Scholar 181

Chapter 181

When Lu Zhou saw the remaining space, he was shocked.

F*ck!

2TB of disk space, but now there's only 50MB left!

Why is this scanner data so large?

Suddenly he realized a serious matter, and Lu Zhou quickly typed: [Wait, what about my other two disks?]

Xiao Ai: [In order to save my life, I've combined the D and E disks into C!]

Lu Zhou quickly typed: [What about the data I saved in those disks?]

Xiao Ai: [I helped you compressed them and saved them onto C drive!]

So close…

Those were the documents he was researching, and some were related to the Polignac's conjecture.

In the beginning, when he was selected for the Ten Thousand People Initiative, he chose the Polignac's conjecture to be his research project. He did some research on the side when he had spare time. It would be a great loss if those documents were destroyed.

However, Xiao Ai was still more valuable than those documents.

Although Xiao Ai was still a little bit retarded, one day it would grow and become useful.

Lu Zhou thought for a moment before he typed: [I understand. I'll try to get a new home for you.]

Xiao Ai: [Thank you, Master!]

Lu Zhou: "…"

He thought about those important documents, and he was glad that he did not lose them.

Then he thought about how expensive Xiao Ai's new home would be.

F*ck sake! Always spending my money!

Lu Zhou rudely closed the dialog window and when he found his valuable documents, he copied them onto his external drive before he opened data from the scanner gun.

He thought that it would take a long time to figure out this data, so he did not expect the high-tech to be so convenient.

When he opened the executable file, a design tool application appeared on his screen.

A three-dimensional drawing of a broken battery was shown.

At first glance, it only looked like a 3-D model.

Lu Zhou clicked on the model.

Suddenly, things changed.

From the composition of the material to the temperature parameters at the time of the scan, all of the data were clearly shown in the pop-up dialog box.

Lu Zhou stared at it in awe before he quickly clicked on the negative end of the battery.

Then, it was like he found a treasure.

Lithium!

His guess was correct!

It was a lithium battery!

He was not clear as to what kind of lithium it was because he did not find any clues of the electrolyte residue.

He guessed that this high tech battery probably used gas or solid material as the electrolyte.

However, this had nothing to do with him.

He would learn the technology sooner or later. Right now, he had to figure out the technology that inhibited the development of lithium dendrites.

This battery was like a fish, and the most delicious part was the fish belly. In this case, it would be the lithium dendrite part.

Suddenly, Xiao Ai popped up.

Xiao Ai: [Master, what's this?]

Lu Zhou smiled. He was in a good mood as he typed: [Your new home will rely on this. Wait till I register a patent. Then I'll buy you a three million yuan server!]

Xiao Ai: [Wow, really!]

Lu Zhou: [Really!]

If this thing really could teach him how to inhibit the growth of the lithium dendrites, then the patent would earn enough for him to buy an entire server farm.

Of course, he had other wishes, so he would not actually spend all his money on servers.

He would at least buy a lab for himself as he could not always rely on the system to give him high-tech components. He had to find a way to make his own technology.

However, he was in no rush to register the patent. It was not like anyone else had access to the battery.

Even though he already knew what the material was, he still had to do experiments in the lab and fake the discovery.

After all, when he registered the patent, he would have to specify the equipment used, source of the material, and the laboratory information. Only after that would people accept his new technology patent.

Where should he submit the thesis?

He had accepted a Nature Weekly interview recently, so maybe he would just submit it to Nature…

Lu Zhou could not help but feel excited.

…

Once Lu Zhou turned off his computer, he then changed his clothes. He ate some lunch at the cafeteria before he went to Professor Lu Shenjian's office.

When Professor Lu saw Lu Zhou, he smiled and said, "You finally came back from Europe. I thought you were going to stay there for good."

Lu Zhou smiled and said, "No way, my visa won't even let me stay there for long."

"Ah, hard to say. If you really wanted to stay there, CERN would take care of your visa. They might even get you a PR," said Professor Lu with a smile.

Lu Zhou smiled but he did not say anything.

Although he knew that the old professor was just joking, he still did not take the joke well.

What Professor Lu said was true. It would be easy for him to stay there.

However, he had never even given this idea a thought.

He liked the environment here and he liked the people here.

He would go abroad for conferences or even to study there, but he would still eventually return to China.

They chatted for a while before Professor Lu got to the main point.

"I'm glad to see that you come back safely. Next time when you fly, make sure you shoot me a text when you land. If it wasn't for Yan Xinjue, I wouldn't even know you were back! Nothing else, that's all I wanted to say."

Professor Lu paused and continued.

“I’m going to Beijing in a few days. Come with me. I have a friend that wants to see you.”

Lu Zhou asked, “Is the friend, Professor Gao?”

“Not him. Why would he want to see you? I see him every day,” said Professor Lu as he waved his hand. He then said, “Old Qiu wants to see you. He’s in the mathematics field as well, so you should know him.”

Chapter 182

Anyone in the mathematics field knew of this god. Even the people in the theoretical physics field knew of him.

However, Professor Qiu was usually very busy, so it was difficult to see him.

On the other hand, one could gain a lot just from a short conversation with him.

Therefore, when Lu Zhou heard that Professor Lu was bringing him to see Professor Qiu, he immediately asked, “When are we going to Beijing?”

Professor Lu smiled and said, “Around October.”

“…”

Then why are you telling me this now?

Lu Zhou was speechless.

When Professor Lu saw that Lu Zhou did not speak, he said, “I don’t have many projects for you to do right now, so just study on your own. I don’t have much to say regarding mathematics, but for quantum chromodynamics, you still have a lot to learn. I already sent the class schedule to your email. If you want

to graduate this year, work hard and go to those classes. I'll test you at the end of this semester. The exam syllabus is the classes that I'm sending you to."

When Lu Zhou heard the broad scope of this syllabus, he said, "Professor, this syllabus is a bit too vague."

Professor Lu smiled and said, "What are you scared of? Believe in yourself!"

…

He had to study hard for quantum chromodynamics, but he had to do something else first.

After Lu Zhou left Professor Lu's office, he did not hang around. Instead, he went back to his dorm and sat in front of his laptop. He began to research the data from the scanner gun.

He did not know how this battery was produced as the technology was way ahead of its time.

Leaving the negative electrode material aside, even the "oxygen screening diaphragm" on the side of the battery could not be produced with the current technology.

Even if Lu Zhou knew the structure and the parameters of the material, he could not just put this information online and hoped that someone else could build it. There was not a laboratory in the world that could create a diaphragm this thin.

Even if he solved the problem of the lithium dendrite, without this diaphragm, he could not create a lithium-air battery.

Everyone knew that not only would lithium react with oxygen, but it would also react with nitrogen in the air to form lithium nitride crystals that were difficult to reduce. If the water vapor leaked, there would be a violent explosion.

The Japanese people were ambitious on this front, but they had yet found a solution.

If someone could solve the gas screening problem, an oxygen tank could be attached to the lithium-ion battery and this could potentially power cars.

However, no one wanted their car to blow up.

After some thorough research, Lu Zhou was sure that this battery was the legendary lithium-air battery.

The positive electrode was a gas chamber covered by a gas screening membrane, and the negative electrode was a lithium negative electrode material encapsulated by an electrolyte. However, the electrolyte was not leaking at all, and the negative electrode material had completely turned into lithium oxide.

The design structure was simple and clear, but even if people had the design model, no one could create it. This was because while the technical difficulties were all in the details, most of the problems were regarding the material.

Lu Zhou tried to search online for the plastic in the battery, and could not even find anything.

Fortunately, the material needed to protect the lithium negative electrode and prevent the growth of lithium dendrites was not something too special. Lu Zhou thought it was solvable.

Lu Zhou saw a piece of copper foil under the fully oxidized lithium anode.

Of course, the copper foil was not the key to preventing lithium dendrites. The key was the modified PDMS 1 nanoporous film covering the copper foil.

There was nothing special about the PDMS material. It was called polydimethylsiloxane, which could be found in skincare products. The nanopore structure of PDMS was the key to solving “breathing problems”.

As for the nonporous film made from PDMS, Lu Zhou guessed that it was made by spin coating it with hydrofluoric acid.

When Lu Zhou saw a specially treated hollow carbon nanosphere under the PDMS film, he guessed that these carbon nanospheres were balancing the lithium dendrite growth.

After around half an hour of playing on his laptop, Lu Zhou leaned back in his chair and sighed, “This task is arduous!”

Even my 20,000 yuan computer can’t handle this… I guess I have to rely on a professional computer to process this data.

He planned to build a laboratory near the University of Jin Ling in order to study this gadget. He would then hire a large group of graduate students and PhD students to work for him. Then, he could even get Xiao Ai to delegate work to these students.

However, right now, there were more important things waiting for him.

Lu Zhou pulled out a piece of A4 paper from his desk and wrote two things on it. He then circled the words “PDMS film” and “carbon nanoball”.

He planned to register patents for these two things. After that, he would register a patent for both as a whole and called it “L1 anode material”.

If he had time, he could even figure out the production process and patent the industrial production process. Even if he did not produce the batteries himself, he could still sell it to others for a profit.

However, Lu Zhou did not choose to do this.

First of all, the design and production of this were out of his abilities. Also, he knew that as a scientific researcher, his fight was in the laboratory, not in a mall or a factory.

As for how to send this technology to the market, he would leave it to the professional engineers to design. He would leave the easy work to the common folks.

It was neither necessary nor efficient to set up factory production.

Factory production and researching products were two different things. He was much better at researching products.

However, it would not be easy to earn patent fees.

He knew that he would have to at least recreate this battery in his laboratory.

Otherwise, he would not be able to explain many things in his patents.

This was part of design experiments.

Once he solved the design experiment, he could happily register the patent.

He would then be making a contribution to society!

Chapter 183

This glory was well-deserved.

“Yeah,” whispered the old man sitting opposite Professor Qiu as he drank tea.

This was Wang Yuping, who helped Lu Zhou back at Princeton.

Although Professor Qiu had a poor relationship with the University of Yan, he still had a few good friends from the said university.

Professor Wang Yuping was one of them.

Professor Wang paused for a second. He then sighed and said, “After the Princeton conference, I thought that this kid was talented in mathematics. I didn’t think that he would be so talented in particle physics as well. I’ve met a lot of young scholars, but none are like him.”

Professor Qiu Chengtong smiled and said, “I’ve seen one.”

“Who?”

“Tao Zhexuan!”

Professor Wang Yuping was stunned. He then smiled and asked, “Your evaluation of him is that high?”

Tao Zhexuan was the first Australian to receive the Fields Medal, and he was the second Chinese ethnicity person to win this award. He was currently teaching at UCLA and considered a genius in mathematical analysis.

Although applied mathematics was not in mathematical physics, his research covered almost all of mathematics. From harmonic analysis to nonlinear partial differential equations to number theory and topology.

Many people called him the Mozart of mathematics because there was no explanation as to how one person could achieve so much in mathematics.

In China, people called Lu Zhou as the “Young Tao Zhexuan”.

Professor Qiu smiled and said, “High evaluation? I think that he can accomplish more than his predecessors!”

Professor Wang Yuping was surprised and he could not help but ask, “Are you serious?”

“Of course,” said Professor Qiu as he nodded. He then added, “When I saw him chose Polignac’s conjecture to be his research topic, I had this feeling in my heart. Now with this article, I’m even more certain.”

Professor Wang Yuping smiled and asked, “Do you think he can solve this conjecture?

“Hard to say. He solved the twin prime conjecture. If I had the energy, I might even try to challenge this problem,” replied Professor Qiu. Suddenly his eyes sparkled and he looked at his old friend before he said, “How about we make a bet?”

Professor Wang Yuping smiled and asked, “Bet about what?”

“I bet that he can solve this conjecture in two years.”

“Not possible,” said Professor Wang Yuping as he shook his head. He added, “I know you have a high opinion of him, but his research problem right now isn’t number theory, but mathematical physics. If he concentrates on number theory, he could solve this conjecture… But as I see it, two years is too short!”

Professor Qiu shook his head, “Research direction isn’t the problem. I think he has the talent to solve the problem. Since we disagree, should we bet on it?”

Slapping his thighs, Professor Wang Yuping said, “Sure, let’s bet! I’ll bet a hundred yuan. It’s not much even if I lost.”

Professor Qiu smiled and said, “Look at you, already talking about losing. How boring, the bet is off!”

…

“Achoo!”

Lu Zhou sneezed and rubbed his nose as he continued to write at his desk.

He had already read Professor Lu’s class schedule.

However, he was still on his summer holiday, and the class would not start until next month.

Lu Zhou did not really leave his dorm over the past few days. He locked himself in his room and tried his best to design experiments using the battery data on his computer.

He had to read a large amount of literature to design the PDMS film.

The reason he was this motivated was money.

With such a large gold mine laying there, he would not be able to sleep if he did not crack at it a little.

There was no exaggeration to compare this technology to a gold mine.

20 years ago, lithium metal was abandoned by the industry because of the dendrite growth short circuit. This turned the battery into a bomb.

However, lithium metal still attracted countless material science laboratories. They were still doing experiments on this topic.

IBM even did a super-calculation of the lithium-air battery project and they assigned a path for each gas molecule to enter the battery unit to avoid gas blockage… However, they were burning money too fast and the project was then cut off.

At the national level, the energy minister from the Alabama team and the Chinese American who won the physics Nobel prize in 1997, Mr. Zhu Yuwen, had been a fanatic supporter of lithium negative batteries for quite some time… However, he was persuaded by a group of people.

As for why lithium batteries were so fascinating, it had to do with its energy density.

The so-called energy density was the energy contained per unit volume. The most important performance indicator of a battery was its energy density. This had been the pursuit of the battery industry.

In the 13th Five-Year China Plan, they clearly stated that their battery technology level should be synchronized with the international level by 2020. One of the most important factors was to increase the battery energy density to 300-350Wh/kg.

So far, the lithium-sulfur battery looked the most promising.

However, if the lithium dendrite problem was solved, then all of the other materials would have to give way to the lithium negative battery.

Those who had studied chemistry would know that the lithium metal anode had the lowest electrochemical potential of -3.04V and an energy capacity of up to 3861mAh/g.

That meant that by using lithium as the negative electrode, it could theoretically reach ten times the energy capacity of graphite batteries.

The most attractive part was that once the growth of the lithium dendrite was solved, there would be no other major design changes that needed to be made to batteries. They only had to replace the graphite anode material!

Chapter 184

If someone else asked to borrow these types of equipment, he would hesitate and might even refuse. However, Lu Zhou was different as he had helped the professor greatly on that last thesis.

That was a billion yuan project, and not to mention, as a shareholder of Zhongshan New Materials, he was a direct beneficiary.

This was only a small favor which he was happy to help.

Lu Zhou was almost embarrassed to see Professor Li agreed so easily.

If I knew that this old man is so kind, I would've just asked for the SEM scanning electron microscope instead…

"Anything else?" asked Professor Li when he saw that Lu Zhou did not speak.

Lu Zhou shook his head, "Nope, thank you, professor."

"Are you fine doing experiments alone? Do you want Qian Zhongming to help you?"

Lu Zhou said, "No thanks. I want to do it on my own."

Naturally, he would not want any help.

Brother Qian would instantly see through his act.

From the design of the experiment to how it was done, Lu Zhou would not be able to explain anything to him.

He had to do this experiment with his own hands.

"Okay then, try not to break anything."

Lu Zhou knew that Professor Li was joking, so he smiled and said, "Rest assured! I won't break anything!"

…

After Lu Zhou took the keys to Lab 304 from Professor Wang, he could finally begin his next procedure.

From the reverse technology of the scanner, the key to solving the problem of lithium dendrite growth was in the treatment of polydimethylsiloxane materials.

In order to solve this problem, he designed two experiments.

However, the key to the problem remained in the processing of PDMS materials.

The untreated PDMS material, even if coated in copper sheet, was no use at all. The lithium dendrite would still explode.

Material science and mathematics were different. The former needed countless experiments and huge investments. The latter only needed a pen and paper. Most of the mathematics research funding was used for travel expenses.

Lu Zhou thought for an entire day and he still could not find a good solution. Finally, he decided to spend 500 general points to ask the system for help.

He saw his general points dropped back down to 1975.

This thing was expensive. 500 general points just for a PDMS material processing method.

The general points required for the technology of the entire battery could probably “buy” a Goldbach Conjecture.

Although it took a lot of general points, fortunately, the materials used in the formula could be found in the laboratory.

After three days and countless failures, Lu Zhou finally succeeded in preparing the qualified PDMS material. A box of waxy yellow gel.

This thing looked like honey and had a jelly texture. On the surface, it did not look like anything special, but when he placed it under a microscope, it did not look like ordinary liquid polydimethylsiloxane.

Lu Zhou could not bathe in this victory for long, so he quickly prepared a rectangular copper foil from the glue machine. He also began to prepare his next step of making the electrode materials.

Spin coating!

Spin coating relied on the centrifugal force and gravitational force generated by the rotation of the workpiece. This would completely spread the coating droplets to the surface of the workpiece.

Technically, the operation was very demanding.

An uneven coating could mean that lithium ions would not form on the negative electrode material.

Although Lu Zhou had some experience with spin coating, he still failed many times.

After a couple of hours, he finally succeeded in obtaining a copper foil that was uniformly coated with PDMS nanoporous film.

As Lu Zhou looked at the copper foil, he could not help but think.

I can probably sell this for hundreds of millions of yuan, right?

Lu Zhou packed up the remaining samples and PDMS materials.

There was only one step left and it was to make a simple battery.

He had to test the performance of this film to see if it was as magical as he thought.

Lu Zhou saw Brother Qian’s demonstration before, so he was basically familiar with the operation.

In another laboratory, Lu Zhou put on a white scientist robe before he placed his hand into the argon-filled glove box. He then carefully fixed the copper foil onto the battery mold.

The binder was sodium carboxymethylcellulose and styrene-butadiene rubber, the current collector was aluminum foil, and the positive active material was still the LiFePO4 commonly found in lithium-ion batteries that were used nowadays!

For the diaphragm, Lu Zhou used the Celgard 2325 three-layer composite diaphragm.

There were only slight changes made to the battery.

Once Lu Zhou finished the assembly, he felt proud of himself. He then carefully took the sample out of the box and closed the valves.

He then exhaled a sigh of relief as he wiped the sweat off his forehead.

“Done!”

When he looked at the sample in his hands, he was really excited.

He had not expected this piousness.

Yes, piousness.

As a scientist, he was devoted to science.

This technology likely came from a civilization far more advanced than Earth.

Perhaps it came from a Star Trek battleship…

No matter where it came from, this valuable debris was in his hands.

Lu Zhou took a deep breath and tried to calm himself down. He then placed the battery sample into the Bk-6808 battery charger before he carefully placed it under the digital microscope.

Now all he had to do was wait.

Hopefully, the result would not be disappointing.

Lu Zhou set a 10-minute photo timer and turned on the battery tester. He then took a Polignac's conjecture research document and quietly started to read.

Chapter 185

Since yesterday, he had completed four sets of charge and discharge cycles and there was no lithium dendrite!

The lithium ions that traveled to the negative electrode did not form white tree ridges. Under the PDMS material, a layer of moss-like pleats was stacked on one another.

From the data on BK-6808, the coulomb efficiency was maintained at a fairly high level!

These results surprised Lu Zhou.

He originally thought that the PDMS material and the carbon nanospheres had to be combined to completely solve the lithium dendrite problem. Yet, the effect was amazing with just the PDMS material alone.

As for the carbon nanospheres, Lu Zhou guessed that it was to accelerate the deposition rate of lithium ions and to use to "level" the folds under the PDMS material.

As for the mossy "pleats", while it definitely had an effect on the performance of the battery, it was much better than the deadly lithium dendrite!

Without the nanospheres, the battery's charge cycle would intensify the wrinkling phenomenon. It would also result in the coulomb cycle decreasing and reduced battery life.

Perhaps this was unacceptable for an advanced civilization, but on Earth, this was negligible.

As long as the battery was safe, any company would love to implement this technology!

Someone could use their phone for a week straight.

Of course, many other factors would also affect the performance of the battery. The battery life depended on how the battery chip was designed, and this part was out of Lu Zhou's expertise.

However, there was no doubt that this new anode material would revolutionize the battery industry!

Whether it was the lithium borate battery or a lithium manganese cobalt battery, the negative electrodes were mainly graphite. As for the lithium-sulfur battery that was still lying in the laboratory, that was inhibited by the lithium dendrites.

Therefore, Lu Zhou knew that what his experiment results meant.

He took a deep breath and closed his eyes.

"System, what will those carbon nanospheres do?"

The system did not answer.

When Lu Zhou opened his eyes, he looked at the sample under the microscope.

"As expected…"

As expected, the carbon nanospheres technology was beyond his material science level. He did not have access to the information.

Nonetheless, this did not matter.

He had the data from the debris, so he did not have to rely on the system to solve the problem.

When he had his own laboratory, he would hire a team of researchers to do the experiments for him.

Lu Zhou unplugged the power supply and placed the battery sample into a small box.

Then, he saved all of the photos from the BK-6808 into his USB and as a precaution, he deleted all of the data.

Lu Zhou cleaned the laboratory and made sure that he did not leave anything behind. He then walked out and planned to return the keys to Professor Wang.

When he stepped outside, he bumped into Brother Qian.

When Brother Qian saw Lu Zhou, he waved and asked, “Is the experiment done?”

Lu Zhou smiled and replied, “It’s done.”

He suddenly thought of something and asked, “Oh yeah, are you studying electrode materials?”

Last year when Lu Zhou was helping Professor Li, he heard that they were going to do an electrode material experiment this year.

“Yeah,” replied Brother Qian as he nodded. With a smile, he asked, “Interested?”

Lu Zhou answered with another question, “What research project is it?”

Brother Qian replied casually, “The positive electrode material of lithium-sulfur battery. The latest research results of MIT found that the sulfur is fixed in the mesoporous carbon material as the positive electrode material and it effectively slows down the growth of the lithium dendrites of the negative electrode. I can’t say anything else since I signed a confidentiality agreement. If you’re interested, Professor Li will definitely welcome you to join our team.”

“I’m fine. Anyway, Professor Lu would not be happy to see me doing experiments,” said Lu Zhou with a smile. He then said, “Also, I don’t think this is a good choice… I’ve read the thesis you talked about as I’m doing a similar research experiment…”

Lu Zhou continued to speak, “… I think that if the discovery was so important, the team from MIT wouldn’t publish it so easily.”

Technology that had been published could not be patented, as it would conflict with national patent laws.

Generally, those laboratories with investment in enterprises (mainly engineering), would usually register the first patent in order to protect the results from the research. It was only after they registered that they would publish the thesis.

Anything that was published was unreliable and similar things had happened in the battery industry.

In 2011, Cornell University’s L-Archer research group published a paper on aluminum-ion batteries. They proposed a battery model in which Al was used as a positive electrode for V2O5 which was once used as a battery model. The “breakthrough” was reported and it was even reported by the famous “Science” journal.

However, the final outcome was unpleasant.

In the MRS 1 meeting, Cornell’s people were attacked by a man named Luke Reid…

Lu Zhou did not know if the MIT results were correct, but he knew that there was no way to inhibit the growth of lithium dendrites from the cathode.

He knew this because he had already solved this problem.

He was even about to register a patent.

Brother Qian shook his head and said, “We’ll still run experiments, just to see how it goes.”

Lu Zhou sighed, “Then… I wish you good luck.”

He could not reveal anything more.

No one would believe him and they might even get offended.

He could only warn them.

However, he did not worry too much. He wondered what Professor Li would say to him after he published his thesis.

He could register his patent by next year, and after that, he could start writing his thesis.

He would be in Princeton by then.

Maybe, by then, Professor Li would give up on this research project.

Chapter 186

These resources meant funding, and it also meant researchers.

Once Lu Zhou went back to his dorm, he began to fill in the patent documents. He had to state the thing he was patenting.

For the sake of caution, he did not brag too much. He only stated it as an “improved polydimethylsiloxane nanoporous film”, and said that it “can protect” the anode material.

This was Lu Zhou’s first time applying for a patent, so he did not know that he was being too cautious.

There was a countless patent application for lithium negative electrodes so he could brag all he wanted to.

Some people even dared to claim to solve the lithium dendrite problem.

Just like submitting subpar theses, the patent industry was no different.

The reason for this was that many scientific research projects required patents. Therefore, they were of no use. One had to have patents for a company to have an interest in investing.

Another reason was regarding policy. Many enterprises were using the old fashion way of “catching up”, which created a lot of patent problems. In order to catch up with the technology of developed nations, the National Knowledge Bureau had been relatively lax on patent applications.

Of course, the most important reason for the flood of patents was that patents were different than journals. Journals were strictly peer-reviewed.

Meanwhile, the auditors would only verify if the patent conflicted with other pre-existing patents. They would not really test to see if the patent was as nutty as it claimed to be.

Even journals could not guarantee that every “breakthrough” thesis was real and reliable, how could patents?

Lu Zhou guessed that even when his patent was accepted, no one would notice the value of his technology unless he published his experiment data online, or wait until his patent was approved before he published a thesis to catch the public’s attention.

The materials section was filled out. As for the specific patent application process, Lu Zhou was not worried. He had a reliable party for help.

Lu Zhou's responsible patent attorney was a 30-year-old man named Han Tianyu. From his CV, this guy looked quite reliable. His professional smile reminded Lu Zhou of insurance sellers.

From domestic patents to international patents, this guy did it all. He promised the fastest handling speed and signed a confidentiality agreement.

Although it cost a lot of money, it was worthwhile to protect his intellectual property rights.

Generally, large enterprises had specialized departments for patent management. Lu Zhou obviously did not have access to that team, so his best choice was to find a reliable patent agency for help.

In fact, many small enterprises and laboratories used patent agencies.

Contacting the auditor and the oral defense was cumbersome. Not to mention, the complicated patent laws were difficult to understand.

If a sophisticated invention had a poorly written patent, the resulting patent could be invalid. The technology could then be stolen by others.

Therefore, the patent exams were one of the hardest exams in the country.

…

After Lu Zhou completed the patent application, he concentrated all of his energy into solving the Polignac's conjecture.

In fact, his daily lifestyle did not change much. The laboratory visits turned into library sessions while the experiment equipment turned into textbooks…

When Lu Zhou saw the young students in the library, he could not help but think.

Maybe two years later, these students would be calling him Professor Lu?

Wow, it's quite exciting to think about this.

Suddenly, a jasmine flower scent floated from the side.

Someone poked his arm and quietly asked, "Hey, how do you do this question?"

"Question? Show me… Wait!"

When Lu Zhou saw the person sitting next to him, he was shocked. He almost thought that he was dreaming.

Chen Yushan was happy to see that Lu Zhou was surprised, so she smirked and asked, "How it is, little brother, are you surprised to see me?"

Surprised… Not really, just unexpected.

"Yeah, it's unexpected…"

Didn't she get into the University of Yan? Why is she back at the University of Jin Ling…

Wait a minute, something doesn't feel right.

Lu Zhou suddenly realized the problem.

"… Speaking of which, I'm also a master's student now."

He did not want her calling him little brother anymore.

Chen Yushan blinked and said casually, "I know, Meng Qi told me. You graduated at the beginning of the year. Speaking of which, how come you didn't tell me!"

Chen Yushan had a sliver of complaint in her eyes.

Lu Zhou: "…"

F*ck sake!

You're the one calling me little brother, so why are you giving me that look!

He wanted to say something but suddenly someone near them coughed.

That loner instantly killed the vibe in the atmosphere.

The two had an awkward expression when they suddenly recalled that they were in the library.

Chen Yushan was a little embarrassed as she pointed to the door and said, "How about we go get something to drink?"

Lu Zhou looked around. Even though he was not done with his calculations, he still nodded, "Okay."

He could not stand the depressing vibes that were coming from the loners.

Also, since she came all the way from Beijing, he was obligated to hang out with her. Their friendship was still quite good.

Not to mention, she was the one buying.

Chapter 187

Lu Zhou smiled and said, “What a coincidence, I’m also studying under an academician, but I feel quite fulfilled.”

Professor Lu treated him pretty well. He took Lu Zhou to Switzerland and gave him a lot of working experience at CERN.

If he did not have CERN’s internship, he would not have found the 750 GeV sample. Neither would he appeared in Nature Weekly or worked with Professor Frank.

“I guess it depends on the supervisor…” said Chen Yushan as she sighed. She suddenly remembered something and asked excitedly, “Oh yeah, Meng Qi told me that you’re going to Princeton next year?”

Lu Zhou nodded and said, “Yeah, I’m going latest summer next year. Once I get my degree, I’ll go to Princeton for PhD.”

“Wow, impressive,” gasped Chen Yushan. Her mouth was wide opened as she stared at Lu Zhou for a long time. She then said softly, “Oh, little brother, you’re giving me a lot of pressure like this. If this goes on, maybe I’ll have to call you as my older brother?”

Lu Zhou was speechless, “Did you just realized this?”

“Little brother, Little brother”

Lu Zhou saw that Chen Yushan kept calling him little brother, so he asked, “What?”

“Nothing, ” said Chen Yushan as she shook her head. She then smiled, “I just want to call you that a few more times since I won’t get the chance in the future.”

Lu Zhou could not help but complain, “I’m also doing my master’s right now! You already don’t have the chance.”

Chen Yushan seemed to realize this as she had an awkward look on her face. She laughed and said, “Don’t be so stingy. Watch out, you might not be able to find a girlfriend…”

She suddenly realized that she was single herself, so she changed the topic, “Speaking of which, did you pass TOEFL?”

Lu Zhou, “I passed it before I went to the Princeton conference.”

Chen Yushan felt like English was her strength, so she suddenly asked, “What did you get?”

Lu Zhou replied, “I think 118.”

Chen Yushan was quiet for a while before she sighed, “Not bad, little brother… Do you really not have a subject you’re not good at?”

Lu Zhou smiled embarrassedly, “I do. I’m not good with modern history… Oh yeah, did you get the offer from University of Pennsylvania?”

Chen Yushan nodded her head and said, “I got it, I’m going at the end of the year.”

Lu Zhou could not believe it, “Wharton?”

Chen Yushan proudly smiled and said, “Of course!”

F*ck me, I can’t believe she got in!

Lu Zhou was astonished.

Wharton at the University of Pennsylvania was known as the birthplace of the MBA. It was the top business school in the US and ranked top three in the world. All of the wall street investment banks wanted graduates from Wharton. Even POTUS went to Wharton.

Even though the admission was not as difficult as Princeton, it was still hard to get an offer!

Also, even if she did 1+2 training, she would have to stay at the University of Yan for another year. Strictly speaking, she would be admitted to the school after September.

It meant that she had half a year left at the University of Yan.

Basically, 0.5+2 training.

Would her supervisor really let her go?

Lu Zhuo had always been suspicious of Chen Yushan's academics, but now he believed her.

This chick really is a genius student.

Even though her mathematics is kind of crappy…

It was getting late, so the two ate dinner together.

Lu Zhou thought that they would split the bill but Chen Yushan insisted on paying. She said that he could buy her dinner next time.

From their conversation, Lu Zhou learned that she came back to Jin Ling to pack up her dorm.

The new semester was about to start, so Chen Yushan had to move her stuff out of her dorm room at the University of Jin Ling and into her dorm room at the University of Yan.

She just happened to bump into Lu Zhou.

Once they finished eating, they walked back to campus.

Suddenly, Lu Zhou thought of something and he asked, “Oh yeah, how did you know I was in the library?”

Chen Yushan said, “I mean, where else could you be?”

Lu Zhou: “…”

Why does she sounds like I’m always at the library?

The pair walked back to the dorms.

These two were only platonic friends, so Chen Yushan did not have plans to go back to his dorm.

She cleared her throat as she held her hands behind her back while she looked at Lu Zhou and said, “Then, little brother, I’ll see you next year.”

Lu Zhou wanted to say bye but felt a little strange. So he asked, “Next year?”

Chen Yushan blinked and said, “Yeah, aren’t you going to Princeton?”

Lu Zhou said, “Yeah… But Princeton is in New Jersey, not in Pennsylvania.”

Chen Yushan tilted her head and said, “But the University of Pennsylvania is in Philadelphia, and I think the University of Pennsylvania is close to Princeton. Didn’t you get off the plane at Philly when you went to Princeton?”

F*ck!

Lu Zhou suddenly realized that geography was not his strong suit.

Last time he went to Princeton, he got off at Philadelphia.

The University of Pennsylvania was close to Philadelphia.

Chen Yushan looked at Lu Zhou’s expression and smiled, “They’re really close together. I’ll check out the place for you first. When you go there next year, remember to call me. I’ll take you to Princeton.”

Chapter 188

Lu Zhou was studying the Polignac’s conjecture in his seat when he looked at Shi Shang with a confused expression.

“What did I do?”

I didn’t do anything. What do you mean humble bragging?

What are you talking about?

Shi Shang sat in his seat and said, “Stop being modest, I saw what you did in Nature Weekly!”

That’s it…

That’s old news.

Lu Zhou looked at Shi Shang and he was speechless.

“You read Nature Weekly?”

“Nope, but I saw it on Weibo!” said Shi Shang. He continued to ask, “So, is there hope for a Nobel Prize?”

When Liu Rui heard Nobel Prize, he stopped studying and began to listen.

He normally did not go on Weibo, so this was his first time hearing that Lu Zhou was on Nature Weekly.

He did not understand how a mathematician like Lu Zhou was able to get the Nobel Prize.

When Lu Zhou heard Shi Shang’s question, he smiled and asked, “I don’t know. Why don’t you go to Switzerland and ask?”

It was not like the Nobel Prize was easy to get. Shi Shang was clueless.

Suddenly the door to their dorm room was pushed open.

Huang Guangming had his glasses on as he carried his suitcase awkwardly as he walked in.

“201, your daddy is back… F*ck me, Brother Fei, daddy was wrong… Don’t… Let me get my glasses first. Ah…”

His glory lasted for three seconds.

Before he could finish speaking, Liu Rui and Shi Shang started wrestling him while Lu Zhou was cheering on the side.

Like this, the previously quiet atmosphere in Dorm 201 was broken again…

…

Strictly speaking, Lu Zhou was only considered as a first-year master's student.

However, this did not matter to him as he would get his degree in a year anyway.

The class schedule that Professor Lu gave him was pretty useless. He would usually study mathematics in his dorm room. Specifically, Polignac's conjecture.

The twin prime conjecture was already solved. Now, he had to find a solution to extend the proof.

The topology method was no longer of any use. He had to find a new method to solve this problem.

This was the most troublesome part of number theory.

There were too many options to choose from. Most people did not even know where to start when facing difficult number theory questions.

However, Lu Zhou stayed calm. He was not frustrated at all.

He had already solved many mathematical conjectures. Even though he was not inspired this time, he knew what being inspired felt like.

Even though he did not have "inspiration hours" to help him, he knew that sooner or later, he would solve this problem.

On the other hand, Lu Zhou's three friends from Dorm 201 began their third-year undergraduate studies.

Lu Zhou felt like he was racing ahead of his peers.

The class leader Tian Jun came back and had a committee meeting. Tian Jun said to check their class schedules online.

Some classes were canceled so some students could not take the classes they wanted.

Normally speaking, in order to study for the graduate entrance exam in their fourth year, third-year students would take all the core subjects in their third year.

It was a pain in the ass when they could not take a class.

Unfortunately, this happened to someone.

“F*ck, my actuarial mathematics class was canceled.”

Huang Guangming screamed in front of the computer.

Shi Shang’s heart dropped and he quickly looked at his own class schedule. He saw that all his classes were still there. He smiled and said, “Not bad, Guangming, you want to get into finance?”

Huang Guangming said, “Shut up, it’s so annoying. Why was the class canceled!”

Normally, teachers with many projects did not want to teach undergraduate students. They wanted to use their energy on PhD students.

They were too busy to teach undergrad classes…

Shi Shang smiled and said, “Then why don’t you choose something else ASAP? I think the Academic Affairs Office website is still open, so hurry up.”

“I know, I’m choosing…” murmured Huang Guangming as he logged onto the academic affairs office website. He then looked at Lu Zhou, “Zhou, which class is easier?”

Lu Zhou replied without thinking, “Mathematical model. Professor Liu teaches this class and he’s a nice guy.”

Professor Liu was the type of teacher to give the students the entire syllabus and not lie about it.

He was also the fairest professor that Lu Zhou had ever come across.

In his opinion, the mathematical model was one of the most simple courses he took.

“Let me look at it,” said Huang Guangming as he looked at the computer screen and clicked his mouse. He said, “F*ck, it’s full.”

Lu Zhou thought for a moment before he said, “Then what about basic number theory? It looks pretty simple.”

“Fine, let me see… F*ck me, there are still 20 spots left!” said Huang Guangming with a surprised tone.

Suddenly, Liu Rui said, “Give up.”

He twisted the pen in his hand and slowly said, “Don’t be fooled by the words ‘basic’ number theory. It’s literally the most difficult mathematics course. Only Zhou would think that it’s easy… Choose something else.”

Lu Zhou: “…”

What the hell?!

Huang Guangming said, “F*ck me, Lu Zhou, don’t screw me over.”

“Oh? Okay then. I don’t really know what is easy…” said Lu Zhou.

Shi Shang rubbed his chin and asked, “Zhou, are you close with Professor Liu?”

Lu Zhou thought for a moment before saying, “Pretty close. After all, he took me to the mathematical modeling competition.”

Shi Shang said, “Then… Why don’t you ask for Huang Guangming? See if the professor can squeeze him on.”

Lu Zhou nodded and said, “Okay then, I’ll ask him today.”

“Zhou, my good friend. I’m…” said Huang Guangming. He was moved as he continued, “I don’t know how to thank you!”

Lu Zhou smiled and said, “That’s easy, just thank me with dinner. The fish restaurant is good.”

Huang Guangming: “…”

Chapter 189

However, this kid did not even realize it.

Maybe that was one of his strengths. Humbleness.

Not many people could accomplish so many achievements at his age. Liu Xiangping had only seen a handful of students, but most of them fell off the board once they got older.

This was because the young talented geniuses would often get distracted by fame and stopped grinding.

Not to mention all the bragging and ego boosting…

This was why Professor Liu was so curious about Lu Zhou.

If anyone else had any of Lu Zhou's achievements, he could spend the rest of his life bragging about it.

However, Lu Zhou was different.

He would get excited and energetic. After the excitement ended, he would calm down and might even forget about it. He did not have that kind of arrogance.

After he got the Higher Education Society Cup, Professor Liu had a strange feeling that Lu Zhou was different than his other students.

Maybe… This is the potential of a great man?

Liu Xiangping was shocked at his own thoughts and it was unclear how this idea came to mind.

He had taught countless students over the years, but only one person was able to make him think this way.

Lu Zhou smiled and said, "Thank you, professor."

"You're welcome," said Liu Xiangping as he shook his hand. He then asked, "Oh yeah, are you going to Beijing in October?"

Lu Zhou did not know why Professor Liu would ask him this, but he still nodded and said, "Yeah… Professor Lu is taking me there."

Professor Liu asked curiously, “Oh, what did Professor Lu say it was for?”

Lu Zhou, “He didn’t tell me… He said it was to take me to visit Professor Qiu Chengtong. Why?”

“Nothing. That’s a good thing,” said Liu Xiangping. He saw that Lu Zhou was oblivious and so, he smiled and patted him on the shoulder, “Then I’ll have to congratulate you in advance.”

Lu Zhou, “…?”

Congratulate?

What’s there to congratulate?

Lu Zhou felt inexplicably confused. He did not know what the old man was saying.

However, Professor Liu would not tell him why. He only said, “It would be boring if I revealed it to you. Go ask Old Lu if you’re curious.”

When Lu Zhou saw Professor Liu’s smirk, he was speechless. He did not like it when someone left him hanging.

He was at a loss.

…

The study of the Polignac’s conjecture reached a bottleneck. Lu Zhou read a ton of documents and still, he could not find an effective method.

Recently on Arxiv, there were many interesting theses. Someone cited his [Annual Mathematics] thesis and discussed his method of proving the twin prime conjecture. This person tried to attack the Polignac's conjecture and it exploded on the Internet.

Lu Zhou felt like some of the viewpoints were interesting, but they were missing something.

He planned on taking a break from this conjecture for a few days. Suddenly, an email from CERN appeared in his mailbox.

[Lu,

CERN's recent research results are exciting. The characteristic peaks of 750 GeV are becoming clearer. The confidence levels on ATLAS and CMS detectors are 1.9 sigma and 2.1 sigma respectively. I believe that with the accumulation of collisions, we will definitely find the hidden secret, the secret behind the characteristic peak of this energy zone… So we might have to start doing more work.

I am watching the Hadron Collider experiment closely. I will update you on any new discoveries.

Also, based on the latest data collected by the LHC, I speculate that the particles there may form the last piece of the puzzle in the standard model. This piece of the puzzle has exceeded the expectations of the old supersymmetric particle.

If this is true, then there is no doubt that our work here will be influential.

With regards to the supersymmetry theory, the current work progress of my students and I have reached a critical stage. In the study of the 750 GeV energy region signal, some interesting data appeared on several detectors.

Regardless of your ability to process this data, I hope that you can give me a reply as soon as possible. After all, there are many people who are staring at the signal of this energy zone. We must race against time.

Also, I am not doubting your academic morality, but I have to remind you to please keep the contents of this email confidential. Please tell me if anyone gives you a hard time.

]

Since this was a professional work email, the old man wrote the words concisely.

Obviously, Lu Zhou would not reject the old man.

He typed a few words on his keyboard and replied, […I will try to quickly process this data. It should only take three days. As for your concern, I guarantee that I will keep this confidential.]

Lu Zhou obviously would not let a third party see this data.

It was not only a matter of academic reputation but also a matter of character.

Lu Zhou hit the “Reply” key before he pulled out a laptop from his drawer. He wiped the dust off and plugged it in.

The compressed file in the email was small and most of it was image and chart files.

Once Lu Zhou finished the decompression, he opened the text file. He then looked at the contents inside.

Suddenly, he raised his eyebrows.

Why does it feel like…

This looks different than I imagined?

The PhD student saw that the professor stopped talking, so he asked, “What’s up?”

“Nothing…” murmured Frank as he read the email and frowned. He suddenly shook his head and said, “It’s an interesting point, but I disagree.”

The young man from China wrote the email.

[Dear Professor Frank, I have some questions regarding your supplementary theory of supersymmetry. According to the Deligne’s theorem on tensor categories, it can be known that the category satisfying certain conditions must be the representation category of a supersymmetric group G so that we can say that supersymmetry is a generalization of field theory. But, in your supplementary theory, it is assumed that there is an extra dimension beyond the symmetry field representation to explain the reason why the supersymmetric particle is too large. Doesn’t this contradict the Deligne tensor theorem?”

Academic exchanges were different than work emails. There was no need for additional politeness, so Lu Zhou pointed it out as is.

He believed that Frank would not be so stingy.

However, the old man’s reply was also ruthless…

From the other side of the Pacific, after Lu Zhou edited the email and sent it to Frank Wilczek, he leaned back on his chair and stretched.

He was about to go eat when an email popped up in his mailbox.

Lu Zhou opened the email and was amazed.

F*ck, he’s already awake?

Switzerland is 6 hours behind, so that means it’s only 5 am there!

Lu Zhou did not know that Frank had already returned to MIT.

The reply in the email was simple, and it was mainly to answer his questions.

[Lu, I received your email. Also, regarding your doubts, I admire your knowledge of mathematical physics. But my suggestion is that you should go and study Wigner's theorem in quantum mechanics. Then you would understand the theory of supersymmetry supplement, and won't have any problems with the assumptions that I made.]

Lu Zhou certainly did not know about Wigner's theorem. This was the cornerstone of quantum mechanics.

This theorem described the principle of symmetry in physics systems, such as how rotation, translation, or CPT changed the state of the Hilbert space.

According to this theorem, elementary particles could basically be represented by the irreducible Lie group, and a tensor product could be made for these representations. Furthermore, this operation could correspond to the physical particle bound state.

Isn't that amazing?

Mathematics and physics were linked by a theorem.

This nature provided a theoretical cornerstone for the later application of the Deligne's theorem on tensor categories in physics.

Lu Zhou knew Professor Frank's intentions. He did not have a problem with the supersymmetric complement theory. It was just lacking in mathematical beauty.

For example, as Lu Zhou said, it was impossible to explain the rationality of this extra dimension by using the Deligne's theorem in tensor categories.

Lu Zhou thought for a bit then typed his thoughts on the keyboard.

[But don't you think that we can use a more mathematical sophisticated model to describes the peaks in the 750 GeV energy zone? There is absolutely no need to introduce an extra dimension outside of a fully symmetric field. What I mean is that maybe this is a particle that we don't understand? Dark matter particle?]

Although in order to convince this old man, Lu Zhou said that the 750 GeV signal may have come from supersymmetric particles, he wasn't actually obsessed with supersymmetric particles himself.

There could be many things behind that characteristic peak. The universe isn't built on a single set of theories.

Lu Zhou felt like it was most likely dark matter particles.

After all, this signal is weak enough that without a large number of collisions, this clue wouldn't have been discovered. Dark matter is difficult to observe as it hardly interacts with other elementary particles, including photos.

Lu Zhou pressed the reply button and didn't bother to go eat. He patiently waited in his chair.

If the old man was looking at his email right now, he would soon get a reply.

As expected, soon after, an email popped up.

[What you said is possible, but I don't think it is likely. I'm certain that CERN's equipment isn't advanced enough to detect dark matter. If the signals observed on ATLAS and CMS detectors are dark matter, I'm sure that the characteristic peaks of the two would not be so consistent. If you have any questions, you can consult Mr. Lynn Evans. And for my theory, I can also add a supplementary explanation.

Lu Zhou read the email from top to bottom but he did not know how to reply. Suddenly, two other emails popped up.

[If there's an extra dimension of compaction, then each field in the high-dimensional space corresponds to a normal field in the four-dimensional space, plus an infinite number of fields that are inversely proportional to the length of the compaction. And the source of this field can be used as the Fourier series of the original zero film field in the compaction dimension!]

[Supersymmetric particles should also exist in this field. This relationship couples the supersymmetric particles with fermions. I think this makes sense, in theory. So according to this theory, we should be able to find supersymmetric particles under the energy mark below TeV, so you should have more confidence in LHC.]

F*ck, this guy types pretty fast.

While the first email made him doubt CERN's equipment, the second email gave him confidence in the collider.

What the hell is this?

Lu Zhou stared at the three emails for a long time while his hands remained static on the keyboard.

The old gentleman was confident in his own theory.

Lu Zhou was speechless and he did not know what to reply.