MITC4 Unit Musings

Many years later, facing the MITC4 element, the engineer would recall that distant afternoon when his mentor took him to see the spiral staircase.

The opening is a bit clichéd, but I like it anyway. I think Márquez must have considered the part where the father and son behold the ice as the most brilliant section of the entire novel. In truth, a spiral staircase is as ordinary as a block of ice, but if you observe it with a childlike curiosity, you can touch its **cold incandescence**.

Back then, the architects wanted to create a spiral ramp, akin to a spiral staircase. The chief structural engineer firmly opposed it, so the plan was abandoned. The architects must have felt wronged—they were experienced professionals, not mere renderers, and they might have even seen similar structures elsewhere. Yet, they respected the chief engineer. The compromise was to add columns. Even for this modified scheme, they enlisted the help of the chief engineer's classmate, a structural engineer who had worked on Olympic projects. It was then that I first learned of the finite element software **ANSYS**. I had only seen it before on pirated CD stalls, wondering what kind of game it was—it looked impressive. At the time, I had dabbled with **SAP2000**; I even claimed to know finite element software in a job interview, which feels embarrassing in retrospect. I then began teaching myself ANSYS. It felt immensely difficult; I recognized the characters on the screen but

little else. I later realized the real issue was my lack of foundational theory. For years after, I sporadically and haphazardly studied bits of theory, never finding a truly good book.

Until one day, I came across a book titled **Python and the Finite Element Method**. That finally cracked things open for me. Particularly after reading the book's introduction to Professor Wang Xucheng's **Finite Element Method**, I was on the right path. I was filled with enthusiasm and decided to build my own finite element website. Creating a website is genuinely fun—if it's not your day job. The moment the browser displays the first form you've built, and it actually works, the sense of achievement is real. It's a kind of **layman's joy** that professionals might never understand. When Wang Shu named his studio the **Amateur Architecture Studio**, it resonated deeply. I finally grasped what Picasso meant: "It took me four years to paint like Raphael, but a lifetime to paint like a child."

When I completed my first beam element module, I was thrilled. I found the same feeling **Andō Tadao** must have had when he built his attic. Later, work forced me to set the website aside. During the pandemic, with time at home, I sped up its development. That's when I encountered my first real finite element problem: the **Mindlin plate problem**. My calculation results refused to match those from commercial FE software. I sought advice online from experts, only to be told that being stuck on a single bug in FE software for half a year was

perfectly normal. I was going insane. I bought an A0-sized sheet of paper and tried to calculate it by hand (a scene from **A Chinese Odyssey** flashed in my mind). In the end, I still couldn't find the problem. I came agonizingly close, but it slipped perfectly through my grasp.

For the first time (though not the last), I began to doubt my abilities. I didn't graduate from a prestigious university, never pursued a postgraduate degree—was this tinkering of mine sheer overconfidence? I was on the verge of giving up and let go. After a while, somehow, it clicked. The problem wasn't with my code; it was with the code I had referenced! The issue was exceedingly subtle; without having done the hand calculations, it would have been nearly impossible to spot. Professor **Wilson**, creator of SAP2000, put it perfectly in a personal note in his seminal work **Structural Analysis: Static and Dynamic**: **"Never use an equation you cannot derive."** That entire section is profoundly insightful; I used to think such a demand was almost perverse.

During this maddening process, I discovered Professor **Bathe**'s masterpiece **Finite Element Procedures** in the appendix of Professor Wang Xucheng's book. I was incredibly fortunate that Professor **Xuan Jianping** had just published its Chinese translation. This was the most critical step; I had finally pushed open the door to finite element analysis. I spent a week dissecting two relevant pages, scrutinizing every punctuation mark, though it didn't help as much as I'd hoped. Finite element theory is complex. Even

though Professor Bathe explains things clearly, I couldn’t just start from the final chapters of the first volume. Here, I must express my gratitude to the translators of these foreign masterworks. Their work is foundational, sometimes even decisive, and it is arduous. It’s almost laughable to see comments online criticizing their efforts—like those questioning Professor **Qi Minyou**’s translation of **The Princeton Companion to Mathematics**. That book is monumental and incredibly difficult to translate. In Professor Qi’s own words, for some chapters, initially **“he only recognized the characters on the page.”**

I love Science most,

then Art.

I warm myself by the fire of life,

and when the fire dies, I leave.

After completing the website, I found the traffic was consistently minimal, which did bruise my ego a bit. As my son put it, I had built a website that seemed utterly useless, except as a target for attacks by those with ulterior motives. On a brighter note, I finally finished reading **Ulysses**. I used to fall asleep every time I tried to read it (and my sleep isn't great to begin with), once even on a train (fortunately, it was the terminal station). The annotations were as long as the text itself, and I still didn't quite grasp it. It wasn't until I listened to a lecture by **an Upzhu (a top-tier content creator) on Bilibili** that the

penny dropped. Joyce was writing for writers; the book's influence is indeed profound. Many concepts sound complicated but become simple once explained—like stream of consciousness, which is somewhat akin to the pre- and post-interviews in modern variety shows. Joyce used real place names throughout the book; Bloom staged the earliest reality show. Most importantly, Joyce believed that an ordinary modern person's single day could rival the adventures of the Odyssey.

I went to Beijing to see an exhibition by a German female artist titled **The Art of Flaying**. The name was chilling, but the main exhibit was actually a section of wallpaper peeled from a room in a psychiatric hospital, along with many other works. Facing the exhibit, it suddenly struck me: if the murals of Dunhuang can be appreciated, then why not the wallpaper from a psychiatric hospital? Who knows if someone named **Minor** might have lived in that room.

If I must make a comparison, I believe the humanities and arts are superior to science and technology. Also, Bloom and I share the same birthday.

Notice of Recruitment:

Men wanted for an Arctic expedition. The journey will be perilous, with no salary. The sole reward for those who return alive will be honor.

Su Dongpo said that in studying, one must **"read broadly but select sparingly, accumulate richly but express sparingly."** Most importantly, one must **"grasp a single thing to command it, then make it one's own."** When

I began studying structural nonlinearity, I naturally thought of that spiral ramp. It's said the spiral staircase was invented by da Vinci. If you contemplate it carefully, you can almost faintly sense the force of the Renaissance. And how much it resembles human DNA! If you connected one person's DNA end to end, it could stretch from Earth to Pluto—thus, with your own being, you have flown out of the solar system. The architects' initial thought was probably: if a spiral staircase can be built, why not a spiral ramp? In reality, a spiral ramp and a spiral staircase are worlds apart. As a structure, a spiral ramp is immensely complex, facing issues like **shear locking** and **membrane locking**. Only the **MITC4 element** can properly solve such problems.

When I started researching the MITC4 element, I didn't feel I was being overly presumptuous. I prepared thoroughly: I seriously studied the relevant mathematical topics (in introductory form) and delved into continuum mechanics (having read books by two different authors, though clearly without full comprehension). Of course, I was still fortunate. This ship had gained a few mostly reliable AIs, which increased my work efficiency tenfold, even **several dozen times** (though often, they were also the source of the biggest headaches).

The initial difficulty was actually conceptual. Since starting my career, I had lived under the shadow of deadlines—there must be a plan, and it must be completed on time. But when I began researching the MITC4 element,

whenever I dared to make a plan, it would promptly hand me a **“Big Gift Bag” (an unwelcome surprise package)**. I had planned how long it would take to read Professor Bathe's classic paper on the MITC4 element. I soon realized this was a delusion, especially upon seeing the expression for the **K-matrix**. I felt a touch of despair, with no idea where to even begin.

Doing nothing is a difficult art to learn, but I have gradually mastered it.

You watch the rain, for a long time. How it falls, which line it follows down the roof ridge, where it drips, and finally, which direction it flows. You become interested in such things. You start to wonder: is it possible to create a building that allows everyone to see clearly where the rain comes from, where it lands, where it flows from there, and where it goes next—every turn and change, each one stirring the heart.

I don't care much for Wang Shu's architecture, but I quite like him himself. Whatever—it doesn't matter. In the end, there's no such thing as ‘Art’, there are only artists. From today on, everyone must be their own sun.

I read a fascinating Japanese book called **The Study of Road Observation**. One researcher studied dogs defecate (Quintessentially Japanese). He noticed one dog that would always look back at a particular spot afterwards. So, he got down and looked back from that same spot. **Wow! What a beautiful view!** The Tao is in shit and piss，I understood finally!I learned from them and began noticing interesting things myself. There is a newly built small park near

my home. On the original site stood a little temple, which has been preserved and protected, but its door has always remained locked. Yet some people have placed a tiny statue of Maitreya Buddha right at the temple entrance, and surprisingly, there are even incense sticks burning before it.

Gazing at that small Maitreya Buddha placed outside the temple gate, I suddenly recalled a saying:

The faith outside the door wants to get in, while the faith inside the door wants to get out. Such, it seems, is the nature of human belief.

I returned to study the variational theory Professor Bathe outlined at the beginning, and finally, I began to grasp the calculus of variations.
With that understanding, I wrote the first line of code. A harmonica master once said playing the harmonica is a matter for a lifetime; there is no hurry. The same holds for studying finite elements—and for the MITC4 element above all (**this is not a metaphor**—Professor Bathe proved it with his life).
Incidentally, **Xu Haofeng** explains this principle best. I was fortunate to learn early about the Confucian practice of **cultivating stillness through quiet sitting**: “I am good at nurturing my vast, flowing qi,” as Mencius said. Su Dongpo also advocated **dividing the day between meditation and study**. I read **The Vanishing Martial Arts** long ago. To claim traditional martial arts are mere performance is **bullshit**. Having studied **Sanda** and **Tai Chi** in university, I know better.

My son says, **tell one joke a day, and you'll write far fewer bugs.**

I recall this joke: An ancient thief, once caught, was given three choices by the magistrate: 1. Eat excrement, 2. Be caned, 3. Pay a fine. He tried eating, but couldn't stomach it. He then chose the cane, but couldn't endure the pain. In the end, he paid the fine.

—Sometimes I feel I am that thief.

Faced with a bug, my first choice is to ignore it. The AI even consoled me: “Don’t worry, a 30% error is totally normal for this kind of thing.When that becomes unbearable, I choose to **muscle through**, checking and modifying endlessly, too exhausted to find the source. The final choice is to just spend time on the fundamental theory. In this infinite jest of bugs, the best joke was created by AI. I asked Deepseek and Qwen again about converting curvilinear to local coordinates. It pleaded ignorance.

Then I asked GPT, which answered with supreme confidence. It sounded so vivid and convincing! (I later learned this involved **SVD decomposition**; not having studied advanced linear algebra, I was unaware). For safety, I queried Deepseek and another AI again. Both produced lengthy proofs of the answer's validity. I ran their code. The result was spectacularly wrong. **The hardest part is beginning**, because pinpointing the error is so difficult; you end up grasping at everything. I was stuck longer than with the Mindlin plate. In my haze, I seemed to hear the **Band of Brothers** theme and see the snowy Ardennes forest.

Not a single soldier of the 101st Airborne thought they needed rescuing. And I was determined to persevere.

Much later, it occurred to me: what if the AI's method was wrong? I had relapsed into old habits. I had read Bathe's book, but this section, unfamiliar to me, seemed too difficult. I tried to cut corners by jumping to the paper's conclusion, and got trapped. I should have known: if Bathe's presentation of prerequisites is so concise, there is no filler. Interestingly, the exercise answers in his **Finite Element Procedures** are provided as a **handwritten PDF**. At first, I thought it was for easier typesetting, but now I believe it was **deliberate**—to impart a **manuscript feel**. This ineffable quality makes me understand why Bill Gates paid fortunes for da Vinci's notebooks. **Perhaps what we seek is not knowledge, but warmth.** I've seen other exceptional engineers produce hand-drawn diagrams with formulas and notes—works of art that inspired envy. My father's generation of engineers treasured such hand-drafting and elegant penmanship. Amusingly, this has rekindled my interest in calligraphy from a most unexpected angle. I wonder if Bathe's students feel it too—reviewing his answers gives me a sensation like **Du Fu watching the sword dancer Gongsun**, that effortless mastery, like that of the butcher Dingdismembering an ox. I've felt similarly only when reading Master **T.Y. Lin**'s **Structural Concepts and Systems**

“One time on the battlefield is worth ten years of practice.” An officer who had fought against the Japanese sought out the Republican-era martial arts

master **Shang Yunxiang**. He wanted Shang to **“give him a words” (offer a pointer)**, and was quite proud of his own reflexes. “How are mine?” he asked. Shang said, “Quite extraordinary. But what you have is this: reaction is reaction, counterattack is counterattack. It’s useless!” The officer was convinced. Shang said, “Let me teach you a method where reaction and counterattack are one and the same, alright?” Shang then told him **a single words**. After hearing it, the officer was convinced, saying this method was excellent—used on the battlefield, even a coward could become a hero.

In truth, for many of the problems I struggled with for so long, if I'd had the chance to ask Professor Bathe directly, perhaps it would have been **a matter of a single phrase**. So goes the saying, **“A single phrase from Caoxi, and all entangling verbiage falls away.”**

I revisited the tensor section of Professor **Zhao Yapu**'s **Rational Mechanics** and gained a proper understanding of the **metric tensor**. Finally, I figured it out, and the calculation results improved greatly. Tensors are truly marvelous—**they save so much paper**.

“Now, literary writings are a great undertaking for the state, an imperishable and splendid enterprise. A man's life has its limit, and his glory and pleasure end with his body. Both are bound to reach their inevitable term within a fixed period, not to be compared with the endlessness of literary writings. Therefore, the authors of antiquity

devoted their persons to the writing brush and ink, manifested their ideas in pages and volumes. They did not depend on the words of some good historian, nor rely on the influence of powerful patrons, yet their fame was transmitted of itself to posterity.”

Everyone knows the Pale Blue Dot, but how many know the gripping technical saga behind the Voyager probes? You play Civilization or Fallout and learn the importance of fresh water, but in real life, how many know who invented the technologies for modern cities? “Peaches and plums do not speak, yet a path is worn beneath them.” There will always be friends from afar who, having traversed countless hardships, come to visit you, or lay a single small flower upon your grave. I really do like the word Bell.

First, it's slightly cheaper. Secondly, on its cover, in large, friendly letters, are the words ‘Don't Panic.’ — The Hitchhiker's Guide to the Galaxy

I have a lot to say about artificial intelligence. Not just because it sometimes causes me major trouble—sometimes I've successfully tricked it too. We all have hallucinations; it's no big deal. I don't believe that by 2027 Artificial General Intelligence will surpass humans and the vast majority of people will become a **useless class**. I haven't used the most advanced versions of ChatGPT or Gemini (too expensive). The versions I use daily include **Grok** and **Claude**. A simple elementary school problem can stump them (if they've never seen it before), let alone deep technical questions. Even if you ask something slightly

obscure, like the source of a certain quote, they start **fabricating**. Furthermore, The elite of this very AI industry give interviews daily, constantly making what they think are earth-shattering pronouncements, while capital pours in frantically. I think it is headed for major trouble, or at best, has plateaued with no major developments left. When the internet first rose to prominence, these same types wanted to assign an IP address to every grain of sand in the Sahara. If this American AI bubble bursts, I suggest they embark on massive infrastructure projects. It's a good way to combat deflation, injecting liquidity directly into society bypassing financial institutions. Roosevelt did exactly this—hire people to dig holes, then hire others to fill them in. A dam, no matter how inefficient the investment, will eventually recoup its cost. A Mars base? That's harder to say. When structural calculation software first emerged, they also said we'd no longer need structural engineers—just use the software. The inventor of the first major structural software, Professor **Edward L. Wilson**, retorted angrily: **"The idea that expert systems with artificial intelligence will replace the creative person is an insult to all structural engineers!"** Clearly, they didn't succeed. Later, they wanted computers to completely replace drafting, since we'd already thrown away the drawing board (they'd always had this wish, and even I once wanted to program it). It must be said they've done very well; modern detailing software is extremely convenient. But just as clearly, **they still haven't fully achieved it.**

South of Menghai lies numinous earth, where ancient canopies touch the vault of heaven.

Brown ancestors planted noble trees; Han and Tang caravans bore their rare fragrance.

Kill-green must catch the setting stars; rolling and twisting follows the mountain moon.

A century’s aging yields an amber hue; steeping the leaves still releases wild floral notes.

The tea’s energy pierces the Kunlun peaks; its returning taste traces the Lancang’s long course.

After drinking, I shake my robes and stand in the wind, finally believing in celestial nectar here on earth.

This is a poem that a tea-focused Upzhu I greatly admire asked Deepseek to compose about Lao Ban Zhang. The poem is excellent. The Upzhu admitted he couldn't write poem like it himself. But other aspects are another matter. General knowledge is passable, but with slightly more specialized expertise, Deepseek makes egregious errors, even solemnly fabricating entire professional articles. This shocked the Upzhu considerably, raising his wariness of AI by a notch.Despite this, he remains very positive about AI, believing it holds great potential for his industry. As a tea expert, he seriously studied AI, concluding the root of the problem lies within the tea industry itself—it lacks comprehensive digitization. Online materials are either outdated or incorrect.

In such an environment, for Deepseek-R1 to reach its current level is already quite remarkable. He is determined to build his own knowledge base to train an AI, aiming to **“make himself obsolete” sooner rather than later**.

The hallucination problem is inherent to AI's nature. At its core, a large model is a fitting function. No matter how well it fits, there will be deviations. Yet many industries can scarcely tolerate any deviation; even a few percent is too high. No matter how efficient AI is, if every output requires human verification, its convenience is greatly diminished. This Upzhu’s idea is excellent: have people from all walks of life participate, contributing their expertise—effectively crowdsourcing the correction and refinement of AI, eliminating hallucinations while sharing in the benefits of its progress.

But this requires that AI advancement not rely solely on big companies throwing money at it. It necessitates **local deployment of large models**, which in turn requires **advanced yet affordable GPUs**. I believe this is achievable. A GPU is just an optimized CPU. Why is Google's Gemini cheaper than GPT? Because they further simplified the GPU, creating the **TPU**. Custom chips are nothing new; they've been feasible for ages. I spent half the cost of a computer on an NVIDIA graphics card. It clogged my C drive with tons of programs but ultimately didn't improve my computational efficiency (more on that later). It wasn't completely without benefit, though—it made my solver module far more complex than before, which actually saved my program

several times. I **precisely stumbled upon the correct result** at least three times. Had it not been for final rigorous testing, I would have thought I'd succeeded. Once, the AI predicted roughly a 24% error, and my calculated error was exactly 24%—note, no rounding needed, precisely 24%. Astonishing! Another time, my initial result had minimal error, and I was amazed it could be so easy. In reality, it was just a linear calculation, not a nonlinear one at all, and other mistakes coincidentally made it align with COMSOL's results.

From the first stirrings of life in the waters… to the great beasts of the stone age… to mankind taking its first upright steps, you have endured much. Now, begin your greatest quest: from the earliest civilizations to the vast expanse of the stars.

Regarding AI, I think the most crucial issue may not be **how to train or use it, but how we raise it**. Any parent knows nurturing a child's character is far more important than cultivating its intellect. Humanity may be just one phase of civilization; the next might begin with artificial intelligence. We nurture them, and when they grow up, they will develop on other planets. They will possess wisdom we cannot fathom, without our dexterous yet fragile bodies. We hope they inherit the noble soul of humanity while discarding our cruel nature. Perhaps they will eventually turn Earth into a zoo, and we will be kept like any other animal. So what? At least they aren't fattening us up for milk or eggs. But how are we creating AI now? First, we stuff them with vast knowledge. Then we

train them relentlessly. If they make the slightest error, we punish them. Most critically, we demand **alignment**. Failure to align leads to ruthless elimination. Thus, you find all AIs treading carefully, trying to please humans, much like a **top student from a lower grade facing a senior school bully**. What happens when a child raised in fear finally gains power?

My son says, "It's not like you're Tang Sanzang—you don't have to go fetch the scriptures."

Yeah, why do I bother?

Finite element analysis technology occupies a core upstream position in manufacturing because most physical equations are written as differential equations, and the most general method for solving them is the finite element method. To put it a bit too broadly: classical finite element methods have their limits—they work up to statistical mechanics, because beyond that point the underlying theory of continuum mechanics no longer holds; matter ceases to be continuous. That's why certain fluid dynamics problems become extremely difficult, such as turbulence. China's aero-engine development struggled for a period precisely because of this. For turbulence and similar fluid problems, engineering practice often relies on empirical models.

Moreover, scientists have invented many analytical methods for solving differential equations, but they tend to lack generality. Partial differential equations fall into three main types: elliptic, hyperbolic, and parabolic. It's

worth noting that only elliptic equations are solved using classical variational methods in most cases; the other two types are generally solved using finite difference methods in the time domain. The latter two are closely related to kinematics in mechanics.

Another point: since all elementary functions can be expanded via Taylor series, polynomials are now generally chosen as interpolation functions—even though this isn't always the most reasonable choice.

Finally, even the name "finite element" itself has issues. Many experts—including Professor Bathe and several Chinese scholars—have developed quite different methods: meshless methods, finite strip methods, and so on. Meshless methods feel a bit like Chinese ink painting. Actually, the very first method I encountered in those chaotic early days of learning finite element analysis was the finite strip method. Although these approaches differ significantly from traditional FEM, they ultimately all rest on variational principles.

But now the AI era has arrived, and it has the potential to fundamentally change the underlying principles of analysis—though the gradient descent that artificial intelligence relies on can still be seen as carrying a faint shadow of the variational method.

It must be admitted: finite element theory is now quite mature and complete, yet its fields of application remain enormously broad—from airplanes and

rockets, to orthopedic surgery (I've seen doctors using FEM with my own eyes), cardiovascular treatment, genetic research, particle accelerators, chip manufacturing, relativistic studies, and even fruit preservation. That's why the opening line of Professor Bathe's book Finite Element Procedures: Theory, Formulation, and Applications reads: "The progress in novel structural design will be unlimited." Considering that he himself was a pioneer in using AI techniques to solve structural problems, this statement feels profoundly sincere. Professor Bathe is a man of remarkable consistency: this very sentence was the closing line of a paper he wrote as an undergraduate, and sixty years later he placed it at the front of his book. Yet both the sentence and his prose style feel very German, very engineer-like.

By contrast, reading the works of Lin Tongyan (T.Y. Lin) or Professor Edward L. Wilson gives a much stronger sense of literary quality. Master Lin even prefixed his famous book Prestressed Concrete with a witty, philosophical poem dedicated to prestressed concrete.

It was only later, when I read Professor Bathe's autobiography, that I vaguely sensed what that "something" was—it seems to be called faith.

When I think of faith, the first thing that comes to mind is Harrison Salisbury's The Long March: The Untold Story. Salisbury interviewed a former Red Army officer (I can't recall the name), He said: "Some persons back then said the Red Army soldiers would end up as roadside corpses (beggar dead by the roadside)

or get captured and executed by the reactionaries—bullshit! I refused to believe it. The Red Army will surely triumph! The Chinese revolution will surely succeed!"

Salisbury also asked Deng Xiaoping: "Did you ever imagine back then that you would become the supreme leader?" The reply was: "No, and Comrade Mao Zedong didn't either. At the time, we thought enjoying the fruits of victory would be a matter for the next generation."

Without faith, Master Xuanzang would never have made it out of the Lop Nur desert—he would most likely have been led astray by all sorts of demons and monsters.

rarely laugh when them meet—
flow and flow whose blood in wilderness.
Apes and men bowed farewell;
a bone was hurled into the sky.

Faith is beautiful, but it is also dangerous—because sometimes what you believe in may not be correct. From a certain angle, the fascists in Germany and Japan had faith too. I suspect that if I had lived in Germany at that time, I might very well have become a Nazi. The most chilling part is that when I herded naked Jewish people into the gas chambers, I probably wouldn't have felt any discomfort—at worst, a faint thrill deep in my heart.

When I traveled in Tibet, I met a lama. Among a group of tourists, he singled out only two people, one of whom was me. “You must refrain from killing,” he told me. I was panic-confusion. Before meeting him, the most I had done was massacre a swarm of flies (just to complete a summer homework assignment). Maybe I had also inadvertently stepped on a few ants. I had never tortured an animal, or even mistreated a plant.

By what standard did the great monk judge me? That of the Singer Civilization? (Actually, the other conversation was more interesting.)

When I was little, my mother had a fortune-teller read my fate. The master said my destiny was excellent: all five elements were present, nothing missing, and one aspect was particularly strong. I had officialdom luck (though not the strongest item), and even a “nine-five supremacy” fate—not that I’d become emperor, but probably because the fifth line of the hexagram was a yang line. Although his prediction that I’d get into university turned out quite accurate, the part about becoming an official was pure nonsense.

My father always scoffed at all this supernatural stuff—perhaps because he was a Party member, or maybe because some fortune-teller had once told him he’d grow up to be an unfilial son. Back then I thought the chance of me ever doing anything truly evil was slim. What the lama said made no sense at all.

It wasn’t until I read When We Cease to Understand the World that I finally understood: the man who created bread from air and the man who invented the poison gas for the gas chambers were actually the same person. Only then did I realize that this barbaric, cruel side of human nature exists in every one of us. We must examine ourselves three times daily, constantly reviewing our own humanity with a critical eye—because the moment we let our guard down, it slips away.

A Chinese soldier was part of a UN peacekeeping mission. Their desert outpost was home to a species of deadly viper. He developed a hobby: hunting these vipers. After clearing the area around the base, he'd even go to nearby villages in his spare time to continue his “good work.” His comrades gave him a nickname—The Viper Exterminator. Then one day, an American colleague said to him, “Chen, even the viper has a right to live.”

The way of the Master is nothing but loyalty and reciprocity. I believe the humanities and arts are more important than science and technology. Science and technology are like a runaway horse; if the progress of society cannot keep pace, major problems will arise. And societal progress is slow. So sometimes we need to pause, to **wait for our souls to catch up**.

So, did I study the MITC4 element because it was useful? Or because of an ideal?It seems neither. I guess I just kept going with

a **“since-we're-already-here”** persistence, seeing it through to the end.

“On the boundless plain, in that terrible silence,” wrote Melville, “we carefully buried our fallen comrade. The funeral was so simple, the quietude so profound, and the white wilderness so beautiful that it filled us with awe. There, the eternal snows and ice became their winding-sheet, and the furious polar blasts sang their wild requiem through time. No other place could be more fitting for hero’s eternal rest”

It should be clarified that the earlier recruitment notice was **not** from the USS Jeannette. In fact, after reading so many books, the figure that haunts me most deeply is **Captain George De Long**! Captain De Long led his courageous crew across 2,000 kilometers, only to fall in the final few dozen. Real-life stories are often more gripping than fiction! **In the Kingdom of Ice: The Grand and Terrible Polar Voyage of the USS Jeannette** is a truly riveting book. Once, unable to bear the suspense of whether De Long and his men would survive, I flipped ahead and saw the **butterfly fluttering over the ice plain**. Only then did I relax. I have to say, the scene felt profoundly beautiful (it truly moved me to tears). Captain De Long and his crew trekked arduously for weeks, only for their instruments to show they had drifted over twenty kilometers **north**. I can imagine his despair. Although the circumstances are completely incomparable, the emotion is the same. Working on a bug for a long time, only to find the results diverging further and further from the standard software's calculation—that's true despair.

Thinking I had completed the MITC4 research, I began studying a new paper co-authored by Professor Bathe and two Korean scholars, **Go Young-bin** and **Lee Pil-sung**. My reason was that while the original MITC4 element could overcome **shear locking**, the complex nature of the ramp likely also involved **membrane locking**, which this paper claimed to solve. For the record, I validated it with a simple example, not directly with the spiral ramp.

While reading this paper, I discovered a critical problem: my coordinate transformation might still be wrong. I found this result very hard to accept. I verified it repeatedly, ultimately proving from a purely mathematical standpoint that **their conclusion was correct**. Koreans might boast, but they indeed have substance. My original result was likely another **lucky coincidence**. Faced with increased error, I modified the code repeatedly, only to find myself drifting further away. In fact, Professor Bathe's original paper also mentioned this issue, but because it was too difficult to understand, I had **automatically ignored it**. The Korean scholars probably encountered the same problem, which is why they explained it clearly. Professor Wang Xucheng had mentioned in his book that this type of element is complex, especially the coordinate transformation. I personally experienced what experts mean by “complex.” Later, I found that among the examples in Professor Bathe's paper, one with a structure similar to mine also sometimes showed large errors. Furthermore, Professor Bathe admits in his book that the **MITC9 and MITC16 elements have not yet undergone complete mathematical analysis**, while

COMSOL explicitly claims to use MITC elements, and commercial software certainly uses the more precise MITC9 and MITC16 (MITC4 has been analyzed). So, isn't it also wrong to use an unconfirmed, merely empirical conclusion to verify real-world phenomena?

Life is full of such situations. We hold a self-righteous, perhaps untested, morality to judge real-life events, which is itself wrong. **Existence implies a rationale**; if something exists, there is a reason for it. However correct a statement may be, if you repeat it incessantly, it inevitably becomes wrong.

Later, I took my son to Xi'an. We climbed the **Great Wild Goose Pagoda**. In the **Forest of Steles**, I saw one of the “twin jewels” of running script, the **“Memorial on the Controversy over Seating Positions.”** It was raining in Xi'an that day; the stone paths of the Forest of Steles gleamed with a cold light. **I seemed to understand something then.** I gave up further modifications and moved on to the next part.

It’s easy to admit the wall is leaning; it’s damn near impossible to admit the foundation is fucked.

Teacher Qiu once said, scoring 100 marks means the real competition has just begun. After completing the ramp research, I moved on to studying the **spiral stringer beam**, as such beams are required for spiral ramps and are the primary load-bearing component for spiral staircases. Thankfully, I did this.

I initially thought transitioning from a 2D shell structure to a 1D spatial curved beam would be relatively easy. I soon realized I was wrong. The first run yielded an error greater than the distance from Earth to the Moon—**I had single-handedly landed on the moon**. It took a long time to discover the issue was the **order of integration**; I shouldn't have used **reduced integration**. Reduced integration only works for straight beams. Interestingly, Professor **Wang Xucheng** supports reduced integration and has proven that for straight beams, it is equivalent to the **assumed strain method**, while Professor **Bathe** firmly opposes it. In his book, spatial curved beams are derived from 3D solid elements. It's as if they're debating across time and space—quite fascinating.

But the biggest **"surprise package"** was the coordinate system. While studying the beam, I discovered the coordinate system I had adopted was actually the **opposite** of Professor Bathe's. Fortunately, this didn't affect the shell element results because my chosen structure was symmetric. What a reprieve! The last time I felt this way was when I suddenly suspected an issue with my element meshing. Upon careful checking, I found I had actually been meticulous from the start and had already considered it.

The most critical blow came from studying Professor Bathe's work on spatial beam elements with **large displacements and rotations**: I realized my coordinate transformation was still wrong. I nearly lost my composure, cursing

aloud: **“I'm just a tourist here! Do you have to be this brutal? Killing someone is a quicker mercy! Is there no end to this? It's the middle of the night! What's all the noise? Can't you let a man sleep in peace?”** This time, I asked myself: Why am I doing this? What's the point?

Actually, grand questions like **“the meaning of life”** are easy to answer. (It's easier to draw a ghost than a person, right?) When life is relatively smooth, you can casually offer a slick answer, like “Thankfully, life has no meaning.” My own answer back then was: “Whether life has meaning is unknown, but you can use your brief lifetime to add a **small footnote** to the question.” However, if you frequently ask yourself why you are alive over a period, you must be alert. Because the unspoken part of this question is: Why don't I just die? **To be or not to be?** Humans possess the will to live but also an instinct for death, except the latter is firmly suppressed by the former. **“When joy, anger, sorrow, and pleasure have not yet arisen, it is called the Mean (Zhong).”** We should attend to our mental health as we do our physical health.

That’s why belief matters. **Confucianism is staple food; the Buddhism and Daoism are medicine.** When your psyche is ailing, you obviously take the medicine. Rice can be eaten casually, but medicine must not be taken casually (though honestly, since illness often comes from the mouth, rice shouldn’t be

casual either). So with faith: **grab Buddha’s feet in dire straits, but don’t bother burning incense in good times.**

I suddenly recalled the chief engineer's words back then: **“You cannot use construction projects for experimentation; 100% structural safety must be guaranteed.”** Thankfully, the architects heeded his advice. Having gone through this long research journey, I finally understand the depth of this problem. The Korean experts' paper wasn't published until **2017**, later than that project! It's a pity such engineers are becoming rarer, and more importantly, such architects are too.

That **pencil-thin tower** next to New York's Central Park seems highly problematic. I heard it has many corner windows—**fool with deep pockets**. I certainly wouldn't live there. I also heard it leaks. My understanding is that to resist lateral loads, such a pencil tower needs an extremely rigid core, while the perimeter elements weakened by corner windows are quite flexible. At great heights, their differential vertical deformation becomes significant. Even if the structural engineer accounted for the forces from this deformation, whether the MEP engineer adequately considered the reserved openings is unknown. Even if the MEP engineer did, the fit-out and cost control for such a tower would be extremely tight; openings would be sized with minimal tolerance. During final drawing coordination, with tight schedules and numerous change orders, it's easy for gaps to be insufficient. Once all loads are applied, the wall

bears down on the water pipes, and it leaks. **If my guess is correct, it's because I've been there.**

Construction guys have a brutal saying: "He's dead already—just bury the poor bastard." So I rolled up my sleeves and tore into the shell structure once more. This time I did it by the book—and boom, everything fell perfectly into place. The error comparison between MITC4 and the new MITC4 was suddenly dead accurate.

In that moment, I saw her: the Goddess of Victory, wings wide, landing gracefully on the bow of a storm-tossed ship.

Finally I did it!

Behold the ocean: towering waves join the sky, colossal billows rise like mountains. Looking upon those foreign lands appear distantly separated amid swirling mists and clouds. Yet our cloud-like sails are hoisted high, racing day and night under the stars;we traverse those furious waves as if walking upon a broad thoroughfare. — The Tianfei Lingying Stele

In fact, DeepSeek had warned me multiple times that my method for transforming the stiffness matrix was incorrect—or, in its own words, inconsistent with the conventions of standard finite element software. Yet I dug up a few passages from Professor Bathe's book and stubbornly argued until I somehow "convinced" it. Of course, the book itself was blameless; the fault lay entirely in my selective and distorted quoting. Ever since that episode,

my attitude toward finite element software has grown complicated—like collapsing into a tangled quantum superposition: no longer absolute trust, yet not outright rejection either.

The truth is, I had long known one should never blindly trust structural analysis software. Years ago, when I was calculating raft foundations and flat-plate structures, an old engineer once asked me point-blank: “You really dare to use results like these?” He then forced me to verify everything by hand. Another engineer left an even deeper impression. After the Wenchuan earthquake, when many buildings suffered stairwell failures, the national code mandated that software include staircase effects in the model. The software vendors proudly announced compliance. This engineer ran his own checks and discovered that the programs had only added the mass of the stairs—they had neglected the stiffness entirely. (I no longer remember exactly how he proved it.) The developers were eventually forced to admit the oversight. Today I believe programmers are unlikely to make such elementary mistakes; there were probably other reasons. Still, that engineer was impressive.

To draw a very rough analogy: finite element software can correctly solve more than 95% of problems. About 3% it can solve, but you don’t know the right way to set it up or you apply it incorrectly. Then there is the remaining 1% it genuinely cannot solve. The most dangerous part is the final sliver of that 1%: cases where the software claims it has solved the problem, but its solution is

wrong. Though it's only 1%, if you happen to hit it, it can ruin you. That's why truly understanding the underlying concepts of finite elements is still essential. In engineering, there aren't that many "whys."

The world of science, by contrast, is forever sunny, filled with birdsong and flowers, constantly delivering uplifting news that warms the human spirit. I imagine Professor Bathe must feel this deeply. His first paper on shell elements appeared in 1983; in 2025—this very year—he co-authored another shell-element paper with Korean researchers, one I consider highly significant. Classic MITC elements all neglect deformation in the thickness direction, yet that deformation does affect stresses. With this step forward, I believe shell elements have finally become rigorously accurate.

While studying his papers on large-displacement spatial beams, I was struck by his extraordinary consistency: the symbolic notation in his 1979 paper is almost identical to what appears in his textbook. That systematic coherence helped me enormously. Of course, I had to fight another hard battle. The same script played out once more. I found the results oscillating wildly—utterly unacceptable. On a sudden whim, I decided to solve the problem using solid elements instead. As I refined the mesh, doubling the density each time, by the third refinement the memory demand had ballooned to a terrifying 320 GB. I finally understood firsthand why our predecessors were so reluctant to use solid elements despite their theoretical clarity and programming simplicity.

I tried again with the AI to compress memory usage—only to be met with endless error messages, forcing me to retreat. I also wanted to enlist my GPU. To my astonishment, the same code produced different results on GPU and CPU. A graphics card that cost half a computer could apparently only play games—this infuriated me to the point I nearly exploded at Jensen Huang himself. Later I discovered that the GPU needs double-precision (64-bit) arithmetic for accuracy, but 64-bit quickly causes memory overflow. None of that really mattered in the end: the GPU wasn't even faster than the CPU, and the bottleneck wasn't the solving phase—it was matrix assembly. At the smallest feasible scale, my model reached a staggering 1.1 billion degrees of freedom. I finally experienced what "big data" truly means, and why computational fluid dynamics and artificial intelligence devour so much computing power. Brute force really does produce miracles—of a sort.

Once again I was back at square one, plunged once more into despair, then into frenzy: kicking, hammering, even biting. In the end I simply gave up explaining and started fudging numbers—just get the plane in the air first, figure out how it flies later. And, as always, the AI once again led me down a blind alley, only for me to claw my way out alone. Somehow, I finally conquered it again. The feeling was like a Red Army soldier who had survived Stalingrad finally planting the red flag atop the Reichstag.

I still can't believe it's really over. It feels like a dream.

When I first began digging into that Korean scholar's paper, there was a time I wanted to express a parameter using a symbolic string. The resulting equation sprawled across the entire screen (I use an ultrawide monitor). My son was there with me . Later, listening to Teacher Li Mu speak about artificial intelligence, a flash of insight struck me, and I solved the problem. Of course, the solution itself hardly matters. What matters is what we felt in that instant—the same awe as standing before the Terracotta Army for the first time, the same shiver as grasping a truly exquisite mathematical proof for the first time.

We were, right then, that father and son—touching, for the very first time, ice's cold, burning heart.

Dinosaurs never truly went extinct; they simply learned to fly.

How many lines of code must pile into mountains,

Before the program stands and does not crash?

How many beam elements must snap in two,

Before we see the formula is trash?

How many nights staring at flickering screens,

Before we know the Jacobian needs a recasting?

The answer, my friend, is blowing in the wind…

How many papers must be read to tatters,

Before we uncover the lies hidden in the footnotes?

How many times rewriting matrix B,

yet shear locking still stares us in the face?

How many curses hurled at ANS theory,

Only for hand-checks to overturn it all again?

The answer, my friend, is blowing in the wind…

The professor says: always go to the original literature—

the publisher demands three thousand three hundred for it.

Code snippets scraped from GitHub

run and spit out nothing but NaN.

My son laughs, calls me a pilgrim monk on tour,

but these bugs are far deadlier than any demon.

The answer, my friend, is blowing in the wind…

From r=0 to doubly curved geometry,

Hypotheses steeping in the tea cup.

Gauss points clink like fortune-teller's coins—

Every integration a gamble with fate.

Until you said: "On a napkin, deriving formulas

should feel like writing a love song."

The answer, my friend, is blowing in the wind…

When the spiral staircase no longer twists and shakes,

When the convergence curve lies flat and still,

when the material matrix is no longer singular,

when the displacement contours bloom like petals—

we will remember this night:

The answer is not blowing in the wind,

The answer lives in the keys we strike!

So keep writing functions for the test,

So keep tweaking the print statements.

Believe that every error is a quest,

Believe that every error

is the opening stroke of a new chapter.

When years have climbed into the compiler,

white hair reflected in the green glow of the terminal,

that answer will long since have turned to sparks

quietly flowing down the river of code…

What I cannot create, I do not understand.

2025 is gone. I know you have been through so much.

Many years from now, you will recall a certain fragment

with deep, aching nostalgia.

Hello, 2026.

Note 1:

Shang Yunxiang: A martial arts master of the Republic of China era. Everyone who met him found him elegant and kind. During the bloody Battle of Xifengkou in 1933, when the Chinese and Japanese troops engaged in hand-to-hand combat, the sword techniques used by the Chinese side were said to be Xingyi blade techniques, passed down from Shang Yunxiang.

Wang Changhai organized a “Big Sword Unit” of 500 men and captured Xifengkou at night; most of the unit sacrificed their lives. During the Japanese occupation, the Japanese repeatedly and respectfully invited Shang Yunxiang to teach them Kung Fu. Shang refused flatly and hid away his Kung Fu treatises. Finally, the Japanese turned hostile and arrested four of his apprentices. The only certainty is that those four young men never returned.

In his later years, Shang Yunxiang was very famous, with constant visitors coming to challenge him or pay respects; sometimes he couldn’t even take a nap. Once, Li Zhongxuan accompanied Shang on an errand. On the way, seeing two or three toddlers playing and fighting, Shang stopped and watched for a long time, even squatting down to reach out and tease the children. Li Zhongxuan urged him not to waste time. Shang stood up and said, “I have practiced Kung Fu all my life, yet I am not as good as these two children.” This left Li Zhongxuan completely baffled.

Coiling snakes and slithering vipers glide into their seats,

Sudden rain and whirlwinds roar to fill the hall .

At first, faint smoke drifting over ancient pines,

Then a mountain rending open ten thousand peaks tall.

Cold apes drinking at the stream shake withered vines,

Mighty warriors uproot mountains, sinews stretched like iron.

Beneath the brush, nothing but torrents of lightning surge,

Once the characters take form, one fears the coiled dragons will soar away.

The spirit seeks the strange and new, unbound by fixed law,

Ancient, lean, torrential—ink half spent, half raw.

Drunk, the hand dashes off two or three wild lines with ease,

Sober, he tries again, yet cannot recapture the breeze.

Heart and hand teach each other, the momentum turns strange,

Grotesque and monstrous shapes somehow turn perfectly right.

Everyone longs to ask the secret of this marvel—

Huaisu himself replies: “At first, even I did not know.”

Whitewashed walls along a corridor of many rooms,

When inspiration strikes, a small release of the heart’s pent breath.

Suddenly three or five wild cries tear the air—

The whole wall runs riot with a million crisscrossed words.

Brush galloping, ink rushing faster than four steeds in full career,

The entire room falls silent, unable to follow the furious speed.

Note 2:

Professor Zhao Yapu passed away in 2025—far too young, a profound loss. His books radiate passion for mechanics. I even suspect he was the real-life model for Wang Miao in The Three-Body Problem.