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The East-West Dialogue on Engineering Education in the 21st Century*

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At the turn of the Century, some critics may speculate on an era of Asia-Pacific nations in the 21st Century. On the other hand, world trends move us increasingly towards globalisation. There have been a variety of educational exchanges between the East and the West in the past, but nothing notable in respect to engineering education. This paper intends to review the differences between the East and the West from the points of view of language, culture and modern technology. The semantic or linguistic system based on alphabetical pronunciation of the West and that based on ideographic or hieroglyphics of the East are compared in their basic structure and learning aspects to cognitive effects. The paper presents many issues and concepts concerning similarities and differences between East and West that may have tremendous implications on engineering education.

BACKGROUND

There are certain connections, if not evidence, between the linguistic system and conceptual fitness for engineering education. However, it is proposed that more rigorous statistical tests should be designed and conducted in the future to substantiate such connections. The cultural impact on education or engineering education is now more evidenced. In the East, Confucian teachings have been highly regarded as the pragmatic and basic precepts for an individual, a family, a society and a government to follow ethically and virtuously. Unfortunately, Confucianism in China has been misused or exploited by the rulers in power to become critically labelled as *anti-science* and *anti-democracy*.

In this era of advanced technology, engineering education is confronted with another setback: computer software that is built on alphabetical structure and logic gives Eastern students an extra burden in learning. Eastern characters are far from becoming a software language, regardless of the fact that today Chinese characters and Kan-ji can be processed quite effectively with the help of large memory chips and large hard disk capacity. It is concluded that the rapid rate of business globalisation and the fast growing cyberspace communication have sped up the East-West dialogue and cultural exchange and blending in recent years.

More direct dialogue and an exchange of experiences between the East and West on engineering education may be promoted to further bridge the gap and bring us to a common ground of enlightenment in the 21st Century.

INTRODUCTION

Historically on this planet, there has been the East and the West, and each took its own path and developed its own distinct cultures. It is quite strange and amazing to notice that many phenomena on this planet and in the universe are polarised into positive and negative, and so too have been the East and the West for many centuries.

Yet while the universe has been expanding, our planet has been shrinking. In this new century, globalisation is not just an idea, it has become a reality. Our ways of life and of doing business have changed because of globalisation. Similarly the old mindset of the polarised East versus West needs a good re-examination and constant dialogue.

To write about the East versus West dialogue on any topic is by no means a simple or clear-cut task. The topic of engineering education is no exception.

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The pros and cons of the Eastern versus Western styles of education have been debated at length for some time. The author was educated in the engineering disciplines in Taiwan, and then in the United States, and has also worked in industry and academies in both places for a length of time.

In this paper, he intends to describe and analyse educational concepts, systems and problems stemming from his observations and experience. Most observations concern general educational problems, but some are directly related to engineering education. Due to the limited space of this paper, more weight and information are put on the East, yet whenever possible some Western viewpoints are mentioned for comparison.

Among many issues and questions of interest we chose only three areas of concern in this paper. These are:

- Language system and impact: ideographic versus alphabetical language systems and their built-in thought patterns.
- Confucius and cultural impact: the historical development of Confucianism in Eastern countries and Confucianism's impact on political, cultural and educational aspects.
- Electronic and high tech impact: new approaches to engineering education following the electronic and information revolution. The language system in the East has caused problems in the course of catching up with the West.

LANGUAGE SYSTEM AND IMPACT

In East Asian countries, such as China, Korea, Japan and Taiwan, a population of almost two billion uses the Chinese script system or its derivatives, which are based on ideographs or hieroglyphics. Most scripts or characters today still can be traced back to picture forms or abstract symbols. There are pronunciation rules for each character, but the application of rules is not as straightforward as for the alphabetical systems of Western countries. Additionally, there are so-called tones or sound inflections and variations on top of already complicated pronunciation rules.

Consequently, the Western alphabetical system can be compared to a one-dimensional serial transmission of audio bits, whereas the Eastern ideographic system is analogous to a two-dimensional parallel or matrix transmission of video bits. The Western learning method relies more on hearing than on seeing, while in Eastern character systems the recognition of two-dimensional pictures prevails over the distinction of sounds among characters. It is no wonder that the writing system is more or less unified but that the pronunciation system is a matter of many thousands of varieties. A study has shown that there are more than 600 dialects within the province of Fu-Jien in China, but they all share the same writing or character system [1]. The following examples may help explain the above points of view.

In Chinese Mandarin there are many words having the same pronunciation as for the word *engineering*, as follows:

- Kung-Cheng (工程): engineering
- Kung-Cheng (功成): to succeed in a work or project.
- Kung-Cheng (工承): to accept or undertake a project.
- Kung-Cheng (恭呈): to submit (a letter or report) with respect.
- Kung-Cheng (攻城): to attack a city or castle.

Another example is the expression for *physics*:

- Wu-Li (物理): energy and principles of matter.
- Wu-Li (吾理): my reason, my way of doing.
- Wu-Li (無理): nonsense, unreasonable.
- Wu-Li (誤理): misleading theory, misunderstanding reason.
- Wu-Li (悟理): enlightenment, understanding through inspiration [2].

Whether such fundamental differences in semantic structure between the East and the West should give students any advantages or disadvantages in the course of learning or thinking are quite open for discussion. Especially in engineering education, which requires in general good graphic recognition and spatial perception, the ideographic system of the East may give students an extra edge. On the other hand, in today's computer age, almost everything from software language and logic to the digitised scheme of processing and transmitting data depends heavily on the alphabetical concept of words and images. In this aspect, students in the West seem to have the upper hand.

In the past, psychological and educational studies have examined the learning processes of children in regard to their cultural background, in particular their native tongue or linguistic system [2][3]. Their conclusions are mixed. Generally, the picture-based approach of teaching languages promotes faster learning for younger children, but not necessarily so for older children.

However, few, if any, studies have been directed to the more specific focus here: the impact on

engineering education. Such studies should be conducted for both high school and college students independently in two different environments - even with cross interactions between them - in order to obtain more meaningful conclusions. The sampling of students in such studies must be carefully grouped and selected so that a meaningful statistical comparison between the two environments may be obtained.

Based on the author's experience and observations at both Eastern and Western environments, students who are educated with ideographic characters feel more comfortable with math than with computer software. Comparing two groups of Asian students in the USA, the author noticed a rather apparent contrast between these two groups as far as their academic performance and career development were concerned. One group (group A) consisted of those who were born in the USA and educated all the way with the alphabetical language system, while the other group (group B) consisted of those who were born and educated for at least six years in Taiwan before moving to the USA.

In their SAT tests, group A performed very well in the verbal test but not as well in the math test; whereas group B was generally outstanding in math but not as good in the verbal portion. Career-wise, group A seemed to outpace group B in creativity and leadership. It should be noted that the author's observations are based on a sporadic sampling of the age group between 25 and 35 and of both science/engineering and arts/business oriented students.

To have a more persuasive and reliable conclusion in the future, it is proposed that a more thorough study be undertaken with pre-designed sampling schemes and test questionnaires for both groups and at more locations besides the USA, including Taiwan, Korea, Japan, Hong Kong or China.

It should be pointed out again that the ideographic languages of the East require a longer time to learn than do the alphabetical or phonetic languages of the West. Generally speaking, students in the West require only about two years of learning to be able to read some simple books. But students in the East are less fortunate as most children take at least four or five years to recognise enough characters to read simple books. It can be speculated that the greater burden of language learning may hinder students from learning science and engineering earlier. In this aspect, basic math learning seems to be less affected.

In spite of using drastically fewer Chinese characters (called Kan-ji) in written Japanese because of having adapted 50 alphabet characters (called Katakana) many centuries ago, Japan still felt the burden of their younger students of learning too many Kan-ji characters. Having considered the pros and cons for a number of years, the Japanese government decided over ten years ago to limit the number of Chinese characters to somewhere between 400 and 450 from nearly 1000 for elementary school textbooks.

With the Communist takeover of China in 1949, a set of simplified Chinese characters called Jian-ti-zu, was designed by scholars and enforced by law to be used in schools, in the media and in publishing firms. China claimed that in doing so it had reduced its illiteracy rate significantly over the years.

In Korea, an even more drastic measure was taken more than five centuries ago, mainly for reasons of national and cultural pride, and secondly for easing the burden of language learning. In 1446, King Sejong declared the use of new scripts called Hangul, which is still an ideographic form composed of some basic symbols. But the use of Hangul was not popular at all until after World War II when the government promoted it with full steam.

In short, the ideographic characters of the East still prevail in several Far Eastern countries. The merit of learning languages through graphic and symbolic icons does have its modern and scientific ramifications. However, the cost and burden of learning many thousands of Chinese characters and tens of thousands of phrases are a fact of life in China and Taiwan. To science and engineering students the burden is even heavier, for they need to prepare themselves to have a high proficiency in English before entering the science and engineering curriculum, as most science and engineering textbooks and papers are still written in English.

In Hong Kong, Singapore and even India, English speaking and writing for historical reasons are more popular than in China, Taiwan, Japan or Korea. It is observed that a much higher number of instructors from the West teach science and engineering in English in these countries. Students in these pro-English countries also grasp science and engineering concepts with greater ease and speed compared to students in the non-English Asian countries. The trend of globalisation may help somewhat, but Taiwan still ponders how to balance engineering education with the burdens and merits of the language system, as well as how to balance global with national responsibilities.

CONFUCIUS AND CULTURAL IMPACT

Another factor that also plays a large role in cultural differences is the influence of Confucian teachings and folk religions in Eastern countries as opposed to that of the Judeo-Christian culture of the West.

Confucian teachings dating back over two thousand years have an undisputed place in, and have been absorbed into, many aspects of the cultural fabrics in China, Japan, Korea and Taiwan. The plural term Confucian teachings is used here to include more than the teaching of Confucius himself. The teachings of his disciples, such as Mencius, and other scholars, such as Lao-tsu, Chuang-tsu and Xun-tsu, are all included and interwoven together. In China, as a whole they are called the Ju-Chia Thoughts or Confucianism.

Confucianism is documented as the Five Classics and the Four Books. The former includes one in rituals, two in history, one in poetry, and one in cosmology and divination known as the Book of Change (I-Ching). The latter was put together in the 12th Century AD to include the sayings of Confucius and Mencius plus two selections that deal with human nature and moral development [5]. These nine books were believed to contain the basic precepts for an individual to lead a moral life, for a family to hold a hierarchical bond, and for a government to rule a nation with justice and dignity. Later in the 15th Century, the Four Books and Five Classics became the basis for the state examinations required for government services.

The Four Ethical Principles and Eight Cardinal Virtues form the keywords of Confucianism. The Four Principles are:

- Courtesy (Li)
- Righteousness (I)
- Integrity (Lian)
- Sense of honour (Chu)

The Eight Virtues are comprised of:

- Loyalty (Tsung)
- Filiation (Shiau)
- Humanity (Jen)
- Love (Ai)
- Trustworthiness (Hsin)
- Justice (I)
- Harmony
- Peace (Ho-Ping)

It should be noted that the word righteousness or justice appears in both the Four Principles and Eight Virtues to stress its extraordinary importance. Also, both humanity and love bind together as a complete virtue to emphasise the importance of applying or practicing love in human relationships. In fact, humanity-love and righteousness-justice are also the two basic ingredients of Judeo-Christian teachings. While the Confucian virtues are regarded on a purely pragmatic, non-religious level, the Judeo-Christian views of love and righteousness extends beyond the earthly domain to a greater love and greater righteousness in the heavenly or God-level domain.

In traditional or ancient China, Confucius was considered a great educator and scholar. It was about 80 years ago that Confucianism started to face strong challenges. During the famous May 4th Movement of 1919, in which the main issue was China's backwardness in science and democracy, Confucianism was singled out as the major target of criticism and was branded as anti-scientific and anti-democratic.

In Japan, Confucianism has somehow mixed with Buddhism and became packaged into the form of Zen for many centuries. Zen is known to be a practice of attaining enlightenment by constant and direct intuition through meditation. Japan adopted favourable parts of Confucianism and made it somewhat mystical and justified within their political structure. In other words, they upgraded Confucianism to a religious level just as the West fortified its social virtues with Judeo-Christian sacraments.

Taiwan stays at a more conservative side than China and Japan. People maintain an old and a traditional view that Confucius was a great educator and scholar of the ages. Though there are some Confucian temples in Taiwan, they are just monumental buildings and nothing mystical in the eyes of people. Each year, the government sets aside September 28 as a national holiday, called Teachers Day, to commemorate Confucius and to emphasise the importance of the Four Ethical Principles and the Eight Cardinal Virtues.

With the above background, it is intended to answer the question of whether Confucianism has spurred or hindered the students of the East in the course of pursuing engineering education. The following points can be considered.

The Many Faces of Confucianism

Over the centuries, China, Japan, Korea and Taiwan have become quite different in their degrees of acceptance or assimilation of Confucianism. At one extremity, China has become strongly anti-Confucianism under the Communist regime, while Taiwan has been a strong fortress for Confucianism. Japan has developed its own mode of Buddhism called Zen, which has a strong flavour of Confucianism. Korea, driven by its strong sense of nationalism, struggled to be independent of both China and Japan in cultural aspects, and became apathetic of Confucianism.

In spite of some disintegration of Confucianism in these Eastern countries, the roots of the Confucianism are still eminent and inherent in upholding a high social value in education. Parents are strong support-

ers for their children's education. They are willing to sacrifice their own happiness to push their children through the college door. One may argue that Confucianism is still worth preserving for its effect on social stability. However, the same stability and high emphasis on academics, combined with the Confucian ideals of respect for authority both in the political and academic realms, can hinder students' creativity and imaginative powers.

It should be remarked here that many Eastern educated students master the ability to perform well on certain kinds of tests; they memorise or utilise and return required information. However, the ability to write creatively, for example, or to question taught material does not seem to be as encouraged or developed.

The Reshuffling of Social Castes: the Rise of the Engineering Image

The May 4th Movement in China in 1919 was a landmark for promoting science and democracy, and also for anti-Confucianism. Confucianism is known to contain teachings that strongly advocate loyalty to the ruler or the authority, hence it is considered to be anti-democratic. It is also responsible for setting social castes in the order of: scholars or officials, peasants, workers, and merchants. In terms of modern professional terminology, the order can be: government, agriculture (farming), industry (engineering), and business (trading). Such social castes are to blame for what had been the value system in China and Taiwan in the past that promoted government officials and debased engineers and tradesmen. The promotion of government officials to the same social position as scholars was not quite the original idea of Confucius and had been a misleading concept no longer justifiable in modern egalitarian societies.

The Confucian castes were reshuffled as early as the famed Boxer Uprising of 1898 to 1901. In the wake of China's disastrous defeat by foreign arms and technologies, a new order of values emerged in China. For the first time in the history of China, there was a slim hope that science and engineering might begin to win social respect.

Freedom and Science

In the history of humankind, great scientists have almost been synonymous with advocators of freedom. A scientist is born to be a seeker and teller of the truth. A scientist is also a proponent for freedom, for without freedom there is no freethinking or studying of new ideas. Galileo Galilei of the 16th Century was put under a permanent house arrest until his death for upholding findings that contradicted church dogma. During the World War II, many scientists fled Germany and Italy to the USA or Great Britain; Albert Einstein was one of them. After World War II, more scientists escaped from the Iron Curtain to the free world for the freedom to seek the truth and for freedom of speech.

During the 1950s and 1960s, a series of political upheavals in China, Taiwan, Korea and Vietnam drove thousands of high-calibre scientists and students out of their countries and resulted in a serious brain drain in those areas. During that long period of political turmoil in the Far East, educational impetus was lost, and engineering education was pushed to a back seat. The more recent Tiananmen Square incident of 1989 also forced many dissident scientists out of China; amongst them was the brilliant astrophysicist, Prof. Fang Lizhi.

From Lu Xun to Bo Yang: Self Criticisms

The root of the Confucianism was shaken both in China and Taiwan as a young generation of writers openly challenged the historical bondages of Confucianism. Their writings unleashed the energy of free speech and free thinking which can pave the way for greater creativity in engineering education in the future.

Lu Xun, a pseudonym of Zhou Shuren, was once a devoted Confucian student who turned into a great writer of modern China during the 1900-1930s. Most of his writings carried political or revolutionary sentiment, and thus were confiscated by the government, then the Nationalist (KMT) regime. One of his long remembered novels was the *True Story of Ah Q*, which described the 1911 revolution of Sun Yat-sen as a muddled and inconclusive event because of the ignorance of the cultural backwardness and moral cowardice of the majority of Chinese.

Another great writer of more recent times was Bo Yang, who was born in China, but fled to Taiwan at the time the Nationalists lost the Mainland to the Communists in 1949. One of his books was *The Ugly Chinaman*, written in 1984 in Taiwan;

> *Narrow-mindedness and a lack of altruism can produce an unbalanced personality which constantly wavers between two extremes: a chronic feeling of inferiority, and extreme arrogance. In his inferiority, a Chinese person is a slave; in his arrogance, he is a tyrant. Rarely does he or she have a healthy sense of self-respect. In the inferiority mode, everyone else is better than he is, and the closer he gets to people*

with influence, the wider his smile becomes. Similarly, in the arrogant mode, no other human being on earth is worth the time of day. The result of these extremes is a strange animal with a split personality [5][6].

The above viewpoints may have gone beyond the scope of the original subject: engineering education. Nevertheless, it is hoped that together they touch upon, and give the reader, a feel for the complex and far reaching ways in which Confucianism has shaped the East. Like all things, one can see both good and bad. Consider the simple example of a knife. Depending on its users, it may become a useful kitchen knife for cutting all sorts of food; it may be used by a thief to hurt or threaten somebody during robbery; it also can be used in a battlefield for fighting the enemy.

China was bound too long by its caste system, suffering delays in scientific and engineering development and contributions to society for more than two centuries. During the period from the 18th to mid-20th Century, the West made significant progress in science and engineering, and took a big lead ahead of the East.

ELECTRONIC AND HIGH TECH IMPACT

Having considered some long-term and deeply rooted problems that have undermined some Eastern countries in science and engineering education, the more recent and rapid impact of today must be confronted. This covers the electronic and high tech revolution that has swept across the West and the East during the past 20 to 30 years.

As a result of the discovery of the transistor in 1947 and of microprocessors in 1970s, the electronic revolution has knocked on the door of every house and has entered everyday life. Its impact on engineering education has been immense.

Never in the history of engineering education have educators felt the need for reform to be so urgent and so prioritised. Some problems encountered in the past include:

- Electronics courses have become the core of engineering curricula. A shortage of good teachers for electronic courses is a problem found virtually everywhere.
- The trend of electrical and electronic engineering and computer science courses/instructors moving from schools of engineering to form new schools of electrical/electronic and computer engineering have strained the business operations of engineering schools.
- Rapid computerisation followed by the digitisation of business transactions once paralysed business operations in the East. This was partly due to problems in supplying enough hardware and also partly due to inadequate input and output systems for ideographic characters.
- International electronic mail has become a trend in recent years, quickly displacing facsimile or paper mail. Again, the question of language usage in e-mail became a point of discussion. In the display or printing of Chinese ideograms, each character has its own bit maps and codes; thus Eastern languages require a tremendous amount of memory space to store and are inherently unsuitable for software programming. However, thanks to high-density memory chips and hard disks generally available in recent years, the processing of Chinese characters via English software has become much more efficient today.
- Engineering education faces not only the challenges of globalisation and rapid technological change, but also the need to employ more cyberspace communication. There is increasing demand to pack more teaching into shorter hours and to foster more extensive interaction between schools and industries. In this new century, the growth of engineering education may be measured by how effective cyberspace teaching can be accomplished between schools and industries and also amongst schools.
- In East Asia, countries that are of pro-English usage, such as Hong Kong, Singapore and India, have a higher percentage of invited Western scholars or instructors who teach directly in English to engineering students. Should other countries in the East such as Taiwan, Japan and China follow suit in order to be competent in this era of globalisation?

This section has dealt with some problems that are common to both, exclusive to each, and also related to West-East interactions. During the past quarter century, the East caught up from far behind with the West amazingly well. Japan took the lead; then Taiwan, Korea, Hong Kong and Singapore followed suit, and finally so has China. It should be noted that in the East, industry was fortunate enough to catch up with the West so long as enough capital and worker-power were invested and long working hours imposed. On the other hand, engineering education operates in a different way. It is not just a matter of capital (money) and worker-power (teachers and students) alone; it requires time and good guiding policies and cooperation with industry.

The language factor also plays an important role in this section. In terms of electronic cyberspace technology and computer language and logic, Chinese characters are considered as impossibly foreign. The Eastern countries that use Chinese characters should pay a price in order to be competitive in the world of cutting edge technology. However, in preserving their cultural resources, they are always at a disadvantage.

CONCLUSION AND REMARKS

This paper limited itself to examining the East-West dialogue on engineering education. The paper also focused on three major aspects of language or linguistic aspects; cultural or Confucian impacts on the East; and the electronic revolution and globalisation. Based on many years of observations and experience in education and industry in both Taiwan and the USA, the author attempted his exploration into these three areas. The following viewpoints are summarised:

- There are fundamental differences in semantic structures between the ideographic characters of the East and the alphabetical phonetics of the West. Generally speaking, it is easier and faster for students to learn to read an alphabetical language than one with ideographic characters.
- The learning of an ideographic system may help in engineering education, which requires a good perception of graphic recognition and spatial imagination. On the other hand, the time taken in learning such a system may also hinder students in their learning of other disciplines.
- Throughout the years, Chinese characters have been variously simplified (in China), modified (in Korea) or reduced in number (in Japan) towards the common goal of simpler learning and communication.
- Computer software built on an alphabetical structure and logic gives students in the West the upper hand in learning and design. As of today, Chinese characters and Japanese Kan-ji can be processed quite efficiently due to the availability of large memory chips and large hard disk capacity, but are still far from becoming a software language.
- Confucianism is deeply rooted in the history, culture and even politics of many Eastern countries. However, the degree of influence varies significantly from country to country. Confucianism has indirectly and, for most part, adversely affected science and engineering development in Eastern countries in varying degrees.
- In Taiwan, Confucius remains respected as the greatest educator over the ages. The mentality of family entrepreneurship is a modern concept of Confucian teachings. Obedience and respect for superiors and parents, and loyalty to friends are hallmarks of Taiwanese society.
- While the 3-C (Computer, Communication and Commerce) technologies and industry have brought much economic fortune to Eastern countries, they also have challenged engineering education to reform accordingly to keep up the pace.
- In this age of cyberspace, engineering education is at the forefront to forge new and creative schemes or strategies that can in the future serve as paradigms for other fields.
- Despite inherent handicaps in the initial stages of the race, mainly due to its language system and secondly due to its late start, the East has caught up amazingly well and has become globally competent.

On the surface the East and the West seem to have gone their own ways linguistically and culturally. But more careful observation and analysis should show that they are actually complementary to each other. Be they sheltered under the influence of Confucianism or the Judeo-Christian culture, they have both embraced the power and potential of humanity, love, righteousness, justice, harmony and peace. Be they educated and immersed in the system of ideographic characters or alphabetical phonetics, they both have conceived truth (knowledge and science), goodness, and the beauty of life.

Resolving language differences seemed to be amongst the toughest barriers for globalisation, but soon this will be overcome by the creation of a new language of business in the 21st Century [9]. Such a new language goes beyond today's most popular English, and encompasses personal, social, business and cultural literacy. It should convey a richer, more global and more imaginative communication that deepens our perspective and broadens our horizons [9].

As the world population has grown larger, technology as well as humanity has shortened the distance of communication. While the West shared its prize in scientific and engineering achievements with the East; the East shared its pride of natural harmony and spiritual enlightenment with the West. In the 21st Century, the blending of East and West and the integration of foreign experiences into one's own is the future direction.

Indeed, as the world becomes more global and borderless, knowledge will become more interdisciplinary, and electronic communications will glide across

language and cultural barriers. The line that has divided science and engineering from arts, literature and humanity will become thinner and blurred. As Albert Einstein once remarked: *not everything that's important can be counted, and not everything that can be counted is important* [8][9].

Eastern philosophy has always been known to be more mystical and even incomprehensible. But more dialogue between the East and the West should bridge the gap to reach the common ground of enlightenment. Such knowledge of enlightenment is mostly intangible, yet more valuable than physical objects

The ultimate goal of scientific or religious searching is to uncover the truth of existence and to share the peace and hope of being in harmony with the nature. It is appropriate to quote what Dr Chen-Ning Yang, a Novel laureate of physics in 1957, during an interview with Bill Moyer:

> *Poetry is a condensation of thought. And when you do this, it becomes a beautiful poetry. It becomes very powerful poetry. The scientific equations we seek are the poetry of nature* [11].

A bridge between the East and the West can be found through a metaphysical connection or dialogue. It seems as if the East looks through a mirror a vague image from afar and calls it the West, and likewise so does the West and calls its mirror image the East. They both wonder why the right is the left and the left is the right with respect to the image. However, the closer they walk towards each other, and the more they communicate with each other, the clearer becomes their mirror image. Eventually, each finds itself in its own mirror image. The mystical East finally meets the adventurous West and both finds each other complementary.

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BIOGRAPHY

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For more than 30 years, he has devoted himself to electronic connector and interconnection technology and has authored many papers and several patents in this field. In 1993, he founded the Taiwan Electronic Connector Association (TECA), which is now an organisation of more than 80 corporate members. He has also served as a Research Member of the Science and Technology Advisory Group under the Executive Yuan of the Government, and as a Consultant Member for the Industrial Technology Research Institute (ITRI).

In recent years, Dr Lee has become engaged in research activities related to nano-structured materials, and conducted an International Symposium on Nano-Structured and Amorphous Materials in April 2000. Since 1999, Dr Lee has been contributing papers to UICEE-run conferences.