Zhang, Yitang's life at Purdue (Jan. 1985-Dec, 1991)

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Dr. Zhang Yitang made a major advancement to the twin prime conjecture as verified by Prof. H. Iwaniec, a famous number theorist. This is a historic result. I congratulate Dr. Zhang, Yitang.

The concept of *prime nummbers* started with Greek mathematics. Euclid shown that there were infinitly many primes. We may view the integers as houses built on the integer spots on the real line, and put a light in every prime number houses. Then infinitely many houses are lighted (Euclidean theorem). What are the relations of all lighted houses? The most nature conjecture is that the prime numbers appear randomly. There is a surprising conjecture (The twin prime conjecture) states that there are infinitly many pairs (p, p+2) of houses are lighted. We can not find any trace of it in Euclidean books. Any way the conjecture might be thousand years old. If the twin prime conjecture is correct, then we may conclude that the integers are not constructed randomly. How strange. What Dr Zhang proved is that there is an n less than or equal to 70,000,000 such that p, p+n are lighted as primes.

Some people are curious about Yitang's life as a graduate student at Purdue University. As the thesis adviser of Dr. Zhang, I will share my memories of him.

1 China to USA

In the year 1984, a famous mathematician Prof S.S.Chern called Prof W.Y.Hsiang, Prof H.H.Wu of Berkeley, Prof Y.T.Siu of Harvard, Prof J.Morgan of Columbia and me to go to Beijing, China to teach a special summer school with graduate students the very best all over China. I was greatly honored by Prof Chern's call and worked a whole summer for Prof Chern's pet project and met several important young futere mathematicians as Dr S.W. Zhang, Dr Yitang Zhang, Dr. M.Chen etc.

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Certainly, we tried to move those talente graduate students to USA. People outside China knew nothing about their qualities. At that time, I was in the graduate committe of Math Department. I use my credit to convince my collegues to admit 10 of them to Purdue. Once they shown up and did excellent in the qualifying exams, and all doubts dispersed. After they shown up I adviced them to various professors at Purdue, then there is only one left with name Zhang, Yitang.

By the recommendations of Prof. Ding, Shihsun (an algebraist, President of Peking University) and Prof. Deng, D.G. (Chairman of Department of Mathematics, Peking University), Mr. Zhang was admitted to Purdue University as a graduate student in Jan, 1985. Prof. Ding, Shihsun specifically requested me to take care of Mr. Zhang. When he arrived, we had a cordial talk. Yitang expressed his desire to work in the field of Algebraic Geometry. I nodded while remembering the call of French mathematician Jean Dieudonné in the international conference at Purdue (it was to celebrate Louis de Brangles' result on Bieberbach's conjecture). Dieudonné said " You should go to the field of algebraic geometry − that is the future of mathematics" to several hundred analysts. Yitang also mentioned that he wanted to study under my guidance. Knowing that he had one published paper, and some training in the field of Analytic Number Theory under Prof. Pan (especially in the additive branch, where the central problem is the Goldbach conjecture), I was happy to have a talented student. I was surprised by Yitang's next request of working on the Jacobian conjecture as his thesis topic. I felt it was odd to select such a difficult task. After seeing his enthusiasm, I settled on it and did my best to guide him.

I thought Yitang as an ambitious, intelligent, and hard-working young man.

2 Education at Purdue

After we settled on his thesis topic, we met almost daily for a whole semester. Our discussions centered on my published paper

On the Jacobian conjecture and the configuration of roots. J. fur die Reine and angewandte Mathematik, 340, 1983, pp. 140-212

Sometimes, they lasted into the dawn. That was the essential part of Yitang's first semester at Purdue.

For the next two semesters, I organized a seminar with five graduate students (including Yitang) on Prof. Hironaka's monumental papers on

the theory of resolutions of singularities. I believed that we doubled the world population of those who had studied the papers after we finished two semesters. Prof. Grothendick once described those papers as among the most complicated thesises in the human history.

Upon completing three semesters of intensive work, I felt that I might not have done the right thing (I behaved too much like a modern day "tiger mother"); I should give him the space to grow. I then laid back and did not do any pushing. He would come to me once a week to talk, and I listened carefully. I told him my philosophy of Mathematics. I think that there are only good Mathematics and bad Mathematics. To find an original proof in a good Mathematics, one must use computatins to do experiments, then you need an insight. It is not wise to totally believe in the partial results of the past. For instance, if you want to work on the grand unification theory of Physics and totally trust Einstein's thesis on unified fields, then you are a fool. You have to look at the new evidents. For instance, my work on the Jacobian Conjecture is beautiful while a generalization to a pair of degrees less taht or equal to 1000 will require a lot more computations, hence will not work by itself. We need more experiments and insight. What I want you to learn from that paper is the methods of computations and the methods of doing experiments. Yitang spent all of his free time thinking of mathematics. After years, Yitang started to believe that he might have gotten a solution, one independent of my paper, to the Jacobian conjecture. As a gatekeeper of the palace of the Jacobian conjecture, I did my duty of examining every claim presented to me and denied the entrance of anybody (even if the claim has nothing to do with my work) if the proof was invalid. "Maybe the Jacobian conjecture is a problem for the future", I thought. In the year of 1991, his 7-th year at Purduei (which was the last year for Yitang at Purdue. according to school rules), I asked Yitang ito compose his Ph. D. thesis *Jacobian Conjecture and the Degree of Field Extension*(click to view) (Anybody's thesis is in the public domain. This thesis in in the Purdue Library). He presented it to the committee which consisted of myself as the chair, L. de Brangles, J. Lipman and W. Heinzer. His thesis passed the committee with flying colors.

3 Daily life

Some people believe that mathematicians are weird. I think differently. All the mathematicians I know are quite normal. Yitang was a normal person for those seven years at Purdue. He was elected the President of

the Chinese Student Club at Purdue University, and he discharged his duty responsibly and served his community well.

Yitang had some background in classical Chinese literature. Sometimes we talked about them. I mentioned to him a phrase of Confucius: "A person who knows a job is no match to a person who likes the job. A person who likes the job is no match to a person who enjoys the job. " I thought that applied to research very well. He agreed.

Sometimes I regreted not fixing him a job. But really, who could tell whether it was a good decision or not? Maybe it was his destiny to endure and turn out to be great. I indeed got a job for my first student at the end of 70's. Later when I my thoughts to my colleagues, they all laughed and told me that it was only normal of one who had taught in the long-gone 60's. The times changed at the late 70's when there was a new term and trend. It was the "tenure track" and that the students should look for jobs on their own. So after Yitang graduated, I told him the normal way of seeking jobs. When I looked into his eyes, I found a disturbing soul, a burning bush, an explorer who wanted to reach the north pole, a mountaineer who determined to scale Mt. Everest, and a traveler who would brave thunders and lightnings to reach his destination. Yitang never came back to me requesting recommendation letters. Apparently, he did not seek a job. Even to the date Yitang announced his monumental result I did not know what was the best for him. Though I was sure of one thing, − he could not survive the life of "tenure-track," "tenure," and "promotions". It was not his type. I regarded him as a free spirit, and I should let him fly. Yitang flew away after he told me that he was going to Rutgers University to talk to Prof. Iwaniec. I bade him good luck. That was almost 22 years ago.

4 Epilogue

There are some questions as to if my paper on the Jacobian Conjecture is correct. I will state reasons why that the paper is correct. In the year 1984, Prof. M. Miyanishi (the Provost of Osaka Universaity) and Prof. S.S.S.Wang (Oakland University) visited Purdue University for one semester for the purpose of studying this paper on the Jacobian conjecture. After one semester seminar, they comfirmed the paper. About 10 years after the publication of my paper, another mathematician published a paper that obtained the same results as mine using a completely different method. In fact, anybody who thinks that there is an error in my paper is welcomed to publish a paper to point it out.

One should not overlook the tenure system in the USA. It might not be suitable for some participants, but it fits most situations.

The year 1985 was extremely difficult for the students from mainland China, they were unknown and without credits. I was the few professors who had personal contacts with them, I had taught the previous summer in the Peking University and had a vivid inpression of them. The mission of education is to spread the knowledge everywhere. It is the noble American spirit. For some 10 years, I had recommended 100 mainland Chinese students to the department and all accepted by the department. I am always indebt to the trust of my judgements by the department. **Only very few of them misbehaved, bit the hands which fed them, none of them murdered their parents/friends, almost all of them performed well and became well-liked.** I was happy that my recommendations brought fruits. Since than, due to the good office of Purdue administration, my friend Mr Lam donated a fund to a fellowship "T.T.Moh fellowship" in my name, I was greatly honored, for the students from mainland China. So far we only used the interests of it, and Mr Lam promised to continue donations until 2020.

Reference;

Prime time, Insight, the official magazine of the Science College of Purdue University(click to view)