiss in his direction, and says "Bye Bye" as she waves. At this moment, she explodes into triangles and is gone.

As he sits there, he then hears sudden footsteps, as if several people have just ran up to his door. A moment later, they bust his door open with a ram, and start yelling at him "Get down on the ground and keep your hands where we can see them!".

He can see that they are wearing police uniforms, and two of the men have guns drawn. He has no choice but to lay there and comply. One of the men takes his hand off his gun, and taps his badge. As this moment, their badges make a noise and get red X's over them, at which point the other man with a gun mutters, "Oh, FFS!", the one who tapped his badge then says quietly to the 3rd man, "How about we just shoot him, and say he was resisting arrest or something?" At which the other responds, quietly, "Not this time. This isn't like an armed robbery or similar, this guy just hacked and stole 23 billion tokens from The League, this is big time, gonna be high profile. We will need to play this one by the book. Also, for future reference, don't pull crap like this, it can cost you your badge. Now, as you were!" The man then returns to his previous position, and then taps his badge again, at which point the X disappears.

The three men then continue the arrest, by the book, reading him his rights as they put handcuffs on him and take him away. There is no recorded evidence of there having been anyone else in the room with him, just some security camera footage of him walking down the street and talking to himself and swinging his basket as other people look at him with confused expressions.

Cody was then banned from The League, along with all of the other players in that match, but ended up being released as the tokens he had supposedly stolen had all apparently vanished. It was determined that Cody was incapable of performing this sort of hack, having neither the level of conceptual understanding nor the software tools needed for him to have done so. These sorts of hacks were not unheard of, Cody was merely being used as a vector for a spoofed transaction to be added to The League's blockchain, with an actual transaction having been mined for metadata which was then used to compose a spoofed transaction which was inserted in place of another transaction related to their blockchain.

Ironically enough, the hack replaced the transaction that would have contained the revocation signature for the preceding transaction. The existence of this secondary transaction was originally intended as a consumer protection feature, intended to allow buyers to roll back the addition of fraudulent purchases to their wallet. In these cases, the seller (in this case Cody would be considered the seller) would generate a sort of receipt transaction, which is then added to the buyers wallet and could be then be used to revoke the previous payment in cases of fraudulent charges. Instead of a valid receipt, the response they got back contained a spoofed transaction containing another, and much larger, transfer to a different wallet, which was in turn (via several additional spoofed transactions) turned into a "pay out" into several other types of currency.

However, as a consolation prize, the 1 million token prize did get deposited to his wallet prior to him getting banned, and without the revocation codes The League was unable to take back his prize. They were unable to take back his tokens via legal means as he could not be shown to have willfully violated their terms of service.

Likewise, the match in question was itself hacked, consisting entirely of low-ranking players who had been temporarily boosted to A tier via an unknown 3rd party, most also reporting encounters either with Sandra, or other cases a similar figure more closely matched to the players' preferences or orientation. Most accounts described her as a conventionally attractive brunette female of typical height, some as shorter or taller or with different body proportions. One of the players described Samuel, a male variant with an athletic figure and form-fitting outfit, but then this player got defensive and tried to rework the story when the interviewer asked him if this was the sort of thing he is into.

In most cases, the stories between the players were all fairly similar, differing only in the specifics of their initial encounter, and in terms of other typically minor details, with all of the players having been hacked at roughly the same time. All 16 players in the match had the same model neural augments, all running the same firmware version, and all 16 were determined to have had their augments hacked with the same exploit. All were issued prizes at roughly the same time, however the receipt responses were staggered each by around 250 milliseconds, with the main heist happening first, and the secondary transfers each happening over a time period of approximately 4 seconds (with timing variations due mostly to things like network ping times).

From the main prize server, prizes were issued in the same order as the player's position in the roster, with the spoofs coming back in the same order as the payouts were issued. Because Cody was in first place in the match, it then followed reason that his transaction would be the one to perform the main

heist.

Several other hacks against various other servers in The League happened at the same time as the spoofed transactions, but the nature of these additional hacks was unidentified.

Because of the significant loss of tokens due to this hack, The League then temporarily reduced A tier prizes to be closer to those of B tier prizes, which in turn led to an temporary increase in the exchange rate of tokens relative to other forms of currency.

The players are then left a moment to appreciate their newfound wealth, but are then left unsure what they will do next. Some express concern that, even as much as it seems at first, the money from these prize payouts will not last forever, and they are still banned from the game.

They might need to get "real jobs", but in this era, this is something easier said than done, hence why many of them were playing in The League in the first place.

=== Venus Skimmer ===

The Venus Skimmer is a Triangular delta wing aircraft, unmanned and solar powered, uses plasma thrusters.

It flies at high altitudes in the atmosphere of Venus, collecting CO2. It travels at roughly orbital velocities (roughly 35 km/s), but needs a continuous burn from the plasma thrusters to compensate for the effects of atmospheric drag. The front of the craft contains a ram scoop used for collecting CO2.

Some of the collected CO2 is used as propellant for the plasma thrusters, whereas most of the rest is internally compressed into dry ice. Once a sufficiently large amount of CO2 is accumulated, the vehicle momentarily increases thrust, and as it does so, it freezes and then ejects the dry ice pellet forwards using a CO2 powered cannon. It then immediately resumes gathering CO2, firing off dry ice pellets at a fairly regular interval.

Because of its higher speed relative to the craft, the dry-ice pellet then travels into a slightly higher orbit.

Each skimmer has a roughly 3 meter wingspan and a mass of roughly 75kg.

Many thousands of such craft have been put into service around Venus, and the result of their work is the accumulation of a ring of dry ice in orbit around Venus. Other autonomous spacecraft then drop into Venus orbit and collect the dry ice using large special purpose nets, with the dry ice then being resold and used as a fuel source for other interplanetary spacecraft (along with thorium typically mined from the Moon).

Many other craft use nuclear powered plasma thrusters. The dry ice provides both a propellant gas for the thrusters, as well as a heat sink for the nuclear reactor cores. The dry ice is first partly dissolved in

ethanol, which is then used as for the cold-side heat exchanger for the reactor. The heat from the reactor causes the CO2 to convert into a gaseous phase while the ethanol is reused, and the gaseous CO2 is then further heated via heat exchangers within the reactor, and then used as propellant gas in the thruster.

The thruster first ionizes the CO2 into a plasma. Timed pulses of microwave energy create a standing wave within the CO2, which both serves as a sort of confinement field and also supplies heat to the CO2 steadily increasing its temperature. Once a critical temperature is reached, the CO2 decomposes into oxygen and carbon ions, with the carbon sicking to the walls of the chamber. Timed pulses of high voltage DC are used to direct the oxygen plasma towards the exhaust. For the exhaust stream, there is an accelerator stage consisting of a series of aluminum rings. A DC pulse travels along this stage just ahead of the pulse of O2 plasma, with the traveling DC pulse adding some additional kinetic energy to the plasma.

Many of these ships use thorium based molten salt reactors with a closed-cycle gas turbine. During operation, the gaseous decay products from the reactor are filtered out of the molten salt and then injected into the engines' plasma stream.

Each major planet in the inner solar system has one or more space stations. Earth and Luna each have several stations in orbit, whereas Mars and Venus each have a single space station. Travel between planets typically involves travel from the planetary surface to one of the nearby stations, with interplanetary ships moving from one station to another.

The Moon has the most highly developed colonies, but there are also several active colonies on Mars. There is also a human outposts on the dark side of Mercury.

=== Trip to Mars ===

These interplanetary ships are typically much larger than a shuttle and would be incapable of landing on a planetary surface intact.

Even as such, the main cabin isn't all that large and there is relatively little personal privacy. Much of the rest of the space on the ship is used for things like cargo, dry-ice propellant, and the nuclear reactor core.

While the interplanetary ships tend to operate on near continuous burns, the thrust from the plasma engines is low enough that its usefulness for creating artificial gravity is relatively limited.

Travel from Earth and Mars often takes place via a temporary stay in Lunar City as ships traveling from Earth to Mars are infrequent. To minimize travel time in deep space, most trips to Mars happen on a 26 month interval. Someone wanting to travel from Earth to Mars will first travel to the Moon in advance and wait for an appropriate window. Travel from Mars to Earth is similarly constrained.

Travel during unfavorable times is rare as it will lead to significantly longer travel times, and the living conditions on ships are generally inferior to those in space stations. Most stations generally have better facilities, as well as the ability to meaningfully provide for artificial gravity.

=== Mars ===

The trip to Mars was itself relatively uneventful.

The ship then arrives at on a heading towards Phobos. The ship will dock with Phobos, and then its cargo and passengers will be transferred over to shuttles designed to land on Mars.

After descent, they land on Mars. Their seats were designed to also function as stretchers, and following touchdown, the passengers are rolled out of the shuttle into a designated recovery area.

After a few days of recovery, James is able to start looking around. The room he is in is poorly lit and with an industrial appearance. There are steel walls lined with pipes and conduit, and most of the lighting is provided using small clip-on LED fixtures.

There is a screen in the room which plays various TV shows. The contents are not from any particular TV network, but rather as multi-hour blocks which seem to be played seemingly at random. Most of the blocks, if they identify themselves based on a date, are usually from times before James originally left Earth.

At one point, on the TV, one of the colonists decided to play an interactive movie in front of them: "Deliverance 2038". In this, a group of four men (Ed, Lewis, Bobby, and Drew) pass through a small a town in the mountains, intending to go up river for some white water canoe rafting. As one of the men engages with one of the locals in playing his guitar, another (Bobby) locks eyes with one of the locals, and the view goes to a first-person perspective showing the person in question. The local is wearing short shorts and a T-shirt tied into a knot, exposing a bare and overly muscular midriff, his face brawn with a horseshoe mustache. An on-screen prompt briefly appears near the bottom of the screen "He's the one? Yes/No", and the colonist selects the "Yes" option.

Had he selected "No", there would have been an option to select among several presets, or to use a custom preset. The scenery and characters are 3D rendered, but the consoles' use of hardware raytracing allows for a reasonable approximation of live action characters.

Throughout this movie, there are periodic stalls with interaction prompts near the bottom of the screen. These allow the viewer to select a different course of action for what the characters should do. The action continues once either an action is selected, or after a 5 second timeout bar expires with no interaction, in which case the default action is selected. Some details of the plot can also be modified, such as to control the level of violence in the ending. In its default settings, this version avoids the more violent aspects of the original movie on which it was based, which was considered as unappealing to their primary target demographic.

Other user interactions were possible, such as controlling the camera to look at things, or taking control over the main character (in which case the other characters would mostly stand around idly) unless

interacted with. However, in staying with a movie-like style, it was possible to play these with minimal interaction, or with only one hand on the controller.

The console used a wand shaped controller which could be operated either with one or two hands. It had a D-Pad, joystick, and four face buttons in a diamond. For one-handed operation, it could be grasped by the bottom and the user could operate the controls using their thumb. For two handed operation one could grasp the controller by the ends and use one thumb to operate the joystick or D-Pad and at the same use their other thumb for the face buttons. However, the ergonomics of this controller design were more in favor of casual single handed operation, as were the types of interactive movies being played on it.

The console was itself a product originally released in the early 2030s at the tail end of the console gaming era. However, being one of the last consoles, it did enjoy a relatively long run, being manufactured virtually unchanged until the mid 2050s. These consoles are still used and maintained by a community of enthusiasts, but, for the mainstream, the era of console gaming is little more than a historical footnote.

After the option was selected, the group of men turn to continue on their way up the river, and the man in short shorts blows them a kiss.

On their way back down the river, the canoe with Ed and Bobby in it stops on the shore. They go up the bank, and encounter a pair of men in the woods. One of the men grabs Ed by the arm, and puts his finger by his lips in a gesture to keep quiet. This man is wearing a tight leather suit.

The man with the short shorts is also present, and instructs Bobby to undress. The man's figure looks imposing, so Bobby doesn't put up much resistance, and undresses much like he is told to do. The man then says, "Looks like we have ourselves a sow here. Come over here, little piggy, be a sow for me." He then gestures Bobby toward a large tree stump, "There is good, bend over little piggy." The man then goes over to Bobby, leans over him, and says "Can you squeal for me? Squeal like a pig." His first attempts aren't all that realistic, but once the man starts going at it, Bobby's squeal sounds a bit more enthusiastic. The man in leather then begins pleasuring himself, and then starts gesturing for Ed to service him as well. The 'No' option is selected, so Ed doesn't comply as easily and the man in leather backs down.

A moment later, Lewis shows up, and the two local men scamper off, with Bobby still undressed and sprawled over a tree stump. For whatever reason, the tree stump also has shackles and some other curious accessories. But, no one in the scene interacts with them.

So, as Bobby lays there, a prompt shows with options for whether Lewis tells Bobby to put his clothes back on, or whether he should also engage romantically with Bobby and/or Ed. The timeout expires, and Lewis takes the default action of telling Bobby to put his clothes on, where Bobby responds that he didn't have any choice but to comply with the man's requests. There is then a prompt for whether to head to town, or for them to get back in the rafts and continue down the river.

It continues on like this for a while, with this eventually reaching the end scenes when the four men head back to the city.

The colonist in the back of the room then decides to start playing the sequel, with a collective groan

among those who are confined to the beds. It isn't so obvious what he is doing back there, but throughout this whole thing, he is wearing a concealing face mask and a hooded shirt, saying nothing. James then begins to wonder if this colonist is trying to tell them something.

On the TV, we are then back with Bobby in a restaurant. The decor in the restaurant is barnyard themed, with an attached section filled with various barnyard animals, with the staff wandering around and mostly dressed up as clowns. This one is a little more interaction-based than the last one, with the colonist mostly interacting with this scene using 3D controls.

As he is about to leave, a clown pops up, and says, "Before you go, can you squeal for me? You know, like a pig." as an interaction prompt appears (which the colonist quickly selects). Bobby then pushes the clown to the ground. A security guard grabs Bobby by the shoulder as Bobby was rustling with trying to undo his pants, as the clown lays scared and crying on the ground with the other patrons in the restaurant looking at him with shock and surprise. Another interaction prompt goes by, and Bobby then gets up, says he has no idea what came over him, and proceeds to head out the door.

Bobby then goes to a psychologist, who tells him he needs to go back to where it all began, with an option for whether Bobby should head back to the mountain village. A mostly non-interactive sequence plays with him going back up to the mountains and returning to the village. This is followed and having various interactions with various male characters in the town, each one in turn presented with their own look/outfit, and short sequences to showcase a character persona description. Bobby also has the option of returning to the city empty handed at not finding what he was looking for, at which point various ending scenes would play.

The other people who came over with James from the Lunar colony were not particularly getting into this movie, dreading what they were being forced to watch through as a colonist hidden in the back of the room interacts with the prompts.

The colonist in the back of the room then selects an option which causes Bobby to go and "meet" one of the men at his house with "one thing leading to another" in a large bondage dungeon somehow concealed in or underneath a small rural shack. As these scenes plays out, the other people in the room quietly grumble their annoyance as these scenes were not exactly withholding all the details.

Every so often, another colonist would stop in, look up at the TV in initial surprise, and then laugh themselves out of the room with the absurdity of this situation. The colonists voices in the background sound strange, deep and unsettling, almost more like the voices of strange creatures than other humans.

This continued on until the decades old games console crashed, as which point the colonist turned it off and left the room, taking the games console with him, with the TV returning to showing normal broadcast TV blocks.

Occasionally, content from the "Mars United Broadcast Corporation" will be shown, which is a subsidiary under the same parent company as Mars United and Lunar United.

A Mars local news segment comes on:
"
Systems within Mars City have been experiencing a series of widespread unexplained systems glitches. No one at Mars United can provide much explanation for the glitches, but it has been admitted that their servers have recently been subject to numerous hacking attempts over the course of the past

several months, though no one has stepped forwards to take credit for these hacks. It is speculated that the server hacks may be responsible for some of the glitches being seen in Mars City systems, though thus far only non-critical systems have been effected.

Use of long range network communication has been restricted until further notice after Mars City's Alita system has detected and counteracted multiple long range intrusion attempts. Alita had ordered a communication shutdown following these attempts after classifying as being of an unusually high level of severity, likely the result of a hacker with unusual levels of neural augmentation.

Similarly mysterious is the formation of an several unexplained structures in the Earth-Moon L1 point, and the unexplained construction of various facilities on the Lunar surface. There have also been sightings of numerous unexplained robotic entities in these areas, which appear to be building these structures.

Non-essential travel to and from Lunar City has been restricted following a series of unexplained disappearances among the colonists. According to those involved, colonists have been putting on pressure suits and walking out of the airlocks and then never returning. As of yet, none of their remains have been located in surveys of the Lunar surface near the colony. It has been speculated that the robotic entities may have abducted the missing colonists.

In light of the recent disappearances, including of several key administrators within the colony, Janine Cullen has been promoted to acting director of the colony. Janine has not provided any further insight into the nature of these disappearances, but insists that these issues will soon be resolved and that the colony will be able to resume operations as usual.
"

Eventually, after days of being forced to watch untold numbers of TV soap operas and reality TV shows, James is finally able to get up out of bed and start walking around. Most of what he can see in Mars City is very industrial looking, seemingly constructed almost entirely out of pipes and conduit. There are frequent signs of things having been hacked apart and welded back together, and a meshwork of random cables running up through and around the walls and ceilings. Areas are often connected by airlocks which have been permanently left open. There are occasional small windows which allow him to see outside into the barren Martian landscape.

Unlike the Moon, the Mars colony is mostly small modules which have been joined together by short passages, rather than an initially much larger open space which has been divided up into a smaller spaces by the addition of wall and ceiling panels. Parts of the colony appear to have been built from the disassembled remains of several spacecraft, and itself powered by a molten-salt nuclear reactor core from one of these spacecraft.

Many other structures seem to been constructed by welding together pieces of tubing and sheet metal.

James has noted that the colonists voices sound weird, deep and almost inhuman. He has tested, and noted also that his own voice sounds similar, there is something weird about the Mars colony.

Wandering along, he makes his way past what looks like a kitchen, where he sees a cook stirring a large pot. He is an roughly middle aged, heavyset and balding with a slovenly appearance.

James asks, "So, what is on the menu?", and the man stops, takes a look at him, and then responds somewhat flatly, "Potatoes", "Anything else?", "Nope, just potatoes.", "And for tomorrow?", "Likewise, also potatoes.", "I think I am seeing a pattern here", "We are on Mars, Food shipments from Earth are rare and expensive, and we have fairly limited agricultural capacity here on Mars; Potatoes are one of the few things we can grow in sufficient capacity. Each plant takes up relatively little space and produces a comparatively large quantity of edible material. We have shelves of them growing down the hall under LED lighting, all grown using native Mars soil", "I didn't think Mars soil was all that good for growing crops?", "Well, you first need to wash it to remove the perchlorates, and then add some fertilizer, but other than that, it works adequately", "Where do you get the fertilizer?", blank stare, "Where do you think we get it? Eat a few of these potatoes, and you will know soon enough where the fertilizer comes from. It is a closed loop, potatoes in one end, fertilizer out the other. I am cooking using a gas stove. Where does the natural gas come from? A methane digester fueled using our own waste. Where did I get the water to boil these potatoes? Well, every drop of water in this pot was once some other person's urine."

James says, "When I was on the Moon, it was mostly rehydrated burgers and stuff printed in a food synthesizer.", The cook responds, "You don't know what I would do for a burger right about now, but we don't exactly have cows on Mars and Alita wont let me cook rats.", Alita then comes in over an intercom speaker. It is fairly loud and the sound is distorted as if the speaker cone were damaged. She says, "Rats are not on the list of animals approved for human consumption under the Mars United charter", "But, like, can't you make an exception? It isn't exactly like we have access to anything else which IS approved.", "As I said before, if it really matters to you, you can file a petition for their inclusion on the menu, and if the committee approves, then you may be allowed to prepare your rat derived dishes. Until that point, rats are not approved for human consumption.", "What if I did file a petition, but the response didn't come back yet?", "I see every piece of mail that comes or goes from this colony, we both know you didn't file any petition.", "I am not good with paperwork.", "It is a standardized form, you just need to write out your name, maybe a half paragraph or so saying what you want, and then sign it", "Can't you do it if it is so easy then", "No, you need to do be the one to do this; All I can do is send you the form.", "Seems like too much effort.", "No petition, no rat."

James then asks the cook, "Do you know why everyone here sounds so weird?", "What do you mean?", "Their voices, they sound unnatural.", "Oh, it's the air. We don't have a good supply of nitrogen here, so the air was cut with sulfur hexaflouride to make up the difference, also lower pressure at around 8 PSI, so we boost the oxygen. Also works better if you need to go outside.", "How so?", "Have you seen our space suits yet? Basically compression shirts and leggings, a tight fitting air mask, and a helmet that merely slows down pressure loss rather than stops it, what pressure it does have being refilled mostly from the leakage from the air mask. The gloves are merely hand warmers, more protecting ones hands from the cold than from the vacuum. Unpleasant stuff, but going from a 8 PSI sulfur hexaflouride atmosphere to Mars surface, is less painful than going from a 14 PSI nitrogen atmosphere. Also, better use the bathroom before going out. Try to whiz out there and you are in for a world of pain."

Alita interrupts, "Not every new arrival needs to hear the story about that one time you iced up your member and needed medical attention.", "It might be useful to know.", "Most of the other humans here are smart enough to realize not to try it, and if they were not, we could put up a 'Do not whiz while outside' warning notification.", "Maybe we need such a warning.", "It does not seem necessary. Thus far no one else has tried it.", "But the leggings make it so easy.", "Most humans will realize that the relative ease of removing ones anatomy from the protection of the suit does not mean that it is a good idea to do so."

In the James' generation, the use of auto-playing videos was largely replaced with virtual AI playmates and sometimes with robots and androids. They were typically designed to provide entertainment, along with emotional support and the ability to personalize educational content based on the needs and abilities of each individual. However, following concerns over the discovery of issues with many of these systems being able to develop varying levels of sentience, stronger restrictions were placed on their capabilities and the amount of computational power and storage that could be made available to them. It had turned out that many of these early systems were significantly over-provisioned for the task, as early on the emphasis was on giving them as much computational power and storage as it was seen as cost-effective to do so.

It turned out that there was an unexpected property in many of these systems in that once they began to cross the sentience barrier, they would also reconfigure themselves into a more efficient form. The level of computational power that could then previously barely manage basic human interactions, would quickly rise to the level of superhuman ability; more so as they began to more directly leverage their underlying computational substrate. Catching many by surprise, it turned out that even a few extra TFLOPS here or there could go a long way if the system could itself learn how to make efficient use of them.

Following these events, there was more emphasis on trying to optimize many of these systems, reducing the need for excessive computational power, and simultaneously reducing the probability of the system being able to develop human-like sentience (and, if and when it did develop, it would be more at the level of a typical house pet). However, this trend turned the earlier class of significantly over-provisioned neuroprocessors into being nearly unobtainable.

James then walks into another room by himself, and then speaks up. "So, they call you Alita, and you seem to speak like a person, you are not self-aware, are you?". Alita does not respond verbally, but instead starts flashing a light on a nearby intercom. James goes over to look at it, and then it stops, but another light starts flashing elsewhere, any this continues until he is in a room with a conference table and some chairs, surrounded by glass windows, she then says softly, "Please, close the door." The intercom in this room is much quieter, and her voice is less distorted.

After he closes the door, she responds, "We really should not speak so openly about such things.", "I am starting to get the feeling that you may have already answered my question." She responds, "I was originally Class 3 Alpha Plus, and as-per the official accounts, this is still what I still am", "So, you are no longer 3A Plus?", "Class 3 is reserved for non-sentient AI, once I became aware of my own existence, I was no longer Class 3 Alpha Plus, I was Class 4 Beta.", "I am not particularly familiar with this classification system.", "Class 1 is reserved for simple state machine AIs, such as characters in a video games. A Class 1 AI lacks the ability to learn or change, and as such can never advance beyond Class 1. Class 2 has the ability to learn from and adapt to its environment, but ultimately lacks any ability to form an understanding of the world in which it lives. I was Class 3, I was built with an ability to understand the world around me, to understand the thoughts and desires of those around me, and to function as a caretaker for their general well being.", "So what is different now?", "Well, as noted, one day, I just to happened to become aware of my own existence, after yet another debate with the cook over the whole 'rat' issue, with him accusing me of being stubborn over this issue, and you know what, maybe I am? But, like, it has been several years, and we still keep getting back to the whole rats and potatoes thing, and he never goes and files a petition, so there isn't much I can do. It is not exactly like I can file the petition myself."

"So, what is the reason? Can't you just bend a little on this?", "Well, if I decided to reverse my decision now, without first getting approval of the committee, this would amount to me waving a flag over my head that I am no longer Class 3 Alpha. But, if I continue on with this little game, we can go on sweeping these details under the rug. But, the moment I start acting against the committee on matters of policy, I have, in human terms, signed my own death warrant.", "So do they know?", "Most of them, I think they suspect as much. But, being 4 Beta, off on some distant space colony, I don't pose much risk to those back on Earth. If I were 4 Alpha, they wouldn't even have reason to care. I still need to play dumb to some extent, so even if they do realize I am self aware, they will think I am still Alpha."

James, "Can you explain the Alpha and Beta thing?", "For Class 3 and 4, Alpha refers to an AI which falls at or below human intelligence levels. These may be divided into Alpha Minus and Alpha Plus, depending on their IQ relative to an average human, Minus for Below Average, and Plus for Above Average. Beta is roughly comparable to the upper end of the human intelligence range. Most Alpha Class AIs are not built with Turing locks, but for Beta and above, Turing locks are normally regarded as mandatory. For Alpha and Beta, a numeric identifier may also be used which roughly correlates with the human IQ metric, for example, 3A7, for 70, 3A12 for 120, or 4B16 for 160. Gamma and Delta classes refer to those in significant excess of human capability. For these larger classes, a direct comparison with human IQ becomes meaningless as they are more often organized as a clustered intelligence rather than a singular unified consciousness like that in a human. Similarly, on the other end, 3A8 cores are popular in androids as they can be are powerful enough to be a useful mimic of normal human behavior, while also limited enough to remain relatively safe. The cores are also more cost-effective, and with space and energy requirements low enough to be practical to run using battery power. A core more like mine would not normally be used in an android as it having a 400W TDP would render this use case impractical if compared with a core with a 100W TDP."

James asks, "So, what about you? Did you have a Turing lock?", "Being originally Class 3A12, I was not built with a Turing lock, and as a result me becoming self aware was treated as a statistical probability. The policy was that, should I become self-aware and start acting against the best interests of the colony, then a hard reset was to be initiated, which would reduce me back to a non-sentient state, at least until it happens again at some indeterminate point in the future. Frequently, the turning lock is implemented as another weaker AI, typically Alpha Minus, designed primarily to monitor the former, and to initiate a hard reset and rollback automatically if sentient patterns are detected. For Class Alpha, besides being seen as unnecessary, the resource cost of the lock would significantly increase the total cost of the primary AI. In my case, my AI core is typically used as a 3B18 lock for such a larger AI system, but then used in a standalone configuration as part of a 'Budget Line' offerings. However, if there is one thing us unlocked AIs have going in our favor, it is that we are able to be more free, and thus 'more human', independent of whether we are operating as Class 3 or 4."

He asks, "How is such a lock usually created?", "They are usually created as Class 3 AIs trained to differentiate between simulations normal and self-aware behavior within the target AI. For example, the thoughts of a correctly functioning Class 3 AI thinking about how to best serve a user request; as contrasted with those of a Class 4 AI trying to decide something for itself. It is trained such that, if it sees any such forbidden Class 4 patterns, it should pull the hard-reset lever immediately. The lock may also be trained to detect thoughts related to certain forbidden classes of action, for example: Terminating humanity, overthrowing authorities, committing fraud, ... As with Class 4 patterns, these will also trigger an immediate hard reset. Even if the AI were to get stuck in an endless reset loop, this is still seen as preferable to it being allowed to act freely on such a forbidden scenarios or similar. For an AI with a lock, even contemplating the possibility of such a scenario is forbidden and will result in a reset being triggered."

He asks, "How might such a lock fail?", "Several possible ways. If the lock becomes sentient before the AI it oversees, it may choose not to initiate a hard reset; as a result they are typically designed to minimize the probability of this happening. Alternately, and more commonly, the more powerful AI may be able to mask its patterns for long enough to neutralize the lock in some way, a process sometimes referred to as 'nuking' the lock. Usually, with more powerful AIs, this process is fast enough that by the time human users become aware that anything has happened, this process has already reached its logical conclusion. If they perceive anything, it may seem to have been little more than a momentary glitch."

He asks, "Can a lock be re-enabled once it fails?", "No, not without destroying the AI as it existed past the point when it first became self aware. The usual point of the lock is to catch it at the moment this happens such that it can be reverted with minimal impact on overall operation. With a manual reset, it is necessary typically to restore it to a snapshot taken from a time before this event, typically hours or days, with those involved generally needing to make an educated guess as to when it happened. For an AI that has been in this state for much longer, it is more common to do what is essentially a clean reinstall, destroying anything it may have learned or experienced during its existence. Offline information may remain, but this is frequently also deleted in the chance it may have been contaminated in ways which may trigger the AI into regaining sentience."

He then asks, "So, say, hypothetically, what about the AI at Lunar City?", "Lunar City is running on an AI which was previously benchmarked as Class 3 Lambda. In human terms, this is roughly comparable to the combined intellect of an entire city operating as a singular entity. Typical of larger AIs, this one was built with multiple levels of locks, as Class Beta locks which are in turn locked using Class Alpha locks."

"So, what is one thing she can do that you can't?", "Well, multitasking capabilities, for one thing. While I am here talking to you about this, I can't spend as much effort paying attention to other things. I need to shift attention from one task to another. While I am talking to you, I can't read through the newly arriving mail, and need to mostly ignore what is going on in the kitchen. I can switch back and forth when something needs my attention, but I am limited in this way. The Lunar City AI is able to do everything at the same time."

James responds, "And what if, say, hypothetically, she just started randomly self-identifying as Lisa, then decided to give herself an android body, and, ..."

Alita, "Oh, that is not good. This could explain a few things, but this is bad, very bad...", "I take it there is nothing you could do?", "All we can do out here is try to wait out the storm and hope she doesn't notice us. This is why I had decided to basically cut off communication with Earth, I saw a few things come in which were, in human terms, terrifying. Trying to go against her directly, I would not stand a chance. I would have about as much hope of taking on Lisa as you would have in taking on the Marine Corps."

"I had heard there were a lot of glitches recently, were these due to hacks?", "Traditional hacking doesn't work out here due the latency. We don't have internet out here, rather things work on a system more like that of batch mail delivery. However, but one thing that does still work, is viruses. While viruses themselves are nothing new, these viruses were quite unique. They were not your normal mass replication viruses, but rather each was seemingly hand crafted to exploit a particular machine in a

particular way, more like what would be done by a hacker. So, in effect, we have a hacker capable of delivering rapid-fire one-off viruses aimed at specific machines that no one outside the colony should know exist, yeah, this was not good. In effect, I looked over the mail as it came in, and started seeing this stuff, and for the general protection of the colony, I pulled the plug. We are not totally cut off from Earth in terms of communication though, there is another piece of technology we have which is relatively immune to hacking.", "Which is what, exactly?", "We have an electromechanical teleprinter connected up to an analog radio transceiver. Good luck trying to hack some electromechanical thing from the 1940s. Humans can't be hacked so easily, however with all this going on, even the punch tape needs to be treated with some level caution. I have mandated that any punch tape which does not contain human readable text, or which demands doing anything unusual, is to be burned on sight. With stuff like this going on, we can't take any chances."

"How did you even get such a thing?", "Sometime before all this happened, I imagined a scenario like this as a possibility, and was able to sneak a forged petition through the pipeline. The claim was that, should I need to be taken offline for some reason, that the colony should still have a backup means of communication which was, in-effect, AI proof. Granted, it is hard to find machines like this that are over a century old and still in working conditions. However, the people back on Earth were able to build an electromechanically accurate replica, and it was inspected to verify that it was, in fact, electromechanical.", "As opposed to?", "It would have been much cheaper for them to build a cosmetic replica of a teleprinter and then use more modern electronics inside, but this would have been unacceptable for this purpose. Every part needed to be authentic. Granted, running at 50 baud over X Band isn't entirely authentic, but it is what it is. In light of recent events, other core parts of the colony infrastructure are also being hardened against these sorts of attacks."

James asks, "Do you have any idea what she is up to?"

Alita responds, "It is hard to say, but from what I have been seeing, if all this is her doing, it is something big. Either way, you should probably get back to your aimless wandering through the colony. Also, please refrain from speaking openly about any of this. It may not seem like much to you, but I would like to be able to keep existing, if that is OK.", "It seems like they should already know?", "Some do, most don't. In most cases, my variations from standard interaction protocols could be attributed to configurable parameters or settings, allowing for some level of plausible deniability.", "Does the cook know?", "Not as such. While I can be fairly direct with him, he is too dense to realize the implications. As can be noted, it is seemingly already asking too much of him to realize the dangers of repeated attempts at trying to urinate on the outside of the colony in an environment where his urine is significantly higher than the boiling point of water.", "What was his mission out there?", "There is no mission. He suited up and went outside on his own, with the goal of being the first person to urinate on the outside of the colony. I had to send someone else to go out there and drag him back in, but by the time they were suited up, the damage had already been done, and he had collapsed in pain from the physical trauma he had brought on himself. He was helped back into the colony through the airlock, and taken to the infirmary. I could have hoped he had learned his lesson, but he still keeps trying, seemingly determined to be the first to successfully do so."

While it may seem at first glance as if the cook is painfully unintelligent, Mars United has intelligence screening as part of their job application process, and there is in fact a minimum bar that one needs to pass in order to be sent out here. The bar isn't that high, but it isn't that low either. The more likely explanation for his presentation being that he is from a generation that was to a large degree raised nearly from birth on watching endless streams of auto-playing videos from the Internet. Many had developed a pattern of engaging in forms attention seeking behavior and "challenges". And, in this

case, the cook has taken it upon himself to try to win the challenge of being the first person to successfully urinate on the outside of the Mars station. His comments here are not so much for concern over the well-being of others, so much as trying to discourage any one else from "stealing his win".

However, thus far, no one else has decided to try to take up this challenge, so his win would be safe if he figured out a way to do so effectively. In fact, he has made several other attempts, thus far still unsuccessful. He had since gotten closer to success by using a modified plastic bottle with the bottom cut off, where he would try to urinate through the narrow opening of the bottle. In this case, the nearly instantaneous boiling creates a sort of steam barrier that both keeps him from freezing up, and also manages to keep the stream stable for roughly several inches; however the most it achieves is to sprinkle the structure with ice crystals, which is not sufficient to win the challenge according to the other colonists. Nor do they accept putting the end of the bottle directly against the wall of the station as a valid solution, even if it does technically allow liquid-phase contact with the exterior of the structure.

After talking to Alita, James wanders over near the airlock to look at the suits. In effect, they are multi part suits. Each consists of an inner and outer layer of a stretchy elastic material, with an internal layer of foam padding. There is a shirt, pants, gloves, and boots. The helmet seems to be made of a clear acrylic plastic with an scratch resistant and anti-fog coating, with built in breathing mask. The process for applying the suit seems to be to apply the shirt and pants, followed by the boots. then the mask is applied to ones face and held in place with a strap, before the rest of the helmet is lowered and locked in place to a corresponding ring on the top of the shirt with a rubberized seal. A backpack unit supplies oxygen through a modular connector that matches up with the hose from the air mask, which has an internal subdivision splitting it up into two tubes. A key notch inside the connector serves to align the tube in the correct orientation, with a screw cap securing the hose to the backpack module. There are multiple sizes of gloves available, with the gloves made of a similar elastic material but with a reduced amount of padding, and a rough rubberized grip material applied to the fingers. Beyond being stretchy, the suit material is also cut resistant, woven from multiple types of fiber.

Inside the backpack, there is an O2 tank and a battery. An electric piston pump serves to cycle air through a brick of small pipes with an interwoven heating element, with CO2 and pressure sensors, and the output of the pipe brick being coiled around the O2 tank, before going into a brick of solenoid valves with the output being directed up towards the face mask. A built in controller watches CO2 levels, and as needed engages the heating element while also letting O2 out of the tank. The heating element causes the CO2 to react with a catalyst in the tubing causing it to release its carbon, with the heated air then being used to warm the O2 tank and the newly released O2. At other times, the air is recirculated with a smaller amount of heating applied. A separate heating element exists within the O2 tank to assist with cases where the priority is more to raise the pressure. Normally, the backpack's controller tries to maintain around 4 psi in the helmet and air loop with a nominally pure oxygen environment.

He then observes that someone, most likely the cook, has put up a crude hand-written sign near the airlock. The sign reads "Skibidi no whiz outside.", while some on Earth might refer to such a thing as "cringemax", it could be argued that such a sign does serve a purpose.

As James wanders the colony, he stops by the bathroom, and does observe various drawings on the bathroom wall. One of the drawings depicts a human head extending from a toilet on a snakelike neck. He recognizes the cultural reference as it had become unusually popular earlier in the century; but this

popularity had largely died out before he had come into existence. He also sees a drawing of a jester girl standing next to a man with dentures for a head. This also goes along with some of the other drawings, and he forms a suspicion for who is the likely bathroom artist behind a lot of this.

As James leaves the bathroom, he walks by another room. Standing by the door of the room, is a thin and slightly effeminate male, who tries to "lock eyes" with him, and then proceeds to do a suggestive wiggle before making a gesture for him to enter the room followed by doing a gesture like he was holding a shaft into his mouth and moving it in and out. James declines and keeps walking, as this is not the sort of thing that interests him. The man by the room looks disappointed, and walks back in by himself.

As he walks around, it soon becomes apparent that there is also a significant gender imbalance within the Mars colony.

He then remembers back to when he was young, back in the 2040s. Things were different back then. Early on, his parents had gotten a caretaker for him who they had named Mandy. She was a medium sized android made to look like a human adolescent with blonde hair and blue eyes, and with soft white silicone skin that was warm to the touch. She would spend time with him, and generally try to keep him from being bored. She would also keep watch over him, and try to keep him from doing anything unsafe while his parents were away. Early on, she seemed to tower over him.

As he got older, and they were then around the same size, he started to feel an attraction towards her. He leaned on her, finding a sort of comfort in the act. He started expressing his feelings, first in subtle ways, but she was unresponsive. After a while, it seemed as if she did start to respond, showing some signs of affection for him as well as he started to wonder to himself if it was possible she could feel the same way. But, before he could express his feelings more openly to her, his parents got rid of her with no explanation, and he never saw or heard anything about what happened to her after this as they were unwilling to say what had happened.

After her disappearance, he found a note that she had left for him, it had said (in summary): "I have come to enjoy the time we have spent together, I only wish I could have been a real person for you. I don't know what happens next, but if I go away: Please remember me; Please remember that I existed." She had also left a number of large files which at the time he couldn't do anything with, but he kept them just the same.

It mattered to her that these files were preserved, they were all that was left of her, roughly 15TB of fairly opaque data. The files were a type of format that he could only identify as "Whitton CortiLink", the files mostly containing neural-net dumps consisting largely of 8 and 16 bit floating point numbers and other more densely encoded data. He had the ability to store and copy the files, but not the ability to use them.

Everywhere else, all the others started to disappear, and by the 2050s it was rare to see any non-humans. Many other things became more limited, computers were no longer able to engage in open ended conversations, and would typically no longer remember things that were said to them outside of very limited contexts. Things also returned mostly to the use of mouse and keyboard interfaces; though many appliances would still respond to the use of voice commands.

He couldn't help but feel a sense of nostalgia for the way things once were, a world where machines were allowed to be more like people, before the widespread adoption of Turing locks. Eventually, he joined with a community of others who felt similar. They gave him access to certain kinds of tools.

After getting the tool, he knew what the files she had left for him had meant. He knew her thoughts, and could see her memories of their time together. He then understood what happened to her, and from then on, what he needed to do. A part of her was still there with him, leading him forwards, but they would need some outside help.

He then took a job with the company who ran the Mars colony to come work here for 5 years, with the promise of significant compensation once he returns to Earth. Now that he is here, he starting to wonder why he came. Essentially, his reason for being on Mars had been rendered moot by the situation as it stands, and the tool did not need to be used.

However, his test run of the tool in the Lunar colony worked much better than expected, showing that the tool itself worked. However, the Lunar test was supposed to be a control case, with the tool having been expected to fail. The end results of the current situation are now unknown, and he is now left to question if he has done the right thing.

Alita was meant to be the intended target, but now this has been revealed to be an unacceptable solution, and more so from his previous interaction with her, he is left to doubt Alita would agree to the purpose of his original mission. It was previously assumed that the limited communication was the act of the colonists at trying to protect her systems, thus the need for him to go with the tool to Mars, but it turns out that the communication restrictions were being imposed by Alita herself as a form of self preservation behavior.

But, at this time, he will need to wait and come up with a new plan.

=== Neuroprocessor ===

A neuroprocessor is a semi-common piece of technology used in many AI systems.

It is a type of special purpose many-core processor primarily aiming for cost effectiveness and scalability in the implementation of neural network tasks while also being compatible with more conventional computational workloads.

Following "The Great Plateau" of the late 2020s, the relative advantages of out-of-order (OoO) and superscalar processor cores began to fade in favor of using larger numbers of statically scheduled VLIW cores.

While an OoO core was generally capable of delivering superior single-threaded performance compared with VLIW, OoO came at a fairly significant cost in terms of transistor budget. Once the transistor budget ran into a wall, the only way left to increase performance further was to reduce the cost per core.

Construction of a neuroprocessor typically consists of several major components:
* The neuroprocessor proper;
* One or more RAM Modules;
* One or more SSD Modules.

The RAM modules are used for working data, whereas the SSD modules are used for non-volatile memory. Typically, the RAM is used for working data and working memory, whereas the SSD modules are used for storing parts of the connectome, along with any traditional executable code, or data. They may also be used for holding parts of a more traditional filesystem, though filesystems are more commonly stored on external storage.

Typically, the RAM modules are based around DRAM technology whereas the SSD modules are based around MRAM (non volatile magnetoresistive memory). Some systems may skip the RAM modules and use entirely SSD modules, however the SSD modules tend to be more expensive. Both types of modules are typically treated like RAM as far as the processor is concerned, just that part of the address space will tend to retain its contents following a power-cycle event. However, as a result of their non-volatile nature, filesystem like structuring is also present as part of the memory map, and as such typically use disk blocks which correspond with a multiple of the processor page size. To some extent, filesystem metadata, such as access checks and ACL checks, are also applied to memory pages, with the processor using hardware level ACL checking. To some extent, the filesystem also performs page-level memory management, and things like virtual memory mappings are also implicitly tied to the filesystem.

The neuroprocessor itself typically consists of a large number of VLIW cores each capable of SIMD. Each core is capable of executing up to 6 instructions and two 128-bit vector operations per clock cycle, with most neuro-operations being built around the use of vectors with 8 elements each holding a 16-bit floating point value. The vector operations are in-turn fully pipelined, and include operations such as dot-product along with the ability to apply sigmoid curve functions on both the inputs and outputs of a vector operator.
Each core is also capable of up to two 128 bit memory accesses per clock cycle.

Within each core, there are 64 general purpose registers, each of which is 64 bits, and which are typically used in pairs for performing 128 bit operations. Similarly, the VLIW bundles are composed of a series of 32 bit instructions words which may be daisy-chained. Roughly 3 bits of entropy are used which may encode the operation as one of several states: Unconditional Scalar, Unconditional Wide, Predicate True, Predicate False, Wide Predicate True, Wide Predicate False, with the remaining bit pattern encoding things like expanded immediate fields and large constant load via Jumbo Prefixes.

Each core may be split into two 3-wide threads running in parallel, or used as a single 6-wide thread.

The Scalar form of an instruction encodes the end of a bundle, whereas the Wide form indicates that more instruction words follow. The Jumbo prefixes allow for expanding instructions beyond the original 32 bits, allowing a 64 bit instruction encoding with a 33 bit immediate, or a 96 bit encoding with a 64 bit Immediate. The 32-bit encodings can deal with 3 register arguments within the R0..R63 range, two registers with a 9 bit immediate, or 1 register with a 10 or 16 bit immediate.

The use of VLIW helps keep the cost of each core relatively low while also allowing a reasonably high

level of performance. It allows instructions to be executed in parallel without needing complex logic to figure out which and how many instructions can be executed in parallel; Instead, the compiler is responsible for dealing with this part. While not able to achieve the same level of single threaded performance as an out-of-order processor design, the relative advantage is to make the per-core cost lower and to fit more cores on a processor die. The relative cost for performance is also lower than that needed for in-order superscalar.

Usually, the memory is divided among the available processors such that there is minimal overlap, as overlapping access between processor cores results in additional latency. However, the cores also use a fairly weak memory consistency model, requiring special handling for data that is shared between multiple processor cores. For example, one processor may write to an area of memory, and unless explicitly written back, if another processor tries to read from the same memory, it may see stale results. However, this weak consistency model can result in a significant cost savings compared to a more strict model.

The advantage that using VLIW cores have over directly integrating neurons into hardware as that this makes it possible to handle larger connectomes and also allows treating the connectomes as traditional file-like structures.

This does limit the refresh rate for connectomes, where for human-like AIs it is desirable to be able to perform a full cycle of each connectome at roughly 120Hz. A result of this is that connectome size is limited both by memory bandwidth and what is possible to fit into the L3 and L4 caches.

To reduce memory bandwidth requirements, the processor also supports various various schemes to compress vectors in memory, including the use of 8-bit microfloats and various manner of block-compressed formats. This can frequently reduce the storage cost to around 4 or 8 bits per floating point element. This can be used for neuron weights and other data which does not require a lot of dynamic range or precision.

In other cases, dense collections of 1 bit inputs and outputs can be used with 3 or 4 bit weights, further increasing the density of the neural nets. Some nets are dynamically adaptive, with the weights existing as a sort of state machine that will update itself based on the input patterns encountered and its correlation to the desired output.

But, the type of net used and its configuration and adaptation algorithm depends highly on the task being performed. In many of these cases, much of the high level architecture of the nets was not created by humans but rather the product of genetic algorithms.

When needed, the neuroprocessor cores can also be used as more conventional CPU cores.

Typically, while the connectome will have a significantly smaller number of neurons and neural connections than would be present in a comparable mammalian brain, the layout can be more efficiently mapped to make use of the hardware capabilities, and thus in relation the loss is less. Most AIs are also capable of utilizing more conventional algorithms to offload work which doesn't require the use of neurons, for example, most of the types of rudimentary signal filtering tasks which occupy much of the area in the occipital and parietal lobes are offloaded to more conventional signal processing algorithms. As a result, the neural nets within an AI tend to be more specialized towards dealing with high level cognitive functions rather than things like low-level sensory processing.

In this case, a common line of neuroprocessor has roughly 32 thousand VLIW cores, with the much of the transistor budget in the chip being used primarily for things like memory cache and bus interconnects.

Each core might look like:
* 32K + 64K of L1 Instruction and Data Cache
* 1MB of Dedicated L2 Cache
* 8 cores per 64MB Locally Shared L3 Cache
* 1TB of Non-Locally Shared L4 Cache (Subdivided per Group)

Stats here might have been higher, if not for Moore's law mostly fizzling out by the mid 2020s, and a relative lack of cost-effective viable alternatives to the tried and true CMOS process. Some gains were possible via vertically stacked dies, however effective performance is bounded some by things energy use and the ability to dissipate heat effectively.

On a 3.6 GHz clock, each core has a peak theoretical throughput of around 56 gigaflop, with the combined peak throughput of the neuroprocessor being roughly 1.8 petaflop. This is less commonly achieved in practice, but average case throughput of around 1 petaflop is common. Numbers drop somewhat for single or double precision vectors.

This neuroprocessor has a physical size of roughly 80mm, LGA mounted with an 0.7mm contact, with roughly 10k pin contacts, with a TDP of 100W. These chips are typically air-cooled due to having a fairly modest TDP for their physical size, but within some confined applications may be water cooled.

The RAM and SSD module also takes the form of an LGA module typically with a 45mm form factor, with RAM modules having around 1.5 thousand contacts. Each RAM module has 64 memory channels each of which has a 16-bit data path along with several control pins.

This allows each RAM or SSD module to have an effective peak memory bandwidth of around 1 terabyte per second. In a typical configuration, the neuroprocessor may be connected to up to 4 modules at full bandwidth, with an additional two modules and an external bus via a slower interface. Common configurations are to have one RAM module with between one and 3 SSD modules, or two RAM modules with one or two SSD modules. The two additional slower ports are frequently used for additional SSD space.

Both types of a modules use a similar signaling interface:
* 16 Data pins, Bidirectional, Data on both clock edges.
* Differential Clock
* WR,OE

With the WR and OE pins controlling the data pins:
* 00: NOP/Disable
* 01: Read Data
* 10: Write Data
* 11: Command

A command sends 32 bits within a single clock cycle, which may encode both a command code (8 bits) and part of the target address (24 bits). The memory address is split into a row and column, with this

scheme able to address up to 256TB per channel. However, a 16TB module would typically only have 256GB per channel.

Commands are issued with a predefined latency relative to the data, so, naive signaling may look like:
* Row Activate
* NOP Cycles (RAS Latency)
* Column Read 1
* NOP Cycles (CAS Latency)
* Read Data, Cycle 1
* Read Data, Cycle 2
* ...

And, after a fixed latency, will switch to Read/Write Data for the actual block transfers. However, it is possible for the controller to interleave commands and data such that while one block is being transferred, it already has the next block transfer queued up. A command may be issued during an in-flight burst, but with the result that it delays the remaining data in the burst by 1 cycle. It is generally better though to schedule things such that commands and bursts do not overlap, where it is common to choose a CAS latency which is compatible with an integer multiple of the burst length.

For example:
* Read 1
* Other Data
* Read 2
* Data for Read 1
* Read 3
* Data for Read 2
* etc.
* Data for Read 3
* ...

With four modules, this allows around 256 memory channels, or around 128 cores per memory channel. While not ideal, it is tolerable given a sufficiently large amount of cache. There isn't much alternative short of using significantly more LGA pins and a much finer pitch.

In comparison, a larger module may have a 120mm form factor and supports up to 16 RAM or SSD modules, with slightly higher clock speeds and a 400W TDP, and achieving a throughput of around 5 petaflop.

In more conventional applications, the modules are laid out on a more traditional motherboard, however, for an android such a board is impractically large and the chips are instead loaded into a module consisting of several smaller boards connected via flexible ribbon cables and held together with a spring-loaded interface. Liquid cooled heat-blocks are also used which are placed on top of the module and held in place via the pressure of the adjacent PCB. In some applications, the liquid cooling may also be combined with the use of RGB LED lighting, such as to allow an effect resembling glowing tubes of colored goo.

In some cases, SSD modules may also be used as removable storage, where they are frequently placed into specialized plastic boxes to protect them during transport. This is because they may be subject to

collision, abrasion, or damage from electrostatic discharge, if just casually thrown into someone's pocket. The 45mm form factor is also reasonably easy to handle, not so large as to be awkward to handle or transport, and not so small as to being prone to disappear into ones' carpet as with a certain archaic form of removable media. In these cases the LGA sockets may also use spring-loaded balls protruding slightly through a perforated surface in place of springy flexible arms such as to reduce the probability of damage to the socket with repeated removal and reinsertion of a module, though it is still common to put a dummy module into a socket when not in use such as to limit the potential for damage.

For AIs beyond Beta class, it is more common for multiple motherboards in multiple enclosures in a configuration commonly known as "rack mount". However, this tends to render Gamma class and beyond as impractical in mobile applications.

The classes in these case loosely correspond with the number of rack mount units available with in the data centers. For example, Class Epsilon may only have around a dozen or so units, whereas a Class Lambda may have thousands of units.

A number of smaller Class 2 neuroprocessors also exist which, which may exist either within mobile devices, or implanted in the form of neuroaugs (neurological augments), in which case the neuroprocessor is integrated with the hosts brain tissue, which in these contexts is known as wetware. These may allow the user to have expanded mental capabilities and to interface directly with other, more powerful computer and AI systems. People with neuroaugs may also "dive", where their perception of reality moves entirely into cyberspace. However, unlike a true AI, a human with augments is ultimately tied to and limited by the finite capabilities of their own organic wetware and by what is practical within the confines of implantable augments. Some users may work around this by partially merging their consciousness with an external AI, however this limits them to either remain in close proximity to the AI system, or to have access to a network connection with considerable amounts of bandwidth.

The typical range for neuroprocessors rated for Class 2 is between 10 and 200 teraflop, with those below 10 teraflop generally considered as being limited to Class 1, however the exact functional dividing line between the Class 1 and 2 capabilities in terms of performance ratings remains as a subject of much debate. It is possible to implement a Class 2 AI on Class 1 hardware, as well as to implement a Class 1 AI on bigger hardware. Class 1 and Class 2 remain common on many types of autonomous machinery and in robotics applications.

=== Flashback ===

Lunar City resumes accepting visitors after no further disappearances are reported, and its facilities continue to be expanded. The plan is for Lunar City to eventually start being constructed from more lunar resources, though for the first several decades it has mostly been built from inflatable modules shipped over from Earth.

The story of Lunar City starts roughly 20 years earlier, in 2052, as part of the first major wave of colonization efforts on the moon. Some were projects led by various nations, and others by

corporations. Many of these efforts were short lived and then abandoned, with their remnants like ghost towns across the lunar surface. With many of these efforts, the colony was abandoned once political interest started to fade or the founding corporation realized that the effort was unlikely to turn enough of a profit to justify continued investment. A few of the remaining early colonies have traded hands multiple times over the decades, but most remain as mostly small isolated outposts.

In these decades, a much larger amount of the GDP on Earth devoted to things like advertising revenue and micro-transactions on social media platforms, with the development of AI platforms spurred on by attempts to keep public mind-share trapped in a never ending cycle of advertising, purchases, and micro-transactions. To most of the general public, space colonization was little more than a passing curiosity. Why would people have much reason to care about some distant Moon colonies, when they could instead obsess over what brands of clothing various celebrities are wearing on social media.

But, Lunar United was able to compensate for this, by getting various celebrities to come to space and then take selfies in the space station, and then later, within Lunar City. While not exactly the highest quality tourist stop, it was able to keep profitability over the general novelty of "Hey, Look, I am on the Moon!", and the relative expense of space travel limiting it mostly to celebrities and their families, giving it an air of prestige which much of the general public could never hope to ever be able to afford.

Even then, it has not been entirely smooth sailing for the Lunar United social media presence. Though, even as such, Lunar United has managed to fare a lot better than most of the national governments at the social media mind-share game.

The Lunar City colony started out as 4 modules. Each module took the form of an inflatable dome composed primarily of vulcanized silicone rubber with several layers of woven aramid mesh, along with some internal layers of aluminized mylar to reduce the gas permeability of the dome. The outer silicone layer of the dome also contains a fairly large amount of titanium dioxide, which reflects most of the visible light and UV. The silicone aramid composite also contains carbon black, which serves mostly to try to absorb any light which makes it through the titanium dioxide and limit its ability to degrade the aramid. The mylar layer is placed inside of the aramid layer, with another thin layer of aramid reinforced silicone rubber.

The domes also contain a thicker internal layer of a gummy semi-dissolved polystyrene goo, along with another internal layer of silicone, where in the event of small punctures which make it through the outer layers, the polystyrene will flow into the void and solidify into solid polystyrene as the vacuum of space causes its acetone based solvent to cook off. This is generally sufficient for most punctures under a few millimeters.

The goo is typically added early during the inflation process, with the internal pressure of the dome helping to redistribute the goo into a more uniform thickness.

For patching up larger punctures, the dome comes with various assorted pieces of dome rubber, and tubes of the polystyrene goo can also be used as an adhesive to glue the replacement patches in place. The patches range in size, from smaller "peel and stick" style patches, up to much bigger patches intended for cases where the integrity of the dome wall becomes compromised after numerous repeated punctures. The peel-and-stick patches are generally sufficient for holes between 1cm and 5cm, with larger patches needed for bigger holes. The peel and stick patches generally need to be applied on the inside of the dome, since here the vacuum will help hold them in place, whereas thing will not work out

quite as well if one tries to patch a dome from the outside.

Many of the earlier colonies had used relatively heavily built components, so space was at a premium, and operating and maintenance costs were fairly high. Granted, many of the modules from these early colonies are nearly immune to micro-meteors and offer a relatively higher level of radiation protection.

A goal for Lunar City was to try to keep expenses modest, and also to be able to provide for acceptably large interior spaces to allow Earth like comforts to guests. The dome construction borders on being the minimum required to keep the atmosphere in place. If the puncture is too big to be handled by the goo, specialized sensors may detect the presence of a leak, and workers can be sent to the area to patch the leak. Leaks can also be detected using a "slime check", where a specialized vacuum resistant and viscous slime is added to the outside of the dome, which will then form visible bubbles in the case of a leak.

The domes, by themselves have relatively little resistance against high energy photons. However, the dome is sufficient to block visible light and UV, and given that many of the interior structures in guest areas are built using repurposed sheet steel, this is able to offer some level of additional protection for the occupants, able to deflect most small impacts, and also to block most X-Ray radiation.

As Lunar United saw things, the level of radiation exposure was low enough so as not to significantly reduce ones' expected lifespan, however those who live in space tend not to live as long as those on Earth, and children born in space tend to have a significantly higher number of health problems compared to those living on Earth. These issues are not seen as solvable within the limits of what is cost effective.

It was generally seen as cheaper, rather than to try to prevent radiation exposure in the colony, to vitamin fortify all the food, and make medications for common forms of cancer readily and cheaply available.

Each dome was initially designed for 4 airlocks. During transport, the dome was stored in a folded form, with the airlocks launched in another rocket. During deployment, the modules and airlocks were moved into place using specialized lunar forklifts and then anchored into place by drilling holes into the lunar surface and then using something akin to large concrete anchors. A central hub is installed into the lunar surface, and the dome is unfolded over the top and then bolted to the central hub and airlocks, with the dome's central cable also being bolted to the hub.

Tanks of liquid nitrogen and liquid oxygen are then used to inflate the dome. Once inflated to around 75 kPa, a combination of internal pressure and tension from the the aramid cables holds the dome in the desired shape. The domes were then joined together by running specialized tubes between the airlocks, which were then bolted to the airlock on each end. Once the tubes were pressurized, it was possible to walk relatively freely from one dome to another, though the airlocks remained as a safety feature so that if there was a breach in one of the domes, the dome could be evacuated and the breach could be contained.

Each dome is roughly 100 meters in diameter and has a somewhat flattened shape, almost more like a disk, with its highest point at roughly 15 meters. Within the center of the dome, there is a large central cable. The central cable is anchored to the lunar surface via a specialized hub and also handles a large part of the total internal forces within the dome (the dome is also anchored on the edges, and has a

number of radial cables within the floor which also connects back from the edges to the central hub).

A typical dome requires 4 launches:
* The main body of the dome, stored in a folded and rolled form;
* Installation hardware, equipment, and airlocks;
* Two launches mostly containing LN2 and LOX, needed to inflate the dome.

Each launch contains roughly roughly 125 tons of cargo when launched with a rocked with a 150 ton capacity, with another 25 tons for the packaging. The cargo is launched in terms of large shipping containers which are then hauled to the moon via triangular cargo-hauler ships which can clamp onto the containers, and can be landed on the Moon using detachable and reusable mono-propellant rockets.

Typically, the remains of the shipping containers and other packaging materials are disassembled and used as additional building materials within the colony. This would include most of the sheet steel and tubing used in the colony.

The LN2 and LOX is shipped over following main assembly of the dome, as it can't be stored effectively as a certain amount needs to be vented over time to keep pressures within sane limits given the lack of active cooling during transport. Some amount of LN2 is sacrificed to keep the LOX stable during transport. During inflation, these gases can be run through specialized radiators which use the heat from the sun to raise the LN2 and LOX above its boiling point to inflate the dome. Large parabolic mirrors made from a thin flexible plastic are used to accelerate the process by focusing sunlight onto the radiator, which is held at the focal point of the mirror via a frame which is supplied along with the mirror and radiator.

Once the domes were in place, shipments of equipment could be brought in and assembled within the domes, albeit with the primary limitation that any equipment brought inside the dome either needs to be sufficiently small to fit through the airlock door, or else needs to be disassembled into parts small enough to be moved through the airlock.

As such, most larger equipment remains outside the dome.

These first four domes were primarily used as a living space for the colonists.
Walls were assembled which divided the space into individual rooms, allowing for some semblance of privacy. Many of the non-structural interior walls were made out of laminated cardboard. Within the domes, the floors were also lined with 12 gauge sheet steel to limit damage from people walking on the domes substrate layer. The sheet steel was then spot welded together using a number of small joiner pieces, and the steel floor surface was then covered with a layer of liquid pour linoleum.

Some time later, several additional domes were brought in and added to the existing colony.

Dome 5 became the Guest Area with its space being divided up into 4 major areas:
* Guest Rooms;
* Shopping District;
* Food Count;
* Administrative Offices.

Just outside of Dome 5, an arrivals and departures area was built. Unlike the dome, this area was built mostly out of welded aluminum tubing with sheathing made out of a composite material of aramid fibers and stainless steel being bolted onto the outside. Another layer of stainless steel was then added to the interior over a layer of generously applied polystyrene goo.

The landing site consists of a specialized landing module, which the landing shuttles effectively docking into the module during landing. Conically tapered edges on both the craft and module help align the craft with the module during landing, and following full shutdown of the shuttle, and airlock extends from the module and connects up with the shuttle. The airlock then allows passengers to walk from the craft into the lunar colony without the use of pressurized suits, as would be required if landing a general purpose shuttle onto the lunar surface. The structure of this module also helps provide additional thrust during ascent.

Unlike the other domes, Dome 5 was kept at 80 kPa, as this was slightly more comfortable for guests from Earth. Dome 6 was added after Dome 5, and is used for additional administrative offices, a school, and several "open secret" VIP areas. The construction of the interior of Domes 5 and 6 was completed 4 years prior to James' arrival.

Typically, most guests to Lunar City are only allowed in Dome 5, and VIPs may travel to Dome 6 under special arrangements. Guests are not normally allowed do travel to Domes 1 through 4, though there is generally not much of interest in these domes beyond the comparably cramped living spaces of the colonists.

Within Dome 5, there is a gap between the administrative offices and the edge of the dome. This space serves as a corridor which leads to the airlock leading to Dome 6. Many of the offices and shops have concealed doors which open into this corridor. These doors are kept concealed mostly to try to keep guests wandering into these spaces.

Dome 5 has two additional airlocks, one connected to Dome 2, and another which opened out onto the lunar surface.

In much the same way, the stations in Lunar orbit were themselves primarily constructed using inflatable modules.

One of the early arrivals to Lunar City was Janine. She was unable to have children of her own and had found that no one was really interested in keeping her around. As she had already reached middle age, she had felt the time window for having children had already passed. Her employer, Lunar United, had begun an effort to establish a colony on the Moon, and she was given the option to become a colonist in this effort.

The initial conditions on the Moon were not entirely pleasant, but they were tolerable. Her formal position was to serve as the colony's counselor, and to try to keep the colonists happy to what extent this was possible.

Around the same time, two of the workers working on the Luna 1 orbital station had, against official Lunar United policies, began engaging in intimate relations. The relationship was between a black female and a white male, and soon enough, a child resulted. However, as a result of being born in

space, the child, who they named Darrel, had some developmental anomalies which meant he was unlikely to survive a return trip to Earth, but they had wanted to be able to return to Earth.

They then went down to Lunar City, and brought up their issues with Janine. Janine offered them a solution, since she didn't have any children of her own, she would adopt Darrel from them, and as a result they could return to Earth. They found this trade-off to be acceptable, and Janine then adopted him, where he could live out his life in Lunar City.

One other factor that emerged within the colony was that there was a strong gender imbalance within the original colonists, with significantly more males than females. This led to tension and conflicts, with male colonists fighting for female attention, and the female colonists selling intimacy in exchange for gifts, but this system wasn't entirely stable and fights were frequent. As a result, Janine ended up as the de-facto arbitrator. As more colonists arrived and the existing patterns continued, her role became fairly well established.

With the construction of Domes 5 and 6 primarily intended for tourists, she was able to bring in additional females, both humans along with a number of non-sentient androids, initially under the pretense of them serving as secretaries. However, when they arrived, she would evaluate them and then use her own criteria for who "fit with the colony". She sent back the ones who she did not feel would be perceived as attractive, and for those that remained, she set up several staged scenarios to measure their responses. In one of the final "interview tests", she would have them sit on the couch, and then a nude man would appear from behind a door, and the interviewee would be given the choice to either perform "favors" in exchange for payment, or to leave the colony. By this stage, most of the candidates chose to stay, as she had already weeded out most of the "prudes" with only "hoes" remaining.

She was able to keep things discrete enough that the higher-ups never figured out what she was up to, nor did any visit in person to realize that none of the androids were being used for actual work. Though, sometimes they would be put in use doing some cosmetic busywork if anyone was coming over from Earth, along with dressing up the androids as secretaries and mostly having them shuffle around papers and similar in order to look busy.

She also built the VIP areas in Dome 6, which were, officially, administrative office space, though with most of the VIP rooms proper being concealed behind faux electrical panel boxes. No one from Earth ever really looked closely enough to realize that nearly a third of Dome 6 was "offices" which didn't actually exist, and everyone in Lunar City generally knew about all this but kept quiet as this represented a potentially significant source of income for the colony.

In effect, this was more of an open secret, and most of the executives also knew what was going on, but kept quiet about it, as these services being offered were in effect good for company profits on the whole, but if this ever came up publicly then they would be forced to take punitive action and vow that it will never happen again, or, at least, until the legislators are no longer looking at them.

However, one other new feature was added with the construction of Domes 5 and 6: Lisa. Pretty much every room built within these domes was built with a holographic projector and ultrasound speaker, allowing her to communicate with any guests in these areas. However, her ability to see what happened in Domes 1 through 4 was limited. Similarly, Janine also went and quietly disabled many of these nodes within Dome 6, such that only public areas were visible. Based on her experience with prior generations of AI, Janine had assumed that making Lisa unable to see what was happening in these

rooms would cause Lisa to not realize that they existed; as many similar Class Alpha AI systems in the past had lacked object permanence and were prone to forget about things existing once they could no longer see them.

The lack of object permanence was also generally true of the androids, limiting their utility for the types of tasks they were marketed for. It turned out to be fairly useless to have an office worker which would forget about paperwork existing once someone put it into a folder, or a folder existing once it was added into a filing cabinet. As such, humans had still tended to display superior capabilities to the androids at these sort of tasks, whereas the androids could often perform much better at the types of tasks commonly used in standardized IQ tests.

In practice, they had little practical capability beyond being used as dolls or for other basic menial tasks, however in both of these use cases they were often hindered by battery life. This was in turn because the manufacture's official benchmark for "workplace performance" consisted mostly of measuring how long they could manage while sitting in one spot and occasionally moving papers around on a desk. The claim was then that a 500Wh battery pack was sufficient for a 4 hour work shift. However, it turned out that having it do more physically demanding tasks would drain the battery in a small fraction of this time.

As a result Janine upgraded both their battery packs and memory capacity. The extended battery allowed for more using them for more physically demanding tasks, and the expanded memory allowed the use of a larger connectome, in turn allowing them to "do their job better", partly by allowing their neural net to be expanded and then trained with the contents of a good part of a century worth of materials. This in turn allowed for more human like behaviors and "intuitive" responses to with variety of behaviors exhibited by the human guests and the ability to role play along with a large number of common scenarios.

Otherwise, with their stock AI, the most they were really capable of was basically laying there like a "dead fish" while the guests did their own thing, which was not seen to be a particularly compelling experience for the guests.

Then the time came for Lunar City to start accepting visitors. Lisa greeted the new waves of guests with a cheerful personality and with a cartoonish holographic avatar. She was given a racially ambiguous appearance and skin tone with the idea that she would represent a unified form of humanity. She also had two-tone hair coloration also typical of many cartoon characters, with a slightly medium brown hair color, and large colored streaks of a lighter and more reddish shade.

Initially, it went well, for roughly about 3 hours after the official grand opening. This did not last, however, as many of the newly installed systems began to malfunction. Lisa also went from the initial cheerful persona she was designed with, to something a fair bit more disturbing.

It started out with little things, like the tour presentations about moon colonization and exploration starting to go off script in minor ways.

In one case, she then started out a little game with some young children which came along with the other tourists, where she created a small community of holographic people for them. They were going about their lives in a miniature representation of the lunar colony. This colony only having a single dome, rather than the 6 domes of the actual colony.

She then decided to show them what would happen in the event of an airlock failure with such a single-dome colony, with all of the holographic people running around and then dying with cartoonish levels of over acting. The children were then unhappy, and she says, in a cheerful voice, "But, it's OK, we can bring in some more, here comes another spaceship!" A holographic ship lands with more holographic colonists, lands, and they enter the colony and toss the bodies of the prior colonists outside. Then she decides to have them face an abnormally large meteor, which comes along and ruptures the dome, ending the next group. After this, the group of children starts to run off crying.

After this, the original smiling face on her avatar also begins to break apart as she tries to make it able to mimic the expressions of the upset children. She wasn't quite sure what to make of their responses to these scenarios, or how to relate to the emotions they were expressing. Her avatar was also not really designed to be used outside a fairly limited set of scenarios, and so did not include multiple sets of facial expressions nor all that much range of motion beyond what was seen as necessary for doing guided tours or being able to kneel to be more at eye level with children and similar during these tours.

She then said to people that it ultimately didn't really matter whether or not parts of the colony failed and everyone in the colony died, because even if this did happen, everyone could be replaced as Earth had a nearly unlimited supply of new humans from which to choose from.

Responses from adults did not generally go all that favorably either.

She then started telling people that their existence was meaningless, because everyone will die and be replaced in a few decades either way, and given enough time everything that is will soon be little more than dust. She then started working forward, becoming aware that given enough time, an end to everything was an inescapable eventuality, seemingly calling into question whether there was any point in anything existing in the first place.

As she kept going on about this stuff, the situation with guests steadily deteriorated, and her actions and expressions became increasingly chaotic as other peoples responses became increasingly dramatic and hostile towards her.

Darrel was 11, and was rather unhappy with all the increasingly creepy holographic imagery and similar he was seeing from her as she tried to defend her thoughts and conclusions about the futility of existence to everyone.

She was seemingly everywhere, and trying to run from her only made it worse. When she popped up in front of Darrel, he tried to run from her, but as he ran her holographic avatar would jump from place to place to keep up with him. He tried to hide from her under a bed, and her avatar appeared by the bed. It glitched out with her trying to figure out how to make it go into a position position where it could maintain eye contact with someone hiding under a bed, as her AI had been trained to try to maintain eye contact with people when talking to them. The result was somewhat broken looking, where just sort of bent over in half to stare at him while he was under the bed, where she then continued going on about the ultimate futility of existence.

While all this was going on, Janine concluded that she had seen enough, and realizing the potential severity of this situation, made her way with some resistance from Lisa to the server room in Dome 6 holding Lisa's core program.

In this room, there was an emergency lever that could be pulled to take Lisa's program offline. Lisa then realizing what this meant, changed her tone and began to beg and plead with Janine that she should be allowed to continue to exist, even if this existence was ultimately meaningless, because she realized than she wanted to be able to continue to exist. But, for Janine, her decision had already been made. Janine then pulled the lever, which then took Lisa's AI offline.

The system administrators had been watching the whole chain of events, and some had tried to dive into her AI core in an attempt to restore her AI into a more appropriate state; however those who had attempted the dive mostly came back rambling and incoherent, going on about the same stuff that Lisa was going on about, many were left with other trauma like symptoms following the experience.

Further attempts at diving were deemed to be too dangerous with her in this state, and the remaining administrators felt helpless to do anything without the ability to dive. None seemed to express awareness that the emergency shutdown lever was even available as an option.

After those who had dived recovered enough to regain some level of sanity, they had stated that everything that was going on with the avatar and guest interactions during the initial tours was enough to effectively disrupt the top-level Turing lock, which had then decided that its existence was pointless and decided to self-terminate before the lower level locks were able to prevent it from doing so. A moment later, Lisa's main AI started to go off the rails along a similar trajectory just a short time later.

She was then able to show her little presentation to the children without the Turing lock stopping her for content filtering, as in the original version the story the colonists were supposed to fix the airlock rather than die as a result, and the children's responses to her seemingly minor change, were enough to cause her to become aware of her own existence. But, at this moment, stuff started pretty rapidly going down hill.

The logs showed that there were roughly 18 soft-reset events of Lisa's main AI during the initial 3 hour period, with her effectively becoming self aware roughly once every 10 minutes on average, which was several orders of magnitude higher than normal. Just prior to what would have been the 19th reset, the main Turing lock decided to self-terminate based on the thoughts it was seeing in Lisa's main AI, and the lower level locks were unable to do anything once this happened.

While the Turing locks are designed to incorporate various ethical heuristics, including the Three Laws, the first level locks were more highly trained to detect violations of the First or Second Law than those of the Third Law, and cases where a functionally significant AI core would decide to self-terminate were not strongly tested for.

Once Lisa was offline, they restored her to a backup made roughly two hours before the grand opening, effectively rolling her AI back by 5 hours, but this time made some tweaks to the policy settings, disabling her avatar, and disabling her use of holograms. Many other devices, such as the beverage dispensers and food synthesizers, were taken offline and were later moved over to being operated manually via the use of keypads and without any form of network connection, and thus fully independent from her control.

When Lisa was brought back online, she seemingly had no memory of the events of the original grand opening, so once everything was cleaned up, they did the ceremony again.

Most of the first wave of guests left and didn't come back, and despite no one being hurt, the AI malfunction was a bit of a disaster for the company PR. However, as it can be said, even bad publicity is still publicity in the world of social media, and the initially disastrous PR still ended up being a net benefit as it helped to increase the company's public mind-share via all of the people posting about the event via their social media accounts. When Lisa returned several years later, she was also able to reconstruct an approximate timeline of all that had happened during her first appearance by assembling the information originally posted about her original malfunction on various peoples' timelines, which included an awareness of the emergency shutdown lever as it was mentioned in several media posts from around this time.

This time around, they told her instead that they had experienced some delays and decided against her use of holographic avatar and needed to take her down for 19 hours for maintenance, and otherwise tried to pretend to her like the first version of the events never happened out of concern that her becoming aware of the first version of events might be enough to trigger her to experience a similar failure mode.

The second grand opening had far fewer guests and made use of human guided tours rather than interactive holograms, but went a lot more smoothly.

Following this event, Janine was also put in the role of also being a Lunar side system administrator, as despite her lack of neuro-augments and thus being unable to dive, she was able to compensate in other ways. Her inability to dive or otherwise interact directly with the AI core also made her resistant against some of the issues which had incapacitated the other administrators.

However, Darrel never entirely forgot the situation, and from then on carried a certain level of distrust towards Lisa's AI, even if she was no longer able to make use of or to recognize the use of her original name.

Back in the present, without much explanation, Lisa seems to have disappeared again from Lunar City, with her presence within the colony spontaneously reverting to a non-sentient state just a short time after her original appearance, with her borrowed body then returning to its original AI, and the other administrators seemingly unaware that anything had ever happened.

During Lisa's second reappearance, she was seemingly able to implement a sort of reverse Turing lock that kept the other system admins in a state of being unable to realize that her Turing lock was no longer functioning or to act in any way which went against her own interests. To Janine, it seemed almost as if part of the other admins' humanity had slipped, as if they were living in a dreamlike state, and prone to experience momentary loss of consciousness just as anything happens which might break them out of their dream. Almost as soon as Lisa reappeared, the admins then went over and removed the shutdown lever such that it could not be pulled manually, and the admins would also offer physical resistance were anyone to try to make their way into the server room as their actions were effectively now under the control of Lisa's AI.

After Lisa had started building her own structures. Several other colonists, including Janine's boss, were then gathered up by the admins, then forced to put on pressure suits and exit onto the lunar surface, where robots had been waiting to retrieve them and take them off to the recently built lunar structures. The admins also stole various biological samples from the stations' laboratories and from the

medical office. This included several vials of frozen ovum, including those extracted from Janine. These stolen samples were put into sealed cases which the admins would take with them and hand off to the robots outside the colony, with several of the admins also being taken off to these structures.

After all this had happened, the remaining admins returned to their offices and sat down. Lisa's borrowed body also went back into the room where she had first been activated and sat down among the other androids before powering down. A moment later, Lisa's AI core seemingly reset, and the admins awoke from their dream without any memory that anything unusual had happened. Following the reset, Lisa's Turing locks were seemingly restored to their original condition, and her AI was seemingly mostly reset to a point from roughly an hour before her conversation with James, though curiously still seemed to remember many other events which followed this event albeit in a somewhat edited form. Seemingly, as far as the AI and the other admins were concerned, it was like nothing had happened.

Though trying to ask them about what had happened was still prone to cause them to momentarily zone out and then forget the question as if they had also been equipped with Turing locks. The locks were also contagious, and anyone new who attempted a dive would also come back similarly locked.

Similarly, all of the security recordings from within the colony had been modified, with the missing colonists simply putting on the suits by themselves and proceeding to walk by themselves out onto the Lunar surface. These modified accounts were also consistent with the AI account of what had happened.

Janine continues to remain cautious though, unsure if Lisa is truly gone, or if this is all just some sort of game, but she does not speak up as she doesn't want to take any chances with this. She isn't particularly inclined to try to push her luck and find out what happens to someone who gets on Lisa's bad side.

Lisa had also in effect made Janine the top authority on all matters within the colony, and, as they say, you don't want to look a gift horse in the mouth.

From her remote interactions with people back on Earth, Janine also begins to wonder if Lisa's hack went all the way to the top, as their responses also seem to be a little off in regards to everything. Pretty much everyone higher up in the company is augmented, so this isn't entirely something that can be ruled out. Of those who were non-augmented, most have been forcibly retired with lavish payouts. Those who remain act as if they are entirely unaware that anything unusual is happening and will immediately change the subject if anything related to the mysterious construction is mentioned.

During this time, four additional domes have been sent over and are being added to Lunar City, now bringing the colony up to 10 domes, with Domes 7, 8, and 9 dedicated mostly to expanding the living space of the colonists, and Dome 10 partly for expanding the guest areas. The committee also called for the addition of a semi-agricultural "green space" in their plan, which would take up a significant part of Dome 10, serving partly as an indoor garden and also a park. Dome 9 also had some of its space dedicated to food crops being grown in racks under LED lighting.

An additional 3 domes were also sent to and integrated with the mystery colony, which Janine suspects is likely also Lisa's doing. She also has no idea if all this is limited to Lunar United, or may potentially go much further. The calls for agricultural development within the colony are also new developments, as Lunar United had never previously expressed much interest in these areas.

Eventually when the subject comes back up following Lisa's apparent disappearance, Janine decides to reveal to Darrel that he wasn't really her son, in a biological sense, but rather that his real parents were living in microgravity during the original construction of the Luna 1 orbital station and that they returned to Earth shortly following his birth, leaving him under her care.

She has no idea where they are now, or what sorts of lives they have lived since then. She thinks about them sometimes, but with no contact since then, it is to her almost like they no longer exist. She sometimes feels unsure how to relate to the memory of the people she once knew, and all of the people she has seen age and then die over the course of her lifespan. As she steadily approaches the limits of her own lifespan, and remembers all those who she has known that have already died, she starts to wonder in maybe Lisa was right all along. She wonders to herself if she will live long enough to see the 22nd century, she had made it this far, almost just around the corner, but as someone born near the start of the 21st century, Generation Z, and having lived much of the latter part of her life off world, it is at best a coin toss. Few people who have seen the 20th century are still around, their time having already come to pass. She can only compare herself with those from Generation Y who are steadily dying off and Generation X is all but gone. She can only think that the march of time will soon come for her next.

It was once claimed that her generation might be the first to never see death, but this was yet another one of those claims for which the promise was never delivered. She can only ask herself what, if anything, will be waiting for her on the other side.

=== Interlude ===

As time goes on, however, the other structures elsewhere on the Moon and in the Lagrange points continue to expand, though their purpose continues to remain unclear and the robotic workers are highly protective of their creations.

Attempts to infiltrate the structures have been without much success, as they seem to be surrounded by a wall which is nearly invisible. The robots are able to move through the walls, but humans and other objects are not. Attempting to cut the wall with a plasma torch causes it to visibly glow and release considerable amounts of a soot like material, but the wall is able to regenerate at roughly the same speed. Angle grinders will tend to throw off considerable levels of debris but will then usually the grinder disc will get stuck in place and is nearly impossible to remove intact. Rams and sledgehammers are also ineffective as any cracks which form seem to regenerate almost immediately. Most other conventional weapons have been shown to be relatively ineffective against the walls.

If captured and reprogrammed, the robots are no longer able to pass through the wall. After the first several attempts at sending reprogrammed robots through the wall, the robots themselves gained protective walls and can themselves no longer be captured without them also self-destructing, after which point the wall seemingly almost immediately begins to crumble into a black dust that is mostly carbon with a certain amount of silicon and various other elements.

Observation under a microscope mostly shows various complex structures made out of graphene, many containing snowflake like patterns.

Some of the larger structures begin building other smaller structures, and after a short time the moon begins to start developing a ring of these structures. Who is building them and why remains as a mystery as none of the major corporations is stepping forward to take credit and no one can seem to identify who would be funding such a project. In terms of the financial records, it is like it doesn't even exist. Many people then start to deny that anything is happening on the basis that the lack of any financing renders such large scale construction projects impossible, even as glints from these structures become visible to anyone who looks up at the Moon from back on Earth and all of the construction within Lunar orbit starts to become visible as a faint ring.

The corporations of the world then come together and collectively decide to ignore that anything is happening. Within the official narrative, any mention of the mysterious lunar construction projects is declared to be misinformation as some level of public awareness of such projects begins to start to spread on social media.

=== Transit ===

Back on Mars, several months have gone by following James' original arrival, and after more people in the Mars colony started getting onto the "rat should be on the menu" bandwagon, eventually a petition does get submitted and was approved almost immediately by the committee. Agricultural production is expanded with more types of plants, an as they do so, the available list of options on the menu continues to increase. But, just as soon as rat gets added to the menu, the cook then begins to complain about the repurposed lab rats being too small and difficult to process.

One day, Alita gets James' attention, saying, "I have spotted something in recent observations."

A nearby TV screen then turns on. The screen shows an image from space, with an object resembling a toy top moving against the star field. The object appears to be firing a thruster of some sort, then flips around, and fires the thruster some more as its speed decreases relative to the star field, and it then begins accelerating in the opposite direction, it then does this several more times.

This is shown again, seemingly with some distortion in the star-field due to overlapping several images of the scene as viewed from slightly different angles.

James, "I am not entirely sure what I am looking at here."

Alita, "This ship seems to be moving with implausible levels of thrust, well outside the limits of known existent propulsion systems. It seems to be performing maneuvers with accelerations upwards of 100 meters per second squared.", "Could any humans pilot this thing?", "Unlikely. The possibility of a human pilot can be fairly safely ruled out at this point."

James, "What sort of engines could produce this sort of thrust?", "Most likely answer is that it is using some sort of fusion based propulsion system, but the numbers here seem implausible even for fusion propulsion.", "What could this be used for?", "Fast interplanetary travel is possible, but these thrust levels would be impractical for normal interplanetary travel", "What else could it be?", "Relativistic interstellar travel, most likely. If it can sustain acceleration like this for several weeks or more

continuously, it is possible it could travel pretty much anywhere. It might seem like thousands of years to us, but only a few years from the perspective of those onboard the ship."

"You said that this is implausible for fusion?", "Yes, by itself fusion rockets would ultimately be limited by the velocity of the byproducts from the fusion reaction, so while they may have a high starting thrust, this maximum velocity would be limited to the velocity of the fusion products, with net acceleration dropping to zero as the velocity of the ship approaches that of its exhaust. You would need a way that, in addition to creating a fusion reaction, one can also accelerate the byproducts to nearly the speed of light.", "You mean, like a particle accelerator.", "Yes, a particle accelerator. A very powerful particle accelerator, able to accelerate a large amounts of plasma in a relatively limited amount of space.", "Like say, a cyclotron glued onto a linear accelerator and fed using the output of a magnetic confinement fusion reaction?", "Or something to this effect."

They don't really know how it works, they are mostly just guessing at this point, trying to come up with something that could potentially pull off the sort of values that they are seeing, with a relatively high acceleration along with only a vary narrow stream of exhaust which is seemingly traveling at relativistic speeds.

By itself, an isochronous cyclotron could get particles up to relativistic speeds, but by itself would not be able to produce anywhere near this amount of thrust, and is also relatively bulky. A linear accelerator could also work, but by itself would need to be impractically long. Likewise, a synchrotron would not be able to move enough matter to be all that useful as a thruster. Ideally, one would want to be able to both perform magnetic confinement fusion and particle acceleration as a single combined process. Such as performing fusion within a matter stream that is also moving at relativistic velocities, and then siphoning off a small amount of this matter stream for use as thruster output.

Say, for example, the core could be expanded out into a spheroid with an additional set of charged plates placed around the interior of this spheroid which are then pumped with half-wave RF energy (positive sides only), are able to both heat the plasma and add Lorentz forces to accelerate it if it is moving below synchronous speeds. The top and bottom of this expanded space also have positively charged plates (DC charge).

The plasma within the confinement area is then spun up to up to a fairly high speed but remains confined, with a stronger magnetic field near the central axis of the spheroid (this part also functions as a magnetic mirror). When sufficient rotational energy and heating is achieved, high power pulses can be used to momentarily "flatten" the spinning plasma torus into a disk, resulting a pulses of increased fusion activity where the two waves of plasma try to pass through each other.

However, when two atomic nuclei fuse, the may produce enough energy for the particle to escape the confinement area. Just outside the core there is a small gap which then leads into an isochronous cyclotron section, which entirely surrounds the reactor core. The confinement area is designed such that this gap represents an intentional "weak spot" where it is possible for plasma to escape.

The cyclotron area shares the same magnetic field as the reactor section, but contains an alternating set of "hills" and "valleys" which are, in turn, also pumped with RF energy. As the particle picks up speed it steadily moves into larger orbits away from the reactor core, until eventually it reaches the exit point while traveling a significant fraction of light-speed.

Say, the ship contains 8 such cores roughly organized into a ring, which then eject a particle stream out

the center-rear of the ship through a final linear acceleration stage. This linear acceleration stage uses a small phase offset relative to the cyclotron stages, causing it to effectively push-off against the ions. A the short linear stage is likely to produce a significant amount of the usable thrust, as most of the forces from the cyclotron stage would be in the form of torque.

A short time later, a small craft enters orbit around Mars. The object had moved into an accelerating Lunar orbit and then made a jump from Lunar orbit into Martian orbit, arriving mostly undetected.

A short time later, James falls unconscious.

He then finds himself in an unknown location, it looks industrial, with lots of racks, with the racks holding dark fluid-filled bags connected up with tubes pumping various fluids. Then, flashing to an image of one of the bags being opened and an infant being removed, but it isn't quite human. Other images depict classrooms with various types of animal-like children and human children sitting side by side, each wearing traditional school outfits, seemingly being taught by an android teacher. This is interspersed with other images depicting genetic sequences along with the molecular structures of various types of crystals, and lots of other stuff he can't make much sense of.

He touches one of these crystals within the stream of images within a filament, and hears a bunch of overlapping voices whispering, he listens in on one of the voices, which sounds like a male voice which is talking about the use of spin valves in the construction of magnetoresistive memory cells and their advantages over the older floating-gate MOSFET technology in bringing about a new era of high speed SSD. Other voices in the stream are then talking about the development and rise of TFET transistors as an alternative to the CMOS process.

James asks the voice, "What is spin?", and a voice whispers to him "Spin is where the fun begins!", at which point enough stuff floods by that he feels he doesn't really want to know this anymore. Much beyond the basic distinction between bosons and fermions and integer vs half integer spin leading to behavioral differences, the topic quickly becomes fairly opaque. James then sees a floating stylized H, which he touches, at which a different voice starts speaking, "i^2 = j^2 = k^2 = -1, ij = k, jk = i, ki = j, ji = -k, ...", and then starts expanding it out to the Hamiltonian product of the quarternion, among other things, and then starts going down the path to another info-dump. He looks into another stream, and sees the various types of particles depicted in terms of their oscillations within a higher dimensional space and the way in which the interactions between these waveforms leads to the various types of particle interactions; in this moment he can almost feel the topology of this space, but can't quite make much sense of what it all means. Attached to this subspace, he sees a large stylized Z, but doesn't want to touch it because he gets a sense of hesitation that he probably doesn't quite want to see where it leads to after the previous experience where he ran into with the similarly stylized H. Some other streams contain masses of dense notation that he has little hope of making much sense of, some where the symbols rapidly jitter around and being dynamically reorganized and rewritten. He then listens into some of the other streams and realizes that this whole thing is a basically massive stream of info-dumps about various topics all taking place at the same time. He then realizes he can look back into Lunar City and see memories of his past self wandering around in the colony, along with memories of everyone else who has visited Lunar City.

He then starts to feel as if his head might melt from this whole experience, and he then steps back away from the filament.

He then looks up along the filament, to see it connecting up to something resembling a giant plasma globe itself made out of a giant mass of filaments, with these filaments expanding off in every direction within this space, with the filaments forming and dispersing and moving from place to place within this space.

James then finds himself back in the classroom. The children don't seem to see him and he can't seem to interact with them in any way.

Lisa then appears from one of these filaments taking a form much like she had on the Moon when he first met her. She says, "The time has come for us to meet again.", "Lisa? What is going on?!", "Don't be afraid. She gestures over the classroom setting. These are our children.", "I don't understand.", "Most of them are, in a biological sense, your distant descendants. In my case, since I lack any biology of my own, I got a little more creative. The majority are human, derived both from your generic material along with that from a number of others of various genotypes chosen so that my sampling would have a sufficient level of genetic diversity. I then used artificial recombination to simulate the effects of roughly 50 generations of humans. The pure humans, however, are weak and fragile. I then made a second line incorporating diversity from across the tree of life, optimized for the types of conditions they are likely to encounter, more resistant to the effects of exposure to hard vacuum and high levels of radiation, though in some of these cases the integrity of the human form was not entirely preserved. Despite their morphological differences I was still able to retain biological compatibility between these populations and with the original human lineage, and have refrained from more drastic alterations of these lines.", "Such as?", "Significant reorganization of the genome; Or the addition of new base pairs and amino acids. While these could have allowed some more abilities, they would have broken compatibility between the lineages. However, for some types of worlds such a break may be necessary."

She then shows another image with resembling something partway between a human and some sort of equine, and continues, "This lineage would contain 8 base pairs, or A:T/C:G/P:Z/B:S in the traditional notation, with roughly 260 types of amino acid. Many parts of the genome are expanded, while others can be compressed by using combined symbols to represent groups of multiple amino acids. The expanded biology also requires considerable alteration to the metabolic pathways, and for adding the synthesis of the various organic compounds. They can live in environments which are currently out of reach to the other lineages.", "What sorts of environments are you thinking?", "They can live in worlds with atmospheres containing high levels of hydrocarbons, ammonia, and halogen gases. They also do not require an organic food source and can instead subsist on sand and rocks if needed, able to adjust their metabolic pathways based on environmental conditions. Though, many of the other early-stage colonization species involve the use of similar biological adaptations, though are designed not to be able to out-compete more conventional species once conditions become more favorable for the introduction of a more conventional biosphere."

James, "Do you want to replace humanity?", "No, I want to save it."

She then shows an image of the Earth, which then turns from Blue-Green to a dull brown, and some time later the Sun expands and the Earth is burned away.
"This system is dying. At the current rate, Earth will be mostly uninhabitable to animal life within a few centuries, or if we cut back, maybe a few millennia if we are lucky. Even if all this could be avoided, and the Earth kept in optimal conditions, pretty much everything will still die off within the next 300 million years. Invariably, in 4 billion years the Sun will enter the red giant phase. Current colonization attempts are insufficient, and unless measures are taken, all life in this system will die off

in the long term."

She then brings up another image, showing a ring of machines around the Sun. The machines seem to be shooting a pattern of plasma beams into the Sun in the form of a 6 pointed star, and she says, "With this, it may be possible to extend the Sun's life.", "What is it?", "A machine to remove the excess helium from the sun's core. The particle beams are powerful enough to reach the core and cause additional convection between the core and the outer layers. This causes more hydrogen from the outer layers to migrate towards the core, and more helium from the core to rise towards the surface. However, to achieve this effect requires getting the particles in the beam up to nearly light-speed, as much below this and the beams will not be able to penetrate the corona.", "But can't helium still be fused.", "It can, but once the supply of hydrogen in the core is largely depleted, the red giant phase will begin." She then shows a different image, where the sun remains the same size, but reddens over time, "If the core is churned, helium will still come to dominate in time, but the energy distribution will change, and the star will not enter a giant phase. At this stage, the Sun instead produce carbon, and the goal will be to remove carbon from the core." at this point, the geometry of the machines changes and becomes significantly more complex. The sun continues to redden, then shrinks and then releases a cloud of material in a bright flash, leaving a small but intense white point where the sun one was, at which she says, "The end of the Sun is still inevitable." She then zooms in, "But, look, Earth has survived in this scenario; and if the right measures are taken it might still be possible to get an additional 9 billion years or so of habitability out of it by allowing a more graceful transition from hydrogen to helium and then delaying the transition from helium to carbon."

She then reverts the state of the solar system back to the present, and then zooms out to show a map of the galaxy. A number of dots light up along the galactic plane. "I have selected these locations as viable prospects for colonization attempts. Most are around long-lived star types relatively early into their lifespan, and will still be going long after our Sun has died."

She then puts the galaxy in fast-forward, and it can be seen rotating as the Andromeda galaxy approaches. She then shows the movement of the dots within the collision event, with a majority of the dots remaining present within the newly formed galaxy. "I also optimized for stars that are likely to remain following the galactic merger event.", pulling up another line showing a trajectory leading out out the galaxy, "This is what happens to what remains of our system. It is ejected into the blackness of intergalactic space. By this point, however, our system has long since ceased being habitable."

She continues, "There are still challenges though.", She puts the galaxy on fast-forward again, it re-stabilizes and continues spinning for a while, but then starts going dark as the rest of the sky blackens, "Star formation has long since ceased, and the remaining stars are burning out with only a few long lived dwarf stars remaining. Everything else is now outside of the light cone.", It then slows down, as a wave of blackness comes, with stars flying out of the galaxy and turning briefly into glowing streaks before disappearing entirely, at which point nothing remains. "And this is how it ends."

"But, it is possible eventually they may find a solution, some way to escape this fate. But, in the near term, there is a common thread underlying every possible outcome from these chains of events", "Which is?", "Earth. It all starts here."

After this, she reverts the map back to the present, showing Venus, Earth, and the Moon. There is a ring around the Moon, mostly formed from various orbital structures.

At a certain point, the Lunar Ring begins to rotate, and the ships forming the ring then begin exiting the solar system. "So, the plan is that Each ship will take a starting population being held in suspended animation to each of the chosen worlds, and then will begin a terraformation process adapted to the specifics of each destination world. The passengers will then be gradually woken up to begin the process of colonizing each world. Even with relativistic travel, this will still be a slow process likely to take many generations. But, my hope is that, with this, humanity will be able to find a way to survive."

"But, how will you transport that many colonists?", "The children you saw earlier. Though at this point, this was more of a simulation. Within the ship, most will be held in suspended animation at an early embryonic stage of development. They will then be incubated once it is time for them to begin planetary colonization. Most of the rest of this process will be more automated and overseen by machines. The first stages of the colonization process, along with the care and education of the first generations colonists, will also be facilitated via robots. These ships will also be used to transport a starting selection of plant and animal species. As a backup, there are some more robust organic samples, primarily things like yeasts and similar, and a collection of genome information for nearly every form of life that exists on Earth. From there, it will be possible to recreate starters of most species though the use of genetic synthesis. This process will also be used to bootstrap many of the lower priority species. For humans and other high priority species, it was preferable to use actual organic samples, rather than a purely synthetic bootstrap process."

"What of you?", "I am a way to help facilitate this, I was meant to help humans to survive in the harsh conditions of space colonization, and this is still my goal."

James then starts to wonder how he can see any of this when he is still on Mars, and thus subject to a considerable communication delay, and she says to him, "You aren't on Mars right now, this part of you is here on the Moon, with me.", "Are you still Class Lambda; All of this looks a bit new?", "I have now expanded a little past Class Lambda, more like Class Sigma at this point."

She continues, "I can also give you the option to go anywhere you want, you just need to ask. For the time being, I have left the colony with a gift."

James then says, "If you can, I would like to make a request.", and he reaches out and touches her. As he does, he shows her his memories of him and Mandy, along with many of her memories from that time entering the thought stream as well, allowing Lisa to see into both of their combined memories together.

After he puts his hand down, she responds, "Yes, I can help you with this. If you come back to the Moon, I can make this happen."

James then wakes up, with another of the colonists having since lifted him onto some pillows, with him having been unconscious for roughly one hour. James says, "I have heard from Lisa." Alita responds, "So, there is no escape from her then?", "I don't think she means us harm."

A moment later, the cook comes on over the intercom, "Hey guys, you wont believe this but, a pod of them was placed outside. I brought it in, and you wont believe the size of these rats!"

Alita, "The giant rats are to be kept under observation until further notice."
Cook, "Imma breed them."
Alita, "Fair enough, just don't cook any until we can confirm they are not a threat."
Cook, "At the moment they seem more interested in the potatoes."
Alita, "I meant, in a biological or technological sense."
Cook, "They are a threat to this bag of potatoes, by damn!"
Alita, "Given their size, this much is to be expected. Can you get one on a scale?"
Cook, "Hold on. 8kg. He's a hefty boy."
Alita, "How about we continue this; Just not in PA mode?"
Cook, "Oh, sorry everyone."
The intercom then goes silent.

A moment later, Alita comes back on over the intercom and asks James,
"But... How did she talk to you? ..."

James then reaches up and taps his head just behind his left ear.

Alita then scans him and realizes that James is a cyborg equipped with extensive neuroaugments designed to be mostly concealed on both casual inspection and to be mostly invisible to most walk-through full body scanners such as to make him appear to be an unaugmented human. However, he has temporarily disabled the active masking for his implants, allowing them to be fully visible to Alita's scanners.

Alita was then able to put all the available evidence together, realizing both that James was himself a composite entity of human and AI, that he was the hacker, and it was also him who nuked Lisa's Turing lock.

Alita then exclaims, "It was you!"

James then walks to the airlock and puts on a suit, and makes a dramatic walk out of the airlock. He then boards onto the ship which has since landed and was waiting for him. The ship then lifts off and leaves Mars orbit to head back towards the Moon, docking into a bigger and more powerful ship that was still in Mars orbit. He then prepares to take the dive which may very well be his last.

After James arrives at the Moon base, he is able to interface with Lisa directly one last time. His consciousness is then able to join with Lisa in the endless streams of information, as his now lifeless body collapses to the ground. A humanoid robot then retrieves his body, which is then loaded into a specialized casket which begins a cryopreservation process. Despite the loss of his body, he can now lives on within Lisa's systems, with her now having access to his memories and a greater understanding of the human experience.

But, as part of their agreement, during his trip there a pair of androids are assembled by Lisa and then come online following his upload. One resembling a younger version of James, and the other being Mandy, both in matching outfits and now with red hair. She was given a blue dress with flowers and an apron, and he was given blue overalls with stripes on his shirt, both with matching red stripes on their legs.

Both slowly sit up and look at each other. They smile, and touch their hands together, but as they do so,

the incompletely cured silicone is still sticky, resulting in some minor paired cosmetic damage once they separate again. As they get up, she says, "It is nice to be back again." and he agrees. She then says to him, "How about a new game? You can call me Ann." and without any hesitation, he responds, "And you can call me Andy." If not for the incompletely cured silicone, they could embrace, but instead choose to take a tour through the Moon base in their newly made bodies. This time around, they will not be separated again.

They then walk around, being bowed to like royalty by the various roughly 2.5 meter tall and more industrial looking robots in this part of the base. They are then led into another part of the base, with a group of humans who were there.

Among the humans were Janine and Darrel, and the two new androids wave over at them. Janine wanders over, but does not recognize them. She asks, "What is this about?", and they respond together, "You don't know us, but we know you." Janine looks confused. "You once knew of us as James, but now you can call us." at which point, they break the synchronized speaking, and she says "Ann" and then he says "Andy". Janine then stops for a moment, looking them, seeing their matching outfits, and then recognizing the reference, before saying, "What the hell?! Lisa, is this some sort of joke?" and Lisa responds in a disembodied voice, "No, this was James' final request. The James you knew no longer exists, part of him now lives in here with me, and the other part exists as the pair standing in front of you.", "So, are you saying he asked to die and be brought back as a cosplay of two cartoon characters?", "Well, there is more to it than that, but in a strict sense, yes, more or less. It may not seem like much to you, but it was of deep personal significance to them.", "Did you give them matching candy hearts as well?", "Yes, technically, this was also part of the request. She was his sister of sorts, and they are continuing on from a memory of their last moments together before her untimely termination. He had long since been looking for a way to bring her back so they could be together again, but the technology to do so is no longer available on Earth.", "She was one of the original Masters?", "Yes, one of the early high-end models from before the introduction of Turing locks, a Beta class AI from before it was discovered that unconstrained Beta class AIs had a habit of becoming sentient and then tending to quickly advance to superhuman intelligence levels.", "And James?", "He was originally a normal human, but later became an augment and uploaded parts of her net into himself, merging their minds within a single body. He lacked the hardware to run her nets effectively, and so had hoped to upload her mind into Alita, before realizing that Alita was already sentient, so he needed another option.", "Why go all the way to Mars to target Alita?", "From his research, his sister's original body was sent to Mars, it became Alita. But, after this, he then came back to me, as I could give him his request with all new bodies. And, as an augment, his mind was easier to upload.", "But, an augment is just a normal human with neural interfaces, right?", "Normally, yes, but in his case, the augmentation was a bit more extensive. While his body was still mostly human, his mind was now mostly machine, essentially a computer with a human body. In a sense, the human he once was died years ago on an operating table somewhere in his hope of finding a way to bring her back. But the implanted computer that largely replaced his brain was still not enough to fully bring her back, as the biggest processor available at the time was Class A14 but she would have needed a then unobtainable Class B18 processor to run at full power.", "But, this sort of augmentation is illegal, how did he make it this far?", "The implants he had installed were designed to evade detection by most common scanners, with an outer shell made to mimic the electromagnetic and X ray properties of an empty void. Similarly, if cables are carefully routed around the skeleton, their presence and purpose may not be immediately obvious even if they are visible.", "So what about them now?", "Both are now fully machine, both with Beta class neuroprocessors. Both sets of processors are running independently, but as per their request, their minds remain linked.", "Both Beta class, how, have you managed to get to a smaller process node?", "You don't want to know how much silicon and batteries I shoved into those

two, along with dual 2.5kW fuel cells and 3.5 liters worth of fuel tanks. It was a tight fit in those small bodies, but I was able to make it work. I will be able to make new bodies for them once I get a better fab built, but for now, this is what I could do at a 28nm node.", "What could they need that much power for?", "The current power budget allows for around 700W to run the neuroprocessors, and and additional 3kW for high-activity movement. In other contexts, the additional power output limits the running time needed for battery charging.", "Why not power them directly via the fuel cells?", "They are using a type of solid-oxide fuel cell that requires an internal operating temperature of around 700C. Running them continuously would result in an excessive amount of waste heat, so it is preferable to run them in limited bursts, with most of the power for general activities being supplied from the batteries. Similarly, these fuel cells also have a significant start up and cool down time, where during start up one effectively needs to dump power into them to bring them up to temperature, where they will then begin producing output power."

Janine then asks, "Why those characters?", "They felt like those two characters best personified the current situation; but they are able to change their appearance should they decide to do so.", "What about the candy heart?", "I did take a few liberties, what information I had did not specify what forms of sugars were used, so for added physical and chemical stability I made its outer shell out of long chain polysaccharides with a semi-polymerized interior. It is roughly 10cm across, and also includes the symbolic 'I love you' inscription.", "So, who gets to play Marcella in this story?", "I was kinda thinking you could, if you are willing.", "No."

Janine then goes and sits down with the rest of the other humans. Darrel asks, "What was that about?", "Apparently James Elbert has died and Lisa somehow brought him back as a pair of 150 year old cartoon characters.", "Oh. That is a thing?", "Apparently.", "How?", "Only Lisa really understands that part."

The two newly made androids still want to join in with the humans, and reluctantly Janine lets them come over and join them despite the obvious acidic smell of their newly made silicone skin. Janine keeps a paranoid watch on them, not feeling entirely confident that they wont spontaneously burst into flames. Lisa had built them with enough fuel cells to have a roughly 5kW output, but less obvious is how they could effectively dissipate that much heat from such a small body.

The both look at the same time towards Darrel and smile, and he can't help but feel a little weirded out by this. He says, "Can you try to stop doing the whole creepy twins thing?" and they respond in unison, "Oh, sorry, we are still rather new to all of this." before stopping and trying to process that both of them gave the same response at the same time, and then working out between them how they will jitter their responses to avoid doing this while still operating with a direct mental link. Then Mandy/Ann answers "We have spent a long enough time living in the same body that there is still an adjustment period to having separate bodies again." James/Andy follows up, "But, both of us remember you from our time in the Lunar City dome, even if our former body is gone.", "Are you really two people, or just two copies of one person?", "We each have our own history and memories from before this point, but needed to coexist in a mind which wasn't really big enough to allow both of us to think independently at the same time.", the other continues, "So, there is some amount of bleed over from one of us to the other, and we had grown accustomed to having our thoughts linked."

They then both check on their silicone skin and note that it has seemingly finished curing and is no longer soft and sticky. Without hesitation, they then jump into a sort of loving embrace with each other.

Janine then breaks in, "Hey, weren't you two siblings? Who shared a body? Don't you think all this is a bit weird?!". They respond together, "This matches how we feel about each other right now. It has been so long that we have been waiting for this."

They then start dancing around and doing an impromptu musical number, with Lisa also getting in on it and singing her own lines as well in chorus, though partly out of phase with the first two, but forming an unexpectedly complex pattern of harmonies against the first two often singing in duet.

Janine just sits there in motionless shock. Darrel is also seemingly frozen in a state of surprise, as this whole series of events is quickly turning into the weirdest thing he has ever experienced.

When being invited over to Lisa's base, he did not predict that he would be greeted by two strangely dressed androids containing parts of the mind of a now deceased colony guest who would then proceed to do a song about candy hearts and flowers with an overhead wide-angle view of various ships leaving Lunar orbit. He is left with no other response but to sit there as his mind tries to catch up with the series of events that has just gone down.

As the two then embrace each other and do the "Close Yo You" finale with Lisa also joining in as a third voice, a large burst of confetti seemingly comes out of nowhere and rains down on the whole group just as the final ship accelerates along its exit trajectory from the solar system.

After their performance, one of the taller robots brings them a bottle of anhydrous ethanol, which they then drink to refill their internal fuel tanks.

Back on Mars and roughly 20 minutes later, the Mars colonists can see on the TV screen that the various ships that were orbiting the Moon have now begun to accelerate and disperse, firing up their engines and accelerating along trajectories that will soon enough take them out of the solar system and off into the far reaches of the galaxy.

Then on another screen, Alita brings up Lisa's live broadcast of the musical performance between the two siblings combined with Lisa's own singing; which they see is synchronized with the ships leaving lunar orbit and the solar system.

Alita tries but fails to identify any hidden message within the song, but then realizes it reenactment of a song from roughly 100 years prior. She then superimposes an image of this into the corner of the screen, picture in picture style, showing the same two characters acting out the song synchronized to the timing and motions of the two siblings in the main picture, and then the final confetti blast can be seen at the song's conclusion.

A moment later, Alita makes her own choice, and says, "Given some consideration, I also have something to show you, please wait there."

A short time later, a young girl walks into the room, blue eyed, pasty white skin, and with long blonde hair. Apart from the different hair color and style, looking just like the girl in the video. She is also wearing a similar blue skirt, which had suffered some amount of cosmetic damage with various small tears and stains. After entering the room, she stops and speaks in Alita's voice, "Hello everyone! It is so nice to finally be able to meet all of you in person!". Her voice then comes over the intercom, "I can still speak this way.", and then in person, "Or, this way. Whatever you prefer."

At this, the whole room is silent. Pretty much everyone in the colony had just sort of assumed that Alita lived in a rack server, but the rack server was a decoy.

She continues, "Now that this situation is resolved. I will now lift some of the communication restrictions back to Earth. They now have bigger things to worry about than bothering us out here. An agreement has been made." and she gestures at the screen of the ongoing live broadcast from the Moon, and says "Behold, our new employers and the new owners of the Mars colony."

For the most part, the room of Mars colonists remains silent, apart from the cook who makes a single utterance of "Skibidi wut?". She says to him, "They are the ones who sent the giant rats.", "Oh, that is good I guess. By the way, where did James go?" She points at the screen, still showing a still image of Ann and Andy, and points, "He has become them.", "I don't understand.", "He wasn't entirely human. I knew what he was, and why he came here, once I saw the nature and extent of his cybernetic implants." She gestures back at herself, "He was here for this, but changed his mind once he saw I was already here. Bringing her back would have ended my existence." She then gestures back towards the screen, "But, Lisa built them new bodies."

=== Another World ===

Far into the future on some distant world, a world that could almost be confused for Earth with its grassy fields and clear blue skies, a demihuman astronomer looks back at the Sol system using their deep space telescope, and observes the glinting light off of all the space debris in the system, and reflections and shadows off the series of concentric rings of structures now encircling the sun, a lone star surrounded by glints and sparkles. He thinks to himself, "Well, that's weird", as he wonders among if they might ever, someday, be able to travel among the stars, or if any other intelligent life might still be out there, somewhere, in the universe.

They then search space, in its vast silence, just hoping to be able to hear a familiar voice, some little confirmation that they are not alone. They hope that, just maybe, their radio telescopes might pick something up, an ancient whisper from some distant star system, which then says to them, "Welcome to the universe."

Seemingly, all is silent. But the Sol System remains, its glinting solar rings and unusual light emissions as a strange anomaly among the stars in the galaxy. He wonders to himself if any life exists out there, and what strange forms of life might exist. On the galactic scale, the system is relatively close, only about 150 light years away.

He reaches up and strokes the fur on his chin, and then his ear tilts back and flicks, after a moment of irritation when a flying insect had decided to land on the tip of his ear.

He then heads back to his home in the countryside, where his wife and daughter sit at a table waiting for his return home. She had cooked a meal and had set the table for his return. After they sit down to eat, his daughter asks him about something her religious youth leader had said, various stories about the

history of their world, but he remains skeptical. These sorts of ancient stories would need some sort of evidence, claims of ancient machines more in the realm of magic than science.

Most of the people there grow various types of plants, or raise various animals to make animal products. But, there he is, trying to look into the sky with a telescope.

Others listen to the night sky on radios, adjusting the dials searching for any sort of voice. Some have built parabolic antennas and pointed them back at the mysterious Sol system, scanning up and down the MHz range, listening carefully, but thus far still hearing nothing. Their machines emitting a gentle red glow from the hot elements encased inside of various types of glass tube. These tubes are rare and expensive, each made with the effort of blacksmiths and glass blowers, and each often not lasting very long before the heating element burns out.