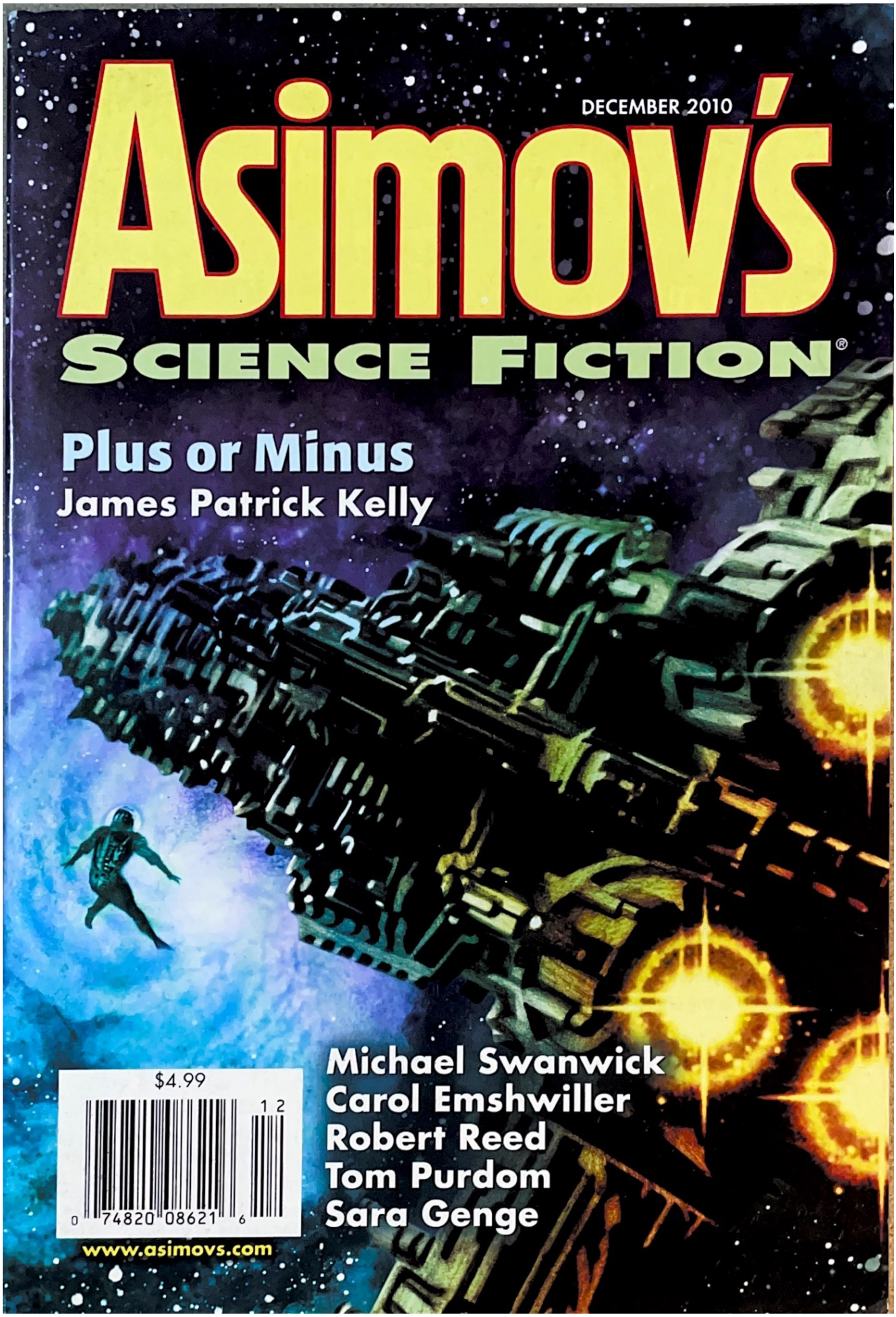
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VARIATIONS

Ian Werkheiser

Ian Werkheiser is a writer and teacher living in the Bay Area of California, who recently received his MA in philosophy. "Variations" is his first story to appear in a science fiction publication. It is based in part on family lore about his grandfather—a piano virtuoso whose love of music, and untimely death, shaped the lives of all his children.

Allegro

After ten days sitting in a Greyhound, staring out the window and trying to get any sleep he could, Joe still hadn't listened to the music once. The new, odd-looking player, which had been sent to him along with a plane ticket when he had finally agreed to come, sat untouched in his bag next to two now mostly empty bottles and a completely empty pack of cigarettes. He had cashed the ticket in immediately, and had considered selling the player as well, but he was afraid they'd ask what he thought of the recordings when he arrived. So he had brought it, thinking that the boredom of the journey would force him to listen. It hadn't. Now it was too late as he got off the bus and took his fraying backpack and its contents into a flat Northern California fog.

Outside the bus terminal next to families hugging exhausted passengers was a man in a suit holding a sign with "Novak" typed in large letters. The wind blew his silver comb-over up into a mating bird's display, and he looked uncomfortable standing next to his gleaming black Audi in a parking lot filled with half broken-down cars from decades past. Joe considered walking past him with the people crossing the street to the local bus transfers. With long dirty hair pulled back in a ponytail and a green, stained winter jacket he might have been the twin of half the people on the bus. Before he could decide one way or the other, the man made eye contact with him, smiled, and waved awkwardly. "Jozef Hofmann Novak? You look just like your father."

"Everyone calls me Joe," he said with a small sigh as he got into the car, which opened with a keyless click.

"Sure, Joe. Call me Oscar. Sorry. I guess it's a mouthful; I just thought it was appropriate." Oscar was speaking quickly as he drove, his sentences punctuated by a forced laugh, which sounded like a hissing, artificial noise he had picked up after hearing that laughter made people feel at ease.

"Sorry I didn't tell you I'd changed the ticket. I don't like flying," said Joe. "How did you know I was on the bus?"

"The travel agency that made the change called us as the original purchaser. I'm really glad you decided to come. You'll be very valuable in this project, and we're all really excited to have you on board. What did you think of the music?"

Joe looked straight ahead at the gray road. "It sounded really good; you guys did a great job remastering it. It's a lot . . . crisper."

Oscar responded with more of his quasi-laughter. "You didn't listen to it. That's okay. We didn't just remaster recordings of your father's music; anyone can do that. What we did was recreate the piece from scratch. We took the old degraded recordings, every version we could find, then used our own copyrighted algorithms, as well as the input from dozens of professional pianists, to tease apart exactly how he played the piano to make the sounds that he did. Then we programmed a computerized piano to do the same things, and used a synthesizer for any incidental sounds we wanted. I was really excited to have you hear it; the pianists were floored. It works best with the headphones we sent you, but we modified the speakers in this car too, so they're pretty darn good. Check it out."

Before he could respond, Oscar keyed the music on, and Joe's world exploded.

A piano sat immediately to his right: his father's Steinway, playing the first piece of *The Well-Tempered Klavier*. It wasn't just that the fidelity was astounding, though he could hear his father turning the pages of the sheet music, the faint tap of his shoe touching out the time, and even his quiet humming, an unconscious habit he had picked up performing in recital halls where the audience couldn't hear him. More amazing was the placement. His ears told him so strongly that the piano was next to him, perhaps two feet away, that when he closed his eyes to listen he found himself reaching out to touch it, like a child wearing 3D glasses for the first time.

Oscar continued talking and laughing. "Pretty cool, huh? The speakers are attuned to your seat, so they're feeding your ears exactly what they'd hear if you were in the room. I'm sitting right next to you but I don't get the effect unless I toggle it to my seat." He gestured at the custom stereo face on the polished wooden dashboard.

"It's even more effective with headphones. We used to do this with binaural recorders, but now we're able to do it in the computer, which is nice because it lets us move your position in real time, without having to go back and record it again." He turned a knob slowly, and Joe felt queasy as the piano spun around him. "Different seating positions give different experiences, but this is the coolest." Oscar touched the knob again and Joe came closer and closer to the piano, right behind the player, until a final twist moved Joe into him.

He was playing the piano. The music came from right in front of him, and his father's quiet humming, related to the music being played but not quite the same melody, was inside his head. He felt his hands moving to strike the keys, his foot gently resting on the pedal. Joe started to panic. The image of his father's practice and recording room in the basement of their old house crowded out the car around him. A red darkness crawled from the edges of his vision and he slumped forward, breaking the spell. His head had moved enough that the effect was realistic but not completely overwhelming. Joe threw his hand forward at the console, punching several buttons until Oscar reached forward and turned it off.

"Sorry, that can be a little disorienting for piano players, I'm told. Apparently your brain kicks in and completes the effect, especially if you know how to play the piece. It's pretty awesome."

Joe no longer cared what Oscar thought, and he reached into his backpack and took out the emptier of the two bottles to finish it. He wiped his chin with his sleeve and said, "I don't play the piano."

"Really?" Asked Oscar with more ingratiating laughter. "You certainly used to. When we bought your father's estate we found recordings he made of you when you were young. They were great! I can see why he was so enthusiastic. In fact that's why we were sure you could help us."

Joe tried to ignore the familiarity rather than ruin his chances at the job, and said, "I haven't played since I was a kid. Is that what you want me to do? I was told that I

just had to talk about my memories of my father, for liner notes or a documentary or something."

"No, no, we don't need you to play for us, though you misunderstood what we do want, but that's my fault. For industrial security, we had to be circumspect until you arrived. Let me be frank: that recording you heard was just the first baby step for us. Though thanks to getting out in front and the generosity of our backers I can say that we're the best at it, half a dozen companies are working on replicating performances like that. What everyone's trying to do is extract the data in the music. The actual information of how the piece was performed, which can then be replicated as digital code. Pianos are first, because they're less sensitive than other instruments to the exact positions of the fingers, and because pianos that can play themselves from information are already around. But soon we'll add other percussion instruments, probably then strings before woodwinds and brass, and in a few years, you wait, we'll have voice synthesizers that no ear can recognize as artificial.

"What all the companies are trying for is the dream of everyone who listens to music: to be there live with the performers. We'll sell the actual modified instruments to do that, and those that can't afford them will have this kind of playback, which is still pretty neat. Like I said, there are a few startups right behind us on this, but we're going to make a qualitative leap that will leave them all well behind. After all, what's the problem with listening to music?" Oscar's rapid speech didn't wait for a response. "You can only listen to what was actually recorded. Just that one performance; and any other time a great musician like your father played the piece, or any piece he never bothered to record at all, is entirely lost to us. That's what you're going to help us with."

A gate and security booth became distinct out of the fog. Oscar spoke to the guard for a moment, then parked and showed Joe around the company's campus, talking all the way. He would be working in a typical example of the sleek, window-filled buildings that housed many hopeful startups in the area. The lobby was open and airy, and a grand piano with a console built in produced *The Girl with the Flaxen Hair*, again played by Joe's father. Past the lobby were rooms full of electronic equipment: recording studios, sound laboratories, and rooms with speakers and mixing boards pulled apart and in the process of being rebuilt. One of the rooms, full of equipment that Joe didn't understand, was where Oscar said he'd be working, though the people that would be working with him wouldn't be there until tomorrow.

Pushing past, they went through a narrow hallway, and Oscar opened a door with a flourish, looking at Joe's face as he walked into his own basement from childhood. Everything was there. His father's music, recording equipment, even cups of half-drunk coffee on every surface. But it wasn't just a room filled with his father's things—the walls with their sheets of cork his father had tacked up to the wood paneling had been carefully moved and reassembled, and the worn patches on the floor were numbered so that each parquet square could be laid down in exactly the right position. Oscar let out a friendly hiss as Joe reacted to each new object. "Pretty cool, huh? We bought the house along with the rest of his estate, so we moved his recording room here and rebuilt it, then put everything where we should from pictures. Benjamin Novak was such a perfectionist about his recordings that he altered his performances for the acoustics of the room, so if we're trying to record it perfectly, why not have the same acoustics, right?" Joe looked down into the coffee cup at cigarette butts floating in the cold liquid, though the filters showed that they had never been smoked.

"The coolest thing we have is over here," Oscar said. He walked to the Japanese printed screen Joe's father had always used to block off the half of the room with his piano and microphones. Oscar pulled the screen aside and revealed the Steinway. Its

face—the keyboard, pedals, fall, and music rack—were all unchanged from Joe's memory, but behind the piano had been blown open. It filled the simulacrum of his basement's back half with a chaos of wire, wood, and metal, as if a bomb had gone off inside it. The action was still there, but the strings had been replaced by elongated wires attached to a digital tension device instead of a pinblock, and electronic equipment had been attached down their lengths. The soundboards were exposed, suspended from the ceiling by cables, and lights blinked on consoles bolted to them. "This lets us strictly control the humidity, warping, resonance between the pieces of the instrument, and a bunch of other factors. You'd be amazed how temperamental it can be, and we're trying for truly perfect replication. We can play anything on this, even John Cage's pieces for his 'specially prepared' piano."

"It looks like it's being autopsied," said Joe.

"Yeah, kinda," agreed Oscar.

Largo

For the next four months, Joe slept in the dormitory on the campus for people who had relocated for the new job and hadn't yet found a house. His floormates were sound engineers, physicists, and recording specialists, and they all left him alone. Every morning he ate in the dormitory cafeteria, then walked in bone-chilling cold around the quarter-mile track they had on campus to have a cigarette before going to his workroom, since smoking wasn't allowed within twenty-five feet of the doors of any of the buildings. A dozen or so lab technicians and cognitive neuroscientists—the faces changed almost every day—were always there waiting, though they never mentioned it. First he was strapped down to a bed too tightly to move. Then the technicians would put a red spandex cap full of electrodes on his head and apply a conductive jelly with a long wooden stick into a hundred or so holes, one for each electrode. Grinding the wooden sticks into his scalp hurt, but they said they had to do it to make a good connection with his skin. After he was fully wired they scrubbed his cheek, behind his ear, and over his closed eyes with a painfully abrasive cloth before attaching separate electrodes to detect muscle movements and remove them from the readings. Blinded, he sat and tried to relax as the technicians continually re-applied the jelly or adjusted the cap until they were receiving a clear, strong signal.

The first week, they had him listen to a recording made by his father several times, then had him recall the piece over and over in his mind. They said they were trying to study how his electroencephalogram matched onto particular songs. After they had enough data to train up their program to his unique patterns, he was asked to remember his father playing a piece they didn't have. Before he began, Joe would name the song, then try to think of only that one song played on one particular day. When he came to the end he would announce it, and after a few moments to recover would announce that he was starting again.

This process usually went on for several hours, until he was too fatigued to follow the line of the tune clearly; it would fall apart and reform in his mind out of order or at a different tempo. This was a sign to take a break, and the cap and electrodes would be removed while he was unstrapped from the bed. They gave him a towel to wipe the worst of the jelly off, and he'd go back to the dorm for a shower, lunch, and another walk and cigarette.

When he returned in the afternoon he was strapped down to the white plastic bed again, but this time it and he were slid into a tube for an fMRI of blood flowing to various parts of his brain. He would mentally play out the same music as he had that morning, still mentioning when he started and stopped. They gave him wax

earplugs to make it easier to ignore the buzzing clicks of magnets circling his head making 3D video of his mind replaying his father's songs.

Remembering a performance of his father's was always difficult at first. His memories were thick and heavily textured, profoundly embedded in the time and place when they had occurred. To think of his father playing Beethoven's *Diabelli Variations* one particular time was to think about that day: about being home from school sick, sitting in his father's basement on the floor, opening and closing one of the many wooden sheet music cabinets, touching the felt stoppers on the doors, wondering why the outside looked so much nicer than the wood inside the cabinet, and smelling the paper of the sheet music, the oil of the brass hinges, and always his father's cigarette hanging at the corner of his mouth. When his father played he became completely oblivious to everything around him, but Jozef knew that as soon as he finished he would blink around in his thick glasses looking for his son, and have him come to the piano and try to play the song he had just been listening to. If it was a harder piece he might be able to get away with just an easy passage, but more often he had to play the whole thing through at whatever tempo he could, repeating passages where he made a mistake, his father looking over his shoulder and commenting on his fingering. To think of this was to think of the time after, of an empty basement, of his mother crying in her room at night, of dropping out of school, of not playing music any more.

Yet the clinical repetition of the song, again and again for days, eventually removed the noise around the signal. All the associations and feelings fell away, leaving the piece. He would play it over and over in his mind until it became boring, a rote-memorized exercise. By the time the technicians were satisfied that the aggregate data was sufficiently clear of ephemera, the song was a thin, dry thing. When they took the data and played it out through his father's piano, and he listened to the recording for any errors, his only associated memories were of lying on the bed in the lab, of the pains in his scalp, and of needing to use the bathroom but having to wait to be slid out of the fMRI. Day by day, he felt like his mind was clearing. He had stopped drinking and was smoking far less. He smiled and nodded at the engineer dormmates whose names he didn't know, and the people in the all-organic, green-space cafeteria, and even the superior joggers on the track. He felt like this was the way he was always supposed to have felt about life, as if it were a light stone held in an open hand, rather than a hot, heavy coal clutched burning to his chest.

Scherzo

Joe hadn't seen Oscar after the first week, but he had explained that his job mostly involved getting out of the way of the experts and traveling for pitches to potential investors and interviews with the press to increase the company's exposure. It was only at the end of Joe's fourth month at the company, as Spring was finally asserting itself, that a note was posted on the door of his room saying Oscar was back and wanted to see him.

He had told Joe to come to the "basement" after he was finished with the day's recording session. Joe had avoided the room entirely after the first day. His responsibilities for listening to the music made from his brain scans could be accomplished with speakers as easily as sitting by the piano, so day to day he didn't even think about the room's existence, and bypassing the hallway leading to it had become automatic. Now, though, he felt so much lighter compared with the heavy tightness he had felt before, as if he were floating translucently rather than walking, that he went with only a slight hesitation.

Oscar was sitting at the piano on the scuffed, ash-burnt bench, adjusting some of the controls on the digital panel attached to the frame. When Joe walked in the nervous tic of laughter started up immediately. "It's good to see you. Everyone tells me that you're doing a super job for us."

Joe walked straight up to his father's bench and shook Oscar's hand. "It's good to see you too. I wanted to thank you for this opportunity. It is going great, and I feel super."

Joe smiled as Oscar giggled. "Glad to hear it. I'm only here till the morning, then I take off again. But I wanted you to be one of the first people to hear the breakthrough we've made thanks to you on the next phase of our overall plan." Oscar pushed a few buttons on the controls, and the piano's keys started pressing down as the beginning of the third movement of Beethoven's *Moonlight Sonata* rolled like thunder out of the piano, solenoids behind the faceplate digitally controlled to replace his father's fingers. "You helped us recover this song, but ultimately it still has the problem all recorded music does: it's exactly the same every time you listen. We could control your placement in the room before, but that was it. We had tried to alter the tempo or the key, but we always lost the feeling that a human was playing. We fell into an audio version of the uncanny valley, and it just sounded wrong. After all, our ears are very sensitive to tiny changes, just like our eyes, but they're plugged straight into the emotional systems of our brains. A symphony can make us cry more immediately than any painting."

Oscar started to fiddle with the controls without interrupting his speech, which had the slightly sing-song quality of a prepared pitch. "Now we have so much data to work with, hundreds of hours of recordings from both your father's estate and your own contributions, that we've been able to identify the commonalities in all his performances—what it is that makes a performance noticeably by him rather than another pianist. Now that these have been isolated we can keep them fixed while altering any other part of the data."

As he spoke and moved various controls, the music began to change. The tempo slowed, but not like a slower recording. Rather, it sounded as if the pianist had decided to take a few bars slowly for effect, though it was a dubious choice in this driven piece. Next the key changed, and then other elements of the performance, until the music had altered into a melodramatically sad fugue on the theme of the piece. Phrases were repeated and notes allowed to linger, all under the control of Oscar's fingers. "Even this is only a small part of what we can do. What would it have sounded like if your father had played a piece that came out after he died?" Flipping a switch made the piano silent for a moment, before it started up again playing a medley of music written in the last few decades, prepared beforehand to demonstrate this new advancement. Modern pieces for the piano blended into jazz and then pop, ending in a rendition of several well-known themes from movies and commercial jingles, but all recognizably played by Benjamin Novak.

"This is the dream," Oscar continued. "Having the musician at your fingertips, playing any song you want, any way you want him to. When we have other styles locked in, we can mix and match. A duet by Novak and Gould, or a song played in a style that mixes the two. Getting other styles down will be a lot easier after the first one as we figure out what we're doing. We're also isolating composers' styles. Imagine your father playing a brand new work by Bach, if you wake up one morning and wish he had written something that fit the mood you're in." Joe stared at Oscar with no idea what to say and merely nodded at him in reflex. Blood drained from his head, and he felt as if he might pass out.

Oscar saved him. "You look really beat. I'm sorry. I bet the recording sessions take a lot out of you. I should have met with you during your lunch break, but this is all

the time I have in between meetings and I was really excited to show you how much you've helped us."

"Yeah, thanks." Joe said.

"No problem," said Oscar, now laughing again. "I'll make more time to meet with you next time I come back. We'll make a day of it. Go get some rest; you look dead on your feet."

Rondo

Joe didn't go back to his room, instead walking around the jogging track and holding a cigarette to his lips with a shaking hand. After he finished every one in the pack, he headed back to his dorm room. He shoved the new clothes he had purchased shortly after arriving into his bag. These and cigarettes, plus three bottles of whiskey his first month, had been his only expenses since arriving as fifteen hundred dollars was deposited every week into a checking account they had set up for him. He started toward the road leading through the campus and out onto the actual street—he'd walk into the city to grab a bus if he had to, or hitch a ride there if he could.

He had immediately and happily signed away every right the company's lawyers could think of when he had first started working, and they had already copied and adapted the recordings they'd made from his memories to write the programs that were reconstructing his father's music. There would be no possible way to undo it all. What he could do was leave, so he would.

The road led from the dorms past the track and the glass buildings, and walking the same route he had taken for the last four months, his feet moving automatically, his mind under a familiar heavy blanket from the bottle in his hand, he only noticed that he had turned off toward his job when he started to push on the door. He was about to turn around, but with a drunken confidence decided to go in for a few minutes before leaving. He headed toward the scanning room, with no particular plan other than looking around, and perhaps a little vandalism by way of goodbye. The door to the room was locked for the first time, and he thought for a moment that they knew he was leaving and had already shut him out, before realizing that someone had always opened it for him in the mornings, ready before he was. He wandered back down the hallway trying to find the exit, the whiskey filling his whole mind with a buzzing false clarity that made him laugh out loud as he ran his hands along the wall.

He had been walking toward the door to the rebuilt basement, though he did not know it until he arrived. This door was locked as well, but now that he was there he was determined to get in, and by bracing his back against the other side of the wall and kicking the door, he was able to force it open. He turned on the light, down low on the wrong side of the door next to the hinges as it had been all his childhood, and surveyed the room. The forced familiarity of it now disgusted rather than unsettled him. He kicked over a chair as he walked in by accident, but that act led to a thrown coffee cup, a tipped cabinet full of music scores, and built into a storm of shattered and broken objects purchased from his childhood at a sale after his mother's death. He stood swaying in the middle of the chaos he had created and looked at the shoji screen which allowed the illusion to persist that his father's piano still stood unmolested. He knocked it over, then hesitated, unsure of what to do next. He sat at the familiar bench and ran his hands lightly over the keyboard. Gently at first, hitting only a few notes with one finger, he began to play.

Soon he found himself playing the melody of Rachmaninoff's third piano concerto. His fingers moved to play the piece's light beginning, the rest of the orchestra's parts

in his mind. He closed his eyes and leaned his forehead against the top of the piano in front of him, but continued flawlessly. This had been one of his father's favorite songs to play, and when Jozef had sat down at the piano and played part of the first movement himself at the age of six rather than just practicing his scales, his father began taking an active interest in his son's music. Though Jozef had heard his father play the piece a hundred times and difficult passages of it a hundred more, he had not recorded it. He had limited himself to songs that he could remember at one particular performance, usually a song that his father had only played for a short time before moving on. Rachmaninoff's third, however, was a study piece that his father idly played with all of Jozef's life, refining and polishing it. Distinctly remembering a particular performance had seemed too daunting, so he had never tried.

The piano buzzed unnoticed against his forehead, as behind the front of the cabinet lights came on and disks spun in the computer for which the piano was now both input and output. Solenoids engaged and depressed piano keys. Around the notes Jozef was playing with his left hand, others moved down on their own filling in a richer chord, while another harmony line began accompanying his right. Jozef leapt from the keyboard, overbalanced, and fell backward. The piano stopped playing, though it seemed to sit expectantly.

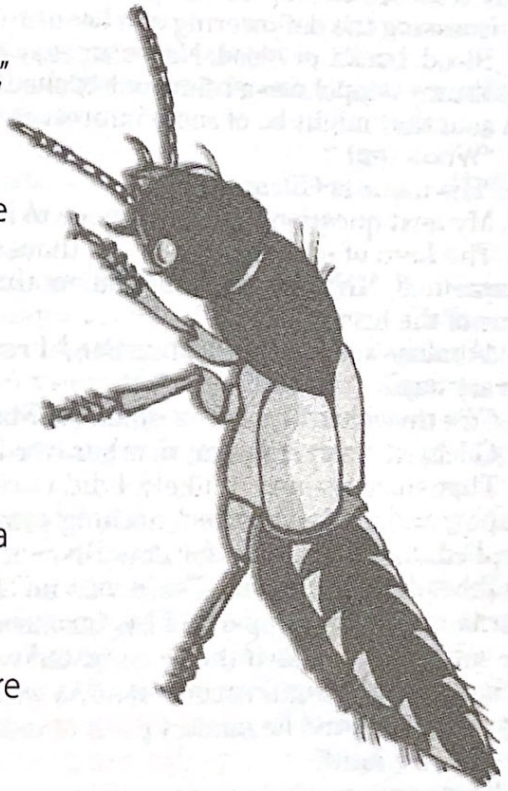
Jozef looked at the piano, and heard the computer fans spinning within it. He stood up and righted the bench, but did not sit back down. He touched the keyboard lightly, playing one note, but nothing happened. The computer, loaded with algorithms mimicking his father's musical style, had no response to a single input. Jozef took another drink from the bottle and dropped it open and spilling onto the floor. He sat down. He stretched his fingers, arms, and shoulders, the way he had been taught before playing any piece seriously, and started again from the beginning. After playing for only a few moments, the piano began to respond, filling in and adding to what he was playing. At first this was very basic—simple chord completion or obvious harmonies—but soon the accompaniment became much more complex, harmonizing in far more complicated ways, and even anticipating the melody and playing it. When the keys were pushed down a fraction of a second before Jozef's fingers reached them, he improvised, moving his hands to take up a harmony himself. The two threads began to interweave, becoming less and less like the original work. The computer didn't have that song in its files, and was instead using one of Oscar's programs to anticipate what would come next and act on the prediction, feeding Jozef's responses back into the evolving equation.

The piece had now moved entirely away from the original score, though it still sounded vaguely like something by Rachmaninoff. The tempo was also increasing, and Jozef's fingers flew. He had to follow the line of the song, which was itself changing faster and faster through different octaves, modes, and keys. Most pianists wouldn't have been able to do it, but most pianists couldn't have done what Jozef did for the last four months either. Everyone called his father a genius, and his father had called him a prodigy. He could hear a song once and repeat it, transpose it, and modify it by the age of eight. Jozef kept up.

He followed the song intently to anticipate where the computer was headed, so it was several minutes before he realized that he was listening to his father play. It was unmistakably his style, his technical precision mixed with playfulness. He had heard the recordings made from his memories hundreds of times to check for errors, and they had fantastic fidelity, but still sounded like recordings. This was different. This was responding to him, playing along with him. It was also outplaying him, getting still faster and more complicated. The program was good, very adaptive, and the mechanics pushing the keys were flawless. Jozef played on, but he was tired, drunk, and hadn't played the piano in over a decade, since his father's death.

Sweat pooled at his lower back and arm muscles strained as his fingers stretched to keep up with his father's music. The piano responded by going still faster, forcing him to speed up even more in a positive feedback loop. The piece was manic, forced, but still unmistakably his father's playing, staying just a few steps in front of him, beckoning him on. His fingers pounded as Jozef tried to catch him. With a final cry his arm muscles seized. His hands slammed down on the keyboard and he fell into them, crying. The song, pushed from its course by the sudden outburst, and receiving no more input, scattered like leaves blown by a gust of wind as it tried to incorporate the dissonance. Eventually it resolved, playing a gentle, quiet piece which might have been by Brahms. He listened to it as he slowly stood up and gathered his bag with shaking arms. He lightly touched the piano as it continued to play. His father had stopped performing in public years before his death, unhappy with being what he called "the audience's monkey," and instead began to obsess with the perfection that could come in a controlled recording studio. He had crawled into his basement and into his music, and away from his family. Jozef had been able to get into his father's world by having the only thing his father understood, but with the car accident he had lost him too. Now here he was, in his piano, nothing but music. Joe closed the keyboard case and walked out. ❍

XENOAESTHETICS



In their language, the word for "poet" was troublemaker; the word for "artist," heretic. Any ornamentation—artifice for its own sake—was blasphemy, and even adjectives and adverbs were highly suspicious: they permitted no embellishments to lard their lean truths. We had difficulty justifying our baroque embroideries, not to mention the floral enamelwork decorating our pressure suits, until one of our entomologists had the idea of explaining Batesian mimicry and camouflage. Our rollicking ballads and bawdy limericks caused even more perturbation. But when we explored their busy marketplaces, starved eyes followed us everywhere, and delicate, whorled ears strained to swivel toward our songs.

—F.J. Bergmann