The Person Who Sent Out the First e-mail from China: The Scientific Career of Weimin Wu

Today the world has entered the internet age. Electronic mail and webpages are displacing traditional mail, newspapers, and magazines. One of the most important achievements that took place in the 20th century was the birth and development of information science of which computers and internet communication are the two very pillars. To coincide with the 50th Chinese National Day, an article was published listing the many "firsts" achieved brilliantly in science and technology in the preceding 50 years: the first atomic bomb, the first artificial satellite, the first electron-positron collider …. However, when was the first computer network for global communication set up in China? And when and where was the first e-mail, an important characteristic of the information era, sent in China, and where to and by whom? It can be said that the first e-mail from China was sent abroad on August 25, 1986, by Weimin Wu of the Institute of High Energy Physics (IHEP) of the Chinese Academy of Sciences, who at that time was a Chinese group leader of the ALEPH collaboration, working with Professor Jack Steinberger at CERN (European Organization for Nuclear Research) in Geneva, Switzerland. Here let us review the history of this event, and also introduce Weimin Wu, a legendary figure in science. He is the only scientist from China who has participated in three different fields of scientific work: the first atomic bomb project, the launch of the first artificial satellite, and the construction of the first electron-positron collider. He had a storybook-like experience during those 50 tumultuous years, and unforeseen circumstances made him the only Chinese scientist to take part in the three high-tech engineering projects which were the pride of China.

To some extent, his experience is also a microcosm of China's history for the past 50 years.

1. The First Computer Network in China for Global Communication

This part of the history began in 1979. That year Professor Tsung-Dao Lee came to China to lecture on high-energy physics. His objective was to bring those researchers in high-energy physics from isolation directly to the frontier of the field. He worked tirelessly and lectured until his voice was hoarse. He left an unforgettable impression on the more than three hundred young scientists and university teachers who attended the lectures from all over China. This was the first time since the Cultural Revolution that self-isolated Chinese scientists became enlightened. "Spring was in the air" in the lecture halls. Weimin Wu was fortunate to be one of the attendees. Afterward, with arrangements made by Professor Lee, about thirty scientists who were in their prime at IHEP were selected via the examination mode to do research at the frontiers of knowledge at the best high-energy physics research institutes and universities in the world. Wu, then 36 years old, was selected and sent to CERN. He joined the CDHS neutrino research group led by Nobel Laureate Professor Jack Steinberger. Wu returned to China in early 1982. During his two-year stint at Geneva, from his viewpoint, the greatest benefit was to have established a connection with the top scientists in the world working at the cutting edge of physics, and to have been enriched with the experience gained in a world-class research environment.

Not long after Wu's return, the CDHS group ceased operation. Using it as a foundation, a new research group ALEPH was formed. This was an experimental group, again under Professor Steinberger's guidance, working at the newly completed LEP, the world's highest energy electron-positron collider. (Recently this group has also ceased operation. Subsequently the CMS and ATLAS groups have been formed for the world's highest energy proton-proton collider (LHC). Wu is currently involved in research in the CMS group.) From 1982 to 1983, Wu was busy at the Chinese Academy of Sciences, IHEP and the National Natural Sciences Foundation of China, trying to gain support to establish the ALEPH group at IHEP. At the same time he maintained contact with foreign scientists in the ALEPH group. Finally, in April 1983, the Chinese group led by Wu formally became a member of the ALEPH Collaboration. The Beijing ALEPH group was responsible for the construction of part of the detector for muons at the end cap, as well as the muon detectors for the entire outer layer. As of today, this is still one of the largest detector parts built in China for experiments carried out by an international collaboration.

Construction of detectors is merely a means, whereas physics research is the end objective. In a multi-national scientific collaboration, a computer network is essential for communication and data transfer. In 1985, Steinberger asked Wu to look into the feasibility of setting up a computer network between CERN and IHEP in Beijing, and he also requested that Dr. Palazzi of the data handling department at CERN work together with Wu.

Communication using computer network was in its infancy at that time, and in China only very few had realized its importance and potential. Therefore Wu encountered tremendous difficulties in his endeavor. There were not only technical difficulties, but also political, administrative, financial and conceptual ones. Would the political security department allow direct online communication with foreign countries? Would the primitive telecommunication system in China be able to handle the technical requirements? How would the expensive communication cost be paid? How to manage the network routing? All of these were difficult problems. Fortunately, the director of IHEP at that time, Professor Ye Minghan, strongly supported Wu's work, and his backing enabled the construction of the computer network to be included as an item in a nationally designated elite engineering project, the Beijing electron-positron collider (BEPS) and Beijing spectrometer (BES). Thus the development of the computer network was assured of political, personnel, and financial support.

The final arrangement made was as follows. A small shielded room in the BES building was provided to house a computer terminal, which served as a remote terminal. This terminal was connected to another computer at "710" Institute. The wireless connection was done by means of an ultrahigh microwave frequency communication device and the antenna on the rooftop of the main building of IHEP. This ultrahigh microwave frequency communication device had been first established and successfully tested between IHEP and the Institute of Hydroelectricity in July 1984 by Wu et al. The 710 Institute was connected to Vienna Broadcast Station in Austria via satellite and from there by telephone line to CERN. In setting up all these links, unforeseen problems arose at every step. For the installation and use of the ultrahigh frequency wireless communication device, approval had to be obtained from the committee on the management of wireless communication and also from various security departments. Harmonious coordination with 710 Institute, the Ministry of Post and Telecommunication, Vienna, CERN and numerous units, appears unimaginable even today, let alone during the time of a far less open era. How all these were achieved in the past is difficult even for Wu himself to recollect. Hard work does not disappoint those who are determined. Finally, on August 25, 1986, Wu sent the first e-mail from Beijing to Professor Steinberger at CERN using remote login mode.*

Of course, the first airplane built by the Wright Brothers was primitive and crude, but it did fly. Likewise, this first network was laughably slow. There was a time delay between when a key on the keyboard was struck, and the appearance of the alphabet on the screen. Nobody today would be able to accept that kind of speed. Nor can anyone remember the long e-mail address of IHEP. However, all these led China to the first step towards the internet world.

2. Participation in Making the First Atomic Bomb in China

Unusual history provided unusual opportunities for Wu.

In 1960, Wu had just turned 17 and graduated from high school with distinction, achieving full marks in all his subjects. Later, he excelled in the nation-wide university entrance examination, and was selected to study in the Soviet Union. At that time, for children of ordinary citizens to be picked to study in the Soviet Union, they had to be outstanding. Wu was one of those lucky ones.

While he was waiting excitedly for the start of a Russian language training course, strange things happened. Classmates had gradually began their new university classes. However, although it was then already September, there was no information about the Russian language training course. Not until in early October did Wu find out the reason. The plan to send students to the Soviet Union had been canceled for that year, in view of certain developments on the Soviet side. To study abroad was then such a sweet dream, and the dream was destroyed just like that for Wu. Soon afterward Wu and 14 other students who were supposed to be sent to the Soviet Union received a notification from the Department of Atomic Energy at Fudan University. These 15 students would form a special Section “Zero”. Each year, incoming students to the Department of Atomic Energy at Fudan were normally divided into four sections: two

*China Internet Network Information Center (CNNIC) recently updated their record of “milestones of early internet development in China” verified by a special committee which stated: On August 25, 1986, Weimin Wu from the Institute of High Energy Physics, Chinese Academy of Sciences, used a PC located in the Beijing Institute of Information to send an e-mail by remote login mode to Prof. Jack Steinberger (Nobel Laureate in Physics, 1988) at the European Center for Nuclear Research (CERN), Geneva, Switzerland. This is the first e-mail sent out from Mainland China as far as all records show.

specialized in nuclear physics, two in radiation chemistry. This Section "Zero" was then creating an atmosphere of mystery to the whole campus.

Events even more mysterious happened. Yang Xiguang, who at that time was the secretary of the party committee at the university as well as one of the party secretaries for the Shanghai city committee, called a meeting with Section "Zero". He announced a "special mission" and "special discipline" for them: participation in a research project to make China's first atomic bomb, and he issued strict orders to them to maintain absolute silence on this matter with their families, teachers and students at the university. In this manner, history engulfed these 15 teenage university students in a top secret national mission. During the day, they had to take classes like all other students. In the evening they went to a mysterious, white, large building in the Department of Atomic Energy to do research. Clearly they carried a heavy burden.

It is well-known that the principle involved in making an atomic bomb is simple, but the technical problems are complicated. For the chain reactions to reach the stage of an atomic explosion, enriched nuclear fuel is required. In natural uranium, ^{238}U is the main isotope. However, the isotope that is responsible for the chain reactions is ^{235}U, which only amounts to less than one percent in natural uranium. Therefore to make an atomic bomb, natural uranium must be enriched. An increasingly higher degree of enrichment will produce a bomb of more power, or one of a smaller physical size.

^{238}U and ^{235}U are very similar in physical and chemical properties; they differ only in the number of neutrons they contain. How to make natural uranium enriched in ^{235}U? This is a top secret. Some national laboratories and gas diffusion facilities in the United States were the pioneers in this kind of experiments. All those Chinese scientists returning from the Soviet Union knew was merely that the same technique was used in the Soviet Union. Perhaps at that time the gas diffusion method was the only one known in the industrial-scale enrichment of uranium. Not to be accused of "leaking secrets", we will sketch the method only briefly here.

Gasified uranium compound is made to pass through a chamber with a difference in pressure between the front and back sections. The chamber is separated into two parts in the middle by a permeable membrane. Since the atomic weight of ^{235}U is smaller, the probability of its transmission through the membrane is higher than that of ^{238}U. This separation is the first step towards enrichment. Repetitive application of this process eventually leads to the desired concentration of nuclear fuel. Therefore a crucial component in making an atomic bomb is the permeable membrane. Its quality determines the efficiency of the concentration process, which in turn determines the quality and quantity of the enriched uranium.

Two approaches were pursued by this secret research group in the Department of Atomic Energy at Fudan University. One used the powder metallurgy method, that is, particles of certain anti-corrosive, gasified metal of a certain size were sprayed onto another metallic membrane of a certain strength, density, and spacing under high pressure and high temperature. No theoretical calculation was available as a guide to fix all the parameters properly. Progress entirely depended on repeated trials, tests and measurement. The other approach was the chemical sedimentary method. A certain metallic compound underwent a chemical reaction to yield the metal as sediment. The sediment was then made to crystallize onto a certain metallic membrane, and further chemical and physical manipulation was applied. Of course there were many details involved. What has been sketched here is all within the scope of some articles in a popular science magazine. Nevertheless this already suffices to show the difficulty of this research. Wu participated in these two approaches at the same time.

Slightly more than a year later, good progress had been made in the research work. On the other hand, that was the beginning of the three-year period when China had severe famine. Universities began a policy to lessen the load of students. Those 15 students in Section "Zero" were attending classes during the day, and doing research at night, and were not even well-fed. After a year, most of those "genius" students began to have difficulty to keep pace in their studies with students from the other sections. Under these circumstances, Section "Zero" was disbanded. Those 15 students, originally destined to study in the Soviet Union, were then made to join the other four sections. Wu was assigned to Nuclear Physics Section 3, and started a normal university life. However, his experience during this period added a memorable chapter to his life. When the Chinese were elated at the announcement of the first atomic bomb test in 1964, Wu was wondering to himself whether the permeable membrane he was involved in its making was used. This is still a national secret, and thus remains a permanent puzzle for Wu. Now Wu is a resident and citizen of the United States, and he works in an American National Laboratory. Of course he has many opportunities to go to Oak Ridge National Laboratory for conferences. Somehow, he has never had the desire to go there. Let Oak Ridge, a name he had heard when he was 17, remain a puzzling place. He does not want to solve the puzzle, because puzzles make life more colorful.

3. Participation in the Launch of the First Artificial Satellite in China

In April 1970, the launch of the first artificial satellite in China was the second achievement in science and technology that shocked the world and brought glory to China. Wu was fortunate to be a participant in this project. His opportunity came again as a result of certain special historical events. Around the world today there are many leading high-energy physicists who have taken part in the development of atomic or hydrogen bombs. This is not surprising because high-energy physics was developed from the foundation of nuclear physics. On the other hand, guided missiles and artificial satellites are completely unrelated to atomic and hydrogen bombs. How did Wu get involved with guided missiles and artificial satellites? His experience during this period may be said to be a miniature picture of the many disastrous, sad, and terrible events which occurred in China at that time.

In 1965 at the age of twenty-one, Wu graduated from Fudan University as one of its youngest graduates. After sitting for the examination, he was accepted as a graduate student by the Department of Modern Physics at Lanzhou University. At that time, a directive of quality over quantity was in force, thus there were very few graduate students. It was estimated that between 1949 and 1965, the total accumulated number of graduate students in all disciplines in China was only a little over 5000. During the Cultural Revolution, graduate students were judged to be the top of the revisionism education pyramid, and they were important targets for the so-called "re-education" by workers, farmers, and soldiers. At the same time, the success rate of admission to graduate schools via examinations was perhaps only one in a hundred. This became a justification that those graduate students had to be seriously "re-educated". What a preposterous proposition!

After the break up in China-Soviet relations, most Chinese scientists returning from the Soviet Union, following Mao Zedong's directive of the so-called "3 lines construction", went to Lanzhou and some other places in the mountainous area far away from the coast. Lanzhou University became one of the Chinese centers and bases for nuclear research.

Wu left metropolitan Shanghai and went to Lanzhou which is surrounded by barren mountains. He was filled with excitement and hope for a brilliant career ahead. No one could foretell neither a "cultural" nor "revolutionary" disaster was soon to begin. Soon after his arrival as a graduate student, Wu was sent to the Dingxi mountainous region, one of the poorest areas in China. There he lived in a cave, isolated from the world, and worked as a shepherd.

Food consisted of potatoes and wild vegetation, and water was collected from the rain and snow. More than once he almost perished. In one dangerous situation, he had to escape from a predatory wolf. In another he was bitten by a shepherd dog and the swelling wound on his thigh caused serious infection. Amazingly he survived without any hygienic and medical care. Once he also survived from the collapse of the cave where he lived. Perhaps it was God's will to save this scientific genius for China.

Many talented persons in their prime were wasted, tortured and destroyed in this period of utter absurdity.

Later under the so-called "universities must carry on" guidance, the then frail and bony Wu returned to Lanzhou. His supervisor, Prof. Xu Gongou (who later became the president of Lanzhou University) was accused of being an authority in reactionary scholarship, and a landlord slipped through the net. He was assigned to clean toilets. "White" horror and "red" horror swept through Lanzhou, and all of China.

To control the chaotic situation, a military regiment was stationed in Lanzhou University. The leader was political commissar Wang Shaoren. He was de facto a scholarly officer, and he deeply appreciated talents. Soon he discovered Wu and his outstanding abilities. Although at that time Wu's parents were labeled as capitalists, Wang tried by all means to transfer Wu from the chaotic Lanzhou University to a better place.

In spite of Wang's best effort, however, in the end Wu was sent to the "corp of construction unit" under the so-called "re-education" policy. So instead of a shepherd's whip, he had a shovel for digging. All day long he had to handle bricks, cement, explosives and sand paste. One wonders what reeducation during the Cultural Revolution had done to Chinese scientists. It was one of the most terrible and dark eras in modern Chinese history.

A historical event near the end of 1969 brought opportunities. China was preparing to launch her first artificial satellite. However, there were very few technologists who were competent for this project. Wang Shaoren was once the political commissar at the data processing station at the base, and he immediately thought about Wu who was in the "construction unit". Even though Wu's background was in nuclear physics, and he had been isolated in remote regions and the Gobi desert for quite a few years, Wang had confidence in Wu's ability and solid foundation in physics, and he believed Wu could become familiar with the project quickly, and to fulfill his assigned duties.

In view of Wang's recommendation, Wu was appointed to do data telemetering analysis for the control system. He was responsible for the data processing of the control system of the last stage rocket which sends a satellite into its orbit. Its control system is very important with regard to various quantitative characteristics of the orbit. After merely a few months, Wu completed his assignment. In this historical event, there were reports of data processing and analysis signed by Wu. A certain instrument developed under his leadership was awarded the National Science Congress Prize in 1978, adding a perfect ending to that chapter of his life. Thenceforth his life would turn to a new page.

4. Observation of the First J/ψ Particle Produced in China

The National Science Congress held in 1978 resulted in the rejuvenation of science in a slumbering China. This ancient civilization was again aglow with youthfulness under the policy of the central government that "science and technology is number one for productivity", and "intellectuals are part of the working class". Under such circumstances, China decided to build a high energy accelerator. The initial plan was to build a 50 GeV proton synchrotron. Manpower is the deciding factor. The dream of previous generations of Chinese physicists to build an accelerator then depended on the present generation to realize. But in 1978, just after the Cultural Revolution, where could one find all the required personnel?

To fill the gap, several talented young physicists were recruited by the national planning committee, and Wu was one of them. Subsequent events had already been described at the beginning of this article. In the following let us turn to the Beijing spectrometer (BES).

Deng Xiaoping said China must have atomic bombs, hydrogen bombs, artificial satellites and guided missiles. Without these, a nation is a nobody in the world. And China must also be involved in high-energy physics, for China must have a place in the realm of high technology.

The revised plan for the advancement of high-energy physics in China settled on constructing an electron-positron collider in Beijing. Before 1985 Wu was only a group leader of the Chinese participation at ALEPH. He was not involved with the work at BES. Professor Xiao Jie, a consultant to the Beijing spectrometer, had realized that computer software, data collection and analysis were the weak points of the project at BES. He urged Wu to join the BES group. Professor Ye Minghan, the Director of IHEP and chief of BES, himself talked to Wu several times and even visited him at home. He wanted Wu to be a vice division director at the BES, in addition to his position at ALEPH. Wu would be in charge of the online data collection, and off-line data analysis.

The engineering work at the Beijing Electron-Positron Collider was essentially completed by October 1988. Commissioned runs were in progress, before the handover to the government. However, during the commissioned runs, the J/ψ particle, a benchmark for a successful run of BES, had not been observed.

The J/ψ particle was discovered in 1974 (Professor Samuel C. C. Ting was one of the discoverers, and was awarded the Nobel Prize for this discovery). If the construction and operation of BEPC and BES had satisfied the required specifications, the J/ψ particle should had been observed.

However, as Professor Ting said, in scientific and technological competition there is only a number one, but no number two. Being number two is effectively the loser. Nevertheless, a J/ψ particle observed at the BES would be a definitive manifestation of a successful operation.

The appointed date for delivery and inspection by the central government was fast approaching, but the J/ψ particle had still not been seen. Professor Ye, Professor Zheng Zhipeng, the division director of BES, and other leaders decided to adopt an intensified action plan. Division directors and section heads were divided into three shifts, working non-stop to find trouble and solve problems. One night Wu, as a deputy division director of BES and a section head Zhang Changchun were on night shift duty. Zhang once worked in Ting's Mark-J group (in Hamburg, Germany), and therefore was a physicist with the relevant training and experience. After inspection, he concluded that the reason for the failure to observe the J/ψ particle was that a certain crucial part of the spectrometer was not operating properly. Voltage had not been raised high enough to the trigger point. Wu agreed with his assessment. However, there was difficulty and risk in increasing the voltage. The quality of that crucial part was not very good, so higher voltage might cause some channels to break. The conventional thinking at that time was to exercise extreme caution — avoiding mistakes was preferred to making risky improvement. Therefore no one dared to increase the voltage. Wu told Zhang that the BES was meant for scientific work, and it was not an exhibition piece for the public. What was the use of operating the machine if it could not reach the trigger condition? That would be simply a waste of time and energy. Wu told Zhang to increase the voltage gradually, and he would take full responsibility. With this assurance, Zhang gradually increased the voltage until it finally reached the desired operating range. Though there were a few broken channels, that specific part did work properly and the trigger condition was achieved. By then it was well into the night. The first J/ψ particle produced in China at last appeared on the screen of the computer at 11.00 pm, 22 June 1989. Wu and Zhang recorded the event, and excitedly telephoned Zheng Zhipeng and Ye Minghan at home. Soon many experts rushed into the spectrometer operation control room, and confirmed the event recorded by Wu and Zhang. Wu recorded the experimental observation and process in the official log book and drafted a report to all the people in the institute. The next day, an air of celebration filled the whole of IHEP.

5. Digression (but not irrelevant)

Wu was lucky. Both due to a strange combination of circumstances, or occasional opportunities, he became the only Chinese to participate in three top scientific and technological projects — the atomic bomb, the artificial satellite, and high-energy physics.

Wu was also unlucky. He was born at the wrong time. According to Wu himself, as far as the three projects were concerned, all he did was to participate. He did not make any contribution that deserved praises. He said when one dies, it is best to leave a legacy. Newton's three laws, Einstein's theory of relativity …. These are the valuables left with the treasury of human knowledge. Even the completion of the first global computer communication network in China was something already done abroad, and was nothing to brag about.

Wu's real ideal is to seek answers to the most fundamental questions in the universe: what is matter? What is mass? What is electrical charge? Where do they come from? The adage "ten wise men cannot answer the question raised by a fool" comes to mind. We are now in the 21st century. The question "where does mass come from?" may seem stupid, but it remains a puzzle to the leading scientists of the world.

When Wu was 18, he wrote a paper entitled "On Zi and Dian". He proposed that all particles are made from two fundamental particles: one he called "Zi", the other "Dian". The fundamental particle "Dian" is the source of electrical charges, and it also provides the "electromagnetic mass". The fundamental particle "Zi" is the origin of "particles", and it provides the "gravitational mass". The two are connected by an unknown "field". All particles in the world are "composites" of these two fundamental particles.

Wu's paper came to the attention of his teacher Ni Guangjiong, who complimented him. Ni was the ex-director of the Institute of Theoretical Physics at Fudan University. In 1986, Ni encountered Wu at Uppsala, Sweden during the annual European High Energy Physics Conference. He attended a keynote talk by Wu presented on behalf of IHEP on the status report of BEPC and BES. This talk was one of the earliest presentations for BEPC and BES at an international conference, and hence it was in a way an announcement that China had then joined the international community of high-energy physics. At the conclusion of the talk, Wu received warm congratulations from the audience, including Nobel laureates and many world-renowned scientists, and directors of research institutes. Of course the honor belonged to the Institute of High Energy Physics, Beijing. Afterward, Ni wrote that in his decades of teaching, having taught more than a thousand students, Wu was among the best of them.

Just as Wu was ready to climb to the apex of science, overnight he was transformed from a graduate student into a shepherd, as described in a previous section. And also just at the time he was a shepherd, the quark model came to the world. According to this model, all hadrons are composed of three types of fundamental particles, called quarks. These quarks have definite mass and electrical charges. Many known particles at that time can be accounted for in this model. This success formed the basis of what is known today as the "Standard Model". When the J/ψ particle was discovered in 1974, the three-quark model required extension so the fourth quark (the c quark) was introduced. Later, a fifth quark (the b quark) and a sixth quark (the t quark) were discovered at Fermilab in the United States, where Wu is now. There the search for the Higgs boson, the only missing particle in the "Standard Model", is ongoing. Wu is fortunate again to be involved in the search for the Higgs boson.

Many Chinese have always raised the question why in all these years China has not produced a Nobel laureate whose scientific discoveries were made within the country. Readers naturally can find the unspoken answer from Wu's experience.

People have often asked Wu about his success. Wu's answer is "I am not successful, because I have not achieved much." Some have labeled Wu as a "prodigy", or "genius". Wu has always said he is not a genius at all, and at most he is merely a person of some ability. He frequently maintains that the objective of going to school is to learn how to learn. This is because the schooling period in life is so short, yet knowledge is without boundary. The important thing is to know the method of learning. Whatever is not known one can then proceed to learn by oneself. It is usually said that there is no poor student, only poor teachers. Wu thinks the opposite is true: there is no poor teacher, only poor students. There is some rationale in saying that Harvard is so good because it has the best students. In many of the scientific and technological projects in which Wu participated successfully, he was mostly learning on the job. His photography has won prizes in Europe. He has written numerous articles, novels, reports, and travel logs for newspapers and magazines. He performed in the “Yellow River Chorus” at the Chicago Symphony Hall. He was awarded medals in the sports meet at Fudan University. Some even claim that his cooking is better than the professionals. All his hobbies were also self-taught.

Wu was asked if he had thought about the Nobel Prize. He said he might have done so forty years ago, but no longer. T. D. Lee, C. N. Yang, S. C. C. Ting and others did their Nobel caliber work before their early thirties, whereas he only started his career as a high-energy physicist in his thirties due to the disruption caused by the “cultural revolution” in China, with even less preparation than a typical university student of that time. For him the Nobel Prize is a dream lost forever.

Wu likes to challenge issues described as “authority”, “number one”, “never happened before”, or “impossible”. At present he is in the CMS group, involved with the search of the Higgs boson, the last unfound particle in the Standard Model. Its discovery may lead to a Nobel Prize. As for Wu, he said “This is a great career, but for me it is also more a way of making a living.”

Wu’s remark carries a somewhat pessimistic tone. But facts may bear him out. China has a population of over one billion. There are plenty of talented persons. Many golden phoenixes have flown out even from remote and poor regions. Wu published a novel in 1986, with the title “The dark shadow of first love”. It is a story about his first lover. The story has a quiet beginning and a melancholy ending, and it has influenced his life profoundly. When Wu was in his teens, he knew a little about electromagnetism. He thought if one installed a generator at a wheel of an automobile, one could use the electricity for illumination. After he had learned some thermodynamics, he thought if a heavy ball was used as a valve for a high pressure chamber, then the ball would spring up if the pressure exceeded a certain limit, thus acting as a safety valve. When his teacher told him that all these had already been done, Wu felt as if he were hit by a staggering blow. After this incident, Wu swore that he must get to the unknown frontier. In fact, dark shadows are produced not only by sad first loves. The era that destroyed the talents of many also had cast a dark shadow over them for a lifetime. There is a lesson and enlightenment to be learned from the experience of this unusual person in the scientific world. We must appreciate talents, discover talents, nuture talents, and make use of talents. If science can have such a spring, a golden autumn with plenty of fruits will surely arrive!