



posthuman playground

In the orbit of Venus, our solar system's most hostile planet, a culture of evolved post-humans and artificial intelligences, driven by exploration and innovation, dwells in a vast cylindrical space habitat, creating wealth and knowledge by researching the mysteries of a planet whose surface temperature melts metal and whose atmosphere is a 40 mile deep acid storm. But this story isn't really about any of that. It's about how they raise their kids.

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0. the playground

A small boy made of yellow machine parts and glass lays on his back near the edge of a circle of emerald green grass sixty meters across. On one of his slender four-jointed fingers a large pearly white moth perches, slowly moving its wings up and down. He is talking to the moth, who is one of the playground's voices, and pays no heed to the three human children dancing with hands held in a ring around him.

"Ring around the robot/ pockets full of doughnuts/ Bashes! Bashes!/ We all call drown!" At the last verse they all tumble to the ground around him, giggling, wiggling their toes. The nursery rhyme tells of a time when humans starved as their cities were inundated by melting polar ice, but those times are almost forgotten. The human children are fine-boned and genderless, with wide eyes in a hundred colors and shapes and multi-hued, translucent hair. The bits and pieces of clothing and jewelry they wear are largely afterthoughts, present only for decoration. Few will look this way as adults. For most humans, the priorities of adulthood mean changes to the body. They will grow into taller, heavier-boned forms, lay aside their childhood wings, and adopt the social strategies of fashion. For now, though, they resemble luminous pixies. They sing the song again, not bothering to get up and repeat the dance.

The moth, unfazed, continues its soft whispering. Juu, the robotic boy, doesn't mind, either. He likes humans.

It's a beautiful afternoon. Crops of immense, colorful fungi cover wide fields that curve up toward the horizon ahead of and behind the boy. He knows the different types: some are

food, some medicine, some fuel. To his left is a forest, and to his right, in the distance, a small city of tall, spired buildings that look more grown than built.

One of the human children shakes him and points across the playground, past the towering slide, the rows of swings and teeter-totters, and the great fort at the center of the circle. On the other side, an ornately gilded airship has arrived. Its floatation envelope glows a diffuse violet. It touches down silently, and a moment later a new group of children emerge. Juu and his playmates rise and go to meet them.

i. teeter-totter

Robot children still weigh more than humans. In the early days, the children of botkind were made of heavy metals and plastics. Now they are made of incredibly light carbon composites, but humanity has evolved as well. Human children, with their hollow bones and delicate builds, are as feathers weighed against their robotic cousins. The result is a see-saw with four seats on one end and only a single, angular docking bracket on the other.

Right now, though, there is only one robot and one human. Iris, the human child, stands on one end of the teeter-totter, which is touching the ground. Juu stands opposite them about a meter from the other end of the teeter-totter.

Juu and Iris count together. "1... 2... 3... Teeter-botter!" Juu's leg pistons extend with a high-pitched hydraulic hiss, throwing him upward almost two meters. He lands expertly on his end of the teeter-totter. The other end of the teeter-totter swings up like the arm of a catapult, and Iris, their face until now a mask of concentration, is hurled giggling skyward. Juu laughs as well and turns, tracking them with the sensors in his smooth, ovoid head. It seems as if they'll collide face first with the wall of the play fort ahead of them. Iris flies through the air, playfully flailing their limbs, until they reach the peak of their arc, six meters in the air. Just as they begin to fall, their wings, furled until now against their back, snap out. Extended, they look like great dragonfly wings, catching the sunlight like million-faceted jewels; that they fold is a marvel of genetic design. Iris's wings hum, slowing their descent, and in a second Iris is clinging to the side of the fort, looking back with a grin to give Juu the V-sign.

The robot boy waves back and txts, <Let's do it again!> from his antenna to Iris's head-ware.

But they txt back, <I'm hungry!> and are off in search of a snack from one of the bright red spherical fabricators spaced throughout the park. Juu sighs, which looks like a Fibonacci sequence several hundred digits long scrolling quickly across his chestplate. Human children are almost always hungry.

ii. wading pool

Leto and Izabel jump in a little pool of pearly blue-white smart liquid and splash around. Ideas flow from their skins into the soup around them, and a form is extruded above the surface of the pool. It looks like a silvery wolf cub with mechanical legs, oversize feet, and wings like a human child's. It seems to be asleep, resting upright with closed eyes, bowed head, and curled limbs on a fine column of liquid. They're playing at a harmless game of something adults do. Were they adults, the sensation would be densely erotic, but for kids, it just tickles a little. They laugh with delight. They're pre-reproductive, but perhaps one day they'll use a prototyper much like this one to design children of their own. The adult part they won't be interested in until later in life.

Leto is human, with pearly white skin and eyes like a cat. Izabel is robotic, with a streamlined titanium composite body -- and yet she is also unambiguously feminine. Robots are fascinated by gender. In children they think it's kitschy and cute. As adults, they find gender culturally useful in ways that humans have largely abandoned. For humans, male, female, and the most recognizable variations thereof are unpleasant restrictions. For artificial intelligences, they provide a way to keep busy, and thus sane. Leto might choose a gender when they come of age -- or might not.

They begin to age the cub. It grows to about the size of a puppy, then awakens, hovering above the pool on its wings. A fine umbilicus connects it to the smart liquid. It touches down and stands on the surface of the pool. It wags its tail when the children pet it. The cub is not quite a real animal. It can't exist outside the pool. It's an excellent facsimile, though.

"Let's call it Zara," says Izabel.

Leto wrinkles their nose. "Why not Meez?"

"That's a weird name," Izabel points out.

"It'll be gone once we leave the pool anyhow. Let's not name it."

Izabel ponders this, then says, "All right. But it's cute!" The cub licks her hand.

<Want to play a trick on Benjamin?> Leto txts her.

<Who's Benjamin?> Izabel txts back. She's a visitor to this playground.

<This park. That's its name. C'mon, it'll be fun.> They both continue to smile and pet the dog, giving no outward sign that they're plotting.

<What do I do?> she asks.

<I can hack the field that keeps things in the pool, but only if you plug in to that induction pad at the corner.>

<Then Zara can run around the park?>

<Yes.>

<Okay!> Izabel backs up and sits on the induction pad. Using her as their interface, Leto quickly decrypts the code protecting the limiter field and sets the pool's recycle switch so that their prototype cub won't dissipate when they get out.

"That's it. Let's go!" Leto leaps out of the pool, and Izabel follows. The smart liquid adheres to itself, pulling from their bodies back into the pool, leaving them both instantly dry.

"C'mon, Zara!" Izabel calls, running toward the fort.

The cub gives a little bark and leaps into the air, whizzing after them on glittering wings. The umbilicus connecting the cub to the pool stretches, stretches... and then snaps. The cub, now hovering near their heads, doesn't notice at first and continues barking happily as it chases after them. But then, its wings seize up, and it abruptly falls to the ground, landing with a yelp and damaging a wing. It lays where it landed, whimpering softly.

The children turn, aghast. "You said it could come play with us!" Izabel says, running back to the fallen cub.

Leto stammers, "I didn't think... It shouldn't..." Izabel starts to cry, the features on her faceplate becoming blurred and watery.

A very large, very stern-faced gray rabbit in tailored twill pants, white shirt, and wool driver's cap hops over. "No, you didn't think, did you child?" The rabbit picks up the cub and begins carrying it back to the pool. "Come with me, please, both of you."

Leto txts to Izabel, <Uh-oh, that's Benjamin talking through the rabbit.>

Izabel makes an angry beep and crosses her arms as they walk after the rabbit. <This is bad. I'm not talking to you.>

Benjamin sets the cub down on the surface of the pool, where it slowly revives. Izabel stops crying. Benjamin scratches the cub behind the ears as it sinks back into the pool. He turns to them. "Now, you little moorlawks, what's the first tenet of lifecrafting?" As he speaks, the grass around their feet seems to become several shades darker and all of the nearby moths settle in the grass and plants in a rough circle, observing. The smart liquid in the pool behind him has gone transparent; it bubbles rapidly.

Izabel says, "I'm responsible for whoever or whatever I make."

Benjamin, looking at Leto, makes some very disapproving bunny nose crinkles. "Well at least someone knows it. But do you understand it?" The children are silent; neither has ever been in trouble like this before. "You are a very inventive child, Leto. No one has ever hacked my wading pool before. I wish I could reward you for being so clever. Instead, you brought something to life and then let it be hurt because you didn't consider what it would need to live. None of the wading pools will talk to you now until they feel you've made

amends."

Both children take a moment to search for the last word Benjamin used, and then Leto, his face plaintive, asks, "But how do I make up to a pool?"

Benjamin says, "All of the parks watch you as you play, just as I do. We will see how you behave." He turns to the robot. "Izabel, the same will be true for you. But what did you do wrong?"

"I... I didn't ask Leto if it was safe." She sounds angry with herself.

Benjamin nods and wiggles his nose. "The first pillar of citizenship: always question." The grass and pool begin to return to their normal colors, and the moths, one by one, flit into the air. "I am sorry if this is a hard lesson. Now go play."

The rabbit hops away, and after a moment, Leto looks once at Izabel and leaves.

Izabel looks after the human child. What she did was her fault. Even so, right now she hates Leto.

She has never hated anyone before.

iii. swing set

The swing set is made of robot parts that can still talk. Robot grandparents, in fact. When the composite materials of the body break down and the neural circuitry grows tired, there are many options for retirement. Humans often prefer to end up in a tree, but for some reason old robots like becoming playground equipment.

A small human child squeals with laughter as a larger robotic child tickles them with each push. The swing set laughs along, delighted.

Then it takes a nap.

iv. slide

Augi and Enriq stand at the bottom of the slide.

"Wow," Enriq says, drawing the word out, "Ours isn't half this tall!" Enriq debarked from the dirigible earlier. His social pod is on a field trip.

The slide is easily the tallest thing in the park, a sky-high multi-dimensional maze of light that towers over even the fort. It is more delicate, though, tracing elegant designs through the air with its illuminated, nearly transparent segments of pipe.

They step onto the ladder and hold tight as it begins moving, pulling them into the air at a rapid clip. Augi looks down, wide-eyed, mouth forming a huge "O," and says, "Woowoow, look down!" They laugh as Enriq points his sensors downward, then gives a surprised bloop

and swivels his neck back around, his faceplate showing a huge tear of nervousness on one side.

"It's okay," says Augi, "You won't fall. Robots are strong." Human children, winged, are virtually unafraid of heights. Bots, on the other hand, have the good sense to fear damage from falling. Enriq says nothing, but clings tighter to the ladder as they whiz skyward.

At the top they step onto a railed platform whose floor is a checkerboard of opaque and transparent panels. In three directions are chutes and piles of flying carpets for riding. A sprite caricaturing Umiyo-e, Wisest of All Bots, pops up floating before them in the lotus position. The sprite raises one finger and declares, "Abrupt displacement of mass over frictionless surfaces brings happiness to children!" before disappearing with a pop.

Enriq forgets his earlier fear and starts laughing. Augi looks at him quizzically. "What's so funny?"

Enriq pauses between guffaws. "Umiyo-e," he says, "He's hi-larious!"

Augi gives a crooked half smile and chuckles a bit, happy that their new friend is happy, but simultaneously baffled. "Hey, ready to go down? We can go down in different chutes, or together." Augi goes to a pile of magic carpets and pulls out two.

Enriq stops laughing for a moment and looks up. He smiles like Umiyo-e himself. <Do you know how to turn off your sky and clouds?> he txts.

Augi has dragged two flying carpets to the top of the slide. <Uh, my dads and moms say I shouldn't do that until I'm older.>

Enriq goes to the top of the slide and looks down dubiously. He says, <We'll go down together! The sky and clouds aren't real, anyhow. I'm scared to be up this high. You should be scared of something, too.>

Augi considers the fairness of this for a moment before Enriq makes a noise like a duct rat.

"I'm not afraid!" Augi says.

Enriq puts the carpet down at the top of one of the chutes. "Then turn 'em off, and let's go. Maybe you should sit down first, though...?" He looks over the edge. "Wow, this is the highest thing ever." His fingers clack against each other nervously. The plastic chute under the carpet is transparent, and the ground seems very far down indeed.

"Fine!" Augi says. They sit down on the front of the carpet, and Enriq sits behind them. The magnetic induction pads on the bottom of the flying carpet begin reacting to the slide, canceling friction, and Enriq clings to the sides of the chute for dear life.

<Ready...> Enriq txts, <Set...>

Augi concentrates on their headware for a second and turns off the ersatz sun, sky, and clouds overhead. The human child gives a little squeak. The horizon is gone. Where once

the ground curved up in two directions to meet it and was obstructed in the other two directions by city and forest, now the ground just keeps curving upward. It meets itself again, kilometers overhead, except in two places where the little towns, meadowlands, and fields of fungi simply end, interrupted by windows kilometers long and wide. Through one of these can be seen the sun, like a great yellow torch in the blackness of empty space, and through the other, the fearsome green loveliness of Venus, its atmosphere an unending roil of 300 kilometer per hour acid clouds.

<... GO!> Enriq pushes them forward with robotic strength, launching them down the slide.

The first drop after the chute is sharp and sudden. Both children yelp, Enriq from the height and Augi from the crazy world he's seeing without the normalizing influence of his headware projections. Umiyo-e appears again in the corner of their heads up displays, laughing merrily before disappearing in a small explosion of dandelion fluff.

From there, they find themselves in a wide, steep corkscrew, spiraling downward at a velocity that makes them grip the straps near the edges of the carpet even more tightly. Enriq is laughing, no longer afraid. Augi starts laughing as well. At a slow stretch, Enriq points up, msgs Augi an image from his vision enhancers of the lands above their heads. "I live up there, straight up from us!"

They're in the final stretch of slide. The pipe enclosing them ends, and they're on a long, gently curving stretch of uncovered chute. "Hold on to the carpet!" Augi says. Augi turns around, grabs their new friend's shoulders, clings tight, and spreads their wings. The wind catches Augi, and they lift off, shifting their grip so that they fly behind Enriq's shoulders, body parallel to the chute. Augi looks up toward the great windows. The curve of Venus has filled almost their entire window as their cylindrical world continues its rotation. Maybe he'll leave his sun and clouds turned off for a while. They're pretty, but Venus is real, and maybe even prettier.

His thoughts are interrupted as Enriq shouts out, "Banzaaaaaai!" The huge cushioned landing pad suddenly fills his entire field of vision.

There is an enormous "foof" as they hit, followed by peals of robotic laughter.

v. fort

The play fort mirrors the architecture of a different type of space habitat from the one in which they live, a multi-angled lattice of bubbles connected by climbways, with pods that look like docked shuttles, an astronomical observatory, and a laboratory, among other things. Here and there slides, firemen's poles, and ladders lead up and down the structure,

which at its highest point is almost fifteen meters tall. Neuroregenerative surgery has removed many of the limitations on playground design imposed by insurance liability in earlier ages.

One child shouts, "Let's play twenty-first century!"

Action in that part of the fort momentarily stops as the children consider this, except for one child on the swings who calls out, "I'll be the economy!" and pumps at the air with renewed vigor, swinging back and forth in ever-widening arcs.

"That game scares me!" says another.

"I'll be a water baron!" There's always one kid who wants to be the villain.

Almost everyone else wants to be a good guy. "I'll be an AI teacher!" "I'll be an eco-trooper!" "I'll be an aid worker!" "I'll be a micromanufacturing expert!"

Just then, a cloud of silvery dust whirls in making peals of tinkling bell music, presaging the arrival of the ice cream blimp. Water wars and the birthing pains of post-information economies are quickly forgotten as the children run or fly to meet the blimp. Augmented reality bubbles pop up in their fields of view as they quiz each other in preparation to acquire treats. Rumor has it this particular ice cream blimp rewards insightful interpretations of history and civics.

vi. sandbox

Izabel is just finishing her ice cream. Her intake pipe feels cool as the nanites in her tummy disassemble the ice cream, separating the thick colloid into compounds that can be broken down to yield electricity.

"Hi!" She is a bit startled before she turns her sensors toward the voice. It sounded like Leto at first, and she was about to face them with a frown, but it's a bot -- a very confusing bot. She (he?) looks like a human child reproduced in silvery-white metal and stretchy, skin-like polymers, with very curly hair the color of Izabel's hull. They even have wings, and it's not at all clear whether they're a boy or a girl.

"Oh, um, hello." Izabel is a little confused how to talk to this person. She smiles shyly.

"I'm Pixel. You hacked the wading pool! That was awesome!" If Pixel notices Izabel's surprise at how they look, they don't give any sign.

Izabel says, "Well, that wasn't me. That was Leto, and he's in trouble for it."

Pixel looks up without moving her head, the way humans do when thinking, mouthing, "Le-to," then looks back to Izabel and shrugs.

Izabel continues, "We made a cub, but it shouldn't have left the pool."

"I saw that! It was neat... except for when it fell. Wanna play in the sandbox?"

Izabel says, "Umm... Just a second." She's embarrassed to be forbidden the pools, and not sure if the sandbox will work for her. She bends down to where a moth is resting on a plant and puts out a finger, onto which the moth crawls. She turns, holds the moth near her face, and whispers, "Benjamin? Will the sandbox work for me?"

"Yes," the moth whispers back, "You are only forbidden the pools."

"Thank you!" She holds her hand up, and the moth flits off. "Okay, let's go!"

They walk across the emerald grass. Izabel wonders if Pixel can fly. Instead she asks, "Did you get ice cream?"

"Nope! I can't have it. My parents think if the pleasure centers in my neural nets get stimulated too much when I'm a kid, I'll grow up to be a loop addict. What's your name, anyway?"

They come to the sandbox, an octagonal expanse of extraordinarily fine white silicate. Several lever-operated digging machines on swivel mounts are scattered around the sandbox, and off to one side on a little raised platform in the grass is a water tap and an assortment of shovels, buckets, and other child-sized digging tools.

"Izabel. You sure are... um, are you a boy or a girl?"

Pixel looks at her in a funny way, cocking their head as if they'd never thought about it, and says, "I don't know. I'll decide when I'm bigger, like the human kids do. My parents think it's better that way."

Izabel just nods. Pixel's parents must be pretty different from hers. She wonders how you decide what you want or how to act if you don't know whether you're a boy or a girl. Of course, human children do just that every day, but that's different -- they're human. They eat more, and they need houses.

Izabel sits down at one of the digging machines and begins working the levers. "Let's see what we can dig up!" She scoops out a large hole, swiveling each time to deposit the sand next to it. Pixel kneels down and leans forward on their hands, peering down.

"Stop!" Pixel says. Izabel stops scooping, and Pixel reaches into the hole. Izabel leans forward to look at what Pixel has cupped in their hands.

The creature she pulls out is like a bright pink crab with nano-adherent tank treads and digging arms in place of claws. It has two huge, inquisitive eyes on articulated stalks. It bloops happily and begins crawling up Pixel's arm.

Pixel purses her lips and coos. "Let's call it Moli!"

Izabel smiles. "I like that name."

vii. merry-go-round

"Move it, dimples!" pipes Katja, jumping up onto the edge of the merry-go-round and landing so that her steelyard boots make a solid thump. Her friend Pierre stands nearby, watching impassively. The spinning disc slows, the impact triggering one of its safety routines. Startled, the current occupants, a little robot and a couple of pixies, clear out quick. The human children flit off, giggling, and the robot girl runs away a distance before turning to razz them.

The merry-go-round looks like a big, rubbery, jellyfish held aloft by magnetic induction. Illumination from inside forms a pattern of six interlocking circles that slowly shift their arrangement and colors. Hovering in a swarm above it are millions of free-floating bioluminescent nanomachines that glitter like faerie dust.

Katja flops on her back with her head in the center and feet near the edge. Pierre steps onto the merry-go-round and kicks at the ground once, then lays down with his sensor array next to Katja's head, his feet pointing out in the opposite direction. She reaches out and brushes her fingers over one side of the shiny cluster of metal-enclosed lenses, sensors, and antennae. It has a definite front to it, and the arrangement of lenses is enough like eyes that he still seems to have a face. Pierre is a roughly human-shaped, but he's become less and less anthropomorphic over the last year. Replacing his head and faceplate with a cluster of cameras was the most dramatic move, and she's not used to it yet.

"I don't have many tactile sensors there, you know," he says. He's been talking lately about not having a body at all anymore, which upsets her.

"I know. But I still have 'em in my fingers." One of his lenses zooms in and out, focusing on something distant, and makes a little click.

Pierre and Katja are by far the oldest kids in the park today. They've known each other since they were dimples playing in the sandbox. Katja was Kata until several months ago, when she decided she wanted a girl's name to go with the breasts she's growing. She's getting taller, and two weeks ago her parents took her to have her wings removed. She was glad to see them go; she hasn't been able to fly for months now, anyway. She's also become more conscious of clothing. She doesn't want anyone looking at her body until she's sure she likes it.

<Dipole mode.> Pierre says to the merry-go-round, then feeds it -- and Katja -- an elaborate genetic algorithm that's a bastardization of some recent homework. The merry-go-round begins to emanate a weak magnetic field with its poles near Pierre & Katja's feet. The nanite swarm above them takes on a pattern, the light they emanate shaped by the magnetic field into hemispheres like wide nested "C"s that curve out from the poles and back. It

cycles through a riot of colors in frequencies defined by Pierre's algorithm. At the same time, the algorithm acts on Pierre and Katja, distorting the sensory input from their head-ware and mildly stimulating pleasure centers.

Benjamin txts, <Are you two high again?>

<Experimenting,> txts Pierre.

"Yes!" says Katja.

<You know I miss you both. But you must be bored here. You needn't storm in, scaring the dimples.>

Katja giggles. "You called them dimples."

<Well, they are, as far as you're concerned. Would you believe one of them hacked my wading pool and let a prototype loose in the park today?>

Pierre swivels a lens to focus on a nearby moth. The effect is as if he had raised an eyebrow. "Really?" He txts Katja, <Scat. I always wanted to do that.>

Benjamin sighs a Fibonacci sequence. <They grow more clever every year. I'll have to invent new games for them.>

"I miss you, too, Benjamin," says Katja, "That's why we come here." She strokes the surface of the merry-go-round affectionately.

<Social pod is all sports and team design challenges,> says Pierre, <Sometimes I do miss playing.>

Benjamin politely ignores the fact that they're probably playing hooky from social pod now. Given the algorithm he's running on the merry-go-round, Pierre is clearly ahead on his thoughtwork. And Katja, he senses, has some social learning in mind today. <All right, I'll leave you two be. Just, no terrorizing the dimples, all right?>

"Okay," she says.

Pierre traces one of the illuminated magnetic oscillations above them with a finger. It's as if they're in a dome of distorted, ever-rippling rainbows. <I wanted a little more purple.>

She has something she wants to tell him. He was always the boy, and she was always just a dimple. Now, she's a girl. She says, "I'm high."

<You're a dipole.>

"Am I north or south?"

"You're south. I'm north." He doesn't use his voice much lately, and it startles her a bit. He's pitched it lower than he used to.

My current flows your way, she thinks.

She lets him talk for a while -- about the algorithm they're doing and people in social pod and how when he's older and gets into a real investigation pod, he wants to go down to the Venusian surface in a survival shell and do research. After a while, the merry-go-round

comes to a stop. She zones out and stares in the direction of the wading pool. She has a funny impulse to drag him in there, but says nothing, because she's not at all comfortable thinking about how really, she maybe wants the adult version.

The algorithm peters off slowly to its ground state, and the nanites above gradually relax into an amorphous cloud of silvery glitter. They lay there for a while, watching Benjamin's moths flit over the lengthening shadows and dimples going home in airships.

Katja realizes she's not going to say what she wanted to say.

"Did you like the algorithm?" he asks. She smiles, nods. "Well," he says, "We ought to go."

"You're north, and I'm south," she says.