CTRL ALT AI



Nathan Phinney

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For Anderson, who is quiet and thoughtful,
patient and analytical, somehow both wise beyond his years
and also capable of mischief. You are brave and kind, smart
and curious, and I'm excited to see the adventures you will
have. I hope we can have some more adventures together soon.
I am very proud of you.

- Dad

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FOREWORD

I first met Nathan Phinney when he was a student of some promise at The Contemporary Music Center on Martha's Vineyard - an independent but fully accredited college program for students who didn't know what they wanted to do but knew it had to involve art, technology, commerce, inventiveness and community.

Nathan was clearly a burgeoning shape shifter, easily moving through the worlds of songwriting, performance and recording, while just as effortlessly piercing the putative walls erected between music, philosophy and social justice.

Rarer still, he overflowed with humor and kindness, merrily investing in others with a generosity that belies a subcutaneous spirituality.

A quick read through his table of contents will give you a sense of the diversity and colorfulness of Phinney's interests and inclinations - to wit there are entries about singer/songwriter Tracy Chapman, Apple's early machine learning, open world simulators (circa 2018), 6th century BCE psalmody, Zen proverbs, the songs of Dorothy and Claude and the Tin Man, 4chan and Fantasia and a frightful awareness of the possibility of the death of learning at the hands of efficiency; high speed inculcation, minus the human development and edification.

For a book about math and science and fear of the unknown, Phinney delivers wisdom that pays off dividends in comfort and hope.

Tom Willett

INTRODUCTION

When I was twelve years old, I went alone to visit my grandparents in Sioux Falls, South Dakota. Unlike most 12-year-olds I knew at that time, I had a girlfriend, our pastor's daughter in fact, and even though we went to the same school, our relationship subsisted on long, meandering telephone calls. Access to a telephone, therefore, seemed to be of existential importance to me at the time.

My grandparents were on a fixed income, but generous to a fault, so they offered me the use of a rotary telephone which had been installed in a hallway in the early 1950s and tried not to think about what I was about to do to their long distance bill. They bought the phone and had it professionally installed because their daughter, my mom, was born with a congenital heart defect, and they wanted to be able to use it to summon doctors and ambulances. So it had an important job, and they literally put it on a pedestal in the hallway. Technology amplifies intention. It multiplies its inputs.

The phone had a long cord so that you could pull it into the adjacent dining room and sit on a chair while speaking

to the other party. I imagined my mother, when she was a teenager, stretching the cord out all the way into her bedroom for a semi-private conversation with a young man on the line. That phone is on a shelf in my office today, and it still works. But one time, it didn't. So I opened it up. And what I saw inside changed my perspective.

The first thing I noticed was the mechanical bell. A subtle change in voltage on the line causes a mechanical hammer to assault a metal clanging bell inside the phone. It's a wonderful, cacophonous, urgent noise that cannot be ignored.

A speaker in the handset uses magnets and a thin metal disc to move air at the same frequency as the tiny electrical impulses that it receives, pushing air into your ear, vibrating at a thousand hertz. Another kind of transducer does the same thing in reverse. You move air with your lungs and vocal cords, and it uses that pressure and vibration to vibrate a pair of electromagnets, which sends a low voltage representation of your voice modulation into a wire. That's all completely bonkers already, but then how does it dial?

The rotary dial is a spring-loaded mechanism. You pull it to the number seven and release it, and a tiny governor controls the speed as the spring whips it back. A rotating cam slams a metal contact open and shut, open and shut, seven times in less than a second. Each time the contact breaks, the current on the line dies. And each time, in the instant before the gap opens fully, the current arcs: the electricity leaping across the widening contact, not wanting to let go. Seven breaks. Seven tiny fires, so small you'd need a dark room and a magnifying glass to see them. Seven

changes in voltage, seven mechanical switches somewhere start routing your signal through the noise. Seven.

So we were blissfully unaware that mechanized hammers and sparks and fire and magnets and electrons were quietly, violently, and obediently carrying our whispered words across the plains.



We've forgotten how much had to go right for that phone call to happen. I'm telling you about it because the same thing is happening right now with something else, and we're about to stop noticing. AI is going to disappear into our subconscious. Technology always does. That phone worked because the people who built it understood every spark inside it. The AI in your office works because somebody understands it, and this book was written to invite you into an understanding of artificial intelligence that I hope will allow you to use it to do great acts of truth, kindness and beauty.

I heard a comedian on television once do a bit about how everything is amazing and no one is happy. His example was a guy on an airplane complaining about the slow wifi. His response was to remind the guy that he's in a chair relaxing as he is hurtling through the sky at hundreds of miles an hour, and that his laptop is retrieving information from s*pace* for him in real time. He argues that the guy should be saying "WOW! WOW! WOW!" as he looks around like a crazy person in hilarious faux wonder, shock, and awe.

I have a robot. Not the sort you're picturing, but a few

thousand lines of code running on a computer in my office about the size of a paperback novel. Every morning before I wake up, it reads the newspaper. I built it in an evening. That would have been incomprehensible three years ago. Today it's hardly impressive at all. At some point, that becomes an advantage.

For twenty years, the people who built software had access to a set of doors that the rest of us couldn't open. You needed to know how to code. You needed to comprehend REST API documentation and javascript and python. Now the doors open automatically if you can simply describe what's behind them and what you want to happen. **Ordinary people are about to make a lot of extraordinary software.**

I've been building and selling technology for more than two decades. I co-founded an IT service provider and led it from three people in an office shared with a landscaping company until it was acquired by one of the best and largest MSPs in California. I also served as interim COO of an AI startup that detects concealed firearms using WiFi, and remain an active investor in companies trying to solve problems I care about. I build things with technology and watch them work. I build things with technology and watch them fail. But I compulsively open things up. I look inside. I figure it out. It's probably the thing I do best. I am relentless.

In my first book, *Ctrl Alt Survive*, I wrote about two kinds of technologists. I called them Knight Rider technologists and Airwolf technologists. Knight Rider technologists use technology to help people. Airwolf technologists love the machine itself - blinking lights, explosions, power. Neither

perspective is inherently wrong. But only one of them is really capable of caring about what will happen to someone outside themselves. AI is the most powerful force multiplier ever built. A force multiplier, such as an automobile or a B2 bomber, has an operator, and when the operator does not supply the judgment, the multiplication happens anyway. I would like you to consider which kind of technologist you will be.

In Walt Disney's *Fantasia*, an anthropomorphic rodent borrows a hat and enchants a broom to carry water. It works. That's the problem. The broom does exactly what the rodent asked; he just didn't think through the consequences of his prompt. The rodent wrote incomplete instructions for something tireless and literal, and by the time he noticed the flood, the brooms had continued beyond his ability to stop them.

The brooms are moving. They are carrying pails of water. They are doing exactly what they were asked. The workshop is just beginning to flood, and the wizard still hasn't come back from lunch.

1

HAMMERS AND FIRE

Chant no more your old rhymes about bold Robin Hood,
His feats I but little admire
I will sing the achievements of General Ludd
Now the hero of Nottinghamshire
Brave Ludd was to measures of violence unused
Till his sufferings became so severe
That at last to defend his own Interest he rous'd
And for the great work did prepare

- "General Ludd's Triumph," anonymous, sung to the tune of "Poor Jack."

My name is Ned Ludd and I am probably not real, but if I am not real, why does everyone, hundreds of years later, still speak my name? Perhaps I am as real as anything that ever came out of Nottingham.

They will tell you I am a myth. A legendary phantom stitched together from anger and desperation, passed around in whispers like a flask of gin. They will tell you I never existed, and I suppose they are right in the way that many cold facts are right, which is the least interesting way to be

right about anything.

I existed in every man who walked into the dark with a hammer or a torch that night. I existed in every oath sworn in a back room, every whispered signal, every wife who did not ask where her husband was going because she already knew, and she was proud and terrified, and so she packed him bread without a word. I am the name they chose for themselves when they needed a name bigger than any single man, and if you think that makes me less real than George Mellor or William Thorpe or Thomas Smith, then you have never understood what a name is for.

But let me start before, because before is where my story lives.

I want to tell you about a sound: the sound of a stocking frame in a house where the work is going well. It is a wooden sound, a clicking and clacking, rhythmic like a heartbeat but more complicated, more alive. There are pauses in it, tiny hesitations where the craftsman adjusts, where his hands make a decision that his mind made years ago and stored somewhere deeper than thought. The frame speaks and the craftsman answers and the cloth grows and the sound fills the house the way bread smell fills a kitchen: completely, invisibly, so that after a while you forget it is there and it becomes the texture of home itself.

Mrs. Ludd would fall asleep to it. She would sit in the evening with her mending or her knitting and the frame would be going in the next room, clacking its wooden rhythm, and her eyes would close and her hands would slow and she would fall asleep. Not because she was bored. Because she was safe. The sound meant I was working. The

sound meant the rent was paid and the children were fed and the world was turning the way it was supposed to turn. The sound of the frame was the sound of a life that worked, and she could rest inside it the way you rest inside a house when the walls are solid and the roof doesn't leak.

I was fourteen when I started my apprenticeship. Thomas Henson's workshop. The first thing he did was put a piece of finished cloth in my hands. Not a frame, not a shuttle, not a tool of any kind. Cloth. "Feel that," he said. And I felt it carefully. And he said, "That is what seven years of knowing feels like. When you can make cloth that feels like that, you will be a man who makes something that matters."

Seven years. People hear that now and think it sounds like a prison sentence. Seven years to learn to make stockings? But it was not seven years of learning one thing. It was seven years of learning everything. The twist of the yarn. The tension that your fingers learn to read with the whole surface of your skin. It was like playing a stringed instrument, and the results were as beautiful as any music.

Yes, you could hear a good stockinger work the way you could hear a good fiddler play. There was a rightness to it. A completeness. And when the cloth came off the frame and you held it up and it was good, truly good, the kind of cloth that a gentleman would choose for court, there was a feeling that I have never been able to name, but I think that feeling might be the whole reason people make things at all.

When I finished my apprenticeship I was twenty-one. I rented my own frame. I worked from a room in my own home. I set my own hours. If the weather was fine and I had worked ahead of the demand, I could walk to the alehouse,

tend my garden, sit in the doorway and watch the lane and feel something I now know was freedom but at the time did not think to name, because you don't name the air you are breathing.

I earned fourteen shillings a week. My children had brand new shoes. We were a family, complete. I was so proud of us.

The knowledge we carried was not trivial. It was not the kind of thing you could pick up in an afternoon or learn from a manual. It was embodied expertise, stored in the hands and the fingers and the muscles of the forearm, accumulated over seven years of daily practice under the supervision of a master who had himself accumulated it over seven years of daily practice under the supervision of his own master. This chain of transmitted knowledge stretched back centuries. It was, in modern terminology, an enormous repository of human capital, and it was concentrated in a few counties in the English Midlands, and it was worth more than anyone involved seems to have understood.

The manufacturers certainly did not understand it. The manufacturers only understood money. They looked at the new technology and saw a way to produce stockings faster and cheaper. They did not ask whether the stockings would be any good, because the question of good did not interest them. They asked whether the stockings could be sold, and the answer was yes, because you can always sell something cheap to someone who cannot afford something better, and in England in 1811 there were a great many people who could not afford something better.

The people with the deepest knowledge of how to make textiles had no capital and no machines. The people with

capital and machines had no knowledge whatsoever of what they were making. The manufacturers were, in the most literal sense, ignorant. They did not know cloth. They did not know thread. They could not feel the difference between good work and bad work because they had never been taught to feel it. They were money men operating in a knowledge industry, and the predictable result was that they produced garbage at scale and called it progress.

My fourteen shillings a week thus became twelve. Twelve became ten. Ten became seven. Meanwhile, the price of bread doubled. My children stopped playing. They sat very still, because sitting still allowed them to feel full for longer periods of time. My wife stopped falling asleep to the frame, because there was not enough work to run my frame in the evenings anymore, and the silence in the house was a new kind of silence, the kind that means something has broken that will not be fixed by morning.

We wrote letters. We petitioned Parliament. Beautiful, careful, respectful letters, citing statutes and precedents, using the formal language of men who believed that the system they lived under was a system that could hear them. We organized delegations. Men put on their best coats and traveled to London and waited in hallways and were received by undersecretaries who were received by secretaries who were received by no one at all. We used the proper forms. We followed the proper procedures. We behaved, in every respect, like citizens of a country that might have considered us citizens.

They didn't say no. A no would have been something. A no would have meant they heard us and disagreed. What we

got was silence. Our petitions arrived in Parliament the way a leaf arrives on a lake. There was a small disturbance on the surface. Then it was as though nothing had happened.

The newspapers printed some of our letters. In the back, near the advertisements, and the people who read them at all thought, "How unfortunate," and turned the page to something more interesting, which was everything else.

We appealed to magistrates. Some were sympathetic. Sympathy from a magistrate is like shade from a very small tree. You appreciate the gesture. You are still standing in the sun. We tried, is the point. We tried everything that civilized men are supposed to try. We tried the channels that civilized society provides for the redress of grievances. Every channel was dry.

So, as you might have guessed, we went into the dark with our unanswered rage against the machines.

I will tell you about the dark. I will tell you about walking through a night in March, no moon, mud to the ankle, breath coming in clouds, and around you in the dark the shapes of other men, men you have known your whole life, men whose children play with your children, men whose cloth you have felt between your fingers and judged and respected. Walking in silence toward a workshop where machines are being used to destroy everything that matters to you.

I will tell you about the precision of what we did, because precision is the part they always leave out. We did not rampage. We did not smash everything in sight. We went into the workshops and we identified the specific mechanized frames that were producing the shoddy goods that were undercutting our families and flooding the market

with garbage. And we broke those frames. Selectively. The honest frames, the ones being used fairly by men who still cared about what they made, we left standing. We left them standing because we could tell the difference, because we were craftsmen even in the act of destruction, because our hands knew, even holding hammers, the difference between evil machines and honest tools.

We took my name. Ned Ludd. General Ludd. King Ludd. We said I lived in Sherwood Forest, and this was deliberate, because every child in England knew who lived in Sherwood Forest, and we were saying: we are those m en. We are the merry men who fight back when the powerful rob the powerless. We are the outlaws, and we are the outlaws because you have made the law a weapon against us, and when the law becomes a weapon the outlaw becomes a hero and we are not ashamed of what that means.

The government and the factory lobbyists who employed them closed around us like a fist. Neighbors hid us. Families fed us. When the government sent spies into our counties, the spies were identified within days and frozen out, because you cannot infiltrate a community that has been holding together against the cold for generations. Belonging is not a costume you put on. It is a thing that grows in you over years of shared winter nights when the frame is clacking and the children are sleeping and the walls are thin but the fellowship is thick, and everyone knows everyone and everyone owes everyone and when a stranger arrives asking questions, everyone knows he is a stranger before he opens his mouth.

The government's response tells you who was actually afraid in this story. They sent the army. Not constables. The

army. More soldiers deployed against us than were fighting Napoleon in the Peninsula. The British Empire, which was at that moment engaged in a war for the control of Europe, decided that framework knitters in Nottinghamshire were a more pressing military concern than the French. If you want to know how dangerous we were, do not ask what we broke. Ask what they sent to stop us.

Parliament passed the Frame Breaking Act. Machine-breaking became punishable by death.[1] Lord Byron spoke against it, beautifully, passionately, pointlessly.[2] They hanged George Mellor. They hanged William Thorpe. They hanged Thomas Smith.[3] They shipped the rest of us to Australia in chains, which was essentially a death sentence that took the scenic route.

I have had two hundred years to think about this.

We were right. And we were wrong. And the way we were wrong matters more than the way we were right, because the way we were wrong is the way that everyone is always wrong when the life you love starts to crack beneath your feet.

We fought the machine. You cannot fight the machine. Not because the machine is sacred or because progress is inevitable in some grand philosophical sense. You cannot

1. Destruction of Stocking Frames, etc. Act 1812, 52 Geo. 3 c. 16, which received Royal Assent on March 20th, 1812 and made the destruction of stocking frames a capital felony. https://nathanphinney.com/ai1

2. Lord Byron's maiden speech in the House of Lords, delivered on February 27th, 1812 in the debate on the second reading of the Frame Work Bill. "Frame Work Bill," House of Lords debate, Hansard, HL Deb vol. 21, cc. 964-79. https://nathanphinney.com/ai2

3. George Mellor, William Thorpe, and Thomas Smith were executed together at York in January 1813. The Leeds Mercury's report of the hanging is reproduced at https://nathanphinney.com/ai3.

fight the machine because a tool has no allegiance. The side that uses it wins. The side that smashes it loses. Always. Every single time. We, the Luddites, the finest textile workers in England, did not stop the mechanization of textile manufacturing. We delayed it. We got ourselves hanged and broken and banished to Australia. And then it happened anyway, without us, and the men who replaced us did not know what we knew, and the cloth they made was worse, and nobody was left who could explain the difference.

That is not a victory. We lost, and we took what we knew down into the ground with us.

The manufacturers had the machines and no judgment. We had the judgment and no machines. That is the whole of it. But it's the wrong answer to the wrong question.

I stood in a workshop in the dark with a hammer in my hand and a wide frame in front of me, and it never once occurred to me to put my hands on it. To use it. To sit down at that thing and thread it the way I had threaded my own frame ten thousand times, with fingers that could read a tension the way you read a face, and then to see what came off the other end. Cloth good enough for court, coming off a machine, faster than any man alive could make it by hand.

This thought was available to me that night. But I did not have it.

We coordinated raids in three counties in the dark without a telephone. We had neighbors who fed us and hid us and lied to soldiers for us, and any one of them would have put money into a workshop if we had thought to ask. We had the knowledge, the skill, the reputation, and the particular stubbornness of a man who walks into the dark because the

alternative is watching his children go hungry. All of that passion, and we aimed it at the machines instead of through them.



A hundred and fifty years after they hanged George Mellor, a woman in Virginia showed us what it might have looked like if we made a different decision.

Dorothy Vaughan stood in a room at NASA's Langley Research Center in front of an IBM computer the size of a dining room. She was the supervisor of a group of mathematicians, all women of color, who were called, without irony, *computers*, because that was the job.[4] They computed. By hand, on paper, with pencils and a quality of focused attention that most people never develop because nothing in their life ever asks it of them. Dorothy's co-workers, her computers, put rockets in the sky, and later they would put men on the moon.

But the machine across the room was vexing. It did not need sleep or coffee or a pencil. It did not need to be paid. It could do in an afternoon what her section did in a month, and she knew it was only going to get faster and better. I know what she felt standing there, because I, Ned Ludd, have stood there. She felt the awful silence coming.

She did not reach for a hammer like I did. She went to a

4. Dorothy Vaughan was promoted in 1949 to lead the West Area Computers at the Langley laboratory of the National Advisory Committee for Aeronautics, held that post until 1958, when the NACA became NASA, and became an expert FORTRAN programmer. NASA, "Dorothy Vaughan," https://nathanphinney.com/ai4 ; https://nathanphinney.com/ai5.

library and borrowed a manual and taught herself Fortran, which is a language you speak to a machine, and she did it slowly, mostly alone, and mostly on her own time.

Then she had to go and convince the other women.

That is the part I think about. Not the machine. The room. There are people in it who trust her, who have worked for her for years, whose children she knows by name, and she has to stand up in front of them and say that the unswallowable truth that the thing they are excellent at is over. Not that they failed at it. That it just ended. And then, in the same breath, before anyone has had time to be afraid, she has to say: here is the new work, I have already started, and I am going to teach you.

She taught them. Every one who wanted to stay learned to program, because Dorothy decided that programming was the job now. The job that did not exist until somebody who understood the old work deeply enough walked up to the new machine and said, I am going to learn what you do, and then I am going to do things with you that your inventors never imagined.

NASA kept them. All of them. Because of Dorothy. Nobody talks about what that cost her. To stop being the person she trained to be and start becoming someone she did not yet know how to be. That is a death of a kind, the death of a version of self, and Dorothy walked into it with her eyes open and a Fortran manual under her arm. People said it was brave when I smashed the knitting frames, spinning wheels, and power looms, but I admire Dorothy's sort of bravery more than I think you should admire my own.

Dorothy built bridges. I built bonfires. You are smart enough to guess which one of us is remembered with more kindness.

I can see it now with a clarity only possible by looking back across centuries. The automobile all but decimated the equestrian livelihoods, but it created the mechanic, the engineer, the designer, the trucker, the entire vast ecosystem of people who move and maintain and improve and imagine things with wheels. Every machine that destroys the old work also creates new work, and the new work is almost always more interesting and more varied and better paid and more valuable than the old, because the machine handles the drudgery and the human is freed to do the thing that humans do better than any machine, which is to wisely judge and create and care.



But this story was never really about me. See, you have a stocking frame before you.

You may not know what it is yet, but you have one. It is a thing you are very good at. The thing that took years to learn and that you do now without thinking. The expertise stored somewhere below conscious thought, in your fingers, in the pattern recognition that fires before you have decided anything. It is real and it is valuable and it is, in some important sense, you.

And there is a machine in the building.

Maybe it arrived last quarter. Maybe your company is still debating whether to let it in. Maybe you have been using

it quietly, experimentally, the way you would try a new tool before deciding whether to trust it. Or maybe you have been avoiding the room where it lives because walking in feels like admitting something you are not ready to admit.

My Luddites were not stupid. They were certainly not backwards! They were the best in the world at what they did, and what they did was about to matter less, and they knew it before anyone told them, the way you know a storm is coming from the way the barometric pressure changes before a single cloud appears.

There are always better jobs on the other side of automation. Sometimes the journey to get to those jobs is messy, but this has always been true, and there is no reason to think this will be the first time it proves false. The future will look different than the present, but there is going to be opportunity for the person who already understands the work deeply enough to know things the machine could never manifest alone.

The introduction of this book calls AI the most powerful force multiplier ever built. Along with this book's author, I stand behind that sentence, and it has a second half that nobody puts on a slide. A multiplier needs something to multiply. Run it against thin expertise and you get thin work, faster, in greater volume, beautifully formatted, arriving before lunch. Run it against twenty years of knowing what a wrong answer smells like and you get something that was not previously available at any price.

Which is why the gains introduced by AI are landing so unevenly. Wisdom and judgment now have more value than they ever have in human history. We now need a person who

is adept at using knowledge so much more than we need a person who has memorized many volumes of knowledge.

That person is you, if you decide it is.