Jenna Alderton

EIGHT

A Slow Start With a Promising End

"It was a certainly a slow boat to United States," jokes Tsu-ming Han as he reminisces his long journey from China to the U.S. back in the December of 1948. It had been a slow journey by boat, twenty-two days from Shanghai through Hong Kong and Manila and ending in San Fransisco.

Mr. Han came to the United States at the age of twenty-two or twenty-three for advanced education. Because he was a major in geology, his field was Economic Geology and he was very much interested in studying ore deposits. With a degree from the University of Minnesota, Mr. Han moved to the Upper Peninsula to seek a career. With the setback of his financial support being totally cut off by the Chinese Communist Government, he was offered and accepted a summer job, reccomended by his supervising professor G.M. Schwartz as an assistant to Mr. Burt Boyum. At that time, Boyum was assistant Chief Geologist of the Cleveland Cliffs Iron Company. At the end of that summer, Mr. Han was asked back as a permanent employee, and he accepted.

To this day, Mr. Han has worked in the Research Laboratory across the street from the Bell Memorial Hospital in Ishpeming, Michigan. He is officialy retired, but he still goes to work everyday.

Mr. Han is presently in charge of the mineralogical section at the research lab. Of his duties, first is the routine work

such as the evaluation of crude ores from different land-offers, outside explorations, and the evaluation of individual projects. Another responsibility of his is to study the efficiency of the concentration products, studying the effects of the textural and mineralogical
transformation of pellets during the pellitizing process on the quality of the final product. The second component of his duties is unroutine work. This covers the investigation of plant operating and product quality problems. In this connection, each problem involves a specific set of circumstances and conditions. In other words, the plant operators find the problem, and Mr. Han identifies the cause of the problem. These problems might be labeled as "big" or plant threatening problems.

Mr. Han tells me the cause of most of the problems that have occured at the plant have been identified. He also tells me that some cannot be solved because of the intimate association of minerals, such as TiO2. Some problems are very difficult to solve economically because of the ultrfine mineral texture, which is mostly finer than five microns. Some Problems are currently unsolved due to the mineral physical and chemical properties. But in order for the problem to be solved, the mineral would need to be changed or destroyed. The most difficult part of his job is to create ideas
toward the investigation and solution of the problem. "My most challenging duty was to find the cause of the poor separation between the ore minerals and the waste occuring at the Tilden during the 1970's." This was a serious problem which had caused panis throughout the CCI management. Through Mr. Han's investigation, he discovered that the cause of the poor

metallurgical separation was due to the presence of small amounts of Montimorillonitic Clay in one part of the ore body. Although this clay is not visible to the naked eye, it can be detected by a method invented by Mr. Han. It is referred to as the "Shake Test." Further research is needed for processing this ore, which is unable to be mined.

Mr. Han's job title was senior research scientist and he states that "curiosity was and still is the driving force for me to conduct my research." This is probably one main reason why he has been so successful.

"My biggest responsibility was how to improve the physical and chemical quality of the final pellet product, and how to find the cause of metallurgical problems, occasionally occuring at the plant." Through visual and microscopical examination, they try to search for a solution on the basis of reasonable scientific interpretations. Mr. Han says nowadays, people trust and emphasize the numbers too much and overlook the observation and examination.

In order to know the cause of the problem, one should examine the products, just like when a doctor wants to know the patient's discomfort, he has to know the chemistry of the blood,but must also examine the patient thoroughly to look for signs and symptoms.

At the research lab, they use a variety of equipment to investigate a problem. For instance, when Mr. Han needs to identify a mineral, he would use an x-ray differation, electron microscope, differential thermal analysis, and a light microscope. In order to determine the physical and thermal properties of minerals and pellets, he uses high temperature

furnaces, differential thermal analysis and thermal gravimetrical analysis, which are often referred to as DTA and TGA. In order to identify minerals and their textural relationships, Mr. Han would use a light microscope.

Over the years, Mr. Han has implemented many new programs and has won some special awards. Back in 1974, Mr. Han was visiting the Empire Mine with a doctor from the United States Geological Survey when he noticed a piece of rock with a fossil liking material. However, Mr. Han did not believe that it was a fossil because it was an iron formation too early for any leavings. Ten years later, a Mr. Bob Burklin stumbled upon a piece of rock with the same fossil material as the one found in '74. Burklin then gave it to another man who let Mr. Han examine it. Mr. Han was very much interested in studying this kind of geological feature. So after close examination, he came to the conclusion that the iron formation found in 1974 was actually a fossil. Mr. Han found this fascinating, therefore everytime he went to the pit, in addition to his regular work he would keep his eyes open in case he found this certain material. On a Saturday at about 1:30 in the afternoon, in the fall of 1990, his searching yielded results. He was leaving the pit, when he stumbled upon a light area located on the eastern wall. He pulled his truck over and walked towards the wall to examine it. That was when he located the actualfossil itself. Through the identification of the ore formation and the age of the ore formation found at the Empire in 1974, the fossil was estimated to about 2.1 billion years old. The 2.1 billion year old fossil was a krypania, which is a type of algae, so the fossil has no formal name but is referred to as algae. Though this is not his proudest discovery, I am truly

amazed. It's hard for me as a student to imagine something this amazing being discovered in a land once known as "A Frozen Wasteland!"

I asked Mr. Han in his own opinion, what the future may hold for the Tilden and Empire Mines. His response did not come as a total shock to me. He told me he thinks both the Tilden and Empire have their own separate problems.

The Empire will face the beneficiation of the harder and fine-grained ore types. Higher cost for treating this ore is expected.

The Tilden has wide variations of ore types and extensive research is definitely needed for processing some of these. If no research is undertaken sometime in the near future, this ore will be wasted and unable to be mined. In short, Mr. Han believes both the Tilden and Empire will continue in operation for years to come. However, the operating costs will continuously increase due to future technology.

Mr. Han stated,"it seems to me that the success of CCI is attributed to the following: one, CCI is the only iron ore merchant where the others are mostly owned by steel companies. Second, CCI is not only a partial owner, but also a manager of the operating mines. Three, CCI has had a strong management and a group of technical staff dedicated to the iron ore mining. And four, CCI owns a lot of ore reserves in the Marquette district." This was his opinion about the key to the success of CCI.

CCI is the manager of different mines owned by CCI and many steel companies in separate locations. Therefore, most of the product produced is directly shipped to these respective companies. However, in order for CCI to remain competitive, the

product being shipped must meet the chemical and physical quality requirements that these companies demand. Hence, in order to satisfy the customers demand and to be able to meet this demand, high technology research must constantly be conducted at the research lab. Research such as the evaluation of the physical quality of pellets by tumble and compression, and the chemical and physical quality under the reducing conditions by testing at different reducing environments, such as low temperature breakdown, reducibility, high temperature melting, and so forth. In short, the technology for steelmaking advances. The quality of the raw material applied by CCI has to be improved accordingly through research. If the required steps for improving this, the pellets could very well be replaced by metallic iron sometime in the near future.

As the educating man that Mr. Han is, I thought it would be interesting to ask what advice he would give the students of today.
So I did. Mr. Han suggested that students should understand the principle and fundamentals of learning, and should try your best ability to recieve an advanced degree, permitting students to work with their head instead of their hands. One should not center on one's own interest but rather think about one's future job and income and in order to get ahead of one's profession one should try to create opportunity rather than wait for it. But, the most important thing of all is to get along and work well with other people.

My interview with Tsu-ming Han has certainly changed my perspective of the technical side of mining. I never realized how much science and research was involved in the mining

industry. I guess with my former knowledge on mining, I always took for granted that mining was more of a "hands on" than a "heads on" career.