

# I-CHING PHILOSOPHY AND PHYSICS

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I-Ching is a book containing an explanation of the entire laws of the universe by which everything is governed, and carries explicit directions on how men should conduct themselves in order to remain continually in harmony within these laws. In this talk, after reviewing the short history, the basic structure and the philosophical meaning of the I-Ching, I try to find out some relationship to physics, and to suggest a simple prescription for the future science.

## 1. INTRODUCTION

Within both the modern physics and the Eastern philosophy we realized that all natural phenomena in this world of change and transformation are dynamically interrelated[8]. Especially, emphasizing movement and change, Chinese philosophy has developed the concept of dynamic patterns which are continually formed and dissolved again in the cosmic flow of the Tao. The **I-Ching** has elaborated these patterns into a system of archetypal symbols, the so-called Trigrams and Hexagrams [1-5].

The ancient Eastern scholars contemplated the cosmos in a way comparable to that of the modern physicists, who cannot deny that their model of the universe is a decidedly psychophysical structure. The microphysical event includes the observer just as much as the reality underlying the I-Ching comprises subjective, i.e., psychic conditions in the totality of the momentary situation. Now the 64 Hexagrams of the I-Ching become the instrument by which the meaning of the 64 different yet typical situations can be determined. Therefore, for someone who likes to look at the world at the angle from which the ancient Eastern scholars saw it, the I-Ching may have some attraction.

From this point of view, the connection between the I-Ching and physics is not only very profoundly interesting but also extremely important.

This talk is organized as followings: in Chapter 2, the history and the structure of I-Ching are systematically reviewed, and in Chapter 3, the philosophical concepts of the I-Ching, including the **T'ai Chi T'u** doctrine and the Huangguk Kyongse s'ul are discussed. Some physical concepts of I-Ching are described, and the possible relations between both concepts are derived in Chapter 4. Finally the concluding remarks including a new paradigm for the future science will be given in Chapter 5.

## 2. HISTORY AND STRUCTURE OF I-CHING

The I-Ching, usually called the “**Book of Changes**”, is one of the oldest and the most important literature of the Chinese classics. Its original structure is made up of the famous Eight Trigrams (Pa Kua), consisting of eight combinations of three straight lines by the **Yin Hsiao** ( ☷ ) and **Yang Hsiao** ( ☰ ), and the eight trigrams are arranged at each point on the octagon. Originally, according to the Supreme Ultimate a simple line symbolizing the

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positing of Oneness ( — ) produce the two modes Yin and Yang. The basic ordering principle of the patterns in the



Through the Four Hsiang, there arise the Eight Trigrams, each made up of combinations of three divided or undivided lines [1-5]:



Each trigram has its own name and property, and the trigrams are considered to represent all possible cosmic, natural, and human situations, as shown in the [table 1](#) [3-5]. They were associated with many images taken from nature and from social life. They were also associated with the cardinal points and with the seasons of the year. Thus, the Eight Trigrams are grouped around a circle in the natural order in which they were generated, starting from the top (where the Eastern people always place the south) and placing the first four trigrams on the left-hand side of the circle, the second four on the right-hand side. This arrangement shows a high degree of symmetry, opposite trigrams having yin and yang lines interchanged. The objects or attributes thus symbolized by the Eight Trigrams are made the constituents of the universe, which form the basis of a cosmological system elaborated by the Han Dynasty scholars in connection with the **Theory of Five States** (or Five Elements).

**Table 1. Fu Hsi's Eight Trigrams**

order	symbols	directions	trigrams	attributes	natural objects	family	symbolic animals
1	☰	S.	Ch'ien	strength	Heaven	father	horse
2	☱	S.E.	Tui	pleasure	marsh	youngest daughter	sheep
3	☲	E.	Li	brightness	fire/sun	second daughter	pheasant
4	☵	N.E.	Chen	movement	thunder	oldest son	dragon
5	☴	S.W.	Sun	penetration	wood/wind	oldest daughter	fowl
6	☳	W.	K'an	danger	water/moon	second son	pig
7	☶	N.W.	Ken	stand-still	mountain	youngest son	dog
8	☷	N.	K'un	docility	Earth	mother	ox

By combining any two of these trigrams to form a diagram of six lines, a total of sixty-four combinations is obtained, known as the Sixty-four Hexagrams, as shown in [table 2](#) [3-5]. The Sixty-four Hexagrams are arranged usually in two kinds of pattern: ① a square of eight times eight hexagrams, and ② a circular sequence showing the same symmetry as the circular

arrangement of the trigrams by the so-called “*One-fixed Eight-changed principle*”. The Sixty-four Hexagrams are the cosmic archetypes on which sometime the use of the I-Ching as an oracle book is based. For the interpretation of any hexagram, the various meanings of its two trigrams have to be taken into account.

**Table 2. Key for identifying the 64 Hexagrams made up by combining two Trigrams. The numbers indicate orders of 64 Hexagrams.**

Upper trigram Lower trigram ↕	Ch'ien ☰	Tui ☷	Li ☲	Chen ☳	Sun ☴	K'an ☵	K'en ☶	K'un ☷
Ch'ien ☰	1	43	14	34	9	5	26	11
Tui ☷	10	58	38	54	61	60	41	19
Li ☲	13	49	30	55	37	63	22	36
Chen ☳	25	17	21	51	42	3	27	24
Sun ☴	44	28	50	32	57	48	18	46
K'an ☵	6	47	64	40	59	29	4	7
K'en ☶	33	31	56	62	53	39	52	15
K'un ☷	12	45	35	16	20	8	23	2

In the I-Ching, the trigrams and hexagrams represent all the possible patterns which are generated by the dynamic interaction of the Yin and Yang, and are reflected in all cosmic and human situations. All things and situations are in a state of continual transition; one changing into another, the solid lines pushing outwards and breaking in two, the broken lines pushing inwards and growing together. Therefore, the Eight Trigrams, together with the Sixty-four Hexagrams represent all the possible situations and mutations of creation, and universe in miniature. This offers a good illustration of the transformation from simplicity to complexity.

In Chinese literature, the Book of Changes had been completed through almost 3,000 years by four holy men, namely, Fu Hsi, King Wen, Chou Kung, and Confucius about 2,500 years ago. The a priori Eight Trigrams and the Sixty-four Hexagrams were invented by the mythological Emperor **Fu Hsi** (~B.C. 3,500?) on the basis of the Yellow River Map, and the a posteriori Eight Trigrams and the Sixty-four Hexagrams were formulated on the basis of the Writing from the River Lo by **King Wen**, one of the founders of the Chou Dynasty (1150-249 B.C.) [3-5].

The T'uan (Judgments) for each Hexagram of the Sixty-four Hexagrams was attributed traditionally to King Wen, and the 384 Hsiao-Tz'u (Appended Judgments) was attributed traditionally to his son Chou Kung (Duke of Chou). This is to show that these trigrams and hexagrams first received systematic treatment at the hands of King Wen and Chou Kung, and that they then become the basis of metaphysics and occultism as set forth in the I-Ching.

After reading the King Wen-Chou Kung version of the I-Ching through his life, **Confucius** (551-479 B.C.) had completed it by adding the supplementary commentaries and appendices, known as the Ten Wings. The first of these constitutes the Treatise on the T'uan (T'uan Chuan), which uses the structure of the individual hexagrams to interpret their Judgments. The second

one constitutes the Treatise on the symbols (Hsiang Chuan), which interprets 384 Hsiao as well as 64 Hexagrams. The third and fourth, known as the explanations of the Words and Sentences (Wen Yen), deals with the first two hexagrams, Ch'ien and K'un, in connection with "*man's nature and doings*". The fifth and sixth, both consisting of twelve short chapters, constitute the Commentary on the Appended Judgments (Hsi Tz'u Chuan), deal with the fundamental ideas of the basic trigrams as well as those of the hexagrams [4-5].

The seventh appendix, the Discourses on the Trigrams (Shuo Kua), consists of eleven short chapters and deals with the symbolic correlations in regard to the system and content of the I-Ching as a whole. It also describes the properties of the a priori and the a posteriori Eight Trigrams, and the principle of changes of Yin-Yang and the five states.

The eighth and ninth constitute the Treatise on the Sequence of the Hexagrams (Hsu Kua), intending to trace the connection of meaning between them in the order in which they follow one another in the text. The last one constitutes the Miscellaneous Remarks on the Hexagrams (**Tsa Kua**), and intended to define each of the 64 Hexagrams in the reversed order.

These appendices offer various interpretations of the Kua as well as of their separate Hsiao. In the modern edition the first four appendices are included in the main text, and the remaining six are left at the end of the text. After the completion of the I-Ching by Confucius around B.C. 500, the contents of the text have been not changed at all. In the Sung Dynasty (A.D. 960-1279) the I-Ching was reinterpreted and used as the bases of Huangguk Kyongse s'ul, the T'ai Chi T'u doctrine and the **Hsing Li Hak**, developed by the six sages such as **So-ong** (A.D. 1011-1077), **Chou Tun-i** (A.D. 1017-1073), **Chu Hsi** (A.D. 1130-1200), and so on. Thereafter they have become the main stream of the Chinese philosophy [4-7].

Almost nine hundred years later, **Lee Dal** (Ya-San: A.D. 1889-1958), who was a secluded unknown scholar in South Korea, has analyzed systematically the I-Ching and made for one to understand obviously the basic principles and the concepts of it. Modifying the Chou Tun-i's T'ai Chi T'u doctrine and the So-ong's Huangguk Kyongse s'ul, he has developed the Sam-g'uk doctrine (3 Chi T'u) and Kyongwon s'ul [4-5].

### 3. THE BASIC CONCEPTS OF I-CHING

The I-Ching or the Book of Changes describes metaphysics connected with the universe and the natural phenomena (e.g. time of day, seasons, weather, family relations, personal relations, etc.), the T'ai Chi principle, the relativity principle, the experimental basis of classical Eastern philosophy, and the bases for meditation and practical guidance on the everyday problems of life. The I-Ching is often called **Chou-y'ok**, in which the word "*Chou*" in Chinese has three meanings: ① Chou Dynasty, ② circle or circumference, and ③ all around or universally, and also the word "*Y'ok*" has various meanings: ① combination of sun and moon, ② shape of a lizard changing its colour twelve times a day, ③ periodic changes, and ④ simplicity (in this case "*Y'ok*" is pronounced as "*T*"), and so on.

Sometimes the I-Ching itself contains three different names: Byun-Y'ok, B'ul-Y'ok, and K'an-I, which represent their own properties relating to each other. Byun-Y'ok means the changes of universe, and describes the physical harmonic motions. B'ul-Y'ok means the unchangeability corresponding to the universality in physics. K'an-I means to understand easily the universal laws by which everything is governed, and it is associated with the simplicity in physics [5].

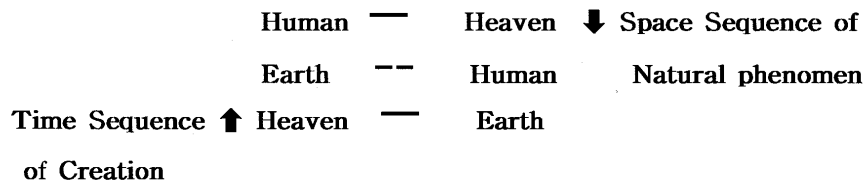
The numbers appeared as a pattern of points on the Yellow River Map, which were used to make the Fu Hsi's Eight Trigrams, are 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, in which 1, 2, 3, 4, 5 are called the basic numbers, and 6, 7, 8, 9, 10 the derived numbers. There are three Yang numbers: 1, 3, 5, and two Yin numbers: 2, 4, in the basic numbers. This classification provides

the theory of Sam-Ch'ien Y'ang-Ji (means three Yang — two Yin or three Heavens — two Earths). The points in the pattern are distributed on the rectangular plane in pairs: (1,6:N), (2,7:S), (3,8:W), (4,9:E), and (5,10: Center) [4,5]. It seems to be considered that Fu Hsi might devised three kinds of Heaven in the universe, and two kinds of Earth in the world. Moreover, he might thought that the productive theory of Five-State-Changes can be produced through the interplay between Yin and Yang, and that this theory is operated in the left-handed change (frame?). Finally, from these assumptions (?) Fu Hsi invented his Eight Trigrams.

On the other hand, the numbers appeared on the Writing from the River Lo, which were used to make the King Wen's Eight Trigrams, are 1, 2, 3, 4, 5, 6, 7, 8, 9, which are distributed in the  $(3 \times 3)$  matrix pattern, in which all the sum of each row or colum or diagonal iare 15, being equal to the sum of Fu Hsi's basic numbers. From this right-handed change, King Wen invented the destructive theory of Five-State-Changes by considering the confliction between Yin and Yang [4,5].

Now, we may understand the meaning of a trigram in the I-Ching by watching at the following diagrams and table [4,5]:

● **Sequential order of Hsiao**



● **Sequence of Numbers:**

$2^0$	$2^1$	$2^2$	$2^3$	$2^3 \cdot 2^3$
(T'ai Chi)	(Yin-Yang)	(Four Hsiang)	(Trigram)	(Hexagram)
(1 pole)	(2 Y'i)	(4 Images)	(8 Kua)	(64 Kua)

● **Structure of Hexagram:**

≡ Double Trigrams

≡ Two Primary Trigrams(Upper/Outer; Lower/Inner)

<b>Upper (Outer)</b> <b>Kua</b>	—	Top line(Top nine Hsiao)	<b>Heaven</b>
	--	5th line(Six five Hsiao)	
	—	4th line(nine four Hsiao)	<b>Human</b>
<b>Lower (Inner)</b> <b>Kua</b>	—	3rd line(Nine three Hsiao)	
	—	2nd line(Nine two Hsiao)	<b>Earth</b>
	--	First line(First six Hsiao)	

Here, **Yang Hsiao** ( ) is called as “Nine”, and **Yin Hsiao** ( ) as “six”. Each pair of the neighboring lines like (first, 2-nd), (2-nd, 3-rd), (3-rd, 4-th), (5-th, top),  $\delta\delta\delta\delta$  interacts under the complementarity relation, and also each pair of the corresponding lines between the Upper and the Lower Kua interplays under the correspondence relation. The Sixty-Four Hexagrams are classified into only 8 nonreversible hexagrams and 28 reversible hexagrams making  $56(= 28 \times 2)$  hexagrams, and there are total  $384(= 64 \times 6)$  Hsiao, interpreted by Chou Kung (Duke of King Wen).

According to the T'ai Chi T'u doctrine, which was originally invented by Chu Tun-i, and recently modified by Lee Ya-San, there exist three Chis (Sam-G'uk): ① Vacuum Chi, ② Yin-Yang Chi, and ③ Yin-Yang Chi with Center Seed, associated with Sam-Ch'ien (three Heavens) [4,5].

Huangguk Kyongse s'ul, which was invented by So-Ong, and also modified recently by Lee Ya-San, describes the time structure of Universe with one period of 129,600 years, by comparing to the pulse-breath numbers (129,600#/day) of human activity [4,5]. The theory of Yin-Yang-Five-States-Changes in I-Ching asserts that one period of human life should be exactly 60 years, which has been confirmed by human biorythm early in 20 century.

Hsing-Li Hs'ueh, started originally by Chu Hsi, contains three concepts: ① Chi-ji non (epistemology), ② Li-ch'i non (ontology), ③ Ch'ien-tao non (cosmology), has been developed and brought forth the Sirhak (positivism) in Korea at the mid of 16 century. The Sirhak has been developed by several Korean scholars: **Yi T'oegye** (A.D. 1501-1570), **Yi Yulgok** (A.D. 1536-1584), **Chung Tasan** (A.D. 1762-1836), etc. and constituted one of the main streams of Korean modern philosophy [7].

#### 4. THE PHYSICAL CONCEPTS OF I-CHING

As discussed in Chapter 3, the I-Ching contains three different characters: Byun-Y'ok representing the periodic changes of in the Universe can be corresponded to the harmonic motions treated in mechanics, and B'ul-Y'ok, indicating the unchangability of cosmic laws by the symmetric patterns of the I-Ching, can be associated with the universality or the basic principles, the conservation laws, and the unified field theories in physics. K'an-I meaning to understand easily the cosmic laws can be related to the simplicity which is very important concept to develop any equation of motion or theory in physics. Using these concepts Fritjof Capra tried to explore the parallels between modern physics and Eastern Mysticism in his book: "*The Tao of Physics*" (Shambhala, 1975,1991) [8]. He explains the meson and baryon octets as well as the baryon decuplet by using the symmetric pattern in the I-Ching. It will also be possible that all the particle multiplets, including  $SU(4)$  multiplets for the pseudoscalar and vector mesons, and the baryons made of u-, d-, s-, c-quarks, could be explained [9,10].

The essential concepts of I-Ching are considered to be the theory of Sam-Ch'ien Y'ang-Ji and the theory of Yin-Yang Five-States-Changes, which are represented schematically and systematically in the Eight Trigrams and the Sixty-Four Hexagrams, as discussed already. Here, Sam-Ch'ien means that there exist three kinds of Heaven, associated with the physical heavens in brackets as followings: Li-Ch'ien (heaven), Ch'i-Ch'ien (sky), and Sang-Ch'ien (space). It also represents three substances such as (Heaven, Earth, Human), (solid, liquid, gas), (father, child, mother), (The Father, The Son, The Spirit), (animals, plants, inanimates), and  $((e, \mu, \tau), (\nu_e, \nu_\mu, \nu_\tau))$  [9,10], etc.. Thus, the "3" is the essential and very important number in physics as well as I-Ching [4,5].

The theory of the productive Five-States-Changes is operating through the natural left-handed process [4,5]:

Water  $\Rightarrow$  Wood  $\Rightarrow$  Fire  $\Rightarrow$  Earth(Soil)  $\Rightarrow$  Metal  $\Rightarrow$  Water

and the destructive one is operating through the reducing right-handed process:

Water  $\Rightarrow$  Fire  $\Rightarrow$  Metal  $\Rightarrow$  Wood  $\Rightarrow$  Earth (soil)  $\Rightarrow$  Water

The interactions not only between Yin and Yang but also between the five elements are taking place by exchanging something, called as Ch'ung-Ch'i by **Lao Tzu** (~550 B.C.), which is well known as the gauge particles in the particle physics. Using a hint obtained from Lao Tzu's Ch'ung-Ch'i, Yukawa Hideki formulated his famous meson theory to explain the nuclear force.

In Chapter 3, we reviewed the structure of a Hexagram consisting of six Hsiao, and recognized that there are the complementarity relations between the two neighboring Hsiao, and also the correspondence relations for each pair Hsiao between the Outer and Inner Kuas. It is needless to say that these correspond explicitly to the complementarity principle and the correspondence principle in modern physics, respectively. Further more, the three generations of lepton family and quark family and the lepto-quark family can be matched with the structure of Hexagram in which we can also realize the perturbation effects compared with those in quantum mechanics.

By combining the Sam-Ch'ien Yan-Ji, the T'ai Chi T'u doctrine and the theory of Yin-Yang Five-States-Changes, it may be possible to build any model for describing the structure of Universe and the structural frame of the  $SU(n)$  multiplets made up of the known quarks[10]. Recently, T'ai Chi T'u doctrine is reinterpreted by using an analogy with the simple harmonic motion in physics, and this idea is yielded to devise the so-called Ch'i Physics. The Si-Sang (Time Image) in the Huangguk Kyongse s'ul can be expressed as an equation by the aid of Hsing-Li Hs'ueh, Sirhak, and matheatics.

## 5. THE CONCLUDING REMARKS

In this talk, I reviewed the history and the structure of the Eight Trigrams and the Sixty-Four Hexagrams, and then, discussed both the philosophical and the physical concepts in order to find out some connections between the I-Ching and Physics by considering the basic principles of Kua structure and the philosophical concepts of the I-Ching.

By comparing both concepts, the derived corresponding physical concepts are summarized as followings:

- ① Trigrams (three generations) for Leptons and Quarks.
- ② Hexagrams for the Lepto-quark systems.
- ③ Eight Trigrams and Sixty-four Hexagrams for  $SU(n)$  multiplets.
- ④ Symmetric patterns of Trigrams and Hexagrams for conservation laws through the invariance principles.
- ⑤ Yin-Yang Five-States-Changes for QED, QCD, and mass spectra.
- ⑥ Yin-Yang duality for Wavicles and relativity.
- ⑦ Complementarity relations in Hexagrams for complementarity principle.
- ⑧ Interplay of Ch'ien-gan Ji-ji for biorythms in everything.
- ⑨ Oracle of I-Ching for estimation of physical interactions (perturbation).
- ⑩ Ch'i-physics for extension of sciences.
- ⑪ Hsing-Li Hs'ueh and T'ai Chi T'u doctrine and Huangguk Kyongse S'ul for the cosmic model.

According to the I-Ching [4,5], there a turning point changing Hsien-t'ien (World of Thought/A priori World) to Hou-t'ien (World of the Senses/A posteriori World), and they say that we are now just at Hou-t'ien. It is told that the turning point was on 1948 year, and thus, we have passed that point half century ago.

I am sure for the 21 century and a new millennium that all the human beings hope and wish to enjoy happily their own life in an Utopia. But, science and technology has been advanced greatly, and then established the so-called high-tech societies, even so as the time goes on, the societies become complicated more and more. Therefore, the human species are losing our own humanity and the Utopia which we really hope to establish goes far away. Why? Because we lost the balance and harmony in our lives. Now, we should stand on the balance with a new readiness and a new perception to recover this unbalanced society. How?

Concluding my talk I propose for the next millennium a simple prescription that the Western science and the Eastern philosophy should be harmonized and synchronized by comparing and matching with their independently obtained consequences through the understanding each other.

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