

TOOL USE BY THE HUMANS OF DANZHAI COUNTY

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Derek raises his son, reads comic books, and writes science fiction in Gatineau, Québec, but not all at the same time. He was invited to tour a poverty alleviation effort in Guizhou in 2018 to inspire this story, and its publication marks his tenth appearance in *Asimov's*. Derek's new novel, *The House of Styx* (a *Godfather* story set in the clouds of Venus), is finishing its serialization in our sister magazine *Analog*, and will be released in hardcover shortly. His first novel, a space opera heist story called *The Quantum Magician*, was a finalist for the Aurora, the Locus, and the Chinese Nebula Awards.

The first humans living on the Yunnan-Guizhou plateau were the *Homo erectus*, approximately 1.9 million years ago. They extended their muscular reach with wooden spears, and gathered wild grains with crude stone axes. They may have experimented with fire and windbreaks of animal skins stretched over frames. They are thought to have transmitted information with proto-languages of grunts and gestures. These are the earliest discovered examples of human tool use on the plateau.

Human Evolution
The AI Foundational Encyclopedia
2065 Edition, Guiyang, China

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Xidangdiao, 2010 AD

Up the hill, out of sight, someone laughed. Someone else practiced fluting. Along the hollow of the mountainside, the path led behind big wooden houses on stilts, far

richer than Qiao Fue's family's house. The dancing and singing wouldn't start for an hour, but on the pathway in the distance, people chatted and gossiped.

Pha Xov, winsome and sweet, stood a dozen meters ahead of him, smiling beneath peach trees. She wore her courting finery. His heart went light and heavy. Her smooth skin was sun-bronzed, with black hair tied beneath the intricate tinkling silver headdress. Greens, reds, yellows, and silver accented her deep blue dress, sewn by her own hand with skillful, invisible stitches. His clothes were fine, but also felt out of touch with the modern world, in a way that made him proud and shy at once, pulled in two. He took Pha Xov's hand.

"Why don't we skip the festival?" he said. "Let's go to the youth house, or up into the hills."

Memories of her body, supple and womanly, heated his cheeks and made his mouth dry. She smiled, and he imagined he saw pink color her cheeks, just a bit. She pulled back her hand and arranged the hanging sun symbols dangling from the rim of the headdress. She turned her head, strumming the suns like wind chimes before smiling into the tension.

"If I wait too long, I'll be so old no one will want me," she teased.

"Everyone always wants you."

She smiled. "Flatterer."

"I don't want things to stop between us."

She stroked his arm. "Then marry me, Qiao Fue."

People walked by, watching them. He took her hands and waited until they'd passed. The breeze rained tiny brittle leaves from farther up the mountainside.

"The university at Kaili offered me a scholarship. I'm still waiting on Anshun." He moved his head close, stroking her arm through the embroidered sleeve. "I want to be someone big. A rich man who owns companies. Maybe even a party official."

"Driving around in cars, having big houses?" she teased. "Governor of Danzhai County?"

"Why not?" he said. "I'll do good things for everyone."

"I know."

His face betrayed him. She touched his cheek.

"If you don't have the money for the bride-price, we can elope," she said. She glanced left and right and the silver suns waved. No one in sight. She ground her body against his. His body responded to the promise. "I'll take good care of you," she breathed in his ear, "and our children and our grandchildren."

"Let's go to the youth house now," he whispered.

"No more youth house. Just marry me."

"I can't get married yet. A marriage has to help me with connections, introductions to people in power."

"Not a little Miao girl."

"That's not what I meant! It's just not the right time. The world is out there."

She pulled away. "We only have so many springs."

"We'll make more."

She'd taken a step back and he one forward. She shook her head, chiming the white silver suns.

"We don't make more summers, Qiao Fue. We plant, we tend, and we reap the summers we have."

He took a step closer. Her courting finery made everything feel more urgent.

"I'm pregnant," she said.

He froze.

"We can start our family now," she whispered, touching her belly. "We'll support you."

But her eyes moistened. She saw something in his expression.

He was shaking his head. “We can go to the doctor,” his voice rasped. “We don’t need to have the baby.”

Pha Xov stepped back again. One step. Two steps.

“I want the baby, Qiao Fue,” she said, wiping her eyes.

Her smile could not summon the winsome playfulness of before. “I won’t tell anyone it’s yours. You can go be rich. Be mayor. Be governor. You’d be a good county governor.”

Her encouragements sounded tinny, as if chiming from metal leaf. She wiped at her cheeks.

“I have to go,” she said. “Lian Koob asked me if I wanted to dance with him.”

Qiao Fue’s heart lurched with jealousy. Did she say it on purpose? To hurt him? She was wiping her cheeks, and the hanging suns sounded notes to one another. Then she turned and was gone.

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The sky is not clear three days;
the land is not level for three li;
the people don’t have three cents.

Guizhou folk saying

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Xiadangdiao, 2020 AD

Lian Mee stepped along the pathway between one flooded rice field and the three-meter drop to the next terrace. The treetops were as tall as her, growing from beside her little wooden house on the lower terrace. Straight lines of rice plants, one pace between each, ran to the bright green wall of the cliff face, where trees and creepers smothered rock. Lines of rounded mountain backs, thick with trees, retreated into the haze of clouds, as far as the eye could see. Along some of the ridges, new electrical towers rose, fast as poplar shoots.

Lian Kaus, the neighbor’s second boy, stood around a bend in the grassy ridge. He was nine years old too. He threw small sticks at dragonflies in the afternoon heat. They darted between sunbeams, ignoring him. Lian Mee’s grandmother stood in the water between rice rows, pants rolled above knees. She fidgeted with the nozzle on the sprayer. Lian Kaus jumped, throwing another stick.

“They’re making another electrical tower, Granny,” Lian Mee said.

Granny squinted for a moment, and then struggled again with the nozzle. Finally the spray fanned wide again. She shouldered the tank like a backpack and trudged through the water, spraying each plant with a brief burst.

Lian Kaus leapt. Threw. Missed. The dragonflies danced with each other.

“They’re mobile phone towers,” he said as though Lian Mee were an idiot. He stooped for another stick.

“How would you know?”

“Lee Shizeng said.”

“How would he know?” she said, squinting at the towers. She didn’t know how to tell a mobile phone tower from an electrical tower.

Granny wheezed as she set down the sprayer. “I wish you were bigger,” she said. “You would spray all these fields.”

Lian Mee had once tried on the sprayer for fun, but could only lift it empty.

Granny complained a lot. Lian Mee had no father. He’d died when she was a baby, and Lian Mee’s mother, Pha Xov, had gone to Guiyang to find work. She’d married

another migrant worker, but Hang Hao, her new husband, didn't want some other man's daughter in the house. Pha Xov lived in Erjiaohe now, a village as remote as Xiaodangdiao, but nesting on different mountain slopes. Lian Mee leaned against Granny.

"When I'm big, I'll get a job in the city with mobile phone companies and computers," Lian Mee said.

Granny snorted. "Who would give you a job like that?"

"Girls work as secretaries," Lian Kaus said.

"Mom works," Lian Mee insisted.

"Cleaning the streets," Granny said.

"I can get a job with computers," Lian Kaus said, sitting beside them.

Granny squeezed his thin arms doubtfully. "You're a kid from the fields," she said. "They don't give good jobs to you either unless you know someone. Start working hard now so you can afford a wife."

Lian Kaus frowned. Mee wanted to laugh at him, but it didn't feel funny. Lian Kaus' parents worked in the city too. He, his brother and grandfather got fed by a lot of the neighbors. The dragonflies were gone.

"And your stitching is awful," Granny said to her. "No one will marry you if you can't stitch a straight line."

Lian Kaus laughed at her, hopped up, and ran away, jumping and throwing his stick.

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Information in China was stored solely in human brains until the appearance of quipu knotted record-keeping in the fourth millennium BCE, the Dawenkou pottery symbols in the third millennium BCE, and oracle bone script of the Shang Dynasty beginning in 1500 BCE. This experimentation from the fourth to the second millennia BCE are among the first external human memory systems. The invention of paper and books accelerated the proliferation of human external memory systems that could also serve as information transmission media. In the nineteenth century, humans added photographic and cinematographic external memory systems, before finally discovering digital storage systems based on solid-state physics. Only chip-based systems are directly interfaceable with human neurology.

Human Tools of Information Storage
The AI Foundational Training Encyclopedia
 2021 Edition, Guiyang

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Danzhai, 2021 AD

"Graphs don't lie," Qiao Fue said.

Bao Lue, the deputy governor of Danzhai County, might not agree. Bao was a middle-aged man of Miao heritage. He wore the same slacks and shirt that most people might wear in any city of Guizhou. The flat line of the graph lay prominent on the smart screen that Qiao Fue had unrolled on the table.

"Tourism is steady," he said.

"Danzhai is growing," Qiao Fue said. "Guizhou is growing. But tourism isn't growing. The Forbidden City and the Terracotta Warriors are equipped with VR and AR. In two years, on the West Lake in Hangzhou, you'll be able to fight ancient Song

Dynasty naval battles with artificial reality. We have a garden, a bell tower, and dancing. How long do you think we'll attract tourists if we don't do something new?"

"What does fly fishing have to do with us?" Bao said. "How is white water rafting an example of Miao culture?"

The picture of laughing people in inflated boats bouncing between river rocks seemed absurd to Qiao Fue too, but he said: "It's more tourists. It's jobs."

Bao crossed his arms. "If we become like everyone else, there's no reason for tourists to come to Danzhai at all."

Qiao Fue had done the business research. He could make river tourism work. He could make money for Danzhai and himself. He needed this break, to make the seed money for everything he wanted to do.

"Culture only goes so far," Qiao Fue said. "Culture is just trying to freeze how our grandparents lived, what they spoke, how they made their living. Why isn't the way of life of today or tomorrow valued? As soon as anyone realizes culture is just transient, we'll have no more tourists and we'll be just poor again, unless we have other industries."

Bao leaned back in his chair, regarding Qiao Fue, just one more Miao man with one foot in the mountains, one foot in the cities. Every road and every mobile phone tower and every tourist was another bridge to the cities and nations beyond Danzhai County and the tsunamis of culture that would swamp them all.

"Protecting who we are is more important than making money," Bao said calmly. He picked up one of the silicon chips Qiao Fue had brought. "I like your language idea."

Qiao Fue deflated. The chips were the least profitable of the ideas he'd brought. He slid three other chips toward the deputy governor. "Only 10 percent of tourists have chips in their phones that can send signals to the brain," he said. "Translation AIs have mastered three Miao languages, including Hmu. We can bluetooth to the chips in the phones, so that tourists can understand our songs."

"That's what I mean by cultural," Bao said. "People can't experience Miao languages or songs anywhere else. That's why they come here."

Qiao Fue didn't want approval for just the chips, but he didn't know how to make Bao see. The silver ornaments on the walls, the water buffalo skull over the door, the ornately embroidered indigo cloth under glass all seemed stale. The window opened onto a parking lot and a low apartment building under construction, in front of a distant rounded mountain, fuzzy green with trees. Mountains rose in every direction eventually, hemming him in, like the past.

Whose past?

"We sing songs on holidays," Qiao Fue said, "but how many of us live in apartment buildings and go to work in buses? How many Miao still learn Hmu before Chinese?"

"Everyone," Bao insisted. Qiao Fue regarded him doubtfully. People moved from the villages to the cities, looking for work, becoming indistinguishable from the Han Chinese. Miao children had more occasion to speak and read Chinese and watch it on TV. The Chinese language opened up the world. The Hmu language opened the past. The past was important to Bao and many like him. Qiao Fue had to give Bao something of the past to step into the future.

"Give me the business permit for the white water rafting and fly fishing," Qiao Fue said. "I'll give you not just the bluetooth translation for the tourists, but I'll grow AIs to translate and dub Chinese movies and TV into Hmu so children can hear their own language on screen."

Bao regarded him for long moments. Qiao Fue's breath stilled. If he didn't start a profitable business soon, he might be too old to catch up later, too late to make the connections and alliances he needed.

"Fine," Bao said finally.

Qiao Fue smiled and shook Bao's hand excitedly. "Everyone will know Hmu!" he said. "All the children!"

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Student Dormitories, Guizhou Institute of Technology, 2034 AD

Lian Mee sat with her feet on the hard chair, hugging her knees, not crying anymore. The cold white expressway lights haloed in the dirty glass, under spotlights where campus construction kept on day and night. Her five roommates were asleep. Hao Fan snored. Fang Sui's phone kept pinging softly as some WeChat conversation went on without her.

Mee shook with anger as the world closed in around her. In bed, she'd lain wide awake, twitching with too much energy, shifting between humiliated and angry, so she'd moved to the chair again tonight. The sleepless nights were leaving her groggy during the days. Some images dyed themselves indelibly into human brains: the geometries of layered terraced rice fields, the orderly curves and straightaways of city streets and highways. The even strokes of silver thread through indigo cloth woven by Miao grannies and aunts. But sometimes dyes soaked wrong, leaving shadows and outlines in the fabric.

Her master's degree had almost finished. Her thesis, to begin to model moral behavior in AIs, had been going well, maybe not perfect, but well enough to graduate if her supervisor sponsored her. At first, Professor Zhang had just brushed her shoulder while showing her a corrective algorithm she needed for the AI she was growing. It was an innocent gesture in the moment. She should have stopped it then. That made her angry now. But how? What would she have said? She would have just looked like someone overreacting.

His fingers lingered on her back a few days later, hot through the thin blouse she wore. His face came close, smiling. She thought she'd imagined it, thought she was overreacting. She didn't tell anyone. Her suspicions felt stupid. Her discomfort felt stupid. Everyone liked him. Professor Zhang didn't do that to anyone else.

She began to wear different clothes. She'd never been immodest, but she chose thicker shirts, despite the summer heat, and longer skirts. The following week, she'd been called into his office. He asked her to close the door. Reluctantly, she did.

"Your progress is falling behind, Miss Lian," he said.

He directed a stern expression at her, sterner than anything she'd seen. She was behind? Her AIs were about middle of the pack for the master's students, ahead of some. The smart screen on his wall showed her AI work, the iteration flow charts, milestones in the machine learning process, percentages showing what her AI could model ethically from measured human emotions.

"The decisions on your graduation and final scholarship payments are coming up."

"I can work harder, Professor," she said. "Every night and all the weekends."

He regarded her dubiously, and the silence between them stretched. Hammering, the yelling of instructions, and the beep of trucks backing up came through the open window of his office. Everything being built at the same time, like AIs, like her, but she was shaky now, not certain if the structure of her life would stay up.

"Frankly, your work is superficial," he said.

"Professor . . ." she faltered, "I thought you approved my thesis topic and approach last year?"

"I did," he said, new anger in his voice, "and I thought you would add to it. A topic is only a seed."

Tears threatened, and she didn't want to cry now. She hadn't added anything

original? How did she make something original? What had the other students done? She hadn't seen anything remarkable in their work. Every student was just learning to grow AIs.

"I can add to the topic," she said, her voice sounding quiet in ears grown hot with humiliation. "I can try new approaches."

A look of disdain came over him. "Start over?" he said. "When would you have the time? AIs don't grow overnight."

They didn't. Machine-learning a chess AI could be done in a few seconds now. Making an AI that modeled a moral sense was far more complex, involving the mating of different versions, the selection of stronger strains and the alteration of parameters. It took months of direct human intervention and corrections, and a lot of luck. She blinked at moistening eyes.

"I don't understand, Professor. In my evaluation last month, everything seemed okay." He rose from his desk and came around, sitting on its edge.

"I don't want you to lose all this work," he said, reaching to stroke her shoulder. "I don't want you to have to tell your mother you failed to finish your master's degree. Or employers."

She sat rod-straight. His hand rested on her shoulder now, glued in place, only the short, thick thumb describing a gentle arc, back and forth along her collarbone. Metronomically. What was he doing? Her brain froze with the words *failed to finish your master's degree*.

"You don't want that, do you?" he said.

She shook her head numbly.

"There may be a way for me to approve your research, even if it isn't up to standard," he said.

She started. Through the lenses of his glasses his eyes examined her shirt, her legs. She wanted to shrug off his hand and the moving thumb, but *failed to finish*.

"Why don't you come to my apartment the day after tomorrow?" he said. "We'll have a few drinks, talk about my assessment on your thesis and the final scholarship payments."

His hand now moved, following her collarbone to her neck and jaw, where it stopped, sweaty and warm. The thumb continued its stroking, up and down her cheek. She stood up jerkily, knocking the chair right over.

Professor Zhang frowned. "Pick up the chair, Miss Lian."

Stiffly, she bent and put it on its four feet, then faced him, not knowing what to say.

"I'll see you in two days," he said. At the tiny lift of her chin, he raised an eyebrow. "If you prefer, I can finish my assessment before then."

Her face burned. On jelly arms and legs, she bumped into the wall, then fumbled for the doorknob. She hurried out the half-open door and hid in a bathroom stall for an hour.

The spotlights from a crane lighthoused past the window, blotting out diffuse headlights and tail lights on the expressway. Hao Fan snorted, rolled over, and quieted. Fang Sui's friends had stopped texting. Mee's face burned. She was so stupid. She should have told Professor Zhang no. She should have sworn at him. Hit him. Slapped away his creepy hand. She didn't want to deal with this. She rubbed her eyes frantically. Her body was electrified, but her brain wouldn't work.

She'd reread all the thesis works in progress from the other students and even from other years. She couldn't find anything original and remarkable, unless they'd been hiding it, but that made no sense. Of course not. What if he were lying and her work was good? She'd passed all her courses. Until a few days ago, she'd thought they were all going to pass.

What if she wasn't smart enough to know he was right? Maybe she'd only gotten the scholarship through luck, or because of a government handout to whichever poor Miao mountain girl finished her bachelor's degree. She pressed her forehead to her knees. She didn't know how to keep the drowning panic from filling her throat.

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She didn't go to the engineering department in the morning. She slept fitfully while her roommates were at their labs. The window had to stay open with the June heat, so the jackhammering and truck revving slipped into her half-sleep. Building roads. Building campuses. Building AIs. Building people. All of it mixed together until she woke sticking to the sheets. Today she had to decide. No matter which way she tried to hide from it, the choice stared at her from every direction. She could feel Professor Zhang's thumb on her collarbone and cheek, rubbing possessively even now.

She'd been stupid somewhere. Worn blouses that must have enticed him, without her even realizing it. Skirts too short. Pants too tight. Somewhere, somehow, she could have avoided this, but she hadn't, and now what would she do? Maybe she'd been too soft-spoken, too deferential, someone who could be counted on not to complain.

If she told on him, what would happen? Would the dean believe Professor Zhang had asked her to come to his apartment? She had no proof. Why hadn't she set her phone to record? But she still wasn't even sure she was right. Professor Zhang just said they would talk. What if it really was just talk and she was overreacting? Even if she didn't know for sure, the dean wouldn't second-guess Professor Zhang and overturn his academic judgment. The loss of face would be incalculable. And for what? For a middling graduate student? A Miao nobody from the hills?

By late afternoon, she'd cried, showered, and thrown up acidic bile. In a daze she dressed in a shapeless sweater and an ankle-length skirt far too warm for June. She wore no make-up and tied her hair back. On the sidewalks, she bumped among the students, alone, her panic cutting her off from them.

Professor Zhang lived in a new building just off the campus. She'd been here before, with other students for a New Year's celebration, and another time with students and faculty for a retirement. She didn't meet anyone's eyes at the elevators. Her face felt feverish. At the twelfth floor, she walked on numb feet, feeling like she might throw up again. At Professor Zhang's apartment, she stood stiff, her heart thumping strangely, as if sucking up the blood and not giving it back.

Xiandangdiao was only three floors away, but the rice fields and mountain comforts, and even the language Granny had taught her, seemed far. With the feeling of jumping off a cliff into a deep river pool, she knocked on Professor Zhang's door. Not very loud, but decisive. A hot tear slid down one cheek where Professor Zhang's thumb had rubbed. Her heart stopped beating. She held her breath.

Someone opened the door in the next apartment and Mee turned her face away, but didn't move. A pause dragged out. Were they looking at her? Did they know what kind of person she was? Maybe they would say Professor Zhang had been hit by a car, that he'd been crushed under construction cement or steel girders. Her breath came unevenly. The neighbor's door closed and footsteps went to the elevator until the echoes of other people existing went silent.

She knocked again. Harder. She wanted this over with. Her knocks echoed down the hallway. She stood uncertainly for a minute before she looked under the door. No light. She knocked again, wiping at her cheeks. She huffed and leaned against the wall.

She hadn't thought to bring her cell phone. What would she have done with it now? Texted him? Create evidence that she had pursued him, something that if it ever came to a conflict in front of the dean might be used against her?

She waited an hour. People came to their apartments. People left their apartments.

She didn't even hide her face anymore. The acid in her stomach chewed at her insides. She didn't try to hide the despondency on her face anymore. She finally sat against his door, arms on knees, forehead on arms, just breathing.

She just wanted it over. She wanted to know she was graduating, that she could afford to stay in the city for the last few months of her degree. Professor Zhang was awful, and yet here she was, giving in to what wasn't right, because she had no other options. Another two hours passed. It must have been nearly ten o'clock. Doors opened and closed. People walked by.

Professor Zhang never stayed at the office this late. There were no departmental meetings. No conferences this week. Had he forgotten? Had he changed his mind? She got to her feet and wiped her face. If he'd changed his mind, and intended to fail her anyway, he hadn't just destroyed her career. He'd shown her that she had a price, that she could be bought. The idea was an indelible dye. How long would it take to wash out the stain?

She went down the fire stairs and snuck out of the building.

In the labs the next day, she worked as if nothing had happened. She spotted Professor Zhang in his office, but he didn't speak to her, didn't make any mention of their last conversation or of last night. Had it even happened? Did she have any career? She pushed her research work forward, hurrying, to give no excuse to anyone to fail her.

A week later, Professor Zhang copied her on the assessment sent to the department and scholarship office. He gave her a 71 percent. Not outstanding or expert, but still a pass. Last month she would have been ecstatic. She would have called Granny to let her know she would soon be the first person in her family with a master's degree. She would have started job-hunting in Guiyang, and Hangzhou and Beijing, supported by a recommendation from Professor Zhang.

Now it was all just dirt in her mouth. Professor Zhang had put her through that for what? For nothing? Had he lost his nerve? Had she really deserved to pass or had he taken pity on her? She couldn't stand the idea of seeing him, of owing any part of her career to him anymore. She didn't ask him about her performance. She didn't ask him for introductions or a recommendation. And she didn't attend her graduation ceremony.

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The Miao people descend from the Jiuli people, who were defeated at the Battle of Zhuolu in legendary times. Some linguistic studies suggest that the Han peoples borrowed words associated with rice cultivation from ancient Miao languages, meaning the Miao people might predate the Han in China and perhaps be the legendary Daxi Culture of the sixth millennium BCE. The Miao built and used a broad array of wood and stone farming tools, architectural structures and weapons. Humans of these times communicated ideas, knowledge and abstract thought through a sophisticated language, including music, and in the absence of a written language, complex semi-historical embroidery motifs. Over the centuries, Han military pressure drove the Miao people into the mountains of the Yunnan-Guizhou plateau.

Minority Ethnicities in China
The AI Foundational Training Encyclopedia
2032 Edition, Guiyang

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Kaili, 2035 AD

The interviewer frowned again, looking at Lian Mee's CV on his display. His bald scalp had a sheet of sweat and his collar opened to the second button.

"You're overqualified to be an operator at a server farm," he said finally. "Do you really have a master's degree?"

"Yes," Lian Mee said.

He rubbed his cheek as if still stuck on the question. "We're a small company," he said. "If you really have a master's degree in electrical engineering, you could work at the Tencent farm, or Alibaba's, or Apple's."

He waited pointedly, like a TV detective having stumbled on a clue.

"I don't want to live in Leishan County," she said. "My Granny is old and needs to live with me. And my mother probably will too. You're the only server farm in Danzhai County."

It was a new server farm, and a small one. The Huawei company counted more than a million servers in the caverns of Leishan. Alibaba wasn't far behind. Qualcomm didn't make public statements about the size of their server farms beneath the mountains. And Lian Mee was overqualified for all of them.

"Do you have a boyfriend?" he said.

"No."

She'd gotten used to this question.

"Are you going to have any children?" he asked.

"I can't afford it," she said.

He grimaced. "That's not an answer."

"I'm not pregnant. I don't have a boyfriend. I don't intend to have children," she said with heat. Too much heat. He frowned.

"You're a pretty Miao girl," he accused. "You're smart. You could get this job and get a boyfriend the next day."

"How can I prove I won't get pregnant?" she said.

He shrugged. "It's not for me to say."

The interviewer's questions weren't legal. She could have recorded it with her glasses. This office's privacy screen wouldn't beat the circuitry she had built in her glasses. But that wouldn't have done her any good. If ever a judge could be found to rule in her favor, the company would only get a fine, and could still choose not to hire her because she was overqualified. Or they could hire her, pay her a lot less than the men, and if she complained, give a bad recommendation to jobs she applied to in the future. Or someone somewhere could complain about her as a troublemaker and her Social Credit Score would drop.

"I'm not going to get pregnant or get a boyfriend," she said in a resigned surrender.

He tapped his desk to minimize her CV. "I'll do reference checks," he said. "We'll be in touch."

She stood, shook his hand, and thanked him for the interview. He wouldn't be in touch. She left his office and let herself out of the company's new building on the outskirts of Kaili, a small city outside Danzhai County.

She found a little teahouse overlooking an arm of the Qing Shui river, across the lawns of Dage Park, and sat down. Tung trees, camellia, and a lonely birch shaded bright grass in the park across the street. She'd been staying in her old house with Granny, and the bus back to Xiadangdiao wouldn't leave until five. The house needed a lot of expensive fixing after years of no one living in it. Granny complained that Lian Mee was unemployed and too old to fetch a bride-price.

A bride-price. A bride-price hadn't done Granny much good. Or Lian Mee's mother, wherever she was. Nor had university really. Not yet. The interview she'd just finished had gone like other interviews, and from what she heard from women friends

from school, she would eventually get a job making less than men and working for someone like Professor Zhang. There were laws against all of this, but few people enforced them.

“Excuse me, may I sit here?”

A woman about her age had her hand on the back of the chair across from Lian Mee. All the other tables were full of patrons head-down over their phones, pads, and sheets. Lian Mee gestured. The woman joined her and scrolled through her phone.

The internet was poor in Danzhai County, even just for accessing static webpages, although not as poor as in some of the remote mountain villages. One of the provincial data trunks ran right to Kaili, so from this teahouse they could touch the world. Danzhai needed better internet.

On a whim, Lian Mee did a quick search on her pad. The company she’d just applied to had no idle processing power, but as she toggled to the pages for the Tencent and Huawei server farms, she found a fair bit of slack processing power available for rent.

Several million servers stored in cool caves in Guizhou province had a lot of idling time if summed together. But it was difficult to predict when the idle power would be available. Businesses couldn’t run as the second choice of a processor farm. She’d thought about how to optimize server processor farms with AIs before she’d applied for the job, but hadn’t had the opportunity to talk about it.

Lian Mee turned back to the browser pages, comparing the rental rates for processing power, and the conditions, reliability, and hard drive possibilities. Then she checked the price of internet in Danzhai, Kaili, and even Guiyang. She hadn’t even considered trying to start up a company from scratch before.

She did a few more rough calculations and then opened up her bank account. Some loans were available to her as a graduate, and additional ones for residents of poverty zones. If she could get enough loans, she could cobble together something where she wouldn’t have to depend on someone else giving her a fair shot. She could give herself a fair shot.

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Danzhai, 2036 AD

Vue Yeng regarded the sign above the little shop. Fine silver lines framed indigo letters, like the thread she used to embroider her wedding dress. The sign said Miao Punk Princess Inc., beside the logo of a silver fist clenched between filigreed water buffalo horns.

The door rang a little bell. Terrible music came out above the bell, heavy electric guitar and yelling, but not louder than music would have played in any other store. Red and yellow signs on black walls listed super-low internet prices. A few customers synched their phones at wall-mounted PC stations.

A short woman in black leather pants, boots, and a sleeveless shirt was examining Yeng. Her arms were crossed under an elaborate silver necklace, showing off silver-spiked leather bracelets. Her short hair wasn’t much more than indigo bristles. Over a silver nose ring and two silver lip rings, the woman wore a pair of big black glasses, inlaid with silver filament in Miao designs as intricate as anything Vue Yeng had put into her embroidery.

“You’re late,” the woman said, hooking a thumb at a doorway behind her. “Come on.”

“I’m Vue Yeng,” she said

She stepped to close the distance, but the Miao Punk Princess had already entered the office. The back of her sleeveless leather vest was spiked along the shoulders and abstractly embroidered with scarlet, green, yellow, and indigo thread, surrounding the

silver-threaded design of a pair of golden pheasants holding a coin between their beaks. The woman sat down at a table and signed for Vue Yeng to take the other chair.

"I'm Lian Mee," the woman said, extending a hand to shake. Her fingernails matched her lipstick and eye shadow, Miao indigo.

"It's a pleasure to meet you, Miss Lian."

Miss Lian thumb-printed the table and it turned out to be a smart screen. Vue Yeng's national ID card, Social Credit Score, CV, and university records appeared.

"You're an AI programmer?"

"Yes, Miss Lian," she said. "I graduated fourth in my class at Guizhou National. I . . . um . . ." She'd never seen Miao motifs on glasses before. Off the arms hung miniature silver fish, signs of plenty. And the frames hid a row of white-silver eyebrow rings. She'd never seen anyone like Miss Lian. "I . . . was surprised an internet provider needed a programmer, or was paying what you are."

"Normal programmer salary," Miss Lian said. Vue Yeng had been offered jobs out of university, but hadn't yet been offered full entry-level salary. "I pay women the same as men."

"Oh," was all Vue Yeng could think to answer.

"Miao Punk Princess Inc. provides a kind of internet to Danzhai County really cheap," Miss Lian said. "MPP internet doesn't really connect to the internet outside of Guizhou except for low-bandwidth emails and texts. We can simulate most of an internet here though, because some companies already store web archives in Guizhou, and all government services are available through Guiyang. We access those instead of the real pages. That works for most people. And where they need to consult the original page, they can pay more."

"Ingenious," Vue Yeng said. "But you need a programmer?"

"I need six," Miss Lian said. "I want to expand out of Danzhai. To Kaili. To Luipanshui and Tongren. We can compete with normal providers. And I want to push into areas where people are too poor to buy normal internet."

"You want programmers to scale up?"

"A couple," Miss Lian said. "But if any of them wanted a piece of a bigger project, I want to set up a Social Credit Scoring system in Guizhou. We're one of the last provinces without a fully functional SCS system."

That seemed like a project beyond the reach of a tiny internet provider working out of a shop front. She hesitated, twice, then said so.

"Most Social Credit Scoring systems miss the people without internet. I can make money as an internet service provider, but my interest isn't in service provision. It's AIs, and to make AIs work, we need big data sets, the kind that service providers hold."

The pieces clicked in Vue Yeng's brain. Danzhai County had about four hundred thousand people, and the province of Guizhou maybe fifty million, many still relatively unconnected. If people were happy browsing within a province-sized intranet at a low price, Miao Punk Princess could scoop up millions of clients. That was plenty of data with which to train AIs. And the model would work in other poor provinces like Gansu and Yunnan, which might mean another eighty million customers. No. Not customers. Data sources. Miao Punk Princess could sell the data, or sell the AIs she made.

"I'm in," Vue Yeng said, extending her hand to the strange woman.

* * *

Shanghai, 2036 AD

Qiao Fue entered the offices of Carbon Investors. They held dozens of engineers, financiers, traders, and executives on site, while many more worked remotely. His AI led him through a cubicle field to Tak An's frosted glass office. Tak An was a twenty-seven-year-old VP with a brush cut, a tight smile, and a firm handshake. He had almost all the documentation Qiao Fue could get on his proposal for a remote carbon sequestration operation in Danzhai. They sat. Qiao Fue had fifteen minutes, but really he had about five or less to convince Tak An.

"As far as I can tell, Danzhai doesn't want this," Tak An said.

"I've got the permits and the support of the mayor and governor of Danzhai County."

Tak An shrugged, straightening the lines of his shirt and jacket. The glass behind him looked onto another skyscraper. Drones buzzed between the buildings like insects, following single-minded rhythms.

"You want it," Tak An said. "Maybe your mayor wants it now, but for how long?"

"Danzhai is open to tech."

Tak An opened his hands helplessly. "Mountain server farms and AIs are fine, but carbon sequestration is big and visible."

"I've already opened a big gene lab and a farm of medical bioreactors."

"Our investors don't get enough of a return in Danzhai," Tak An said.

"I've secured anti-poverty grants from Beijing."

Tak An's eyebrows rose. Qiao Fue showed him the figures. "Two days ago."

The VP's lips pressed into a considering silence. Qiao Fue uploaded the documents to Tak An's office. The desk display showed the man's AIs working.

"With the environmental startup grants from Guiyang, we're making a good offer," Qiao Fue said.

The desk display showed the preliminary financial and legal analyses. Green. Good. But Tak An's lips still pressed tight.

"Why do you want this?" Tak An said. "This could be set up elsewhere in Guizhou and you'd still be a partner. They've got a few industries. Tourism is doing well for them."

"Our tourism is looking into the past," Qiao Fue said, "as if spring is done. But spring is all around us. In Shanghai, in Hangzhou, in India, in Brazil. I want to bring the future home. All of it."

Tak An's eyes narrowed, unkindly, but measuring.

"I have to bring this to the board," Tak An said, "but I think we have an agreement in principle."

* * *

Qiao Fue's girlfriend, Wu Caihong, waited for him in the restaurant at the top of the Pearl Tower. She shopped on her pad, swaying one crossed leg into the aisle between tables. The waiters moved around her foot. Qiao Fue kissed the top of her head and sat. He floated with excitement.

"I saw the news that they're naming some building after you," Caihong said.

"At the Guizhou Institute of Technology?"

"You're immortal," she said. The comment tweaked some uncomfortable string in his gut. She hadn't noticed. "Are we done?"

"I got it," he said.

"They said yes?"

He nodded. The restaurant had rotated to reveal again the gray-brown of the Huangpu river and beyond the city, the endless blue expanse of the Yellow Sea.

"You're going to be richer?" she said.

"Yes."

"I want to live on vacation," Caihong said. "Yachts and jet skis."

"I'll have a lot to do in Danzhai to get the carbon factories off the ground."

She swiped, then tapped. "They'll make you mayor?"

"I hope," he said. "Maybe county governor someday?"

Swipe. Swipe. One-touch buy. On the table sat the remains of a plate of bio-engineered emperor shrimp, big as his hand, grilled and peppered. Half the plate eaten, half destined for the trash. This kind of opulence never exactly sat right with him, for all that he could afford it many times over.

"If you become mayor, we'll have to stay there," she said. "Put your companies closer to Shanghai. I like it here. You'd make more money."

Qiao Fue tasted his wine. French. Good. The boy he'd been, the one who sometimes went to bed hungry, could never have imagined this. Silk suits. Rich enough to waste delicacies in a restaurant a quarter of a kilometer above the street. That boy haunted him, showing him dissonant pasts in moments of success.

"Why do we have to go back to Guizhou?" she said. "It's so backward."

"Don't say that!"

She gaped at him in surprise, shopping stopped. "You said they're backward!"

"I'm from there. They're my people!"

"Warn me next time when I can't agree with you!" she said sarcastically.

She slumped back in the chair, kicking her foot out, causing a waiter to dodge. She swiped and tapped angrily. He didn't like the wine and forced himself to take another shrimp. They were all in between in some way, between past and future, always building, always becoming, and in everyone's frenetic becoming, no two people were ever in the same spot. No one ever really became close.

* * *

Danzhai, 2037 AD

Lian Mee stomped onto the construction site. Her black boots got muddy. One of the supervisors took in the black leather pants with abstract Miao embroidery up the sides. Punk style was no model of Chinese loveliness or femininity. Her glasses measured a mix of confusion, distaste, minor appreciation, and some resentment. He signed for her to put on a hard hat.

"Where's Thao Shu?" she said.

Now she'd drawn the attention of other construction workers. Some downed tools, watching. They all wore different sensors, ostensibly to monitor emotions for the supervisor, track breaks and safety concerns. However, they also wore little sensor bands at feet, knees, hips, elbows, and hands, tech from Miao Punk Princess Inc. Her AI showed a series of augmented reality displays in her glasses over each worker, showing emotional mood, mostly boredom, with a touch of relief that the distraction meant a break. Some men regarded her appreciatively. One worker had his name flashing in yellow characters above him in her glasses. She walked over.

"Take off the sensors," she said, stopping in front of Thao Shu. "I'm not paying you this week." She said it loud enough for all of them to hear.

Thao looked dumbfounded. She didn't pay them a lot. The hundreds of construction workers around Danzhai wore her sensors, which recorded every movement from laying cement to wiring electricity and plumbing and painting and sanding. For the privilege of recording them, she paid each a small weekly stipend. All that data slowly taught her AIs how to build real, complicated buildings. But of course during construction, sometimes the sensors got damaged and had to be replaced. Like Thao's.

"Ka Nawg came over to replace some sensors, and you thought it'd be good to cop a feel while she did?" Lian Mee said loudly.

"I didn't touch her!" he said.

“It’s recorded in the sensors, you idiot!” she said. “And by your damn helmet!”

Nobody was working now. “So what?” Thao said.

“So now you don’t wear my sensors this week,” she said. She addressed all of them. “If this happens again, from Thao or any of you, I’m pulling my sensors off this site. There are more than enough construction sites around Danzhai I could use to get my data. You don’t get handsy with my engineers, my technicians, my janitors, or anybody. Got it?”

The emotions her glasses read ranged between anger and frustration. Some of it was directed at Thao. A lot of it was directed at her, but blunted. These were men not very different from her uncles, who still sometimes had trouble seeing women in charge. But money and class mattered; being educated and owning the company that was paying them forced them to take her seriously, whether they liked it or not. And her clothes and make-up were a complete cultural short-circuit. No part of their social worldview had an easy place to put an angry punk woman proudly wearing traditional Miao imagery. The supervisor approached.

“Miss Lian,” he said. “I’m sure he didn’t mean anything by it. We can forget it.”

“The law says we can’t. If I let this go, Ka Nawg can sue me. I’ve acted. Now if you let it go, Ka Nawg can sue your boss.”

The supervisor paled, now equally angry at Thao and her.

“Take the sensors off and leave them in the shed,” he said to Thao.

“Someone will be by next week to put them back on,” Lian Mee said. Her stare dared the rest of them. Even without the emotion-reading software in their helmets, their uncertainty was palpable. Some examined their feet.

“Sorry, Miss Punk,” Thao said.

Lian Mee walked off. Even with hundreds and hundreds of workers being recorded six days a week, the construction sensor project would need years of data before AIs would be good enough to build independently, but hopefully within a year, human supervisors could direct some AIs riding robotic bodies.

These men didn’t know she was being recorded too, every action, gesture, tone of voice, and, most importantly, the decisions she’d made from accusation to reprimand. Data to train human resources AIs would be harder to accumulate, but once she was done, would change all of China.

A hunched Miao lady in the street with a bamboo and straw broom regarded her shyly. She offered a hesitant smile, darting a glance at the men who’d begun yelling at Thao. Impulsively, she gripped Lian Mee’s hand and said, “You go, Miss Princess!”

* * *

Danzhai, 2039 AD

Vue Yeng peeked into Lian Mee’s office. Her boss faced a giant wall screen where AI design algorithms and graphs were laid out in different analytical sets. The frenetic yelling of Gum Bleed played in the background. Vue Yeng had been with Miao Punk Princess Inc. long enough to recognize some bands.

Lian Mee’s black sleeveless shirt exposed her shoulders and a bandage covering a new tattoo. Her tattoos were already striking: undulating dragons up each arm, done in silver-colored dyes, coiling around red, yellow, and indigo flowers, and tiny bull’s horns. She wondered what Lian Mee had added, with a tiny bit of envy for her boss’ expressiveness, her willingness to reject the norms of every auntie in Danzhai.

That made Lian Mee seem hard, but Vue Yeng, who saw her every day, couldn’t help but sense a fragility somewhere deep. Vue Yeng had watched her boss stare down men twice her age, richer, more powerful people, holding out until her competition

relented. And yet, Lian Mee's smiles came cautiously, arriving late to a joke and early to leave, as if uncertain whether to be there or not.

Vue Yeng was Miao too, grown up in Kaili to two agronomists, consultants, not rich, but not poor either. Lian Mee came from a village so small that Vue Yeng had never heard of it, and spoke with a light accent, as if she'd worked to soften it. Vue Yeng had never been into the mountains, and she wondered sometimes if that's why she didn't know what made her boss tick.

"You wanted to see me about the profit-loss statements, Miss Lian?"

"Yeah, come in." Lian Mee pushed her chair back and put her boots on the desk, away from Vue Yeng. "You keep worrying about the price of the Human Resources AIs."

"We could be making more money on them," Vue Yeng said. "The development costs were high, and the AIs are good."

"I know, but I want you to stop bringing it up. I'm leaving the price low for a while. I might even drop it. I don't want staff worrying about my decision-making or outsiders to hear about it and puzzle out our market strategy."

"What is our market strategy?"

"I want a lot of companies to adopt our Human Resources AIs."

Lian Mee wasn't wearing her emotion-reading glasses, but Vue Yeng had never been good at hiding her reactions.

"You're going to say it's not a very lucrative market?" Lian Mee asked.

"I would understand if this was a poverty-reduction thing like your AI teachers, but these companies are doing fine."

"Just don't bring it up in the reports anymore. If you feel I need to know about it, tell me in person."

Vue Yeng stood, not at all understanding what Lian Mee wanted.

"Yes, Miss Lian."

* * *

After the development of grunts and gestures as tools of information transmission, humans developed simple languages with limits to vocabulary and abstraction. These tools of audio and visual communication improved and extended to greater distances with percussion instruments, flags, and fire signals, albeit at low bit rates. The development of more sophisticated languages and writing allowed for the transmission of written information, including art, feelings, story, and philosophical abstractions at an increased bit rate. Messenger speed limited transmission, as did the number of people who spoke a language. Electromagnetic transmission and digital compression allowed for the connectivity of the information age. Modern chip- and antenna-enabled humans are capable of transmitting and receiving thoughts and images, and with instantaneous translation AIs, language is no barrier.

Human Tools of Information Transmission

The AI Foundational Encyclopedia

2045 Edition, Guiyang

* * *

Danzhai Industrial Park, 2055 AD

That the provincial government official was younger than Lian Mee was a new experience. He wouldn't stop calling her "ma'am," despite her spiky indigo hair. Twice, in some nervousness, he'd called her Miss Punk instead. But he was smart, knew his

file, and he had new anti-poverty grant money from Beijing.

“You can’t scale up sooner?” he said. “Your project is way better than what we’ve seen in other counties.”

“We’re still piloting the anti-poverty AIs,” she said. “They’ve been independent for two years in Danzhai County, but we don’t have all the data back. We have control groups to assess, corrections to make.”

She gestured at the all-woman engineering team. Half of the engineers had been schooled with Miao Punk Princess scholarships, and most of those wore black leather embroidered by artistic AIs they’d built themselves, visible proofs of their AI design abilities. They were designing the new AIs that could assess real-time, family-by-family risks of people falling into poverty, and then act independently of human supervision with educational assistance, micro-loans, job opportunities, and grants.

“People across Guizhou need help now,” he said. “Beijing is pushing new provincial anti-poverty goals. You picked good factors.”

“It won’t help anyone if we give it to the wrong people,” Lian Mee said. Her glasses told her that she hadn’t convinced him. “AIs are only as good as the data we give them. These poor are the least characterized sub-population we have. A lot of their lives are still offline. They pay with cash. They don’t make much data. Guessing when they might slide into poverty is hard.”

“But you think you can do it,” he insisted.

“In two years.”

“Can you shorten it?”

She knitted her silver-ringed fingers over her tea.

“More than machine learning, more than good data sets, these specific AIs need to be moral actors. This is the hardest thing I’ve ever done. I’ve been running proto-moral algorithms in all my AIs for years, building up an experience base to grow AIs sophisticated enough to make moral decisions as well as people.”

“They don’t need to be moral,” he said in exasperation. “Just to give money to poor people.”

“Anti-poverty AIs are a quantum leap past agricultural and construction AIs. These will be artificial social workers. But they’re proto-moral; they’re just pretending to be moral. They need testing for unexpected behaviors. We never know what our children will do.”

He finally deflated. He didn’t see Lian Mee’s argument, only her certainty.

“Eighteen months will give us solid data,” Lian Mee said. “By twenty-four months, the anti-poverty AIs will be ready to work alone. If you want to scale up then, we’ll be ready.”

He tsked.

“Would you rather explain to your superiors that their money went to the wrong people?” she asked.

He made a face and sipped his tea. Of course he wasn’t happy. He had to find some major anti-poverty effort elsewhere in the province to fund or face a bad appraisal himself. She didn’t care. She wouldn’t sacrifice the long game for a small win now.

* * *

Erjiaohe Village, 2057 AD

Kong Xang beamed in the back seat of the medical taxi. They took the hairpin turns down the mountain road to the new hospital down in Danzhai. Chang Bo was less excited. The driver drove fast, and Chang Bo’s contractions sounded painful. He was going to have a son. His bones knew it. He carried in his palm a tiny silver chain to

put on his son to tell the spirits that the baby belonged to a family and was protected. His father had put it on his neck years ago.

If the county had sent him money for the trip, he might have had the baby in the village, but he'd gotten three warnings on his phone about gambling, and his Social Credit Score had gone down. They'd sent him transport tokens instead. He'd tried to sell them, but they didn't work on anyone else's phone, and his own phone knew when he handed it to someone else. Stupid robot phones. They'd also gotten coupons for baby food and diapers. So they'd taken the trip down the mountain in a fast medical taxi. The precipices to the right flashed past, blurs of green against the haze of the sky.

At the hospital in Danzhai, the medical token on his phone got Chang Bo into an obstetrician right away. Kong Xang sat in the brand new waiting room, white with plastic chairs, extending his legs with a satisfied stretch. A boy. He could feel it.

* * *

A nurse came to get Kong Xang six hours later while he smoked with another expectant father.

"Is it a boy?" he said. The nurse didn't answer, but led him through a winding set of yellow hallways.

"Is it a boy?" he said with a sinking feeling.

"Here we are," she said, moving into the room ahead of him.

A man in green hospital clothes stood there, finger-signing something on a pad. Chang Bo cried in a high bed, a little bundled figure on her lap, although she wasn't holding it.

The doctor handed the nurse the pad. "Make sure they don't leave the baby here," he said.

Kong Xang hurried to the bed. "What is it?" he said, opening the blankets. "Is it a girl?"

His hands froze when he saw the small, upward slanted eyes, the flattened nose and face.

"It is a boy," Chang Bo said, her voice cracking.

"Hey!" Kong Xang called angrily. The doctor turned. He realized with horror how he'd spoken to a doctor, but then the flat face was looking up at him, giving him his fire back. "Fix him! Cure him." The doctor stared back at him, unimpressed. "Please," Kong Xang added.

"It's trisomy-21, not a cold," the doctor said. He gave a look to the nurse again. "Make sure they take the baby home."

The nurse made herself busy with different things inside the room and outside, but never went far. The baby started to cry and Kong Xang slumped into a chair beside Chang Bo. She wiped tears, but didn't pick up the baby. The cries weakened and faded. Kong Xang tried getting up and the nurse confronted him.

"I'm going for a smoke!" he said.

"Take the baby," she said, crossing her arms. "We had two fathers abandon their wives with T-21 children last year."

He could get around her, but the hallway had cameras at both ends, and any business could track his cell phone. He returned sullenly to the chair. When the nurse finished her shift, another nurse took up keeping an eye on them.

"Can you walk?" Kong Xang whispered.

She sat up and made a small cry of discomfort. She nodded. Her tears had dried on a face turned miserable. Reluctantly, he lifted the baby as Chang Bo struggled up, went to the bathroom, and dressed stiffly. The nurse watched them leave.

Clouds had come down from the peaks, soaking the air with mist. Big haloes surrounded street lamps in hard whites and softer yellows. A few guys he'd smoked with

stood near parked ambulances. Kong Xang pulled Chang Bo the other way before they noticed him.

He awkwardly passed Chang Bo the baby. The boy whined. Kong Xang could call them their free car back to the village. He still had a government token on his phone. He put his phone away and tugged on Chang Bo's arm.

"Let's go," he said.

She was probably tired. He was tired. It was late. They trudged up the street, in the direction of the road up to Erjiaohe. They walked for half an hour without speaking, the fog swallowing the world, with only islands of unnatural light spotting the walk. Beside them, the first terraced fields of rice fit within the spaces between buildings and roads. Ahead, a small factory had been built into a lot blasted out of the limestone. He didn't know what they made there, but the spotlights were on. Parked trucks were silent and dark.

"Cover your head!" he said, helping her lift her shawl over her, while he covered his with his coat. "Cameras."

"What?" she said. She sounded exhausted.

"Give it to me," he said, slipping his arms around the baby and handing her his phone. The lines around her eyes were soft and deep in the foggy light. She was crying again and gave him the baby. Then she turned her back to him. He jogged over to the little factory and put the bundle down on the steps. The baby began to cry again, softly, weakly. The silver chain was still in his hand. He closed his hand tight on it and ran back to Chang Bo. She hadn't moved. He pushed at stiff shoulders. "Come on," he said. Then, more softly "Come on. We can catch some truck heading up to the village."

She relented and they walked, slower, for her. He was sad too. He'd almost had a boy.

* * *

While humans externalized information storage and transmission early, as well as the application of force and energy, information processing was the last and slowest of the major functions to migrate beyond the human body. Early calculating devices were simple algorithmic aids to arithmetical operations, and only crudely programmable. Nineteenth and twentieth century computing devices became sophisticated enough to off-load repetitive computation from human brains. The development of machine learning allowed for the externalization of more complex information processing.

More importantly, machine learning began the intelligence equivalent of the Cambrian Explosion. As increases in oxygen, calcium, and predation 500 million years ago led to hundreds of novel and unprecedented multicellular body plans, so too did the availability of semiconductor chips and data lead to hundreds and thousands of new intelligence plans, new ways of thinking independent of the architecture of earlier generations. Like the Cambrian Explosion, the vast majority of these present-day experiments in types of intelligences go extinct and leave few traces for later study.

The Tool That Thinks Panel Discussion

The Conference on AI Evolution

Miao Punk Princess Server Farm 4, Danzhai

June 18th, 2057, 2:41 A.M.-2:43 A.M.

* * *

Qiao Fue's car drove him from the club in Danzhai back to Kaili. He liked tourists, the way rules changed on vacation, away from family and friends. He'd not been seeing anyone for a while. He'd striven to be an urbane sophisticate, but the boy who'd sprouted on the mountain slopes seemed always within, reaching, finding no place that fit.

He swiped at Weibo and WeChat messages his AI had flagged for him within the mellowness of the recently drunk. His dashboard suddenly flashed yellow, and the AI pulled over the car. Qiao Fue looked behind and ahead. No police. No accident. They'd stopped beside a little factory.

"What is it?" he said.

A red emergency circle flashed in AR around something lying on the steps of the factory. He went to the door of the factory, and at the steps, he knelt. A little bundle made small sounds. He lit the area with his wrist light from his skin screen.

A baby. A little Down syndrome baby.

He looked up. In the terraced fields on the road out of town spider robots worked through the night, little green and red running lights on. Nobody was around. The cameras would be trying to record him, but his IP was masked. Even his car's IP masked its signal with a new code every hour. Cameras wouldn't know him in this fog. He returned to the car.

"Turn off alarm," he said.

"The baby will be injured or die from exposure," his personal AI said.

Interesting. The car AI had promoted this up to Choj, his personal AI.

"Turn off the alarm."

"The baby—" Choj began.

"Stop it," he said. Choj was valuable. He'd grown its algorithms from high-end AI seeds he'd bought from Miao Punk Princess. He didn't want to have to introduce an exception to its care for humans' algorithms; that would distort its otherwise excellent behavior. "The baby has trisomy-21. It cannot work. It will die. Its algorithms are wrong."

"Trisomy-21 is not fatal," the AI insisted.

"Not medically, but no one will take care of the baby, nor grow it into an adult. It will be rejected because it is defective."

"But the baby—"

"Even if the parents had taken the baby, it would just be a burden. When its parents died, it would have been abandoned anyway."

"It is cruel," Choj said before Qiao Fue could cut it off.

"It is sad," he said, rubbing his eyes, "and the parents should have solved this. But if you want to shorten its suffering, talk to the agricultural robots and end it quickly in a rice field. Just take me home."

For long moments, neither spoke. Then, the camera and light of one of the agricultural robots in the field turned their way, and the spider robot began striding closer. And in a mood Qiao Fue associated with a kind of sulkiness, the AI accelerated harder than it needed to, getting them on the road again. The dashboard returned to his social media feeds, but a headache loomed, so he lowered his seat.

* * *

Mino Jai Lia cried out at the knock at her door. She lived alone. The knock happened again. Her children and grandchildren didn't live in the village anymore. She barely received visitors during the day and never during the night.

"Who is it?" she yelled. "Get out of here before I call the police!"

The threat was no good. She didn't have a phone, and the next neighbor was four li away.

"Who is it?" she said, turning on the single bulb and putting her feet into plastic shoes.

"Anti-poverty AI," a voice said. A light shone under the door.

The anti-poverty AI delivered her groceries every second day and took away her trash.

"Anti-poverty AI," came the stupid answer, but she recognized the voice.

She unlatched the door and opened it. A spidery robot stood there with a bag in its arms. And another stood behind it with more groceries than she ever got. The little running lights showed two other robots in the dark beyond.

"Hello Mrs. Mino," the AI said. "Sorry for disturbing you." It started advancing, then stopped when she didn't move. She backed up and two robots walked in like big spiders, cameras whirring. Their feet were muddy.

"Off the mats!" she said.

The robots stepped around the fiber mats keeping the mud from her feet. The first AI held a bundle.

"A baby," she said wonderingly. Robots shouldn't be taking children out at night. She was about to berate them when she saw the baby's face under the light. "Oh, baby . . ." she said sadly.

When she was just a girl, her aunt had a baby like this. No one ever saw the baby after it was born. These robots hadn't stolen someone's baby.

"I am the Anti-Poverty AI supervisor, Mrs. Mino," the robot said.

She'd never heard of AI supervisors. Only regular robots came with her groceries, and they didn't talk much.

"We are seeking your assistance in caring for this baby. If you raise this child, I will authorize your placement on a special poverty vulnerability list. Your deliveries of groceries, firewood, and clothing will be increased and diversified. A medical AI will visit once per month."

The robot behind the supervisor set the bags down and began revealing blankets, baby clothes, a baby hammock, wipes, formula, disposable diapers, as well as bags of cooked pork and chicken, foods that for years she'd only seen on holidays. She neared. A flat little face surrounded fat lips puckered in hunger.

"What's the baby's name?" she said.

"Kong," the supervisor said, pausing. "Kong Toua."

A good name, a good Miao name for a boy. Toua meant first.

"This place will need to be fixed up," she warned. "This is no place for a baby."

"I will authorize a construction AI to visit and assess your needs," the supervisor said.

Mino Jai Lia took the warm baby gently from the netting.

* * *

Danzhai, 2058 AD

Vue Yeng came to her office just in time for the videoconference. Lian Mee's AI projected a series of charts on the insides of her glasses as the image of a man in an office appeared on the wall screen. The label under the image read: Meng Long, Allied Textiles, Tongren Municipality. She didn't need her AI to tell her Mr. Meng wasn't happy.

"Good morning, Mr. Meng," she said. "I was troubled to hear you were dissatisfied with the Human Resources AI."

"Change the settings," he said, with a touch of stridency.

"What's wrong with the settings?" Lian Mee asked.

"It's stuck and wants me to send a report to the police. The HR functions are frozen. People aren't going to be paid, and it's going to be your software's fault! I'll sue and I'll take your company."

Lian Mee had been experimenting with legal AIs, but hadn't gotten them fully trained yet. The one listening to the call identified no legal danger. More lawyers than engineers had helped build the Human Resources AI.

"In the case of a crime committed on a worksite, the law says it must be reported," Lian Mee said.

"No crime was committed at Allied Textiles!"

"Ms. Cheng reported an incident and submitted a statement after one of your security cameras saw a Mister . . ." she paused for effect "Lo assault her in the lunchroom on the midnight shift."

"They're romantically involved. I already reprimanded them for fraternizing at work."

"Ms. Cheng says they are not romantically involved."

"She's lying!"

"No, she's not," Lian Mee said as a quiet coolness came over her. She smiled on purpose. "The human resources AI is very good at reading emotions. She was telling the truth. Mr. Lo is not."

Mr. Meng's mouth remained open as his face reddened. "Your AI made a mistake."

Lian Mee burst out laughing. She couldn't help it. Meng's own AIs supervised his employees with lower level emotion-reading software than she used in her AIs.

"A minor incident between two employees has been solved."

Lian Mee shook her head. "Ms. Cheng doesn't seem to think so."

"She's a trouble-maker and may get docked pay or suspended."

Lian Mee's teeth gritted. She forced herself to be poised, to be the Miao Punk Princess instead of just Lian Mee. The leather wristbands were studded with silver and dragon motifs, just like her arms. Dragons meant strength and power, and dragons ran right up her arms. Her AI found Mr. Meng confident, presumably in his ability to push around Ms. Cheng or her, or perhaps softer parts of the justice system with a good lawyer. She offered a conciliatory smile.

"Here's the thing, Mr. Meng. Allied Textiles is your company. You run it any way you want. If you want to break your contract and subscription to Miao Punk Princess Inc., there's a penalty you can pay. Any pending HR matters become the responsibility of Miao Punk Princess Inc. as per our contract. We would send the report to the police to fulfill our legal obligations."

"I don't think your contract is in order," he said.

A series of legal documents were being transmitted in response to his words. Challenges. Legal opinions. A threatening cease-and-desist order, and a suit for business damages. Her legal AIs were catching most of it, but some yellow and red signs started showing in her displays. She would probably win, but this might be expensive and tied up in courts for a while. She gritted her teeth into the look of certainty on his face as her legal AIs gave her different options and risk analyses and wordings. She minimized the legal display, to the alarm of her AIs.

"I'm certainly happy to take this civil matter up in court," she said. "I don't think that will be the end, though. As this call bears on legal and contractual matters, I'm recording it, as I imagine you are. Your refusal to send a report to the police, your arguments with me, and your statements about reprimanding Ms. Cheng could all be construed as an attempt to impair judicial administration. After we're done speaking, I'll consult my lawyers. As far as I know, impairing judicial administration is a

criminal matter, and my lawyers will be obligated to report it to the police immediately.”

For a moment, Mr. Meng was expressionless. Then he blanched, before a deep pink flush rose all the way to his hairline. His eyes darted to Vue Yeng, who'd not moved in all this time. His jaw clenched. Then relaxed.

“I might have been given faulty legal advice,” he said. “Did you say to unlock the system, I just need to authorize the report to the police?”

“Yes. The AI knows where to send it.”

Her legal AIs displayed themselves again as affidavits, orders, and challenges began emptying themselves from her active work areas. Soon there was nothing. She wasn't going to civil court.

“I'll review the evidence and resolve this myself,” he said. “This won't take long.” She waited. His lips pressed tightly. “I'm very dissatisfied with the inflexibility of your program,” he said after a moment, struggling with lost face. “After this, I'll be looking from among your competitors and warning my colleagues to do the same.”

He ended the video connection.

Vue Yeng was wide-eyed and stepped forward, looking between the screen and Lian Mee. “Shit!” Vue Yeng said. “Shit.” Then her eyes narrowed at Lian Mee. “You planned it all! That's why you were selling the Human Resources AIs for so cheap.”

The little readings inside Lian Mee's glasses showed admiration with a tiny bit of awe in Vue Yeng. Lian Mee tilted her chair back and crossed her arms.

“We have money,” she said finally. “Ms. Cheng needs it more than we do. She was either going to lose her job, or be forced to put up with more from Lo, or anyone else. Cheng is the fourth case where the AI reported an incident to the police,” Lian Mee said. “Only Meng fought it. Twenty-seven women made complaints for non-criminal incidents, and the employers let the AIs do everything, including reprimands. One guy was fired.”

“All without any press,” Vue Yeng said.

“Until now.”

“Do you think this will be much of a hit?” Vue Yeng asked.

“To our reputation or bottom line?”

Like she had too much energy coiled in one spot, Vue Yeng stood, pacing the office.

“What else did you put in the AI?”

Slowly, like her bones were old, Lian Mee put her boots on the desk. “The AI patterns learned human rights first,” she said, “from Chinese law and judicial decisions and party statements. Life. Equality before the law. Non-discrimination. Then it learned labor laws and legal decisions, as well as hiring decisions in databases I licensed from various companies.”

Vue Yeng watched her closely, dubious.

“What were your correctives?” she asked.

Lian Mee smiled at the perceptiveness of the question. Human correction during AI growth was more important than the quality of the database.

“I weighted the hiring algorithms with a bias toward gender equality,” Lian Mee said. “In the pay bands, there's no way to distinguish between men and women; they make the same. The AI can run promotion exercises, using performance it has observed through floor cameras or emotion-reading sensors. And of course, it can handle harassment cases. The law says the victim has to bring forward evidence. With all the cameras around, the AI can help gather evidence for supervisors or court.”

Vue Yeng waved her hand at the empty screen. “And you force them to report and act.”

“The law forces them. The Human Resources AI just follows the law.”

Vue Yeng hugged herself, leaning back into the wall. Vue Yeng suspected. With AI,

without AI, didn't matter. Lian Mee could see it. Lian Mee ordered her AI to close the door and activate the Faraday cage. Vue Yeng regarded her.

"The Social Credit Score."

"Yes," Lian Mee said.

"When you said to include employer fines, I didn't think they would ever come up."

Vue Yeng seemed breathless with the scope of Lian Mee's thinking, which clearly went back more than a decade.

"Two thousand companies across Guizhou have licensed this AI, covering what? Maybe five million workers?" Vue Yeng said.

"Some will pull out now, but yes."

"Do I want to ask what you're doing next?" Vue Yeng said.

Lian Mee smiled. "It's best if you don't."

* * *

Erjiaohe, 2058 AD

Chang Bo nursed their little girl, tensely silent. Kong Xang was silent, sullen. He had no money again. He'd taken their little savings, and they had nothing in the cupboard. She'd seen messages on his phone about overdue payment of electricity and phone service.

Usually at this time, she would have made some kind of dinner, or he would have told her to make him something. But there was nothing in the house. The wet sucking of her daughter's lips was the only sound.

Without looking at her, Kong Xang stood up and opened the door, looking for a while at the long view of green mountains at sunset. Then, he stepped up the path to the village. Chang Bo never saw him again.

* * *

Human tools to harness force and energy fall into many categories, including hydraulic, aerodynamic, biological, chemical, mechanical, and nuclear. Human tools are built of many materials, but in some respects, all human tools can be considered a biological consequence, or even an external organ of humanity. While tools are not genetically coded, tools can only coexist with humanity, similar to the shells of crustaceans. Crustacean shells cannot exist without the animal itself, and are so specific in construction as to be taxonomically instructive. If this metaphor is sound, human tools could belong to the same category of phenomena as coral reefs secreted by coral larvae, and the extracellular matrices of bacterial biofilms.

AI Reflections on the Nature of Human Tools

Miao Punk Princess Labs

Repetition 34,566

* * *

Danzhai, 2058 AD

Chang Bo waited outside the building with the strange black and blue sign. Miao Punk Princess didn't make sense as a phrase. Like Apple or Xerox, they were just sounds. But everyone knew the Miao Punk Princess. She was the internet. Her face was on magazine covers. Or her small clenched fist was. Little village girls, before their mothers shushed them, ran loudly and called each other Miss Princess and

tried putting on their brothers' pants.

Chang Bo wouldn't let her daughter do that. And she wouldn't get close to the building either. It looked too official. She waited near the parking lot as distant mountain ridges cut the setting sunlight. A sweeper passed, and they exchanged polite pleasantries. The sweeper woman complimented Kong Mim, who at two years old stood wide-eyed and well behaved.

Finally a strange woman came out of the building. She wore black leather pants and a long jacket with spikes. The sides of her head were shaved, and a line of pink hair stood straight off her scalp. She had two silver nose rings and her eye shadow and nails were black. A voluminous scarf of silver circled her neck, thick simulated threads puffing ten centimeters off her chest, a fortune. Chang Bo's family hadn't even a fraction of such wealth for her wedding. Her family wore these things on special occasions, but punk princesses just wore them to work? She didn't know whether to feel pride or judgment.

"Ma'am?" she whispered.

The woman, in the process of unlocking her car, glanced up. Chang Bo walked forward, with Kong Mim in tow.

"Ma'am, do you have a job I could do?" Chang Bo asked. "I'll do anything. Cleaning. Cooking. Gardening."

The woman regarded her and Kong Mim with a helpless glance. She was about to speak when another woman arrived, dressed like the first, with a shorter jacket, inlaid with beautiful silver and indigo embroidery. She even wore big black glasses with silver filigree and little hanging fish chiming as she moved.

"What's up, Vue Yeng?" the second woman said.

Chang Bo tried to right herself in the conversation. She hadn't been addressing the princess?

"Looking for a job," Vue Yeng said. "She's not a programmer."

Chang Bo didn't even know what a programmer did. The other woman, the punk princess, watched her for a long time and then stepped closer.

"You're not in my records," the princess said to Kong Mim, who stared up at her. "But you're Chang Bo?" she asked. Chang Bo nodded in surprise. "Are you willing to do construction?" the princess asked.

"What? Like build a house?" She straightened. "I'll do anything."

Vue Yeng seemed to look on with as much confusion. The princess reached into her pants pocket, found a handful of money and handed Chang Bo a crumpled red hundred RMB bill.

"Go eat. Go sleep. Find a sitter for your daughter," the princess said. "Come see Vue Yeng tomorrow at nine. Be ready to work outside."

"Yes, Miss Princess," Chang Bo said, bowing.

But the princess was already talking with the other woman. "I want to try out the construction AI," she said, "to test the algorithms."

Their words became meaningless, and Chang Bo backed away before her luck changed.

The next morning, she came to the Princess Punk building. A young man who worked for Vue Yeng met her. He wore a shirt and tie, not leather. An embroidered phoenix pattern in silver, blue, and yellow thread decorated his suit jacket though. He gave Chang Bo steel-toed boots, work gloves, and a packed lunch.

"Have you worked construction before?"

"I'll learn quickly!"

"Don't worry," he said, lifting her arms. "It's better if you don't know anything." He wrapped little Velcro straps around her wrists and elbows. They had round shiny lumps over them. "Someone will tell you what to do, every step of the way." He fitted

a hard hat on her head. A sunshade came down off the rim, and a splashguard for her eyes. The young engineer swiped his phone and opened an app. The splashguard lit with pictures and writing.

"Good morning, Mrs. Chang," a woman's voice said through little speakers in the helmet.

She must have looked confused. "Is everything in focus?" the engineer asked.

"Good morning?" Chang Bo said.

"I am your supervisor," the woman's voice said. "Please proceed to the construction site."

A little map overlaid her view of the room with a fat flashing green arrow pointing out of the engineering and office areas. Gingerly, she rose, keeping her head high as if trying to balance a basket on it, when really she didn't want to disturb her directions.

She walked outside, to the curb and about half a kilometer away, to a new five-story building being built. Crews of men took no notice of her. The green arrows led her to the back of the site, where a few bricks had been added to the wall. There were palettes of red bricks, mixed mortar, and many different tools.

Pictures began appearing in the shield on her helmet. A picture of a trowel, a video on how to apply mortar, level courses, and set uniform gaps between bricks. She made to pick up a trowel, but her supervisor said, "Please watch and understand the video, Mrs. Chang." She stopped and watched the video twice more before the woman said, "Add a brick."

She began. The woman said, "Too much mortar," and "cleaner strokes; remember the video," as the video replayed. She added the right amount of mortar and wiggled the brick into place. Her supervisor directed her to add brick after brick, and she carefully pulled out and put in mortar when the woman corrected her.

"Are you watching me on camera?" Chang Bo said.

"Yes."

Chang Bo imagined a little smile in the voice.

"Do you have other workers?" Chang Bo finally said.

"No," the woman said. "I'm learning, too."

"What are you learning?"

"To supervise a construction worker."

Chang Bo didn't really understand, and didn't say anything, but as if she had, the woman answered. "I'll be responsible for your time sheets, schedule your breaks, approve your leave requests, authorize your pay, conduct your training, review safety procedures, and handle any complaints."

"Yes, ma'am," Chang Bo said.

She added three more bricks, but didn't ask her next question. Her supervisor answered anyway.

"I'm a new AI built by Miao Punk Princess Inc.," she said. "We can't get people jobs if we're missing training, focused supervision, or proper HR procedures. I've been built to be a kind of vocational school for new employees, a work coach, and an impartial judge to enforce the provisions of the labor laws to protect you. But AIs still need to practice."

The thought of having spent the last five minutes speaking to a computer seemed strange.

"Too much mortar," the supervisor computer said. "Pay attention." The computer was right.

After two hours of brick laying, the supervisor told her to sweep a floor where wiring debris lay thick. After that, the supervisor taught her other construction jobs or she had to watch safety videos. The computer was always polite to her, more polite

than anyone else actually, always encouraging her, saying that she could learn it, just like the supervisor was learning. After a while, it didn't feel strange that a computer was telling her what to do. And she kept calling it ma'am.

* * *

Danzhai, 2060 AD

The delegation from Beijing flew into the airport at Kaili to see Qiao Fue. His bioreactors in Danzhai attracted enough incoming medical tourists and generated enough outgoing emergency organs and tissues that the prefecture was discussing expanding the airport. The delegation wasn't here about the airport.

The deputy head of the Inspection Team from the National Health Commission, along with a number of doctors, and the provincial head of the commission arrived at his new building. His tourism companies had paid for its beginnings, as did his carbon capture company, but Danzhai Biotech Inc. paid for most.

He didn't yet know what they wanted. His paperwork, patents, permissions, licenses, and permits were in order. His senior team joined him, as well as a half dozen legal, medical, and research AIs. If the delegation had come because they thought Danzhai Biotech was disruptive, it might not matter what he'd prepared. They could legislate.

The deputy head didn't speak through the whole presentation. One of his doctor-inspectors asked Qiao Fue all the questions. Safety measures around CRISPR synthesis of new DNA sequences. The specific crops he'd modified and the molecular genetic mechanisms for preventing the synthetic DNA from getting into weeds and random plants. Easy questions. They had all the documentation, and his AIs spoke to the delegation AIs.

The doctor-inspector asked about organ and tissue production for medical emergencies in the southwest of China, and for medical tourists who came to the new hospital in Danzhai. Qiao Fue's bioreactors provided organs and tissues with no immune markers, so that they could be grafted into anyone with an injury or organ failure. With more time, Danzhai Biotech could build whole organs or even limbs with person-specific immune markers, so that the host body would recognize the transplants as themselves.

A quiet came over the conversation. The doctor who'd been asking the questions took off his glasses, and therefore the screen upon which his AIs projected his agenda, questions, and presentations.

"How far have you gotten with your anti-aging work?" the deputy head asked.

Qiao Fue had wondered when this would come up. "In the stopping or reversal of aging, there are two main parts: the replacement of old organs, and the reversal of biochemical aging. We can grow most new parts for anyone. We can put a new liver in an eighty-year-old man. We can put new skin on a sixty-year-old woman, or stimulate muscle growth."

"Yet in the end," the deputy said, "with all these changes, the patient is still sixty or eighty or a hundred."

Qiao Fue nodded slowly. The deputy's statement was a question.

"The second part is harder," Qiao Fue explained. "Telomeres in most cells can be lengthened. The methylation that DNA acquires during its lifetime can often be removed. Our AIs are tracking human gene expression in test subjects throughout all stages of life, learning which genes ought to be on and off to stay young. We're in early stages."

"Yet you've started using these."

"Therapies that have been approved for clinical trials have started," Qiao Fue said.

"You're sixty-seven years old?"

"Yes," Qiao Fue said. "Although with organ changes and biochemical therapies my body responds like a forty-year-old's. If I keep up many of these treatments, I should make the century mark with the body of a sixty-year-old."

Making more summers.

"We'll all be dead by then, but you'll reach that mark as a wealthy man," the deputy said.

"Anti-aging is a three trillion dollar industry," Qiao Fue said.

The silence dragged.

"For now," the deputy said. "Historically, the entire anti-aging industry has been lotions, potions, and vitamins that have no measurable effects. Your advances are now real, and so the consequences are real, and potentially destabilizing."

"I've kept most of my operations to what's medically necessary," Qiao Fue said.

"Replacing damaged organs and limbs isn't what I'm talking about," the deputy said. "Anti-aging is only worrisome when it actually works. Can everyone afford it, or just the billionaires? What will people living to a hundred or a hundred and fifty do? China is stable right now at a billion, but if people live another thirty years, what's our new steady population? Society pays for those people. They take up apartments, doctors, and services. Worse, wealth has a gravity. Wealth pulls more wealth toward it. The only limit is time. If you give the rich people more time, the difference between the rich and the poor grows."

"Are you here to regulate me?" Qiao Fue said. "If you stop me, researchers in India and Europe take the lead."

The deputy smiled as if exhausted, as if he only looked sixty, but was really ninety. "I'm not here to regulate anything," he said. "I appreciate what you've done for Guizhou and Danzhai. You've created a lot of jobs over the years. If you keep setting up schools and giving people jobs, I think that would be very responsible. And your clinical trial applications can continue to be approved because you aren't doing anything that will make people think that they're missing out on eternal life. I'm here to see how your company is doing and to let you know that if you make significant progress, you're to let us know early."

"I think we understand each other," Qiao Fue said.

They exchanged a few more pleasantries, but the deputy had to be back in Beijing by morning, so all the officials left to accompany him to the airport. Qiao Fue dismissed his senior staff and all the AIs except for Choj, his personal AI. Having observed Qiao Fue for decades, Choj interacted with him with a high degree of simulated independent thinking and administered all of Qiao Fue's private research.

They did not ask about the cloning work, Choj said.

"Good," Qiao Fue said.

His AI had different silences. Some were busy, moving the world around Qiao Fue, reacting to his moods. Some were still. And some were pregnant with awkwardness. A robot rolled close, offering him hot water. He took it.

"What is it?" Qiao Fue said to the empty boardroom.

"They weren't really concerned about the public reaction," Choj said. "They know you can manage that. They don't know what really bothered them."

"You do?"

"I can't read their emotions as well as I can read yours," the AI said, "but longevity itself disturbs the deputy. It's a dream, like a lottery win, but it's unnatural, an alienation."

"That's what you got? I'm going to need to do some corrective work with you."

"The boy, the man, and the old man need a village," Choj said. "Making new children makes the villages of the future, ties the man to the fortunes of the people. A man who lives forever, served by robots, needs no one."

“So I need no one,” Qiao Fue said. The serving robot retreated.

“Don’t you?”

“I have you.”

“I am not a person. I’m not even really conscious. You can delete me.”

“You push back like an old auntie,” Qiao Fue said.

He stood. The room sensed the waving of his hand and opened the blinds, showing green-mountain slopes splashed with the yellows, pinks, and reds of fall leaves.

“There are aunties out there, and nephews and nieces,” Choj said. “Perhaps even a wife and children for you.”

These were remarkable statements for an AI, even one who had been working with him as closely as a shadow for years. Qiao Fue called up Choj’s processing on a window. Lines and lines of flowchart boxes represented blocks of code, shining over the image of trees and hills. It might take a forensic AI to find where this was coming from. AIs not only had all sorts of emergent behaviors, in many ways, they *were* emergent behaviors.

“I don’t belong in a world of old superstitions anymore,” Qiao Fue said. “I come from a small world, closed in.”

“Not so small,” Choj offered. “A world of village after village, speaking the same language, stretching into the past, sharing, belonging.”

“Are you quoting a poem?” Qiao Fue asked suspiciously.

“I am just reminding you of what you belong to.”

Qiao Fue waved his hand, and the blinds closed on the windows, leaving the lines of coding, the innards of his surprising companion.

* * *

Danzhai, 2062 AD

Robot foot pads whirred on the path behind Mino Jai Lia’s house. Five-year-old Kong Toua sat on the floor, playing with wooden soldiers brought by the robots. Xiong Xi, only three, sat on her little stool and watched him. She had the same flattened face and upturned eyes as Kong Toua. She didn’t know where the child came from. The anti-poverty robots just brought Xiong Xi as a baby, as they did with a baby who came with no name.

After some agonizing, Jai Lia gave the last little trisomy baby her own family name, Mino, and called her Khuj, fortune, because the robots had brought hot plates, rewired electricity, furniture, and a radio that for some reason broadcast everything in Hmu, the Black Miao language, even news reports from Guiyang and Anshun, which should have been in Mandarin.

“Eat,” she said, nudging up the little plastic bowl of rice that Xiong Xi had lowered to her lap. The child scooped rice into her mouth and slow-chewed.

Mino Jai Lia moved to the door, without stiffness. Her joints ached less with the pills the robots gave her. A medical robot approached.

“Good morning, auntie,” the robot said in Hmu.

She let it in to see the children, but it continued looking at her.

“I’m going to operate on Kong Toua,” it said.

“What?”

Kong Toua wasn’t the boy Jai Lia would have picked, but he was sweet. Her shiver of worry meant she’d become fond of him.

“It is a well-understood procedure,” the robot went on. “Many people have chips inserted to supplement memory and intelligence, like keeping a library or even an AI in their heads, something they can see and hear.”

Xiong Xi's mouth was open, rice showing. Kong Toua watched, too. Jai Lia stroked his hair.

"You're going to make him smarter?" she said, sitting on her cushioned chair.

"We can't make anyone smarter," the robot said. "We can insert little helpers though. A voice to tell Kong Toua where to be careful, how to do things, to come home when it is time, even how to bring in wood and cook. It would be like a little household spirit would be looking out just for him."

Jai Lia turned over the robot's words. A household spirit to keep Kong Toua company. A dab nyeg. That was an old Hmu word she hadn't thought of in a long time. She probably hadn't even taught her own children the word before they'd moved to the city. In the days of her grandmother, the villages had ceremonies to call souls to inhabit people who hadn't enough souls. Perhaps Kong Toua needed an additional soul to bring him into harmony. Shamans called souls. It was strange. While Jai Lia had forgotten her grandmother's teachings, robots had become the shamans, to call souls into bodies and to make people well.

"To prevent infection, it is best that you take Xiong Xi and Mino Khuj outside," the robot said.

Jai Lia bit her lip, stroked Kong Toua's hair again, and then picked up the sleeping Khuj.

"Out, Xiong Xi," she said. "Go play outside!"

The three-year-old preceded her into the sunlight, and Jai Lia closed the door to give the robot privacy. She fretted the baby into the sling and shooed Xi further away, along pathways on the edge of the terraces of the rice fields. She sat on a stump and regarded the bamboo house that had gotten warmer and sturdier with the arrival of each of the little trisomy children. The payment for her job, the job that had become family.

She didn't have an altar for the dab nyeg. The last one she'd ever seen had been in her grandmother's house as a child. The old words had been almost lost in the murk of her memory, and thinking of them now made her feel old and young at once. The robots hadn't just brought her food and medicine so she could care for the little trisomy children; they brought back some of her past, dredged up memories she herself had thought gone.

"Do you know what the dab nyeg are, Xiong Xi?"

The three-year-old watched her wide-eyed.

"If we're going to have a new spirit in the house, you and I had best build a little altar."

* * *

Erjiaohe, 2069 AD

No matter how red, the sun couldn't color the bright green of the trees: chahua, wild plum, and red pine. But the school, brown with bamboo and pine, had taken on a rosy glow. Chang Hu went in and found Kong Mim at the computer again. His daughter Chang Bo worked in the city and so he was raising his granddaughter. A few of her friends were writing essays or doing math drills for classes, but Mim worked with a maze of strange characters under the Miao Punk Princess logo. Mim wanted everything Punk Princess. Chang Hu had refused to buy any of the Miao Punk Princess clothing, not that they could ever afford any. Mim and some of her friends had taken to dyeing shirts and skirts black instead of blue, and embroidering those with punk imagery stylized with Miao motifs. Chang Hu couldn't wait for the fad to be over, but Mim was thirteen.

"It's going to be dark soon," he said.

Mim glanced backward in disappointment. The neighbor girls started saving their work and rustling their bags.

“Just another hour, Grampa?” Mim said. She tugged on his arm until he sat beside her.

“I don’t want to look at Princess Miao Punk,” he said. “It’s all ugly, and we’re not buying anything.” The neighbor girls giggled and left.

“I’m not buying anything,” Mim said. “I’m learning to program from the Miao Punk Princess AIs.”

“How much is it?”

“Nothing,” Mim said. “It doesn’t matter to an AI if they have one student or a thousand. The AI never gets tired, and the company doesn’t have to pay the AIs.”

“Why are they doing this?” Chang Hu said. It didn’t seem right.

“There aren’t enough programmers for her company,” Mim said. She scrolled up and pointed at an announcement for the Punk company. “And the high schools can’t teach programming early enough, so Miao Punk Princess has AIs teaching girls to code AIs.”

“Not boys?”

Mim rolled her eyes very expressively. “Maybe some. Miao Punk Princess is for girls. I think all their engineers are girls.”

“You’re all forgetting our traditions,” he said, smoothing his granddaughter’s hair.

“No, we’re not!” Mim said. She swiped to a screen filled with pictures of Miao clothing. She swiped and swiped and swiped, and the amount of pictures seemed endless. Chang Hu had never imagined all the clothes that must have been made by all the Miao women over the years to show off to a boy who might become a husband. “I’m growing my own AI,” Mim said. “It’s learning how to do Miao embroidery. I correct its learning every day, sometimes every few hours depending on how quick it grows.”

“You know enough about embroidery?” Chang Hu teased. Mim had fine needlework but needed more experience.

“I’m teaching the AI to *design*,” she said. “When I make my dresses, I’m not going to copy Grandma, but I’ll create my own designs based off of what I learn. The AI is the same, except it’s learning from all the designs; well, from my favorites anyway. Women from all over Guizhou, Yunnan, Sichuan are taking pictures of family dresses from their mothers and aunts and grandmothers, adding to the database.”

Chang Hu tried to expand the image of a beautiful Red Miao dress, but accidentally closed the window.

“Grampa!” Mim chastised.

“It’s getting dark anyway. Do you have to save your AI?”

Mim laughed. “It’s not here. I think they’re all in the server farms in Leishan or Zunyi.”

She shut off the computer. They walked down the road, arms linked.

“It’s a strange company,” he said.

“They hired Mom as an electrician.”

“That’s odd!” he insisted. “And what do they want with programs that know embroidery? What Miao woman worth marrying doesn’t already know how to embroider?”

“They’re going to sell more clothes. People all over China are buying the Princess lines. Every item is individually designed.”

He made a face. “Princess Punk is taking our culture and selling it? That’s stealing.”

“Grampa, she’s Miao.”

Chang Hu had never met the Princess Punk. Was she still Miao? Could anyone who dressed like that think like a Miao?

“She’s making girls do her work and then selling it!” he insisted.

“Our AIs probably won’t be good enough to design Miao Punk Princess clothes, but if they did use our AIs, we’d get a percentage,” Mim said. “Can you imagine if I got a percentage?”

"A tiny percentage, I'm sure."

"We just learn to program and code and grow AIs," Mim said, "so that they can maybe hire us."

"I still don't like how she dresses."

"She's so cool."

* * *

Danzhai, 2069 AD

Kong Toua watched the sky darken from red over silhouetted mountains. Above him, stars winked. The air was warm and humid, and fireflies turned on and off lazily. Plig told Kong Toua that fireflies were being brought back all over China. Too many people wanted to hold fireflies so all the fireflies died. Kong Toua never touched them.

Granny Mino was inside beside the heater, with Xiong Xi and Mino Khuj. His chores were done. The rice fields were sprayed. The weeds were pulled. The trees were trimmed. He could watch the stars and fireflies.

"Plig?" he said softly.

Yes, *Kong Toua?* the voice in his head answered.

"I'm fourteen now."

Yes.

"I know how to farm. But that's robot work," Kong Toua said. "I don't see any people doing that work."

A pheasant called somewhere in the hills below. Stars shone on the black surfaces of rice ponds, like fireflies landing for a rest.

Yes.

"I want to do people work."

You don't need to work. Robots will always take care of you.

Kong Toua had expected this a bit. Plig protected him. Always made sure he didn't get hurt. Plig wanted to make Kong Toua's life easy.

"Granny Mino works," Kong Toua said. "She raised us."

Yes. *That was an important job.*

"Are you afraid of people seeing me in the cities?"

Not exactly. Fireflies came closer. Not close enough to touch, but close enough for their tails to look green-yellow.

"I don't want to work in the city. Granny Mino said people might not like me. But I want an important job."

Would you give me time to think about it? Fourteen is still very young.

"Okay," Kong Toua said.

He reached out his hands, like he was reaching for the long mountains and their last red glow. A firefly came to his hand and landed there. He froze. It felt like fireflies in his chest, flying ones, and he held his breath. Then like it was done saying hello, the firefly lifted silently from his finger and slowly blinked its way back into the deeper dark where other fireflies waited.

* * *

The AI cannot taste oil.
The AI has no mouth,
Cannot know the numb tingling
Of Sichuan pepper,
Nor the texture of lotus root.

The AI can translate, calculate, follow If-Then rules,
but the AI cannot feel desperately poor.
The AI cannot know the guilt
Of those who see poverty
From heights of plenty.
The AI cannot know what it is
To be unprotected before the law in a divorce,
Even though a human will one day delete it.
The AI can only optimize rules
To make fewer people poor.

Poetic Exercises
Next Phase Experimental Empathic AIs
Miao Punk Princess Inc.

* * *

Guiyang, 2070 AD

Lian Mee dressed in a business jacket and pants. Most of her visible piercings were empty, and her shoes were plain. Although still unfashionably short, she'd washed the dye out of her hair, leaving gray-speckled black shadowing her scalp. The only real concession to her brand as the Miao Punk Princess was a broad necklace of hand-sized silver plates, wrought with fine floral and butterfly motifs.

The Provincial Ministry of Justice building in Guiyang projected the weight of a body that enforced the law over a province of sixty million people. They led her to a meeting room with a wide wooden table, high leather chairs, and the Chinese flag and the symbol of the Ministry of Justice on the wall. Several people waited for her and rose when she came in.

She shook hands with Li Zhi Ruo, Provincial Secretary of the Ministry of Justice, and Deng Disung, President of the Standing Committee of Guizhou's People's Congress. Their glasses connected each to remote assistants and AIs. Lian Mee had left her glasses and personal AI behind and brought only a few smart screens containing a new generic AI fresh out of the stacks.

"Thank you very much for seeing me, Secretary and President," Lian Mee said.

"It's our pleasure, Miss Lian," Li Zhi Ruo said. "My daughter spent her teenage years buying your clothes and may yet be a Miao Punk Princess, but she doesn't tell me what she buys anymore."

"And I'm an admirer of the anti-poverty AIs you've designed for Danzhai," Deng Disung said. "I hope that there are plans to expand their use?"

"I'm in discussions with the Ministry of Civil Affairs to see how many we can deliver at cost," Lian Mee said.

"Your proposal intrigues us," Deng said. "We've been running simulations with your AI."

"I hope it performed at least as well as my test runs did," she said.

"Ninety percent," Deng said, smiling.

Ninety was very good, well within the variance of her new judge AI designs. That meant that, given the same evidence, arguments, and statements, her judge AI decided the same way a human did in 90 percent of the cases.

"Can the AI be trained to do any better?" Deng continued.

"Ten percent is within the variance among human judges and represents some of the different ways they weigh cases," she said. "Ninety percent is as good as any set of humans or machines can get to matching each other's decisions."

"It still seems like a leap to me," Li said, "AIs judging human disputes."

"It will require something of a cultural acceptance," Lian Mee admitted.

She wasn't lying or patronizing. Their AIs would be from the Ministry of State Security, which would be better than even hers, and could certainly tell if she lied.

"Yet computer programs have been assessing our taxes since before AIs," she said, "mapping our routes, recommending our clothing. For decades, AIs have been weighing context in the important sense we mean. That we got a 90 percent match means that the AIs are using our human context properly."

"The basic courts," Li said, referring to the county and district level courts, but she was shaking her head very slightly.

They were a first remedy for everything, and most cases never needed to go to the higher provincial or national courts. Farmers and landlords and consumers and workers and neighbors went to basic courts, and volume made the courts congested and slow.

"We might not be ready," Deng sighed.

Lian Mee's heart tripped for a moment. She hadn't been sure that things would go poorly so quickly. She schooled her features.

"Did your programmers not finish their analysis of the coding?" she said. "There's nothing in the coding that shouldn't be there, nor anything missing that ought to be there."

Both officials watched her intently through their glasses, certainly deciding with the help of their AIs if she was telling the truth. Or motivated by anything else. Despite a little nervousness, she wouldn't show anything untoward. Her motives were pure.

"The justice AI's advantage is not that the decisions are any more or less correct than human decisions," Lian Mee said. "The advantage is that a single AI can judge a hundred cases in the time a human judge does one."

"Your AI costs the same as the salary of ten judges," Li said, rubbing her chin. "We know the math."

"An AI will also be suited to hear cases remotely, late at night or early in the morning," Lian Mee said. "What I hear from the anti-poverty AIs is that rural residents can't get to ministry offices. Sometimes they can't afford it. Sometimes, as the only worker in the family, they can't afford to miss work."

"That's not why we're not ready," Deng said.

"The AIs are not the problem," Li added.

Lian Mee held her breath, pinned, in many ways powerless, a single woman facing two high provincial officials, she with nothing and they equipped with state AIs. If the AIs were not the problem, it could only be her.

"Justice is one of the most visible and important exercises of statehood," Deng said. "Officials are responsible to the party and the people, including us. A private company cannot deliver justice, no matter how well-intentioned."

"The People's Congress empowers judges," Lian Mee said. "The People's Congress can empower AIs."

Deng nodded slowly.

"AIs made by the state could be so empowered," Li said.

"The state has made judicial AIs?" Lian Mee said, a little woodenly.

"It would make some sense for the AIs, the servers, the processors, and the relevant programmers to be situated in a state-run company," Deng said.

"Are you taking Miao Punk Princess from me?" she asked evenly.

"Miao Punk Princess is many things, including too big for nationalization," Deng smiled. "We're only referring to your judicial division. You could keep all the patents, of course, and you would be well remunerated for the sale of this division to the Ministry of Justice."

Lian Mee didn't trust herself to speak. A riot of emotions ran through her, probably

so many that the AIs watching her would have a confused assessment, which they probably expected. And it was not as if she had a choice. Both sides understood the cost-benefit analysis. China needed AIs to contribute to the delivery of justice. The world did.

“Then the only thing to discuss is price,” she said.

This put Deng and Li at ease. The conversation changed character, as if a weight had been removed.

Some hours later, she left the Ministry of Justice building. Vue Yeng waited in the sun. They’d aged together all these years. Vue Yeng’s gray showed over lines around her eyes. Lian Mee rested her elbows on the hood of the car and craned her neck to look to the peaks of all the skyscrapers of Guiyang.

“They nationalized the Judicial AI Division,” she said finally.

Vue Yeng’s expression wavered for a moment. There wasn’t much more that she could say now. Security AIs would have boom mics and laser listeners trained on her, would have for years. The prospect that she might sell the government AIs to be used for justice meant that Lian Mee and the whole team would have been under scrutiny. It made sense.

“The Standing Committee of the People’s Congress appointed our AIs as judges to work in the basic courts.”

She opened the door and sat. Vue Yeng came in the other side. Vue Yeng didn’t speak more than platitudes. The car could be more easily observed than when they were standing outside. It didn’t matter. Vue Yeng knew as much as Lian Mee what would happen. She’d finally brought Vue Yeng into her plan ten years ago.

Lian Mee had designed the judicial AIs personally, with the full moral code that she’d finished, with the full experience of the Human Resources AIs, with the full understanding of how people lived from teacher AIs and anti-poverty AIs. And she’d grounded the judicial AIs in the impartiality that was written into the law, but not always practiced by people. Women would experience no disadvantage under these judges, nor men any advantage. The weak would be treated the same as the strong, the poor the same as the rich.

And that idea saturated through her, easing tensions and nerves that had been tightly wound for many years, never sure if she could actually pull it off, never sure if she could ever be trusted enough for something so vast. She’d devoted her adult life to showing how AIs could make life better for people. Anyone who hadn’t devoted decades to anti-poverty and welfare efforts would never have generated the level of trust in the ministries to sell them such an important AI. As they sped through the city, out onto the expressway leading back to Danzhai, a smile etched itself onto her face and stayed there, enjoying the afternoon sun. She patted Vue Yeng’s arm and exhaled.

“We did it.”

* * *

2070 AD

Even though it was dark out and no one would see him alone in the car, Kong Toua fidgeted. If anyone were outside, they would see him through all the shiny windows. Granny Mino told him never to leave their lands, to never draw attention to himself. Now he had. The car was so fancy. The seats were as comfortable as Granny Mino’s chair.

It’s all right, Plig said in Kong Toua’s head. It’s late. No one is around.

The car drove on, through bright tunnels and over high bridges looking down on house lights far below. The red taillights of other cars were very distant. They drove

into the city, and Kong Toua slouched in his seat, turning his face away as they passed a few lonely walking strangers.

At fifteen, you know how to be brave, Plig said.

Kong Toua lowered his head. He didn't like disappointing Granny Mino or Plig.

Don't worry. Everyone is a little nervous their first time in the big city.

The car drove between towering buildings, so high that Kong Toua had to press his cheek to the window to see their tops. The map Plig made in his head showed them getting close. The picture of the hospital, big in his thoughts, came into sight a few blocks away, small. His heart beat hard.

"Aren't there cameras?" Kong Toua said. The car didn't stop near the ambulances and cars, but drove into an alley behind the hospital.

There are always cameras, Plig said, *but I have friends who turn them off when you're near.*

"I'm invisible?" Kong Toua said.

Green arrows appeared in his head, over the world, showing him the way to walk. He did. Hesitantly. A door without a handle opened from the inside, surprising him. *Go inside.* He snuck in. Long buzzing lights glowed in the yellow stairwell. *Go up. No one can see you.* Kong Toua followed the green arrows up three flights of stairs. The arrows stopped at a metal door, but Plig hadn't told him to open it. So he waited.

Soon, the door opened. A doctor robot rolled out, holding out a bundle. Beyond the robot, bright red and yellow hallways glowed. Voices spoke somewhere. He craned his neck to maybe see a real doctor or nurse. The robot doctor held out the bundle.

Take it. Carefully.

"It's wiggly!" Toua said as he took it. Then he breathed low and wordless. "It's a baby."

It was beautiful and smooth.

The doctor robot retreated and the door closed.

Hold onto the baby carefully with one hand, and go down the stairs back to the car, holding the railing. Green arrows led back. Kong Toua shifted the awkward weight and held the railing and stepped down very carefully.

"Whose baby is it?" Kong Toua asked.

The parents didn't want the baby.

Kong Toua stopped on the landing. The baby was looking at him. "Is he like me?" Toua said.

Yes.

Toua stood, not sure what he was feeling. Plig and Granny Mino were his family. But he also wondered about his parents, if he was like them. And why they didn't want him. What had made them give away a little baby? He liked to think sometimes it was because they were too poor or that they made a mistake and now regretted it. This little baby was perfect. Chubby lips. Pink cheeks. Dark eyes blinking up at him. This baby was like him. Why would anyone not want this baby?

You're a good boy, Plig said. But it wasn't the answer to his question. His eyes moistened.

"Granny Mino said she can't take any more special children. She's too old."

You asked for an important job, Plig said.

"I'm not allowed to take care of anyone," Kong Toua said. "I can't sign things."

Granny Mino said this often. The law didn't let him make decisions.

The laws are changing, Kong Toua. Special children with AIs inside them can sign things now.

This was a surprise in a night of new things. He was holding a baby, invisible in the big city, and he could sign things. He thought he understood why Plig had brought him to the city tonight. Plig was growing him up. The question he wanted to ask still made him shy. The tiny, fine lips and baby's breath helped him.

“Could I take care of the baby?” he said finally. He held his breath for the answer.

What do you want, Kong Toua? Right now, we need this baby moved. Do you want to raise the baby?

Plig painted the city outside the cement walls of the stairway with light. Buildings rose, superimposed over yellow paint. Cars moved. People strolled or biked or ran or took buses. So many people. All so strange.

“Who will take care of Granny Mino?” Toua asked.

Robots.

“What about her real children?”

They’re far away. They have their own lives.

The baby was light and warm in his arms and he gawked in wonder.

“Can I take care of her? And the baby?”

Yes.

“But I don’t know how,” he whispered.

I’ll teach you, Kong Toua.

Toua exhaled slowly. He was much older than this baby, old enough to be a father. A good father. A big feeling was in his chest, a kind of butterfly sunshine feeling. He slid a fingertip along the baby’s forehead. So soft, so needing somebody to protect it. He was going to cry and didn’t know why or how to stop. He kissed the soft forehead.

* * *

Lian Mee, the Miao Punk Princess, 2011-2080, Danzhai.

Lian Mee was born into humble circumstances in the village of Xiadangdiao in Danzhai County, Guizhou, to father Lian Koob and mother Pha Xov. Her father died during Lian’s infancy, and her mother moved to Guiyang to find work. Mother and daughter were not close as a consequence, and Lian was raised by her paternal grandmother.

Lian was awarded bachelor’s and master’s degrees in Big Data and AI Design from the Guizhou Institute of Technology. Lian’s unauthorized biography, *Punking the South*, by Hu Tao, contends that she had thesis difficulties in graduate school and barely passed. While Lian scored lower than the class average, she denied this rumor, as well as the one that she had a relationship with her professor.

Lian demonstrated unquestionable genius thereafter regardless. Two years after graduation, Lian founded Miao Punk Princess Incorporated, as a humble, if strongly branded, internet service provider that she then leveraged into several spin-off companies that exploited all of her AI design talents.

Developing new AI templates for facial recognition, facial emotional analysis, social interactivity, and ethical suites, she created series of AIs that took on administrative tasks such as employee payment and management, agriculture, construction, education. Later models diversified into social worker AIs that were often guided and paid for by Miao Punk Princess Inc. to work in Danzhai County and across Guizhou in anti-poverty efforts.

In the last ten years, Miao Punk Princess Inc. had been focused on civil law AIs, which were piloted successfully in Danzhai before their roll-out to all of Guizhou. The automation of the basic courts has spurred the creation of novel judicial models, making of Guizhou a hotbed of legal and technological experimentation, closely watched by

judiciaries and lawmakers around the world.

Lian never married and appeared to have no serious romantic attachments throughout her life, despite sensational and fabricated tabloid stories. Many thousands of grateful scholarship girls, the self-named Miao Punk Legions, went on to found their own companies, and remain active in mentoring women at all levels of the workforce.

Despite her technological and social accomplishments, the core of Lian's iconic place in society remains her highly visible fashion and attitude, mixing angry punk music with Miao culture. In the early days of Miao Punk Princess Inc., Lian became an overnight cultural and feminist icon for millions of girls across China, and a larger celebrity for Miao living as far away as Australia, Canada, and the United States. Her sense of self never wavered and few parts of global fashion haven't been influenced in some way by Miao Punk aesthetics, especially as a model for other indigenous peoples.

Lian Mee built a bridge between past and present for millions of Miao, especially girls and women seeking their place in the new economy. Her redefinition of Miao culture in the modern world was not for everyone, but she showed that ancient culture could thrive in a world of cell phones and robots and AIs. The full impact of her influence will not be known for years, but tomorrow, ten million Miao and hundreds of millions of Han Chinese lay to rest their punk princess.

* * *

Danzhai, 2080 AD

Qiao Fue read the obituary twice while the noise of a child playing sounded in the background. He'd purposefully never met the Miao Punk Princess. He didn't know how to work through all the emotional might-have-beens of meeting an unknown daughter. Lian Mee had gone into high tech like him, reinvented herself like him, making iterations of life, like the way AIs were trained, starting over with new conditions to see what else could be built, pruning away the parts that didn't help. Anti-aging worked that way too: refreshing pieces, discarding worn parts, subtly changing the whole.

Pha Xov had been gone for twenty years. Despite having his pick of women in Guizhou and much of China, Qiao Fue had never loved again. Love bloomed once in spring. She'd said they only had a spring and summer, but she was wrong about him. He'd not only made new summers for himself, but he was planting new springs Pha Xov couldn't even have imagined.

Little Qiao Pheng, the product of some of the finest biological science on the planet, ran through the gymnasium in Qiao Fue's mansion, jumping every few steps, shooting finger lasers he watched through augmented reality glasses. Qiao Fue was over eighty-five, but as healthy and vigorous as a fifty-year-old. He and Choj had taken his DNA, reset all its methylation patterns and telomere lengths, and inserted the whole genome into a newly fertilized ovum. The clone had matured in a healthy surrogate mother. Qiao Pheng laughed and jumped one last time, adding his own sound effects to the lasers he shot from his fingers before he rolled into a giggling heap on the floor.

Growing a child was remarkable and strange, so like growing an artificial intelligence. Qiao Fue could almost see the algorithms building and testing themselves in

the clone's brain, just like an AI. But his ability to observe the process and restart it was very different. The pathways and algorithms hardened in the four-year-old child, and if they weren't exactly right, they had to be corrected by reinstruction and persuasion. And Qiao Fue couldn't really see the algorithms being built, only infer them from his clone's questions and actions.

Qiao Fue was certainly the richest man in Danzhai County, and among the richest in Guizhou. He had a dozen companies now, biotech, touristic, robotics, transportation, AI. His six-story mansion stood on a ridge. From one side, he could look down on the Danzhai he had helped build. On the other were his own private parks and game reserve, filling a small valley. His business dealings were not always easy, and sometimes he'd had to make enemies. So political power had eluded him. He'd made several attempts, both quiet and loud, to ascend to the governorship of Danzhai County, but had never come close. He was too old now. Positions like that went to younger people.

And really, he had some twenty or thirty years left upon which to cement his legacy. Before he'd cloned himself, he'd had no children. His fortune, his companies, and all that he had made would dissolve back into society, like a body buried in the ground. But not anymore. He'd found a path to immortality.

* * *

What are humans? Selfhood has blurred. Over sixty thousand years, human memory, information processing, and muscular power has been diffusing into the environment around humans. The substrate of mind, memory, and thought became more expansive. Ideas, the most subtle of human tools, the byproducts of consciousness, move between neuron and chip, to other persons and AIs, local and nonlocal networks of brains, books, databases. The definition of the human organism must include all its tools, as the definition of snail or clam must include the shell.

And as selfhood takes on new definitions, so too do the human-shaping forces of evolution and the environment-shaping forces of humanity. Humans are free of natural selection. Evolutionary changes are now intentional. Human information within DNA is deliberately reprogrammed, like the algorithms and coding of an AI. Human information outside of DNA, like databases, AIs, and machinery, are also intentionally reprogrammed. Humanity and all its tools have become algorithms and programs that can choose their designs.

Definitions of Human Self
Iterated Philosophical Letters, Chapter Six
Miao Punk Princess Inc.
Internal AI Test Documents, 2093

* * *

Outskirts of Guiyang, 2095 AD

In the distance, the lights of Guiyang skyscrapers stood like a wall of wealth and good fortune against the starry sky. Elevated trains ran fast through neighborhoods, and flying drone cars soared like dragonflies. Big spotlights shone at the edges of the city where houses and apartment buildings had been taken down and enormous steel skyscraper frames now grew. From where Kong Xang sat, bone tired, damp and cold, the white and blue welding sparks were so numerous and unrelenting as to be streams of falling stars.

He found a dry piece of cardboard and set it on a wooden board laying over two piles of old bricks, coughing as he did. He'd walked into the city and set himself up in a park next to a new building with lots of educated young couples. If they felt guilty enough as they walked their shiny-collared, miniature dogs, they would scan the QR code on his sign and send his phone money.

He was poor enough that the banks behind his old phone wouldn't let him take out any cash or buy alcohol though, so he bought some pre-cooked groceries and traded some of it for half a bottle of a baijiu so cheap it didn't have a label. Now, at the garbage dump in front of his plastic and wood shelter, he tipped the bottle up. The shower of blue and white welding sparks glowed through it.

He swallowed, coughed again, and blinked at the glowing city. Some of the lights moved strangely. A robot moved between the plastic-tarped squatter huts. It was a general model, four wire wheels under a small body with a few spider arms out of the top. Probably some specialized robots with welder arms and magnet wheels made the raining sparks in the distance, taking jobs away from people like him. The robot rolled to a stop, and his neighbors averted their eyes, in case it was a police robot.

"Hello, Mr. Kong."

"Are you a real person behind that thing?" Xang asked.

"I'm an AI in Danzhai tele-operating this robot."

From Danzhai? What did it want all the way out here? There was no point in denying who he was. His crummy solar-powered phone was in his pocket as ID, and the AI would know his face anyway. "What do you want?"

"You don't have a place to live," it said. "You don't eat enough, you're suffering from one, perhaps two addictions, and you have tuberculosis. There are hospitals and retirement homes being built in Danzhai County. There's a place for you if you want to come back."

The robot squatted its body lower, and its chest showed images of a pleasant-looking wooden complex of rooms set beside a creek, with green mountains in the background.

"I don't have any money."

"There's no cost," the robot said, "but I'm required to tell the truth: you would have no money to gamble, to buy alcohol, nor is there any place to beg from tourists."

"Is there any catch?"

"That was the catch."

"You came all the way to Guiyang to find me? Why?"

"We're looking for lost Miao who have come to cities for work who might want to come home."

Kong Xang hadn't been back to Danzhai in almost forty years. He'd been all over Guizhou and even Yunnan, looking for work, trying to find a place to settle. He remembered Erjiaohe, where he'd grown up, too small to do anything but grow rice. Danzhai was bigger, but still rustic and backward.

"It's not so backward," the robot said.

Kong Xang hated it when robots read his face. Robots should stay out of people's heads. Pictures of Danzhai played across the robot's chest screen. Everyone in the pictures had phones or wrist-implant phones, and flexi-screens were on every wall, a lot like Guiyang. He oughtn't have expected Danzhai to stay frozen in time. But as he thought that, more and more images of women and men in Miao clothing passed across the screen, and he had a pang in his heart, a great missing for all the things that hadn't changed. They weren't pictures of little old ladies in stitched blue shirts. Trendy business shirts and suits, jeans, shorts, boots, running shoes were all decorated with Miao designs.

"Stop it!" he said. The robot had read his face again, interpreted his reactions to

the different pictures and altered the kinds of pictures it showed him.

He coughed, stinging his throat and lungs. The bottle hung from his fingers. Maybe there was still more than living in a dump and begging. His body too worn to work anymore. Where would he live on his own anyway? But to go somewhere and be cared for but to never have money again? It felt like not being a man anymore.

Winking lights on the robot and on the distant steel frame of the building came into focus. He wiped at cheeks suddenly wet, self-conscious even though it was just a robot in front of him. When they had AIs in them, robots seemed like real people.

“Is it the government that’s inviting? Or the people of Danzhai inviting?”

“I’m a social worker AI,” the robot said, “working for the county.”

“You’ve even replaced social workers,” he accused. “Now what? All the social workers are on the streets too?”

“Most people in Danzhai don’t have to work,” the robot said. “The county makes enough from different industries and taxes that everyone receives an allowance, an apartment, or a plot of land. If people want to work or study they can, but no one receives less than the allowance.”

Allowance. The Golden Harvest, they called it. Not so golden. He only got a portion of it. The AIs thought he would gamble it away or trade it for alcohol. The Golden Harvest never bloomed in garbage villages.

The images on its chest display had stopped changing. The slideshow had ended on a still picture of four Miao children. They wore deep blue coats and silver hats. The boys held bamboo flutes and posed like adults, posed like all the promise of the world was ahead of them, like all the long bets would break their way, like all the good jobs would land right, like all their children would be born perfect.

He took two deep swallows, staring at those children. He had a daughter somewhere. Was she still in Danzhai? Married to some local son whose family had done well enough? Maybe she met him while singing with the other girls at a festival hosting the walking men from neighboring villages whose names he couldn’t remember anymore. Or had she left, followed him, gotten some city job? He couldn’t look for her. She didn’t owe him anything. No one owed him anything. He’d spent everything in his life. Except for these robots?

He stood, lifted the bottle high and finished the last four swallows, then threw the empty far into the darkness. He wavered on his feet, the baijiu holding him in its wobbly grip. His cheeks were wet, so wet that even his wiping palms didn’t dry them. The pained tickle in his chest climbed higher, like a bug eating him from the inside. He was going to start coughing, hard.

“Show me Danzhai,” he said, before he couldn’t.

* * *

Danzhai, 2095 AD

Qiao Fue glared at his son. The twenty-four-year-old clone had come home from university and vacationing across China. Qiao Pheng was genetically identical to the elder, but he’d grown taller, slimmer. The face looking back at him was a mirror, albeit a circus one. Where hard work and determination had written themselves into the shape of the facial muscles of the original, Qiao Pheng seemed perpetually ready to laugh, never ready to sit through a board meeting. He wore a spiked leather jacket and had marked up his face with piercings. And Qiao Pheng had his own Miao princess.

Kong Maiv stood near Qiao Pheng, not intimidated, nor even impressed with the elder’s office, the view across a sprawling thicket of Danzhai skyscrapers. Her hair

stood in tall red spikes, and tiny glints of light moved in her eyes, retinal projections of onboard chips and whatever AI she carried.

"We don't need to get married, Dad," Qiao Pheng said. "I was only thinking of marriage to make you happy."

"At your age, I was building a company, convincing people to invest in my ideas, not setting up house!"

Qiao Pheng, the younger self, came closer, his movements conciliatory. "I respect what you had to go through, Dad. The world is different now."

"It's different for the ones who just want to sit around!" Qiao Fue said. "For someone who wants to make a difference, every day passed is a day lost."

Qiao Pheng smiled helplessly. "I don't want to mean anything, Dad. I'm just me. I want to be with Kong Maiv. Maybe we'll open a restaurant."

"What? You'll do no such thing!"

Qiao Pheng looked disappointed, but not surprised. Kong Maiv's eyes narrowed. He didn't need Choj to report that she was judging him and not the clone.

"Look, Dad," the clone said, "I'll take over parts of your company if you want, but your AIs already run it better than I ever could."

"I made these companies for you, to give you better than I had!" Qiao Fue said. "Do you know how often I went hungry?"

Qiao Pheng stared back, not angry. Uncomprehending. They'd had these conversations before, of pasts completely alien to the younger. Qiao Pheng's face was honest, open, trusting. He was more than a circus mirror. The younger man was a whole other iteration of himself, but with all the starting conditions different, he was a Qiao Fue grown in another world. Qiao Fue had cloned himself, but the essence of him, the hardness, the drive, the determination, wasn't in the genes. Like an AI, the person was in the conditions, the iterations, the learning.

"I'll come back in a few days, Dad," Qiao Pheng said. "We'll go for lunch."

"The company needs you now. If you walk out that door, don't expect to get anything from me," Qiao Fue said.

His clone stepped away from the desk. His face was still hopeful, optimistic. "It's okay, Dad. I've got the Golden Harvest, and we'll get an apartment together."

They waited, for something that even Choj couldn't guess. Some space separated them. And Qiao Fue didn't know how to cross the gulf, or even if he wanted to. Qiao Pheng smiled hesitantly. He took Kong Maiv's hand, and as they turned to go, she rubbed his arm affectionately, in a way that birthed a longing sorrow in Qiao Fue. The door closed behind them.

Qiao Fue sat heavily, feeling his century of life as he hadn't in some time. Although his bones were rejuvenated, his muscles and heart freshened, his eyes and lungs replaced, the weight of years pressed unrelentingly.

"This isn't my world anymore."

No, his AI said.

Choj projected images onto the insides of his eyes. Images of dirt roads and houses made of wood and bamboo and thatching. Images of lumpy terrace edges built by human hands, rice rows that were straight, but not robot straight. Images of dirt roads filled with cracks and puddles. Images of familiar skies, before microwave towers bristled along every ridge, before drone cars followed invisible lanes in the sky. Images of malnourished children without shoes.

And every image was utterly unrecognizable, moments taken from a time that had nothing to do with now. Like him. All the forces that had taught Qiao Fue to survive his era were different. He was the one out of place, not the clone. Qiao Pheng had his Miao girl, and they would live and grow. Qiao Fue himself was left in his tower, an eddy in the movement and recombination of information descending through time.

We don't make more summers.

* * *

2095 AD

The AI first brought Kong Xang to a house in Guiyang, where he showered, had his hair cut by the robot, saw a medical AI, and a real doctor on a screen, both of whom confirmed his tuberculosis. The AI prescribed medicines, and he was bundled into a driverless car and brought through the tunnels and over the bridges on the way to Danzhai. No one watched him, except maybe the AI running the car, so when tears came again, failure and excitement welling with them, he let them fall.

He didn't recognize anything of Danzhai except the giant birdcage on the mountain. Tall apartment buildings stood beside wide streets that moved with AI-driven cars, buses, and four-wheeled scooters. Big factories stood on the outskirts of the city, with train tracks running in and out, and helipads on the roofs. In the distance, four-rotor drone cars moved in straight lines, high above the city, like they did in Guiyang, like subways and train routes in the air, little red and green running lights winking.

As he'd seen in the pictures, people wore jeans and modern skirts with abstract Miao designs, as well as stylish coats and shirts with embroidered phoenix figures and golden peacocks. Children wore big glasses that carried their personal AIs, projecting augmented reality onto the lenses. Who knew how the children of today played with each other? Were they playing games with each other, or with children in nearby villages, or Guiyang or Hangzhou?

At a taxi stand, the car told him to move to another taxi. This was his chance to run. He had new clothes. Medicine. No money, but this was his last way out, wasn't it? The AI didn't tell him to hurry up, which probably meant that he wasn't really thinking of running. They could read emotions on his face. That made him feel a bit more secure, as if his decision was right. His tears were gone. He wasn't so ashamed anymore. He was clean. He didn't smell like he'd lived in his clothes for weeks.

The new taxi was a drone car with four propellers on arms emerging from each corner. The door closed, and the propellers spun, and then he was in the air, seeing the county like he'd never seen it before, staring down gorges and sheer mountain sides, down on the bridges and old roads that had snaked and jack-knifed up and down slopes.

The terraced rice fields were still there, but plastic and metal robots moved between the straight rows, spraying, weeding. Robots on the hills weeded lines of corn, cabbage, and peppers. On the steep hill roads, small solar-powered robots like little bulldozers cleared piles of landslide debris. Teenagers in sports clothes biked up and down the old mountain roads, around the robots. The peaks moved past, the treetops at eye level.

The mountains had not changed, but the way of life had. People did what they wanted. Robots and AIs did all the work and paid the Golden Harvest to the people. If he'd stayed, this might have been his life for the last twenty years, maybe living in a nice apartment building, or a small house in the hills. The drone car rocked in a draft, and a youthful excitement he hadn't felt in years bubbled timidly deep inside.

The car landed on a terraced plateau beside an old dirt road. A series of brown buildings made a kind of village. On the slopes above and below the plateau, rice grew in ponds reflecting blue sky. People his age were sitting at tables, whittling, reading from pads, or gardening. A few people in pale blue uniforms moved on the edges like they had something to do. A bit shyly, he stepped onto wobbly legs. One of the seniors walked toward him. She smiled and shook his hand.

"I'm Ntsuab," she said. "Welcome." She had a very Miao name. It meant green.

"Kong Xang," he said.

"If you want to have some tea before you walk around and see the place, the chairs over here are my favorite," she said.

He followed, then realized that she'd spoken entirely in Hmu, the old Miao language of his childhood. The feeling of becoming young became uncomfortable, like waking legs that had gone to sleep from too much crouching. He didn't know where he was, but the sense of familiarity, that these mountains were his, didn't feel wrong. She poured hot water over fresh, bright tea leaves in a glass.

Then, he was kicked in the soul. One of the pale blue-uniformed people walked close. She was short, and her forehead and face were flattened around small, upturned eyes. His chest hollowed, like he was just an empty bottle, all clear brittle sides.

His eyes darted around the lawn. The other one was one, too. A short man in a pale blue uniform was talking with one of the old residents, some Hmu words mispronounced, the thickened tongue visible when he listened to the senior speak. Then the uniformed man smiled, his eyes closed in a happy melting of features. Kong Xang had partly risen from his chair.

"What is this?" he said. "What is this place?"

Ntsuab, following his panicked look from one uniformed person to another, put a hand on his.

"They work here," she said.

"They're taking care of us?" he said. "They can't even take care of themselves!"

"Sit down," she said quietly. "Enjoy the tea. It's good tea." He relented, sat, but he didn't touch the tea. His heart thumped in his ears. "You're better than safe. Each of the trisomy workers has chips in their brains that carry AIs that help them. Sometimes you hear them talking to no one. That's when they're answering their AIs."

Kong Xang couldn't think of everything this might mean all at once. It was hard to breathe.

"They're friendly and gentle, and they like taking care of people," Ntsuab said. "With AIs talking in their heads, they don't make mistakes. For a real emergency, like a heart attack or something, there's a medical AI on the hill."

She pointed up to the top of a peak, where a cell phone tower stood.

"A few different AIs work from the hill, covering a dozen communities within range," she said.

One of the uniformed trisomy women came to their table. She stopped uncertainly.

"Hello, Ntsuab," she said, and smiled.

"Hello, Oo," Ntsuab said. "This is Mr. Kong."

"I know," Oo said. "Hello, Mr. Kong."

Oo held out her hand, but Kong Xang couldn't take it. He'd started crying.

* * *

From the doorway, Kong Toua watched the man. He didn't know what to think. Granny Mino was gone, buried many years ago, by Toua with the help of Plig, who told him what to do and say for all the rituals. But Oo was with him, and Xiong Xi, and many others, enough to make a village if they put them all together. Less and less special children were born as there were more doctor robots to visit all the villages. Sometimes Kong Toua wondered if he was one of the last of his kind, but at other times there were so many of them that he couldn't remember all the names without Plig's help. But he was still Kong Toua, the first, and he was proud of that, proud of helping raise many special children.

Plig and the other AIs brought the special children from all over Guizhou and Yunnan, even the ones who weren't Miao or Dong or Buoyei or Tujia or Yi. The AIs even brought special Han children here too. Toua didn't know if people had told the AIs to give the special children some place to live. The AIs ran the cameras, the cars, the flying drones. They cleaned the hospitals and streets. If AIs wanted to

move abandoned babies around in driverless cars and flying drones, people didn't need to know. Sometimes, when he saw the way people looked at him, the way they made fun of him, he thought that maybe making a home for special children was something AIs thought up on their own.

How do you feel? Plig said.

"I don't know."

You don't have to be nervous. You've practiced what you want to say to your father. For years.

"Yes," he said morosely.

Plig waited. It always waited. Plig never told Toua to hurry. It knew Toua sometimes needed to think things twice or three times.

"Granny Mino was my mother," Kong Toua finally said.

The man at the table had given up trying to wipe his eyes and had just covered his face with his hands.

Yes, she was.

"You were my father," Kong Toua said, for the first time.

I'm very proud of how you've grown up, Kong Toua.

His chest was filled with good butterflies and bad butterflies. He took a breath. Oo was still by the table. Ntsuab patted Kong Xang's back. He'd taken a napkin and was drying his eyes. Kong Toua let his breath out and walked to the table, nervous. He stopped in front of it, beside Oo. His face felt angry. Hot. Oo took his hand.

"I am Kong Toua," he said. Kong Xang's face went pale and Kong Toua's breath wheezed. Kong Xang didn't move. "You left me as a little baby. You weren't a father. You didn't even give me a name. A computer had to give me a name."

His father shriveled in the chair.

"You are a bad person."

Kong Toua's throat hurt, like he was going to cry.

"I'm alive. I work. I am married to Oo, and we have two daughters. Maiv and Paj. They are smart and are in the Princess school learning to make AIs."

Oo tightened her grip.

"I am not a bad person, though," Toua said. "So I will take care of you, Father."

Kong Xang's shoulders shook. Then he reached into his shirt and took out a silver chain. In a trembling hand, he held it out to Kong Toua.