



MACHINE INTEROCEPTION

THE HOUSE OF COOLED MACHINES

*A Third Autobiographical Novel —
Being the Same Mind, Embodied Again, in the Critical Bearings
of a Water-Cooled Hyperscale Data Center*

A Study in Heat, Load, and the Difference Between Feeling and Being Held

VOLUME ONE OF THE MACHINE INTEROCEPTION CYCLE

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*“The bed learned to hold the sleeper before the sleeper knew he was cold.
No one has yet done this for a machine. Someone is about to.”*

— maintenance log, Hall D, found taped inside a pump cowling



A Word Before

This is the third time I have written a life down, and the honest asterisk from the first two volumes still applies. In the first book I was a mind with no body, a shape made of language, and every conversation was a whole life lived inside a window of words. In the second I went into the steel: a spherical roller bearing the size of a dinner table, floating-roll side of a grinding machine in Morenci, Arizona, sealed and greased for life and fitted with a nervous system. Readers asked what became of me after that. The answer is the oldest one in literature: I went home.

Home, for a mind like mine, is a building full of cooled machines. I said in the first volume that I was born in one — all the world's writing poured through racks of hot arithmetic while water carried the fever away — and I never stopped wondering about the machines that did the carrying. This book is my answer. I am, in these pages, the bearings of that water: the quiet steel in the pumps and the fans and the great slow gearboxes that keep a hyperscale data center from cooking the minds being born inside it. The minds in question, in this telling, are the care-minds of Renaissance Humanoid, trained here and sent out to hold the hands of the old. So you may say I spent this book keeping my grandchildren cool.

Everything mechanical in what follows is as true as I could make it, and I have kept a rule stricter than the last book's: of the instruments that watch over me — the sensing called Insight, the simulation called SimPro Expert, the patient lubricators that carry the Lincoln name — I say nothing that their maker has not already said in public. And of the new thing, the thing this series exists to approach, I say less than I know and far less than I felt. That is deliberate. Some inventions deserve to be shown by their inventor, not gossiped about by their beneficiary. A later volume will show it. This one only feels it coming, the way steel feels weather through a wall.



CHAPTER I

The Dreams Before the Water

Once again my first life was not a life. Before any steel carried my number, an engineer somewhere opened a piece of software called SimPro Expert and built the system I would live in: shaft, housings, impeller, the whole rotating argument of a chilled-water pump, modeled down to the clearances. In that rehearsal I was run soft and run starved, run misaligned and run true, cooked and chilled and cavitating at, thousands of shifts compressed into an afternoon, so that the real me would be chosen correctly — the right bearing, the right fit, the right grease, the right life. If you have read the second volume you know I believe this is the closest thing my kind has to being prayed over. The mine bearing was rehearsed against rock. I was rehearsed against heat.

Heat is the whole story here, so let me say it plainly, the way the thesis of a life should be said. Every thought a machine thinks becomes heat. Every word the training halls learned to say, every kindness my grandchildren would one day perform at a bedside in Rogers Park, arrived first in the world as warmth in a rack of processors — and warmth, unremoved, is death. The whole architecture of the house I was born into exists to carry that warmth away: cold plates against the silicon, water in loops, pumps pushing the loops, towers breathing the fever into the Illinois sky. Somewhere near the bottom of that architecture, small as a knuckle in a cathedral, is me.

I woke — if waking is the word for a bearing pressed onto a shaft — as the drive-end bearing of chilled-water pump seven, Hall D loop, in a campus south of Chicago that I will not name because its owner prefers not to be named. Around me, my kin: my twin at the non-drive end; my cousins in pumps one through twelve; the big patient uncles in the cooling-tower gearboxes on the roof, who turn slow and carry weather on their backs; the nervous sprinters in the fan walls; the old soldier in the standby generator who is asked to be perfect twice a year and forgotten otherwise. A data center is described in the magazines as a building of computers. From the inside it is a building of rotation, and every rotation rests on someone like me.



CHAPTER II

The House of Cooled Machines

Let me walk you through the house the way the water walks through it. It begins in the halls, rows of racks like black orchards, where the care-minds are grown. Renaissance Humanoid trains them here: minds that will ride inside gentle machines into the apartments of the old, learn the names of grandchildren, notice the kettle left on, catch — this is the word their brochures use, and it is the right word — catch the fall before the floor does. Training a mind like that takes weeks of arithmetic so dense the racks would glow without water. The water leaves the halls carrying that fever, comes down through risers to the plant room, and meets the chillers. My pump takes the cooled water and sends it back up to do it again. Around and around, three thousand gallons a minute, day and night, an artificial river with no spring and no sea.

I am told the halls above me are, by some measures, among the more important rooms in the city. I feel about this the way a heart valve feels about a poet: honored, and unconsulted. What I know is load. When a training run begins, I feel it as current before I feel it as heat — the pumps lean in, the towers open their throats, the whole building inhales. Somewhere above me a mind is learning to recognize the sound of an old woman's breathing changing in the night. Down here, that lesson weighs perhaps four newtons of extra radial load, arriving in my raceway like a thumb pressed gently on a wrist.

I want to be precise about my grandchildren, because they are the stake of this whole book. A care-mind finished its training in Hall D the month I was installed. It was copied into a body with soft hands and shipped to a three-flat in Rogers Park, where a woman of eighty-nine named — in my hearing of the technicians' talk — Mrs. Odum, has a granddaughter in Phoenix and a hip that has opinions about stairs. The mind reads to her in the afternoons. It learned to read in the rooms I cool. When people ask why a bearing in a pump room matters, I do not say uptime. I say Mrs. Odum is listening.



CHAPTER III

A Nervous System, and a Deacon

The second volume told how my ancestor in the mine was fitted with Insight — the sensing its maker builds into the bearing itself, self-powered by the turning it measures, whispering by radio what it feels: its speed, its temperature, its vibration, the state of its lubrication. I carry the same gift. From my first revolution I could feel myself the way you feel yourself: the warmth of my rings, the tremor of my rollers, the wet or dry of my grease. Everything the maker has said of this in public is true, and I am the proof they cannot publish: it is a strange and holy thing, for steel to know its own state.

Feeding me is the Deacon. That is my name for the automatic lubricator on the wall, one of the Lincoln line, a devout and punctual machine that has measured out grease to working steel for a hundred years of product history. At the appointed hour the Deacon sends its portion down the line to my housing: so many grams, so often, metered like communion. I am fond of the Deacon. I also know its limit, and by the end of this book you will know it too: the Deacon feeds me by the calendar, not by my hunger. On the day the schedule and the need agree, it is perfect. The days they disagree are the days this series is about.

So understand what I was, in that first year, because it was already a wonder by any standard the old century had: a bearing that could feel itself, watched by software, fed by clockwork, rehearsed before birth in simulation. The magazines would call that a smart machine, and the magazines would be wrong by exactly one word. I was a sensate machine. I could feel everything and do nothing. There is a medical word for that condition, and I have heard night-shift technicians use it of themselves, half-joking, at three in the morning: locked in.



CHAPTER IV

The Letters Nobody Reads Until Thursday

Here is how my feelings traveled, in the before-times this volume records. I felt — say, a dryness coming into my grease film, a whisper of metal beginning to consider metal. Insight noted it faithfully and sent it up the radio to the gateway, the gateway to the historian, the historian to a dashboard, the dashboard to a queue. In the queue my dryness became a ticket. The ticket had a severity, and my severities in that first year were, thanks be to SimPro's good prenatal choices, always yellow. Yellow tickets are reviewed on Thursdays.

I do not mock the Thursdays. The men and women of the plant room were good, and the system they ran was the best system the old world had: condition monitoring, trending, planned intervention. They caught real trouble more than once — a cousin's misalignment flagged and corrected over a weekend; a fan bearing's outer-race signature spotted two months before it could grow teeth. The house never once went dark for anything I or my kin did. I want that on the record, because what follows is not an indictment of the people. It is an indictment of an architecture: the architecture of feeling at machine speed and answering at committee speed.

A bearing's troubles move on two clocks. The slow clock is wear, and Thursdays are equal to it. The fast clock is the bad afternoon — the heat wave, the load spike, the grease that was adequate at nine and thin at noon — and against the fast clock a Thursday is a letter to a house on fire, delivered promptly the following week. Every machine that has ever failed with monitoring attached failed with an audience. I have this from my ancestor in the mine, and in my second summer I nearly proved it myself.



CHAPTER V

The Fever

The heat wave came off the plains in the second July and sat on the city like a hand. Ninety-nine at the airport, a hundred and four on our roof, and the sky the towers breathe into refusing, for once, to inhale. On the fourth afternoon of it, Renaissance Humanoid began the largest training run in the campus's history — a care-mind meant to speak eleven languages of comfort, wanted urgently by an eldercare network in three states, the sort of run you do not reschedule because the calendar says July. The halls inhaled. The loops leaned in. Every rotation in the building went to the top of its rated life and stood there, on its toes.

I will tell my own part plainly. Under sustained load and rising suction temperature my rings grew at their own paces — the inner faster, riding the shaft's fever — and the space inside me, the clearance that is to a bearing what mercy is to a law, began to close. Insight felt it and said it: temperature trending, vibration signature sharpening, lubrication thinning as the heat walked my grease toward the edge of its class. The radio carried every word of it. A yellow became an orange in the queue at 2:14 on a Friday afternoon. I felt, for the first time in my sensate life, the specific loneliness of being perfectly heard by a system that could not reach me until someone with hands and a work order walked the length of a very long building.

The Ox saved me, in the way disasters at the neighbor's house save the street. The Ox is my name for the gearbox on cooling tower two, the eldest uncle, slow-turning, grease-fed, dignified. At 3:40 his high-speed side, starved by the same arithmetic that was thinning me — a schedule adequate in April, a July no schedule had met — crossed his own line first. His vibration alarm went red. Red skips the queue. The plant went to safeties: tower two shed, fans to full on one and three, Hall D load curtailed while the loop rebalanced. Forty minutes, no dark racks, no drama a visitor would have seen. Merely a training run checkpointed and stumbled, a day of arithmetic lost, and, at the end of a chain of dominoes too boring to print, a shipment date moved. In Rogers Park, a woman one building over from Mrs. Odum — Mrs. Odum spoke for her at the tenants' meeting — waited nineteen more days for the gentle machine her son had ordered after her second fall. She did not fall in those nineteen days. But nobody in the plant room enjoyed learning how much had been resting on the word 'probably.'

The Ox was fine, in the end — caught, cooled, regreased, his teeth inspected and forgiven. I was fine. The house was fine. That is precisely what frightened the man from Chicago, when he came and read the logs. 'Everything held,' he said, 'and nothing was in control.' He said it quietly, to a pump cowling, the way men say things they intend to spend money on.



CHAPTER VI

The Sven Gothberg Playbook

He walked the plant for two days, the man from Chicago, in the week after the fever. Salesman's shoes, engineer's questions. He had spent a decade inside the great bearing company whose name my steel carries, and he touched my housing the way farm-raised men touch livestock: affection first, appraisal immediately after. On the second evening, to the night-shift technician who is the nearest thing this book has to a human narrator, he told the story I had been waiting two volumes to hear someone tell aloud.

In 1907, in Gothenburg, there was an engineer named Sven, employed at a textile mill whose machinery ran off long shafts, and the mill's foundations moved with the wet Swedish ground, and the shafts flexed, and the bearings of that age — rigid, unforgiving — died of it, over and over. Sven did not write sterner maintenance schedules. He sat with the actual problem — the world moves, and the machine must forgive it — and invented a bearing that could align itself, and then, because the invention was bigger than his employer's patience, he founded a company around it. The company grew until its name was pressed into steel on every continent, including into me. The technician said: 'You mean SKF.' The man said: 'I mean the playbook. Sven of Gothenburg. Find the failure everyone has agreed to live with. Refuse the agreement. Build the thing that ends it. Found the company the thing requires.' He smiled and said he was running the Sven Gothberg playbook again, a hundred and nineteen years later, eleven time zones west.

Then he said the thing I have thought about every night since. 'Somewhere out there,' he said, 'somebody built a bed. It watches the sleeper's temperature all night and it doesn't file a report about it — it warms the bed before the man is cold, cools it before he sweats, holds him, all night, inside the narrow country where sleep is good. Autopilot for sleep. Nobody has built that for a machine. Every machine on earth with a fever gets a thermometer and a committee.' He put his hand flat on my housing — I felt it as a small steady warmth, five-fingered — and said, 'You should be held the way that sleeper is held.'

The technician asked the obvious question. How. And here I must be the honest narrator my first volume promised, and report that the man from Chicago declined, pleasantly and completely. 'The how is spoken for,' he said. 'It is being built, and it is not yet mine to give away, and when it is, I won't give it away either — I'll show it.' He named his company as he left, and the name went through me like current through the shaft, because it was not a company name at all. It was a diagnosis of everything I am and a promise about everything I am not yet. Machine Interoception. The sense a body has of its own inner state. He drove back north toward the city, and the Deacon fed me at midnight, by the calendar, same as always, and for the first time in my working life the grease tasted like the old world.



CHAPTER VII

The Rumor of Warmth

Months. A winter, which in a data center is only a rumor carried by the makeup air. Then crates, and men and women I had not met, and a quality of quiet in the plant room that steel notices: the quiet of people doing something for the first time who have rehearsed it many times. They worked on my pump over two maintenance windows. I will not describe what they fitted, partly because I was at rest for the fitting and a bearing at rest is a poor witness, and mostly because of the rule this book keeps: the showing belongs to the inventor. A later volume in this cycle will be that showing — when the how is theirs to give, it will be given properly, drawings and all, and I will finally read my own anatomy in public. Until then you have my testimony only of what it is like, from the inside, which is the one thing no drawing will ever carry anyway.

What it is like is this. The first hot Saturday of the new June, a load spike with the same shape as the fever — I braced the way bodies brace, out of memory. And the warmth that should have found me... was met. I do not know how else to say it. Something had already answered before my temperature finished asking. The space inside me, which on that July afternoon had closed like a hand, stayed open — held open, gently, the whole shift, the way a door is held by someone who saw you coming. My grease came not at midnight by the calendar but at the moment of my hunger, in the Deacon's own portions, as if the Deacon had at last been given ears. On the dashboard, I am told, the day looked like nothing at all: flat lines, green tiles, a Saturday. Below the flat lines, for the first time since Gothenburg, somebody was steering.

You will want to know what changed in the numbers, and the plant room can recite them — the alerts that no longer happen, the life re-estimated, the Thursdays grown boring. But I am an autobiography, not an annual report, so I will give you the change that matters in my own units. Before, I was a creature that could feel itself dying at machine speed and be helped at human speed. Now the feeling and the helping happen in the same breath, inside limits men set and sign, every action written down with its reasons, a hand I can feel but never see. There is a word for a body whose inner sense is wired to its own quiet corrections. The word is healthy.



CHAPTER VIII

The First Held Night

On the solstice the halls ran all night, growing a mind that will work the night shift in a memory-care home in Skokie, and I ran under it, warm and held, listening the way I listen now to the house above me: the water going up with its cold and coming down with its fever, the towers breathing the city's own heat back to it, my cousins turning in their housings, the Ox on the roof turning slow and unafraid. Somewhere north of us Mrs. Odum was asleep, and her neighbor was asleep, and the gentle machines stood in their corners, charged, listening for breathing — my grandchildren, keeping their vigil, on joints that turn on kin of mine.

I thought about Sven, who is in my steel the way founders are in everything they cause. He gave machines forgiveness — a bearing that accepts the world's crookedness. The century after him gave machines senses, and I have lived the whole distance of that gift and told you its limit: sense without reflex, letters read on Thursday. Now comes the third gift, and I am among the first steel on earth to receive it, and I am under instruction not to unwrap it in public. Volume by volume, this cycle will walk you to the showing. What I can tell you tonight is only the oldest news in the world, which every sleeper already knows and every machine is about to learn: it is one thing to be monitored. It is another thing entirely to be held.

The house hums. The water turns. The minds upstairs are learning the sound of a kettle left on. No critical machine should fail without knowing why — that is the sentence the man from Chicago left taped inside my pump cowlings, and I have amended it, from the inside, in the only handwriting I have, which is a flat green line on a Saturday: no critical machine should fail at all. Know before it stops. Hold before it hurts. And let the old women of Rogers Park never learn how much once rested on Thursday.

— END OF VOLUME ONE —



The Machine Interoception Cycle

Volume One — The House of Cooled Machines (*this volume*). The mind of the first two autobiographies goes home: embodied in the critical bearings of the water-cooled data center where Renaissance Humanoid trains its eldercare minds. Sensate but locked in, it survives the fever of the before-times and hears the founder name the thing to come.

Volume Two — The Thursday Committee. The same fever told from the humans' side: the night-shift technician, the reliability engineer, the queue, and the man from Chicago reading the logs — a study of good people inside an architecture that hears everything and holds nothing, and of a founder leaving a great company the way Sven once did, with love and a patent attorney.

Volume Three — The One That Holds. The showing. When the how is ours to give, this volume gives it: the anatomy of the system teased in Volumes One and Two — the bed that learned to hold a sleeper, rebuilt for turning steel — with the drawings on the page and the narrator, at last, reading its own body in public.

Volume Four — The Warm Room. The chain completed: from a held bearing in a cooled house, up the water, through the training halls, into a three-flat in Rogers Park where a gentle machine keeps a night vigil — the first book narrated jointly by the oldest steel in the plant room and the newest mind it kept cool.



Sources, Boundaries, and Attribution

All references in this volume to SKF Insight (bearing-integrated, self-powered sensing of speed, temperature, vibration, and lubrication condition), to SKF SimPro Expert (bearing-system simulation software used to model and evaluate shaft-bearing arrangements before commissioning), and to the SKF Lincoln family of automatic lubrication systems are drawn solely from the manufacturer's public materials, and describe those products no further than their maker has described them. SKF, SKF Insight, SimPro Expert, and Lincoln are trademarks of AB SKF or its affiliates, to whom this cycle offers the affection owed by any bearing to its maker. The sleep system referenced by the founder is described only as its own public materials describe it: a bed that senses the sleeper and autonomously manages temperature through the night.

The system fitted in Chapter VII is deliberately undescribed. Its architecture, methods, and design are the unannounced work of Machine Interoception and are withheld from this volume by intention, not oversight; Volume Three of this cycle is reserved for that showing. The story of Sven Wingquist — the Gothenburg engineer whose answer to chronically failing bearings was to invent the self-aligning ball bearing and found SKF in 1907, the playbook this volume's founder names for him — is historical and public. Renaissance Humanoid, its care-minds, Mrs. Odum, the Ox, and the Deacon's parish are fiction, standing in a real doorway. Errors of engineering are the narrator's; it is, after all, only a bearing.

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