Scholar 371

Chapter 371: Just Go For It

Finding superconducting materials from carbon nanomaterials was a novel idea.

Although people had researched this topic before, no one had ever produced any significant results.

Therefore, Lu Zhou wasn't sure about this either.

However, since most scientific research started from a guess, Lu Zhou decided to just go for it.

After determining the research direction, Lu Zhou called Sarrot and told him the story.

Sarrot's eyes widened as he asked, "Superconducting materials? Why do you want to study this?"

Box..

Lu Zhou said, "I think it's interesting, is it not?"

Sarrot: "No, I mean that barely any research has been done in this area, we would have to start from zero."

Lu Zhou: "…"

"So it's very likely that we will have to take a long time before we can produce any patent-worth results." Sarrot couldn't help but say, "Why don't we continue to do batteries? The industry is looking forward to a new and improved HCS-2 material."

Lu Zhou laughed.

“The industry is definitely not looking forward to a new and improved HCS-2 material. It’ll take some time for them to adjust to HCS-2.

“As for the patent, don’t worry about it. I won’t use patents as a standard of evaluation, just do your research.”

Sarrot shrugged and said, “Okay, as long as you don’t care about losing money.”

Although he couldn’t understand his boss’ motives, as long as someone was willing to pay him to do experiments, he was fine with anything.

Sarrot then said, “Actually if you don’t care about patents, we can cooperate with other research teams. This will speed up our in-progress results. I know a Massachusetts Institute of Technology research team that is also doing this. We can work with them.”

Lu Zhou asked, “What is the name of the team?”

Sarrot: “Pablo Jerillo-Herrero research project team. They’re well known in the graphene industry.”

Lu Zhou asked, “Will someone like them want to cooperate with us?”

“Depends on who proposes for the cooperation. If it’s me, they will probably reject me,” Sarrot shrugged as he said. He then continued, “But if the Hoffman Prize winner, inventor of the Theoretical Model of Electrochemical Interface Structure, and leading person in computational materials science were to ask them, I’m sure they wouldn’t refuse.”

Emmmm…

Lu Zhou felt that even though Sarrot’s argument was a bit strange, it made sense.

“Okay then, I’ll contact them.”

Lu Zhou hung up the call. He then turned on his laptop and searched for information on the Pablo Jarillo-Herrero research team using Princeton’s database.

The academic community wasn’t big, so it was easy to find out what someone was researching. Lu Zhou only had to find his recent theses.

Lu Zhou quickly found the relevant information.

Ten years ago, this research team did research on graphene’s superconductivity.

In 2007, they published “Bipolar Current In Graphene” in Nature. In 2014, they also published “Graphene’s Quantum Spin Hall State” in Nature again. The most recent thesis was on “The Ferromagnetic and Heterostructure of Van Der Waals Crystals”; all of them were interesting research topics.

Lu Zhou wrote down the email address of the thesis author and quickly found Pablo Herrero’s blog on Google.

As per what Sarrot said, they were researching an interesting topic— the superconductivity of graphene at low temperatures.

They could provide a new idea for studying superconducting materials.

“The materials science world has a lot of nutty people.”

Lu Zhou opened his email and began typing.

[… Hello, Professor Pablo Herrero,

I am Professor Lu Zhou from Princeton University. After reading your Nature thesis, I became very interested in your research direction. I want to cooperate with you on graphene superconductivity research, what do you think?]

Lu Zhou leaned back in his chair and waited for a bit.

He knew that most people checked and replied to emails in the mornings.

Professor Pablo Herrero should be sitting at his computer, reading the email.

Lu Zhou was correct.

Within five minutes, he received a reply.

There was only one line in the email.

[I'm fine with it, do you have a specific cooperation plan?]

Lu Zhou smiled and began typing.

[Of course…]

…

Lu Zhou managed to reach a cooperation agreement faster than he had imagined.

For this type of low patent probability projects, most professors were willing to cooperate with other research teams.

According to their agreement, Lu Zhou would send a consultant researcher to help them with computational materials science methods. Also, for research exchange, they would send a researcher to Lu Zhou.

Both parties would study the topic of two-dimensional carbon nano superconducting materials. The final thesis would be signed by both parties.

The next day, Lu Zhou found Connie, who was doing his postdoctoral.

Compared to Jerick, Connie, who has been working with Lu Zhou for a while, was more suitable for this task.

Lu Zhou found Connie and said, “I need you to go to Boston.”

Connie was doing an experiment at that time. When he heard Lu Zhou, he stopped and asked, “Boston? Why?”

Lu Zhou said, “I’ve been in contact with the Pablo Jarillo-Herrero research team at Massachusetts Institute of Technology. We’re doing collaborative research on the superconductivity of carbon nanomaterials. I need you to visit for a while, it might take a few weeks or even a few months. Of course, I will pay for all expenses. Do you have any problems with your schedule?”

“Nope, no problems,” Connie said with a smile. He then added, “I got this… When do I leave?”

Consulting exchange was a good opportunity to network, especially when one didn’t have to pay for it.

Any student would be eager at such an opportunity.

Lu Zhou nodded.

“You can start preparing now, you leave in three days!”

Chapter 373: Visiting Harvard

Lu Zhou remembered that Qiu Chengtong was the leading person in partial differential equations.

There was no doubt about Old Qiu's achievements in differential geometry.

Anyone who had read the book "Differential Geometry" would know that he was the founder of geometric analysis.

What was the geometric analysis?

It was the study of integrating partial differentiation into differential geometry.

Although the Chinese academic community had mixed opinions on this figure, the international academic community still respected this scholar.

Box..

This could be seen from his rewards.

There were only two mathematicians who had won the three big prizes: the Wolf Prize, the Fields Medal, and the Crafoord Prize. One of them was Lu Zhou's mentor, Deligne, and the other was Qiu Chengtong.

When Lu Zhou won the Shiing-Shen Chern Mathematics Award, he had a brief encounter with Old Qiu. However, because their research areas were different, they hadn't stayed in contact.

Navier–Stokes equations was a partial differential equation problem. Lu Zhou had no doubt that Old Qiu was the leading expert in partial differential equations.

A Ford Explorer parked itself near the department of mathematics building in Cambridge, Massachusetts.

Lu Zhou got off the car and didn't know where to go.

Therefore, he used his intuition and spoke to a person that looked like they study mathematics.

"Hello, where is Professor Qiu's office?"

"You want to find Professor Qiu?" said the guy with glasses as he looked at Lu Zhou. He felt like he had seen Lu Zhou before. He then asked, "Why do you want to find Professor Qiu?"

Lu Zhou said, "I have some questions I want to ask."

Maybe Lu Zhou looked too young because the guy with glasses chuckled and said, "Professor Qiu doesn't have time for your simple questions, just ask me."

Lu Zhou smiled and said, "Oh yeah? Then can you explain to me if there's a backward self-similar solution for the Navier-Stokes equation?"

The guy froze.

However, he didn't want to admit defeat. He began thinking about the problem but wasn't able to come up with an answer.

It was obvious that he studied partial differential equations, and he knew about the Navier-Stokes equation.

However, it was also obvious that he hadn't done any in-depth research.

Otherwise, he would know that this problem was actually answered in 1995 by Necas.

Lu Zhou looked at his watch as he asked, “Can you take me there now?”

“Sure, bro.” The guy smiled and said, “Come with me… Old Qiu is a busy person, so he might not want to meet you.”

Lu Zhou smiled and didn’t say anything as he followed the guy.

They started to talk. Lu Zhou found out that this guy was called Zhao Wei, a Shuimu University graduate. He was now studying mathematics at Harvard.

“You’re an undergrad?”

Lu Zhou said, “Why do you say that?”

Zhao Wei smiled and said, “Because you have a full head of hair, and you look young.”

Lu Zhou: …?

How…

Does this make sense?

Zhao Wei continued to say, “… You found that problem in a textbook, right? I suggest you focus on the basics first. Only then should you study more in-depth problems.”

This guy was very interesting. He didn’t have bad intentions; he was just a bit too nosy.

If Zhao Wei became a professor, he would be deeply loved by his students.

Lu Zhou smiled and said, “Makes sense, noted.”

Zhao Wei was happy to pass on his knowledge. He smiled and said, “We’re all friends here, we should help each other. Come find me if you need any help. You can call me, Brother Zhao!”

Lu Zhou said, “Okay then.”

Brother Zhao is an interesting name.

Zhao Wei smiled and said, “You know my name now. Little brother, what is your name?”

“Lu Zhou.”

Lu… Zhou?

Zhao Wei frowned and couldn’t remember where he had heard this name before.

The two finally arrived at Old Qiu’s office.

Although the office door was open, out of politeness, Lu Zhou still knocked on the door.

Old Qiu was writing at his desk when he looked up.

When the old man saw who was at the door, he was stunned. He then frowned before putting on a kind smile.

“Oh, guests…” Old Qiu stood up and smiled as he asked, “What brought you here?”

Lu Zhou smiled and replied, “I ran into a bottleneck in my research, and I want to ask you some partial differential equation problems.”

Zhao Wei was confused about why Old Qiu was so nice to Lu Zhou.

Finally, he remembered who Lu Zhou was…

He thought about his arrogant conversation with Lu Zhou and wanted to crawl into the ground.

When Old Qiu heard Lu Zhou's request, he looked interested.

"Partial differential equation? This is my cup of tea, what is the exact problem?"

"It's related to Navier–Stokes equations."

Old Qiu's eyes suddenly lit up; he was even more interested now.

"Navier–Stokes equations? This is interesting… Sit down, I'll find my tea set; this will take a while."

Lu Zhou nodded and sat down at the tea table.

Suddenly, Old Qiu noticed that there was someone else at the door.

"Who are you?"

Zhao Wei said, "I'm Zhao Wei, I'm a student of Professor Steve Nadis!"

"Oh, Professor Nadis' student." Professor Qiu pushed his glasses and said, "Then, sit down?"

"No, it's fine." Zhao Wei shook his head and said, "I'm just bringing Professor Lu here, I won't bother you two."

Listening to these two big names talk would be helpful for Zhao Wei's research.

However, Zhao Wei felt like it would be too much pressure for him to sit next to them…

"It's just learning, no big deal." Old Qiu smiled and said, "Come and sit down, and drink some tea before you go."

Chapter 374: Another Grinding Session

The tea was ready.

A fine mist floated out of the teapot.

The old man picked up his cup and had a sip of tea before he started to talk.

"Out of all of the partial differential equations, the Navier-Stokes equations is probably the most difficult one. We cannot directly apply the partial differential equation theorems on the Navier Stokes equations, we can only get an approximation.

"From what I know, the Clay Institute has been researching the turbulence phenomenon. Although they have produced some results, they were nothing impressive.

"The plasma turbulence that you want to study is even more difficult. First of all, there isn't a computer that can handle that kind of calculation. Secondly, we can't obtain accurate observation data. We can only rely on inaccurate data."

Box..

Lu Zhou asked, "Why?"

Old Qiu smiled and said, “Because we don’t have a method to observe high-temperature plasma ions. For example, if we take a nano-probe and poke it into the gas to collect molecules, the movement will perturb the gas and disrupt the data.

“We can use electrostatic probes and magnetic probes for lower temperature plasma. However, for any high-temperature plasma, any slight disturbance can cause the whole system to collapse. It is impossible to constrain the plasma.

“Therefore, we can only obtain the model by using the electromagnetic waves emitted by the plasma itself. However, the spectrum of the electromagnetic waves emitted by the plasma is wide, the amount of information is large, but the information contained is quite messy. The established model would only be accurate for a certain range.”

Lu Zhou said, “Is there a solution?”

“Nope.” Old Qiu put down the teacup and said in a joking tone, “If you can design an experiment to observe high-temperature plasma, then your contribution to the physics world would be akin to what the contribution cryogenic electron microscopy did to the biology world.”

Lu Zhou smiled; he didn’t know what to say.

Although the high tech system had information on engineering, Lu Zhou’s energy was limited. He had barely studied engineering.

He was fine at designing experiments.

But designing the experiment instrument was beyond his capabilities.

“My personal suggestion is that since the experiment problem can’t be solved, why don’t you perfect the theoretical tools first?” The old man looked at Lu Zhou and said, “Mathematics is your strength, right?”

Lu Zhou was stunned, and he suddenly had a thought.

Yeah.

Mathematics is my strong suit.

If I can't create a piece of experiment equipment, why don't I create a theoretical tool first?

For example, the Navier–Stokes equations are used as a tool to study more complex problems. Just like how I was studying additive number theory, I needed to create other tools before I could tackle the Goldbach's conjecture.

Lu Zhou thoughts gradually became clear.

The rest of their conversation was centered around mathematics.

Old Qiu was very experienced in partial differentials.

Although he had never studied Navier–Stokes equations before, his opinions were still helpful for Lu Zhou.

Just like this, two hours had passed by.

The mist on top of the teapot disappeared, and the tea gradually became cold.

Zhao Wei sat next to them as he anxiously listening to their conversation.

He was a PhD student; he had nothing to add to the conversation.

This was a painful thing for him.

It wasn't just mental pain, it was physical pain as well.

Because he drank too much tea…

After three hours, the conversation between the two finally ended.

Lu Zhou said bye to Old Qiu, and Zhao Wei was finally set free.

Zhao Wei quickly went downstairs, and he rushed to the toilet to relieve himself. When he came out, he quickly caught up to Lu Zhou.

"Hey, Lu Zhou, what did you guys talk about?"

Lu Zhou was in a good mood, and he replied, "Some interesting things."

Zhao Wei said, "I heard something about nuclear fusion, is that thing real?"

It would be amazing if it is real.

Lu Zhou didn't answer the question. Instead, he asked, "What do you mean by real?"

Zhao Wei was stunned by the question, and he said, "Like, if it is achievable."

Lu Zhou smiled and said, "The basis of science is to achieve things that cannot be achieved. If the problem is already solved, what is the point of researching it? You're a PhD student, why are you asking these outsider questions?"

Zhao Wei blushed as he scratched his head and smiled.

“I want to buy you dinner, do you have time?”

Lu Zhou nodded and said, “Okay.”

Anyway, it was dinner time.

He would never refuse a free meal.

…

Lu Zhou was inspired by his conversation with Old Qiu.

As per what the old man said, the most important thing was to create the tools to solve the problem.

Which meant that he had to get himself a ladder before he could climb the wall.

Before he could get a ladder, all he could do was to walk around the infinitely long wall.

Lu Zhou returned from Harvard to his Princeton house. He re-examined the problem from a different perspective and felt like every single cell in his body was bursting with inspiration.

He sat in his study room and twisted a pen in his hand while he talked to himself.

“… Building a theoretical model for the plasma requires accurate observations.

“However, since I can’t create an experiment tool, I can only start with the part I can solve!”

Lu Zhou stretched his neck, picked up the pen, and wrote a line on a piece of blank paper.

[The Existence of Smooth Solutions of 3D Incompressible Navier-Stokes Equations with Specific Initial Values]

He looked at this title and felt full of motivation.

It was time to grind again!

Chapter 376: He3 Atom Probe

At the cutting edge of theoretical physics, it was common to throw a particle into an unpredicted chaotic system.

Then, the system could be observed indirectly by the motion of the particle.

In fact, Lu Zhou's experiment proposal idea came from his earlier work at CERN.

The whole system of plasma could be treated like a pool table where playing a shot could tell you where the balls were.

As for the particle that would play the role of the "white ball", there wasn't a better option than helium-3.

First of all, its atomic diameter was small. It consisted of two protons and one neutron, which was close to the atomic mass of helium-2, and the nuclear structure was stabler than helium-2! Not only could it avoid indistinguishable multi-atomic collisions, but it could also pass through plasma easier.

Box..

In order to reach the temperature at which the fusion reaction occurred between helium-3 and deuterium, a temperature a hundred times of the magnetic field would be required.

Therefore, there was no better option than helium-3!

Due to a large number of particles in the plasma system, the effect of the helium 3 atom on the entire system was negligible. After all, throwing one atom into the system was much better than inserting an atom probe!

The helium-3 atom passed through the plasma and collided with the particles in the system. The electromagnetic waves generated in the collision would act as “sounds”, which could be heard by the observation device. Using this data, the macro and microscopic parameters of the plasma system could be analyzed.

After that, the helium-3 atom would collide with the target material and the impact data would also be recorded.

As long as the helium-3 atom collided with the plasma system, and the electromagnetic wave data generated by the collision and the impact data on the target material could be collected, Lu Zhou was confident that he could indirectly analyze the system using mathematical methods.

This could be put into a simple analogy.

If someone were measuring the refractive index of water, studying the whole water system itself would be too complicated. However, studying one beam of light injected into the water and observing the change in the angle would be much simpler.

Lu Zhou’s experiment consisted of injecting the helium-3 particle into the plasma system!

“… We only need to set up a large palm-shaped target material on the first wall of the stellarator to capture the helium-3 particle emitted from the atomic gun which can be generated by the collision of helium-3 with tritium atoms in the emission cycle. The electromagnetic wave signal and the data of the impact angular momentum when the final helium-3 hits the target can be recorded. Then, we can indirectly analyze the state of plasma under high-temperature pressure!”

“I’m not saying that it can’t be done,” Professor Lazerson looked at Lu Zhou and said, “but are you sure that you can process the data? If we launch N particles, then there are N variables that would be involved! We also have to consider the disturbance of the magnetic field on the plasma…”

With enough variables, even a supercomputer wouldn’t be able to calculate the model.

However, Lu Zhou wasn’t shocked by Lazerson’s words.

Lu Zhou was confident, and he said, “I have 90% certainty that this will work.”

Although building a mathematical model sounded tedious, it was nothing a supercomputer couldn’t solve.

Lu Zhou believed in his ability to build theoretical models.

Professor Lazerson was slightly hesitant, and he couldn’t make a decision.

In theory, the idea should work. However, the premise was that Lu Zhou could complete his theoretical model and that the helium-3 atom would produce electromagnetic waves.

Then, they would have to analyze the collected data successfully.

Data that couldn’t be analyzed was no better than random noise.

“… Give me a reason to trust you.”

“Is the Goldbach’s conjecture enough?”

Professor Lazerson said, “Not enough! That only shows that you’re an expert in number theory, it means nothing to me!”

“Then what about the ‘Theoretical Model of the Electrochemical Interface Structure’?” Lu Zhou said, “I know you’ll say that it only means I’m an expert in theoretical chemistry and computational chemistry, not an expert in plasma, right?”

Professor Lazerson didn’t say anything.

Lu Zhou continued, “But I want to tell you that all of my research is based on data. Processing data, analyzing data… I’ve processed much more data than this experiment will produce!”

Professor Lazerson was speechless, and he went into deep thought.

Lu Zhou saw that he wasn’t speaking so he continued, “Believe me! It sounds hard, but it isn’t impossible! We only have to use an atom probe to insert the helium-3 into the plasma.

“If we succeed…”

Lu Zhou looked at him and said, “Then it would undoubtedly be an invention worthy of a Nobel Prize.”

The Nobel Prize wasn’t only a reward for theoretical discoveries, it would also award major inventions that revolutionized the world.

For example, in 2017 October, the Nobel Prize in Chemistry was awarded to three scholars who invented the cryo-electron microscope.

As per what Old Qiu said, if someone could establish a method to observe the parameters of a high-temperature plasma system, the effect on the physics industry would be huge.

This would also undoubtedly push forward the controllable nuclear fusion project!

“This sounds…”

Professor Lazerson took off his glasses and wiped his glasses with a handkerchief.

He became more and more excited.

However, he wasn't sure.

Lu Zhou looked at his watch; ten minutes had passed.

Lu Zhou was about to give up and find someone else to cooperate, but suddenly Professor Lazerson put on his glasses.

He was no longer hesitant toward Lu Zhou.

Instead…

He was excited!

"… This sounds interesting!"

Lu Zhou sighed in relief and smiled as he reached out with his right hand.

"I'm happy to hear that."

Finally, someone didn't tell him that the "idea is unrealistic".

…

Convincing Professor Lazerson saved Lu Zhou a lot of trouble.

The Princeton Plasma Physics Laboratory was a world-class laboratory. They also cooperated with nuclear fusion research institutes around the world and had a tremendous amount of resources and talent.

They were one of the only research institutes to have this quality.

If Professor Lazerson was still unwilling, Lu Zhou would have to write a letter to the Max Planck Institute and consult the scholars at the Max Planck Institute for Plasma Physics.

As for building a laboratory himself with the same capabilities of the PPPL…

It would cost a lot more than a few hundred million.

Lu Zhou reached a cooperative agreement with Professor Lazerson. He consulted other experts on this matter and decided to name this technology as “Helium-3 atom probe”.

The project team name was only three letters.

“He3”.

Over the next few days, Lu Zhou basically went back and forth between the Institute for Advanced Study and the Plasma Physics Laboratory. He was either reading the literature on plasma research or working with Professor Lazerson on He3. He also sat with plasma physics experts and engineers of the project team to exchange ideas on the experiment design.

Even though Lu Zhou finished his theoretical research, he was still busy.

While Lu Zhou was working on the “He3” project, his thesis was published in Annual Mathematics.

His thesis on partial differential equations was finally available to the public.

Lu Zhou didn’t pay attention to the mathematics community’s reaction to his thesis.

In his opinion, he didn’t produce any particularly outstanding research result. It was only reinforcement to the foundation laid by predecessors.

However, fate was sometimes wonderful.

Lu Zhou didn’t expect things to go in the opposite direction.

The stone he threw into the pond of mathematics didn’t sink. Instead, it floated to the top…

Chapter 378: Enough time!

The Navier–Stokes equations was one of the seven Millennium Prize Problems; it gained popularity due to its applications in engineering and physics.

Now that a genius scholar wrote a thesis on this topic, the Navier-Stokes equations were receiving more attention than ever.

Many mathematics and physics doctoral holders in major universities and research institute were all talking about this problem.

They were curious if Lu Zhou was taking on the Navier–Stokes equations.

If he was, what stage was his research at?

Was it only the Annual Mathematics thesis?

Box..

Most people believed that this genius had already produced far better research results than the Annual Mathematics thesis.

Lunchtime, Princeton Institute for Advanced Study.

“I’ll have a bacon sandwich.”

“Another sandwich… Do you really not want to try other flavors? You’re always eating the same food, it’s not a good diet.”

The chef recognized Lu Zhou because he ordered the same food every time.

“No thanks.”

Lu Zhou took the sandwich and coffee from the chef. He then found a comfortable place to sit down.

Normally, he would cook for himself or even eat the Ivy Club, but these days he would often eat a simple sandwich before heading to the plasma laboratory.

The design of the experiment sounded simple, but it was extremely complicated to execute!

In addition to the obvious problems, there were many hidden and unclear problems that needed to be solved. This required both theoretical and engineering knowledge, which meant that Lu Zhou had to keep in touch with the engineers at the laboratory. He also had to exchange ideas and find viable solutions with the engineers.

Lu Zhou felt like his speed of comprehending engineering material was unexpectedly fast.

As for how fast…

It was similar to his speed of studying mathematics two years ago.

Lu Zhou slowly ate his sandwich while he was still studying complicated problems.

Suddenly, a blonde woman sat across from him. She took out a microphone out of nowhere before she said, “Hello, Mr. Lu Zhou, I am sorry to bother you. I’m a BBC reporter.”

Lu Zhou stopped eating his sandwich and looked at the blonde lady before he asked, “What do you want?”

He didn’t recall doing anything spectacular recently.

She obviously wasn’t here to talk about the Hoffman Prize which had happened a long time ago.

The reporter smiled and said, “The thing is, your thesis in Annual Mathematics recently has attracted worldwide attention from the academic community. I want to ask if you are attempting to find a smooth solution to the Navier–Stokes equations, to challenge one of the Millennium Prize Problems?”

A normal mathematics problem wouldn’t be worthy of an interview from BBC, but the Millennium Prize Problems were different. Its million dollar prize was worthy of a news headline.

“Oh no, you have it wrong, there’s no such thing.” Lu Zhou shook his head and said, “I only researched the Navier–Stokes equations to facilitate my own experiment. Even though I found an interesting result, it is not worth of being commended.”

The reporter looked at Lu Zhou and said, “Unbelievable… Can I ask what are you experimenting on?”

“It doesn’t matter, I don’t want you guys to report on my research and write an unrealistic headline,” Lu Zhou said as he crunched up his sandwich wrappers before he threw it in the trash can. He then added, “I can only tell you one thing before the research results come out.”

Lu Zhou was worried that if he had told BBC he was designing experiments to study the turbulence phenomenon of plasma at high temperatures, the BBC would report that he was going to solve the nuclear fusion problem. Lu Zhou's phone would blow up again.

After all, this was a BBC reporter.

Due to their exaggerated headlines and shady reporting techniques, they were banned from Wikipedia citations.

The reporter didn't care about Lu Zhou's remark. Instead, she leaned forward with the microphone and asked, "What thing?"

Lu Zhou said, "No comment."

Reporter: "…"

…

Lu Zhou went to PPPL after the short interview.

The engineers at the lab were already working.

When Professor Lazerson saw Lu Zhou, he greeted him.

"The Wendelstein 7-X accepted our request to install the target material and atomic gun for our next experiment. They will also help us collect the data."

Lu Zhou immediately asked, "When is the next experiment?"

Professor Lazerson wasn't sure, and he said, "In a month… We must come up with valuable results before December! Otherwise, they might consider postponing the experiment. The ITER project is running out of money, and all of the laboratories are racing against the clock."

Lu Zhou said, "There's not much time left."

"Yes, not much time left. Of course, we can wait until the overhaul in June, but…" Professor Lazerson said.

"But?"

Professor Lazerson continued, "But PPPL won't continue supporting our research without restrictions. If we don't produce any results for half a year, they might scrap the experiment."

This project relied heavily on PPPL. The funding was from PPPL; the talent and equipment were all from PPPL.

There were many high tech projects being developed, and nuclear fusion was only one of them. The "He3" atom probe was only a sub-project under the nuclear fusion project.

If this project took up half a year of resources and didn't produce any results, the laboratory director might call off the project, or at least delay the project.

Unless there were multiple Nobel Prize winners endorsing the project, or the project itself was worthy of a Nobel Prize.

However, Lu Zhou obviously wasn't a Nobel Prize winner, and neither was Professor Lazerson…

Lu Zhou said, "We can't wait for half a year?"

Professor Lazerson said, "Normally we can, but research projects recently have been on a tight schedule, so less important projects will be delayed… no matter how interesting the project is."

He certainly hoped the project could continue.

After all, the physics community could only “detect” plasma, not “observe”.

The two concepts were completely different, and the models built from the concepts were also completely different.

If Lu Zhou could really use his mathematics abilities to complete this experiment, the Nobel Prize committee might even consider Lazerson for a prize.

As an engineer, this was his only chance to win the Nobel Prize.

When Lu Zhou heard Lazerson’s explanation, he said, “We have to work faster! The deadline is the end of the year, so we have to finish it before the end of the year.”

Professor Lazerson asked, “Is there enough time?”

Lu Zhou looked at Professor Lazerson, and he replied, “There is definitely enough time!”

Chapter 379: Greater Transmission Power!

Translator: Henyee Translations Editor: Henyee Translations

There wasn’t much time left for the “He3” project team.

Everyone was racing against the clock.

Finally, due to everyone’s constant effort, a rough prototype was completed.

The prototype consisted of two parts; one part was an “atomic gun” used to accelerate and emit helium atoms, and the other was a target material installed in the vacuum chamber for receiving helium-3 atoms. There were also various computers and sensor components.

As for why this was a rough prototype…

It was because almost all of the parts were pieced together.

Box..

The acceleration track path of the atomic gun was taken from an old particle accelerator from the Argonne National Laboratory. The vacuum chamber used to hold the plasma was designed by the PPPL when they were working on the stellarator.

This entire system could heat plasma up to 7,000 degrees, which was a long way from the “high” temperature of 100 million degrees. The electromagnetic field was also an order of magnitude below the stellarator’s, which was 10T.

However, it was enough.

Every experiment would start with a proof of its feasibility. They didn’t have to complete nuclear fusion in the vacuum chamber, and they didn’t need a high density of the plasma.

They only had to successfully collect data from the plasma and analyze the data to get an “observation”.

Then, they just had to integrate this observation device on the stellarator.

In fact, Lu Zhou’s original idea was to obtain the old stellarator from the WEGA experiment group.

But it was only an idea. Professor Lazerson told him that their stellarator couldn’t be bought with money.

All in all, the prototype was complete!

The particle accelerator path was the atomic gun's "barrel", while the target material for the high energy helium-3 particles was a tungsten-titanium alloy. Behind the target material were the sensitive probes that would collect the data of the impact.

Although the engineering team encountered many problems, it was generally a smooth ride up to this point.

Some final adjustments were done, and Professor Lazerson eagerly announced the start of the first experiment.

The researchers in the laboratory spent countless days and nights working on this project. They needed a successful experiment to boost their morale.

However…

Not everything went as smooth as expected.

The second the helium-3 atom was injected into the plasma, the atom quickly rose to a high temperature and collided with the orbit wall. The detector connected to the other side of the target material collected electromagnetic wave data of the helium-3 atom.

God seemed to have played a joke on the researchers. The helium-3 shot from the atomic gun didn't travel through the plasma as expected.

It didn't hit the target material.

Obviously, they successfully fired the atom bullet.

However, they weren't able to recover the bullet.

The first experiment failed…

…

The 21st experiment was over.

The laboratory was silent.

The atom probe mounted behind the target material still didn't detect the signal emitted from the helium-3 impact.

The experiment was facing their biggest bottleneck yet.

If the emitted atom couldn't be collected, then the experiment would be meaningless.

The first to break the silence was a nuclear fusion engineer.

He said, "Maybe the probe isn't sensitive enough? Maybe the impact happened, and we just didn't detect it."

This was a possibility. If the collision signal was too weak, it might have been ignored by the detector.

"Impossible," a plasma theoretical physicist said. He then added, "The electromagnetic wave has a unique shape, and the only possible scenario is the helium-3 atom deviating from the orbit path… You should know this."

The plasma physicist was looking at Lu Zhou.

Lu Zhou didn't say anything; he only looked down and nodded.

Lu Zhou could tell from the electromagnetic spectrum image that the helium 3 atom didn't penetrate the plasma. Instead, it "disappeared" inside the plasma particles.

The atom might have been confined in the plasma electromagnetic field, but the orbit path was changed due to the collisions…

If a particle that entered a chaotic system could not be observed, then it would become a part of the chaotic system. Even if it still existed, it would be considered as "missing" in the physics sense.

The research seemed to reach a dead-end…

"This idea might not work at all," Professor Lazerson said as he took off his safety helmet and looked at the computer screen. He then looked at Lu Zhou and said, "The plasma used in the experiment was only 7,000 degrees, it's far from the stellarator's plasma density…"

Professor Lazerson's intentions were clear.

Even though the temperature was greatly decreased, the helium-3 particle still didn't penetrate the plasma. There was a doubt that the helium-3 particle wouldn't be able to penetrate the hundreds of millions degree plasma in the stellarator.

Lu Zhou looked at the computer screen, and suddenly, he said, "We need an atomic gun with a greater transmission power!"

"Yes, we need a larger atomic gun. It would be nice to get the Swiss Hadron Collider as an acceleration module and put our helium-3 atom on a rocket and make it pierce through all of the particles," Professor Lazerson said. He then shook his head and added, "You know that's not possible."

"Don't exaggerate so much," Lu Zhou shook his head and said, "I did the calculations, and we only need to increase the electromagnetic field strength of the atomic gun to 1T. Then, in theory, the helium-3 particles will be able to penetrate the plasma."

Lu Zhou didn't rigorously calculate this number; it was a rough estimate based on experience.

They might not need 1T, but 1T was definitely enough.

"This is ridiculous! The stellarator only has a magnetic field strength of 10T!" Professor Lazerson couldn't help but say, "Are you serious, do you mathematics people have an idea of numbers? Do you know how expensive superconducting materials are?"

This was still a problem of funding.

Although the PPPL laboratory was powerful, its annual funding was only US$40 million.

This money was split between many projects, and the "He3" project only had US$4 million of funding.

They used recycled parts and equipment to save money.

After all, every experiment they ran was burning money.

Professor Lazerson suddenly had an impulsive thought.

Maybe… working with Lu Zhou is a bad idea.

The engineers in the laboratory were silent; they didn't want to anger Professor Lazerson anymore.

Lu Zhou's request was ridiculous; it was like a rich person telling a homeless person to buy a house to solve all their problems.

Lu Zhou didn't say anything. Instead, he quietly waited for Lazerson to finish his words.

He then looked at Professor Lazerson before he coughed and said slowly, “What if… I can solve the funding problem?”

Chapter 380: Able To Do Anything With Money

The laboratory went silent for a minute.

Professor Lazerson rubbed his nose and said, “Sorry, what did you just say? I didn’t hear you.”

Lu Zhou: “I’m saying that I can solve the funding problem.”

Professor Lazerson looked at Lu Zhou like he was an alien before he spoke in disbelief.

“You sure?”

Professor Lazerson wasn’t the only one in disbelief; the engineers standing next to him couldn’t believe what they were hearing.

Box..

Lu Zhou: “I am sure.”

Professor Lazerson smiled and shook his head as he said, “Your prize money isn’t enough. Even if you win both the Fields Medal and Nobel Prize and sell the medals next year, it still won’t be enough.”

There had been people who sold their Nobel Prize medals in the past, but Lu Zhou would never do something like that…

At least for now, he wasn’t lacking money.

Lu Zhou sighed and didn't try to explain. Instead, he asked, "How much will it cost?"

Professor Lazerson obviously didn't think Lu Zhou could afford the funding, and so, he said in a joking tone, "If you can find US$10 million, then I guarantee you our project will be funded."

Lu Zhou didn't reply. Instead, he walked outside of the laboratory and called his manager, White Sheridan.

Sheridan picked up the call; he was probably at his office.

"Hello?"

Lu Zhou said, "It's me."

Sheridan already knew who was calling from the caller ID.

He said with a respectful tone, "How can I help you?"

Lu Zhou said, "Check how much money is in the Star Sky Technology's business account."

Sheridan said, "… I'll have to consult the finance manager for the specific amount. After that, I'll send the financial report to your email."

The parent company of Star Sky Technology was registered in the Cayman Islands, while the Star Sky Technology North American branch in Philadelphia was independent of the parent company.

Sheridan was mainly responsible for managing the patents, so he had to contact the parent company finance staff for financial documents.

However, Lu Zhou didn't want to know the specific number; he only needed an estimate.

"Is there ten million?"

When Sheridan heard this number, he hesitated for a second.

"There's definitely ten million…"

My boss…

Is underestimating our capabilities.

The company's income on HCS-2 material patent license alone was more than US$10 million.

The revenue from the modified PDMS patent licensing hadn't been touched, and Umicore had been paying money quarterly to the account.

The only cost was the one where Lu Zhou spent a hundred million on a Chinese laboratory.

US$10 million was nothing for Star Sky Technology.

When Lu Zhou heard Sheridan's answer, he nodded.

"I'll send you an account in a bit. Transfer 10 million there."

Star Sky Technology's business structure was simple as Lu Zhou was the only shareholder. He had the power of a king, and he didn't have a board to answer to.

Sheridan didn't ask what Lu Zhou was planning on doing. Instead, he replied in a respectful tone, "Yes, boss."

…

Lu Zhou rarely talked about his assets with outsiders, because honestly, earning money was too easy; it almost didn't feel real.

Other than the small number of people that followed him closely, almost no one knew about the branch of Star Sky Technology at the Cayman Islands. They didn't know that the modified PDMS patent license and HCS-2 materials license had already netted US$100 million.

Even if this money were put into a bank account untouched, the interest alone would be enormous.

Lu Zhou wasn't interested in yachts or jets, and the only expenditure he had was experiments.

When the US$10 million arrived in the He3 project account, the project auditor rushed into the laboratory due to the sudden influx of cash. The auditor handed Professor Lazerson the printed wire transfer information…

The entire laboratory went dead silent.

Lu Zhou looked at Professor Lazerson and coughed before he asked, "Is US$10 million really enough?"

Lu Zhou thought this was nothing compared to the budget of the particle accelerator.

However, he didn't know that the entire PPPL's annual research funding was only US$40 million.

The amount he injected into the He3 project was worth a quarter of the entire budget of PPPL…

Professor Lazerson gulped and nodded.

“It’s enough…”

Lu Zhou noticed that the researchers in the laboratory were looking at him, and he coughed softly.

“Start working, we don’t have much time left.”

The researchers and engineers in the laboratory glanced at each other before they went back to work.

Professor Lazerson looked at the piece of paper and then looked at Lu Zhou. He then asked, “The funding problem is solved?”

Lu Zhou: “Solved.”

“Unbelievable! Where did you…” Professor Lazerson didn’t know how to express his astonishment.

Lu Zhou guessed what he wanted to ask, so he said ambiguously, “Actually, I researched chemistry a while ago, and earned some money from the patent.”

Lu Zhou pointed to the Apple laptop on the office desk and said, “For example, the electrode battery material inside this thing was probably invented by me.”

Professor Lazerson’s eyes were wide open as he said, “But still, it’s ten million… Are you crazy?”

Lu Zhou smiled and said, “It’s fine, I have more than enough.”

Professor Lazerson: “…”

Engineers: “…”

Researchers: “…”

Evil capitalist!

What a punchable face!

But why am I…

So jealous!

…

The only problem the He3 project team had was insufficient energy on the helium-3 particle. This could be solved by increasing the intensity of the confined magnetic field of the atomic gun.

The strength of the confined magnetic field could be increased with money.

Yes, that was how scientific research was conducted. Anything could be solved with money. If Lu Zhou invested a billion dollars, he could make SpaceX send a rocket to collect helium-3 from the moon.

Of course, Lu Zhou didn't have a billion dollars…

In short, with the US$10 million, the He3 project team could directly purchase accelerator components from the Brookhaven National Laboratory or even from CERN. The experienced engineers of PPPL could then modify the parts.

This did cost a lot of money.

But Lu Zhou thought it was worth it…