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The Topology of Absence

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A Doppler Shift

“Let’s say we get lost in a snowstorm when we’re driving,” Aurora’s father says. “How will we be found?”

Aurora is twelve. She barely sees her father between her school and his work. He is there in the witching hour, but he has set his schedule so he is sleeping when she is home. Conversations like these are hard to come by. “I don’t know,” she says, setting down the pencil to her math homework. “Tell me.”

She imagines that he would tell her to stay in the car, and he would open the car door and fade into the sheet of blizzard like a message written in disappearing ink. She imagines that he would come back not too long after. He would have a way home, and her mother would be with him, and she would be carrying the groceries she left so long ago to get.

He takes her pencil and flips to a fresh page in her notebook. He draws a small circle. “That’s the car,” he tells her, and then he draws an X. “And that’s a cell tower. The one cell tower picks up your cell phone’s signal and knows that you are along a certain line”—he draws a line from the X to the circle and past it—“but it doesn’t know where on the line you are.”

“Okay,” Aurora says. She leans forward on her elbows. “That doesn’t make much sense to me. Shouldn’t it—”

“If there’s a second cell tower”—her father draws another X—“it can tell where you are along second line from it.” He draws the other line from this second X to the circle and past it again. “Where the two lines intersect is where you are, and then somebody can find you.”

Aurora takes the pencil and notebook from him. “Are you so sure cell towers can find us along such a narrow line? How do they do that? I’d think that they’d be able to tell we’re more in a certain region, like if we were in a general direction...”

She starts to draw a coordinate plane. She only finishes drawing the y-axis before her father speaks again.

“Of course they would. For goodness sakes, kid.” He stands up and pushes away from the kitchen table. “You think I would be telling you these things if I didn’t know them for sure?” He backs down the hall that leads to his bedroom.

Aurora only hums a little. She finishes the coordinate plane. “If the first cell tower knew we were south of it”—she draws a horizontal line and shades below it—“and a second knew we were west of that cell tower....” She adds a vertical line and shades to the left. Her father has vanished into his bedroom, but she still speaks aloud. “If there was a third tower, and it knew we were northeast of it.”

She looks down the hallway to his closed door. “You’re ignoring me,” she calls out.

“I’m not here,” he calls back.

She draws out the line $y = x$, and she shades everything greater than y . A triangle looms in the middle, dark gray with graphite. “Maybe my system isn’t as specific as yours, but I think that’s how it probably works.” She shrugs at her diagram and turns back to her math homework.

“Wouldn’t they have found where Mom went if your method were true?” she asks a few minutes later. She knows she is loud enough to be heard through his closed bedroom door.

“You know I don’t like to talk about her,” he says, loudly, sharply. He opens his bedroom door just to slam it.

Her father refuses to speak to her for a week. She sees him even less than usual, and he doesn’t even put out leftovers for her dinner. Then it is her thirteenth birthday. To celebrate, he gets the piano he has been promising for years, and he speaks to her. He only says, “Happy birthday, Aurora,” but for her that is enough.

The piano is an upright, a small one that looks huge in their apartment. Her father bought it used, and it is covered in marks and scratches that he rubs at whenever he has to squeeze around it to get to the kitchen from the living room.

She doesn’t get piano lessons like the other kids, but she finds a beginner’s book in the piano bench that teaches her the notes and chords and what to do with the pedals. The piano takes a year to respond to her—to sound musical, even though she plays the same notes every single night until she knows all the notes and chords and scales and little songs in the book by heart. The first time the music sounds right

under her fingers, she has bled for the first time. She feels like a woman now, with breasts and blood and music.

When it finally does sing at her touch as she wants it to, her father is half-dead of depression. Aurora goes to the school's music teacher and asks for music.

"Who's your piano teacher?" the music teacher asks. He is holding a black metal music stand, and he carries it to the back row of chairs in the orchestra arrangement.

"I don't have one," she admits. She follows him to the file cabinets in the corner. "But I've been playing a beginner's book for a while, with scales and little songs, and it just clicked. I get it now."

He pulls open a drawer. "There's a lot here," he says, flipping through the folders. His bright blue shirtsleeve catches on the dividers, and she wants to un snag it for him; she is close enough to reach down and release it, but he shakes his arm and his sleeve comes free. "I can just make you copies of a lot of stuff. Some Chopin, Tchaikovsky, Shostakovich, Beethoven, Debussy—all those foreigners." He laughs at his own joke.

"Thank you so much," Aurora says. She doesn't laugh. "I really mean it."

He pulls out a thick stack of music. "I'll have copies for you by the end of the day. Can you come after school to pick them up?"

"Of course," she agrees. "Thank you," she says again.

He waves his hand. "Now get to class."

At home, her father doesn't even notice her new music. He just goes to bed, and she tries not to notice his earplugs. She tries to play "Clair de Lune" quietly.

She spends hours every night playing all of the music the teacher gave her. She masters the rhythms with the aid of a metronome that she filched from her science teacher's classroom. The metronome had been one of many that the teacher had used to show that they all synchronized when placed on a moving table.

She graduates from middle school, and she spends the summer on the piano bench. When school starts again, she goes to the high school music teacher's room. The same music teacher is at the high school as was at her middle school. He even recognizes her.

"How's piano?" he asks.

"Tell me about composing," she says. She leans on the piano and strokes its keys too lightly to make a noise. "I've noticed that the chords change in a specific way, but I don't know how or why."

He walks to the whiteboard. "It's complicated," he tells her. "Are you sure you want to know?" He erases the rhythms written up there, leaving a blank staff.

She says, "I want to know the—well, is this the grammar of music? Or is it its sentence structure? Or style? Or is it a formula?"

He laughs to himself and uncaps a blue marker. He writes out a scale and begins to explain.

She comes back every day for two months, and he writes with the blue marker and plays chords on the piano. Finally, he tells her that he has taught her as much as he can. The rest is just doing it. He hands her a thick stack of blank sheet music. "Come back sometime," he tells her. "Share what you write."

She promises she will. She goes home and sets one sheet of the paper on the piano with a pencil, and then she places her fingers on the keys. Her father is gone. She plays loudly, and it does not sound good yet. Her name will not be famous tomorrow, but she is okay with that.

A blue folder slowly fills with her own compositions. She returns to the music teacher's classroom three months later when she thinks she has finished a couple of pieces. The music teacher listens with his eyes closed, sitting in the concertmaster's seat.

"You wrote that since I last saw you," he says when she has finished and silence fills the room. He does not say it like a question.

"Yes." She smooths out her red shift-dress and places her hands in her lap. She glances over at him to see that his eyes are still closed.

"Pretty good," he says. Then, eyes opened, he gives her a critique, and she writes notes in the margins of her score.

He shows her some of his own compositions later in the year. He plays on the cello or on the violin and once on the piano. She does him the courtesy of commenting on his music, and the next time she hears him play, he has listened to her. They continue like that, comrades in music, for the next couple of years.

They start to write a duet between the cello and piano late in her junior year when she is barely seventeen. The first day, she stays so late at school with him to work on it that it is dark when she returns home, full to the brim with happiness and music and the feeling that she actually found her place in the world. When she enters the apartment, her father is sitting on the piano bench. He hits random notes. It hurts her to hear how unmusical he is.

“You’re out late,” he says, and he hits a G.

“I’m working on a duet,” she says, and she won’t tell him with whom. “I got caught up, lost track of time. That’s all.”

A C♯ rings out next. “I never would’ve guessed how much you love this thing.” He presses down both his hands on the keys. A cacophony of notes rings out, and when it starts to fade he does it again.

She wants to lift his hands from the ivory and lead him to his bedroom and place his earplugs in his ears so she can practice her part of the duet and maybe work on it. Or she may work on the piece that she is secretly writing for the music teacher.

“You love it more than me,” her father says.

She wonders what he means. Does she love the piano more than she loves him, or does she love the piano more than he loves it? Aurora doesn’t know what to say.

“Your mother did that first, you know,” he tells her. He taps a B, then a F♯.

“Did what?” She steps forward and pulls his hands off the keys.

He flips his palms upward and grabs her wrists. “Loved something more than she loved me. In her case, it was another man.”

“I’m your daughter. I’m not her.” Aurora pulls away. “It’s a piano.” She steps back and retreats to her room. A minute later, she hears the piano bench scrape against the floor as he stands up. The sound of his own bedroom door closing follows a few moments later.

She doesn’t return to the music teacher for a whole week, in which she spends nearly every free minute working on the little sonata she’s writing for him. She almost wishes she could quit the piano for her father, but the music is like an addiction; she craves the smooth ivory beneath her fingers, the piano’s sweet voice as she makes it sing with only a press of her finger, the way the whole room shakes with her playing. Aurora plays lightly when her father is home, and she leaves his earplugs on the kitchen counter. She works through the night twice and falls asleep in Calculus. The little sonata is nowhere near ready when she walks into the music room with it hidden behind the duet and a few other pieces, but the fact that it is there quiets the image of her father on the piano bench.

The music teacher does not greet her from where he sits in the back of the cello section. One of the large stringed instruments lies on the ground beside him.

“I’m going to die,” he tells her. He holds a bow in his hands like he could snap it in half, but he does not touch the hair.

“We all are,” she replies, joining him as stand partner. She straightens the belt on her doppler shift and turns to face him.

“I’m going to die soon,” he says. He drops the bow on the stand, where it makes a loud metallic clang. “I’m sick.”

She reaches out and clasps her hands over his.

The music teacher laughs humorlessly and pulls away from her. He picks up the cello. “Let’s finish the duet,” he says.

On her eighteenth birthday, her father packs a suitcase and leaves their tiny apartment and its piano that takes up half its space. He packs and leaves right in front of her, even though she is seated at the piano. It is as if the instrument renders her invisible. Or renders him invisible.

“Where are you going?” she asks when he is nearly out the door.

“I’m leaving,” he tells her. He has one hand on the doorknob. His back is to her. “You’re an adult now. You don’t need me anymore, and I’m going to find your mother.” He hesitates before he shuts the door and says, “Happy birthday,” and then he closes the door quietly behind him.

She thinks of being lost in a snowstorm, and all she can think is that he is not a cell tower, and he will not find her mother.

Aurora goes to the high school, but the music teacher is not there. He is in the hospital for the first time; he has been there for almost a week. Aurora sits and does not play at the piano in the music room. She does not go home at all, because all she can imagine is her piano mocking her for imagining that this wasn’t going to happen.

The Maternal Matrix

The woman on Aurora’s doorstep could be anyone: a salesperson, a childhood friend long forgotten, or a stranger stopping for directions. She barely reaches Aurora’s nose, even though she wears pink high heels.

“Are you Suzanne?” she asks Aurora. Her veneered teeth flash in the bright sun.

Aurora places her palm on the open screen door and leans against the frame. She starts to shake her head. Only her parents and she know that Suzanne was the name her mother chose for her.

The screen mesh bulges out where her hand rests, and Aurora eyes the woman carefully.

"I'm your mother," says the woman. She shifts her weight to her other foot, and she looks like she wants to walk past Aurora and into her home. The bright pink and orange of the woman's shirt is so bright the rest of the world looks dim in comparison.

"Okay," Aurora says slowly. "So you say you're my mother." She feels only the steady expansion and contraction of her heart. She wants to back away, to shut and lock the door; at the same time, she wants to embrace the woman before her. She wants to ask, Why did you say you were going for groceries? Why did you lure my father away? Instead, she asks, "What do you want?"

The mother reaches forward and grips Aurora's arm tightly. The screen door jerks farther open. "I want to meet you," she says. Her long, acrylic nails dig into Aurora's skin. Her fingernails are the red of wilted roses. The woman's other hand grips the doorframe.

Aurora winces and pulls away, and the mother has to grab at the screen door's handle to keep it from slamming into her. Where the mother touched Aurora, the skin is red and swollen. It looks like it is already beginning to bruise.

She says to the woman, "I don't think I need to do that. Meet you, I mean." She thinks of her father and the few hints he had dropped about her mother. She thinks of how he left in search of her. He must not have found her. She wonders if he tried to use cell towers and cell phones, and if that is why he failed.

"What?" The mother's green eyes—the same as the daughter's—widen, and her lips press together in a small, hard line. Her hand flexes; her long nails cut half-moons in the pine doorway, crescents that will never go away.

"You heard me." Aurora's voice breaks under the weight of the words. She shuts the door; it closes solidly even though her hands shake. She wonders if she shut it too soon.

Aurora watches out the window. The mother doesn't look back as she walks down the drive with her hands curled around the strap of her handbag and her shoulders brought up against the wind. Aurora closes the curtains and tries to look away, but she can't help but notice that the white curtains turn her mother into a figure engulfed by snow.

Hyperboloids in the Time of Multilateration

Aurora goes to a piano concert when she is years past college and hundreds of miles from her hometown. The ivory keys—barely white specks on the distant stage—call to her. The familiar concerto fills her ears. She wants to play alongside the pianist, but the last time she even was close to a piano, she was barely eighteen. The music teacher had died, and she had sat at the piano bench and played nothing.

Her fingers ghost along the familiar notes as if the program the usher gave her is a piano. The man sitting next to her gives her a sidelong glance and opens his own booklet. Halfway through the second movement, she starts to cry. This piece is in D major, uplifting and happy, and even the slowness of the second movement doesn't hinder that feeling. Aurora's tears are anything but happy.

Intermission is called and the lights raise. She stumbles over the people in her aisle, her head turned away from the empty piano. As she wipes her eyes, she bumps into one more person and apologizes.

"Aurora?" the person asks.

She swipes at her face one last time. She hopes her eyes aren't too red. The music teacher's wife stands next to her in the mass of people trying to flee the auditorium.

"Hello," Aurora says. "It's been a while."

"Aurora," the music teacher's wife says again.

Aurora remembers that she is a private inspector.

The music teacher's wife continues, "It's nice to see you. How is piano? Have you been playing much?"

"I haven't," Aurora admits. The crowd surges forward, and the two women walk into the lobby. "I haven't been able to play since..."

The PI nods once, sharply. "Have you been enjoying this concert?"

Aurora raises a hand to rub at her eyes. "No," she says. "What about you?" She hesitates over what to call the music teacher's wife.

"Rebecca," she says. "Call me Rebecca now." She gives Aurora a tight-lipped smile.

"Do you like this concert, Rebecca?" Aurora says.

"I haven't really enjoyed it either," Rebecca admits. "Reminds me too much of him."

"It reminds me too much of my playing," Aurora shrugs. "Which reminds me of him, and my father, and the fact that I can't do it anymore."

A bell rings, warning them to return to their seats. Neither of them moves, and people move around them like they are rocks in a river.

"Let's go get coffee," the music teacher's wife says.

"Or a drink," Aurora says. "I'm much older than twenty-one now."

"Coffee," Rebecca says. "I'm sober now."

They end up at a greasy diner a couple of blocks away from the auditorium. Neither of them has been here before. They sit in a booth in the corner, and it barely takes any time to order their coffee. Aurora debates whether or not to get ice cream.

"The ten year anniversary of his death was yesterday, you know," the music teacher's wife says. She stirs a packet of Splenda into her coffee. The metal spoon sounds loud against the ceramic.

"I know." Aurora sets down the dessert menu. "Rebecca," the name still tastes foreign on her tongue, and she sips from her coffee. "I'm sorry I didn't come to the funeral."

Rebecca waves a hand. "It's okay. It wasn't really him anyway. All the music was this religious bullshit—"

"I should have played his piano piece," Aurora says. "And I wrote a little piano sonata for him. I never showed it to him, but it would've been fitting."

Rebecca doesn't say anything, and Aurora can't catch her eye.

"I started it before I found out he was sick," Aurora says, filling the silence, "when we were working on that duet, as a thank-you for all he's done for me. But then he got sick, and my dad... it was the only thing that I could actually write or play."

"He wrote you a piece too," Rebecca says. "Cello, of course. 'Aurora Borealis.' I have a recording of it somewhere. The sheet music too."

Aurora presses the heels of her palms into her eyes until colors explode behind her eyelids. "If someone got lost in a snowstorm," she asks. "And you had to find them using their cell phone, how would you do it?"

Rebecca taps the mug with her finger, recreating the rhythms of the concert they are not attending. “Well, there’s this thing called multilateration,” she says. “You can find the distance of the cell phone from two cell towers, and it will give you a two-sheeted hyperboloid—pretty much a 3D hyperbolic curve. Do you remember doing those in math?”

Aurora nods. “Conic sections,” she says, pulling her hands away from her face.

“This is 3D,” Rebecca says and smiles a little. “Well, you get several possible points, so you do it again with another tower, and then another. And then you get a smaller number of possible places where the person—or the cell phone—is.”

Aurora imagines her father braving a snowstorm. She imagines her mother in the eye of the storm. Their phones are lost somewhere, and she cannot find them now.