Stephen E. McKenna and Victor H. Mair **A reordering of the hexa-grams of the I Ching**

INTRODUCTION

The importance of the *I Ching*[a], or *Book of Changes*, in Chinese philosophy cannot be overemphasized. It represents a unique attempt to create a totally abstract representation of the real world. The sixty-four hexagrams contained therein cover all possible situations which can arise,[1] and they, along with the interpretations attached to them, must be thought of as a system.

Most studies of the *I Ching* have focused attention on the interpretations attached to the individual hexagrams, but some consideration has been given to the overall structure, and the relationships among the hexagrams. Since the significance of each hexagram should become clearer in the light of that hexagram's position in the overall structure, this is obviously not an unimportant field of study. Blofeld sensed this when he stated that, "If, in dealing with any hexagram, we glance at those immediately before and after it, we shall be able to evaluate the total situation more effectively."[2] But this presupposes that the hexagrams be arranged in a logically meaningful sequence.

The purpose of this article is to discuss briefly orderings of the hexagrams which have been previously put forward, and to present one of our own making, hopefully showing its validity as a useful tool to understand better the hexagrams. This new ordering was devised under our belief that an ordering ought to exist which follows a logical system of development, both in geometrical appearance and in the interpretations attached to the hexagrams.

PREVIOUS ORDERINGS OF THE HEXAGRAMS

To discuss the factors which contributed to the making of this ordering, it is first necessary to review certain previously suggested ordering systems.

One factor which has commonly appeared is the idea of arranging the hexagrams in pairs. Two main methods of doing so were used. One was the *ch'ien-kua*[b] in which each hexagram was paired with the one into which it would change if turned upside down (that is, "inversion"). The other was the *p'ang-t'ung*[c] in which two hexagrams are paired if they are opposites line for line, so that each position occupied by a strong (undivided) line in one hexagram is occupied by a weak (divided) line in the other (that is, "opposition"). Thus the hexagram *Kou*, Coming to Meet, is paired with

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Kuai, Breakthrough, by *ch'ien-kua*, and with *Fu*, Return, by *p'ang-t'ung*.[3]

	Ch'ien-kua	P'ang-t'ung
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Kou 姤	*Kuai* 夬	*Fu* 復

The ordering which presently appears in the *Book of Changes* is the so-called Chou ordering, traditionally attributed to the founder of the Chou, King Wen. If he was in fact the author, that would date the ordering to about 1150 B.C. Kuo Mo-jo[d], however, has presented evidence to date the text of the *Book of Changes* to the middle of the Spring and Autumn period, around 600 B.C.[4] The "Ten Wings," of course, date from an even later period.[5] In any case, it is clear that a different ordering was in use prior to it. Judging from the available evidence, Arthur Waley's opinion that "The text was probably cut up and shuffled a good many times before it reached its present order"[6] seems well grounded. The *Li chi* records that Confucius found a volume dating from Shang (1766–1112 B.C.) times called the *K'un-ch'ien*[x].

Confucius said: "I wished to observe the way of the Hsia dynasty and, for that reason, went to Ch'i.[7] Though it did not fulfill my expectations,[8] I did obtain the *Hsia Calendar*. I wished to observe the way of the Shang dynasty and, for that reason, went to Sung.[9] Though it did not fulfill my expectations, I did obtain the *K'un-ch'ien*.[10] Thus did I observe[11] the way of the Hsia and the way of the Shang by means of the intervals of the *Hsia Calendar* and the meanings of the *K'un-ch'ien*."[12]

This title, *K'un-ch'ien*, is composed of the first two hexagrams in the Chou ordering, but in the reverse order.[13] In fact it is not surprising that this should be the case, since early Chinese thought gave precedence to the feminine (*yin*[au]) force, and the hexagram *K'un* is made up entirely of divided lines, representing the *yin*.[14] The Chou dynasty was the most strongly patriarchal society to appear in China up to that time, so the reversal of this fundamental precedence would be expected if in fact King Wen was responsible for the reordering. If, as Kuo Mo-jo asserts, the present version was established after Confucius, it is equally understandable that it has an even stronger patriarchal impress.

Aside from this reversal of the precedence of the two basic hexagrams, there is only one apparent logical factor in the ordering, that of pairing. Most of the hexagrams are paired according to the *ch'ien-kua* method. There are, however, eight hexagrams which remain unchanged when turned upside down; these are arranged into pairs by *p'ang-t'ung*. There appears to be no logical reason behind the progression from one pair to the next.

Among the Ten Wings is an appendix, the *Hsü kua*[ay] ("The Sequence of the Hexagrams") which attempts to explain the progression in ideas from one

hexagram to the next. Fung Yu-lan lamely tries to justify the ordering which it presents:

> There must be some reason for arranging the hexagrams in this way rather than in another, that is to say, the arrangement must presuppose some idea, unless the hexagrams were simply put together at random. A little study, however, will show that it is improbable that the hexagrams were put together simply at random. So to the arrangement of the hexagrams, we have to give some interpretation. *The interpretation given in this chapter seems to be rather artifical*, yet in the main it is an interesting interpretation, and an old one.[15]

Richard Wilhelm calls the ordering "unconvincing,"[16] and James Legge comments, "The connexion between any two is generally sufficiently close; but on the whole the essays ... resemble 'a heap of orient pearls at random strung'."[17] The Chin[az] dynasty commentary of Han K'ang-po[ba] observes that "Whatever the *Hsü kua* may shed light upon, it is not the secrets of the *Changes*. Rather, following the order of the hexagrams, it makes a pretense of explaining the meaning.... This is due to sticking too closely to the text and not ferreting out the real meaning, falling instead far short of it."[18] Finally, it is curious to note that the *Hsü kua* sometimes explains the hexagrams in a way that is impossible to justify from the main text.

The first true attempt at a logical ordering of the hexagrams[19] was that of Shao Yung[bc] (1011–1077) in the Sung dynasty, often noted as a historical anomaly. Shao Yung started with the two single lines, strong and weak. Then he produced the four possible two-lined figures, by adding on first a strong, then a weak line to each. In this way he developed a chart of all sixty-four hexagrams. The first four steps are shown here.
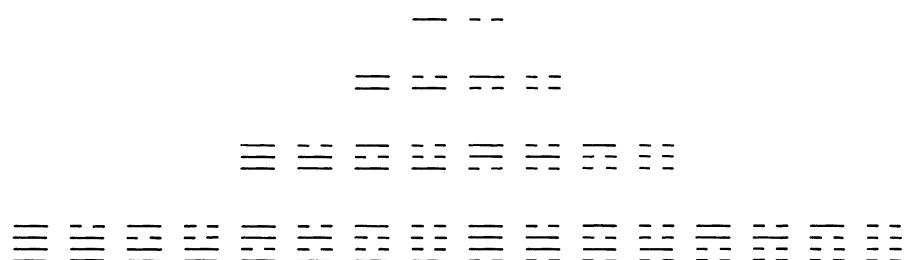
This ordering system corresponds almost perfectly with the binary number system invented by Leibniz six centuries later.[20] The binary system is very much like our normal decimal number system except that, instead of ten digits, 0–9, there are only two, 0 and 1. Thus the sequence goes: 0, 1, 10, 11, 100, 101, 110, 111, 1000, etc. Shao Yung's ordering system was brought to Leibniz' attention by Father Joachim Bouvet, a Jesuit missionary in China. Because he was unsure whether to read left to right or vice versa, Leibniz made the mistake of thinking that the order started with *K'un* and finished with *Ch'ien*. By identifying the divided lines with 0's and the undivided with 1's, he matched Shao Yung's ordering to his own binary system.

In his philosophy, Leibniz identified 0 with the nothingness of unformed Chaos and 1 with God. He felt that Shao Yung's ordering system showed the development from the one to the other, and in fact recommended using the system for purposes of evangelization. At that time there was a common tendency for missionaries in China to try to present the Christian God as something which was not foreign to Chinese thought, and attempts to identify Him with Tao were common.

The Shao Yung-Leibniz ordering system is mathematically logical in the progression from one hexagram to the next; it is not logical, however, in its progression from one interpretation to the next. When the situations described by the hexagrams are viewed in this order, the development from one to the next seems to follow no pattern at all.

THE DEVELOPMENT OF THE PROPOSED ORDERING

In seeking a logical ordering system, we began by looking at the way in which one hexagram becomes another by "moving lines." A moving line is a line which is so strong that it changes to its opposite. In a very strong hexagram, all the lines would be moving lines, and in many cases it is easy to see how the situation represented by a hexagram could change into that represented by its *p'ang-t'ung* opposite. We arranged the hexagrams in pairs in this way.

The phrase "*p'ang-t'ung*" appears in the *Wen-yen*[bf] commentary on the hexagram *Ch'ien*, where it reads: "The six individual lines open up and unfold the thought, so that the character of the whole is explained through its different sides."[21] *P'ang-t'ung*, which is translated here as "different sides," literally means "lateral interchange." This phrase has been interpreted to mean that there is a correspondence between *Ch'ien* and the six hexagrams which can be formed by a change of only one line. However, the great Ch'ing scholar of the *Book of Changes*, Chiao Hsün[bg] (1763–1820), theorized that *p'ang-t'ung* means changing all the lines at once, so that each hexagram is paired with its opposite.[22] Certainly this is not an unreasonable supposition considering that *K'un* and *Ch'ien* were paired in both the Chou and Shang orderings. Although Chiao Hsün proceeded to develop the concept of *p'ang-t'ung* in such a manner that it could be applied to all of the hexagrams, he followed tradition in keeping *Ch'ien* in the first place.[23]

We have chosen the feminine hexagram, *K'un*, to start our sequence out of a desire to return to what we believe were the original ideas involved in the shaping of the *I*. The early Chinese philosophies emphasized the mother image as the origin of all things, and the existence of a version of the *I Ching* during the Shang period shows that the origin of the *I* predates the patriarchal society of Chou.

The next step in constructing a logical ordering system was to find a method of development from one pair of hexagrams to the next. It seemed most logical to have a minimal change between the hexagrams, that is, only

Figure 1. The Binary Gray Code Sequence

000000	011000	110000	101000
000001	011001	110001	101001
000011	011011	110011	101011
000010	011010	110010	101010
000110	011110	110110	101110
000111	011111	110111	101111
000101	011101	110101	101101
000100	011100	110100	101100
001100	010100	111100	100100
001101	010101	111101	100101
001111	010111	111111	100111
001110	010110	111110	100110
001010	010010	111010	100010
001011	010011	111011	100011
001001	010001	111001	100001
001000	010000	111000	100000

one line changed. What was needed was a system by which all possibilities could be covered through an orderly progression while changing only one line at each step. We chose, like Leibniz, to view the hexagrams as analogous to binary numbers. There does exist a type of binary number system which progresses while changing only one digit in a perfectly orderly manner. It is known as the Gray Code, for Frank Gray, a theoretical mathematician who developed it.[24] When the hexagrams were arranged in *p'ang-t'ung* pairs, and the progression from each pair to the next was according to a Gray Code progression, a logical sequence of development became apparent in the interpretations of the hexagrams. Figure 1 shows the sequence of development for the initial sixty-four binary numbers in the Gray Code; Figure 2 shows how this combination of *p'ang-t'ung* pairing and Gray Code progression translates into an arrangement of the hexagrams.

In his correlation between the binary number system and the hexagrams, Leibniz identified the rightmost digit in a number with the top line of the hexagram; he did this because that is the way Shao Yung had developed his progression of the hexagrams. Obviously the correspondence could have gone the opposite way, with the rightmost digit analogous to the bottom line of the hexagram. We chose to view it that way for the following reasons: In any numbering system the rightmost digit changes most frequently while the leftmost changes least frequently. It seemed logical that the most important line of the hexagram, the fifth, should be the last to change. Note that nowhere in the sequence does the sixth line alone change.

There is some reason to speculate that the proposed ordering may be a rediscovery of an older order. The strongest argument in favor of this assertion is the logical progression of the interpretations, which we shall detail presently. However, it is first necessary to establish that the ancient Chinese
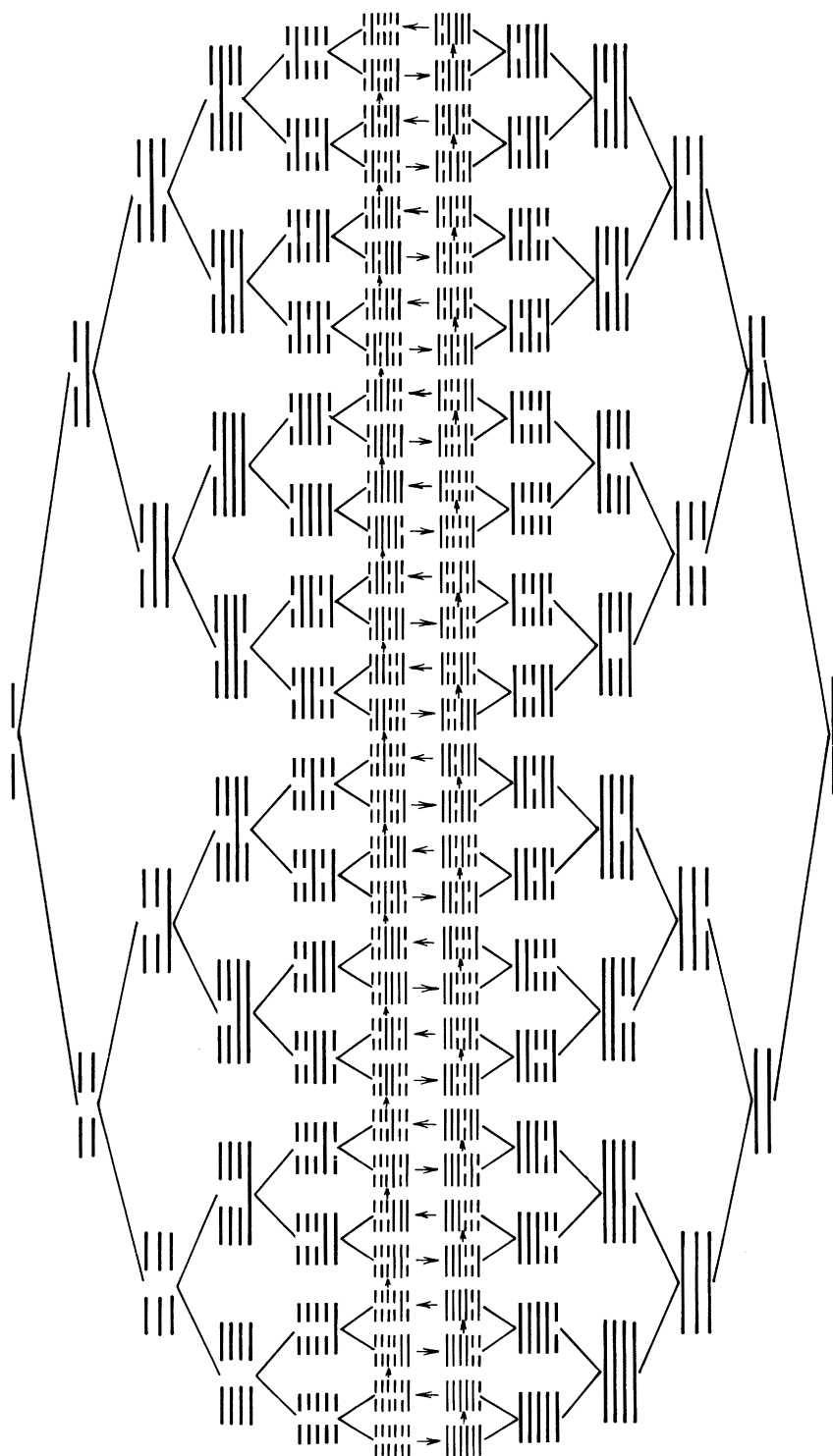
Figure 2. Ordering of the Hexagrams
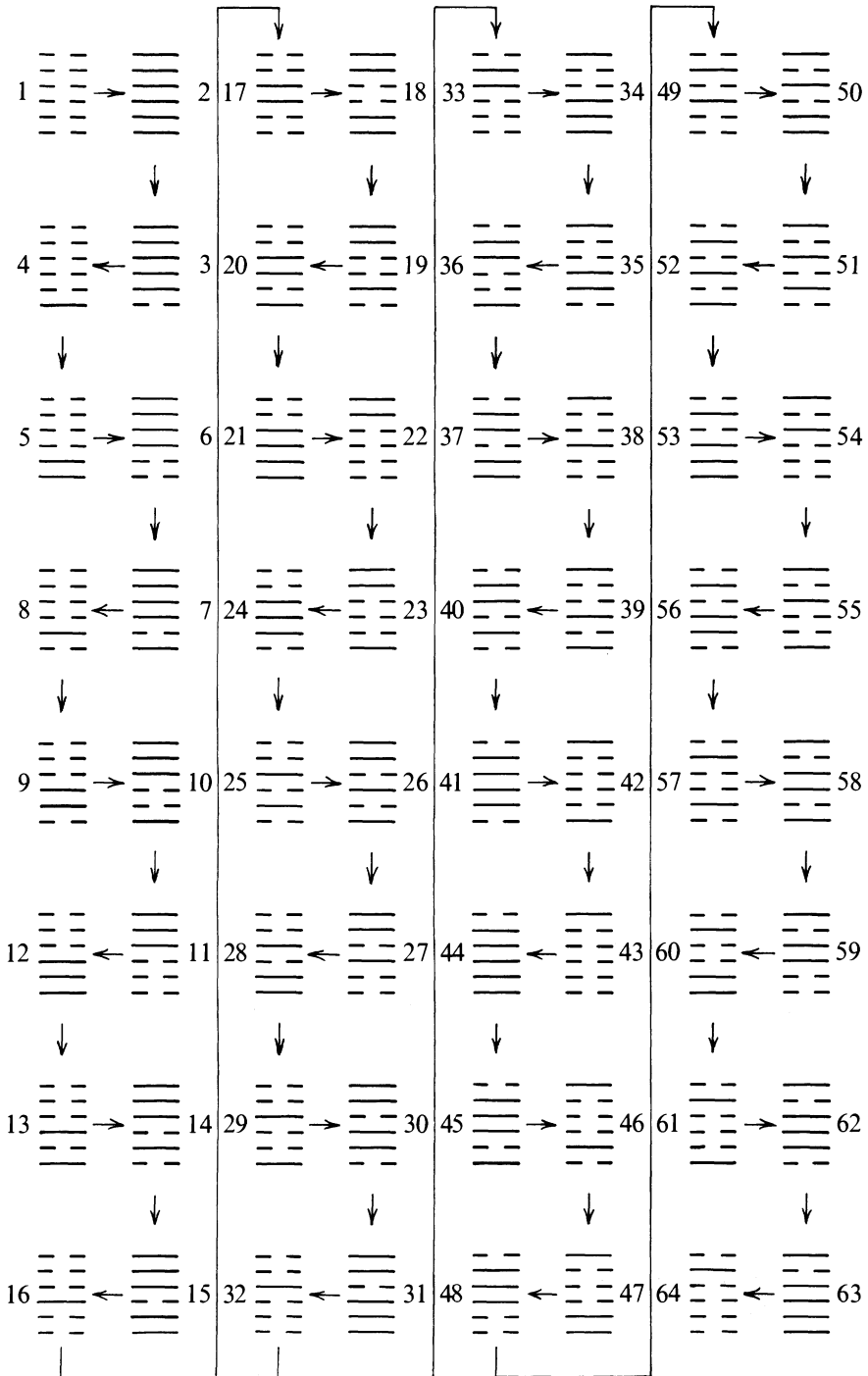
Figure 3. Diagrammatic development of the proposed ordering system

were capable of developing this ordering system. The Gray Code was invented in this century and is in general known only to applied mathematicians and computer scientists; we do not assert that such a mathematical code was known to the ancient Chinese. Shao Yung, himself, derived his binary code not mathematically but by means of a chart (see second chart herein). We have appended Figure 3, to show how the proposed ordering could be developed and not require any mathematical knowledge. This chart differs from that of Shao Yung in three ways.

First of all, while Shao Yung begins from the two single lines, divided and undivided, at the top, and develops his chart line by line downward, our chart uses these two as poles, developing from them toward the center. Second, Shao Yung's system developed the hexagrams from the bottom line up; ours starts at the top line and adds on lines beneath it. Third, and herein is contained the distinction between a Leibnizian binary code and the Gray Code, the method of adding on lines is altered. In both charts, a single figure in one row produces two figures in the next. In Shao Yung's ordering this development is always accomplished by adding on first an undivided line, then a divided one. In ours, the order in which the next line is added on alternates. Thus, for example, the

five-lined figure ⚏ produces the pair ⚏ and ⚏ ,

and the next one, ⚏ produces the pair ⚏ and ⚏ ;

the order of the bottom lines in the pairs is reversed. The bottom half of the chart mirrors the top half, with every strong line in one half reflected by a weak line in the other.

A simpler way of seeing the distinction between the two methods of ordering is to look at the finished arrangement of the hexagrams. In the Shao Yung ordering, the top line of the hexagrams alternates between divided and undivided. The fifth line alternates every two hexagrams. The fourth line alternates every four hexagrams, the third every eight, the second every sixteen, and the bottom every thirty-two. The Gray Code development is similar but changed slightly, that no two lines change at the same time. The bottom line begins with one divided line, then alternates by twos. The second line begins with two divided lines, then alternates by fours; the third begins with four, then alternates by eights, and so on.

We believe it significant that certain elements of this system appear in the ordering of the trigrams. It is especially interesting to note the development of the trigram family.[25] The order in which they are presented are: *Ch'ien* (father), *K'un* (mother), *Chên* (first son), *Sun* (first daughter), *K'an* (second

son), *Li* (second daughter), *Kên* (third son), *Tui* (third daughter). This sequence can easily be set up in a table such as Figure 2:
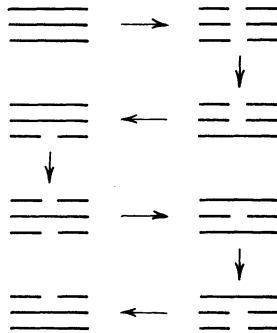
This shares several obvious features with the proposed ordering of the hexagrams, differing mainly in its choice of *Ch'ien*, not *K'un*, to begin. It develops, as the proposed ordering does, by a *p'ang-t'ung* switch followed by the change of a single line. Although it is not exactly a Gray Code, it does show similarities: it matches perfectly the succession of the lower trigrams of hexagrams #21–28 in Figure 2. Because of this, we believe we are well justified in stating that the concept of developing through *p'ang-t'ung* followed by the change of a single line would not be foreign to Chinese thought.

THE SEQUENCE OF THE INTERPRETATION

We consider one of the strongest arguments in favor of the proposed reordering to be the logical way in which the interpretations attached to the hexagrams develop. Each hexagram describes a situation; not only is there a clear progression from one situation to the next (that is, it is easy to see how one situation could develop into the next), but the starting and ending points are also logical.

These interpretations, which rely heavily on the Wilhelm-Baynes translation, are based on the Judgments of the hexagrams as a whole. The Judgments on the lines deal with individual components of the general situations and, for simplicity's sake, are not discussed here. A complete exposition of the hexagrams in light of the proposed reordering would require far more extensive treatment than we are able to afford them here. The following sequence of interpretations is, therefore, intended to serve as a suggestive outline only and should not be considered as a full and final statement of the meaning of the reordered hexagrams.

1. *K'un*[bq], The Receptive (No. 2 in Chou order). This is the logical starting point for anyone beginning a new endeavor. The situation described is one of weakness, when one is not yet ready to begin active work. There is no point in trying to accomplish something if one does not have the strength necessary to

complete the task. The text here recommends that a person in this situation should find a strong person under whom he can serve. Although the text does not explicitly say, this is also an ideal position for developing one's strength, by learning from the example of the person followed; such a position is analogous to apprenticeship, wherein one gradually reaches mastery of an ability in one's own right.

2. *Ch'ien*[br], The Creative (1). Even after achieving strength, he continues to fortify himself; he is now ready to begin work.

3. *Kou*[bs], Coming to Meet (44). After reaching a position of authority, he begins to exert his influence on those in lower positions. Here he encounters his first challenge. He must deal with less worthy, but powerful, men who seek to gain ascendancy. He must work vigorously to prevent any gain in power by such people. Since he has the power to accomplish this, there is no reason for any sort of compromise.

4. *Fu*[bt], Return (24). When the problem has been dealt with, he should rest to prepare himself for future endeavors.

5. *Lin*[bu], Approach (19). Again there is a time for vigorous action, and success is assured; however, the situation is not stable, and the time for action will come to an end when obstacles arise. He should be watchful, so that he can sense the change in fortune and be prepared to cease his activity. If he continues to act, mindless of the change in situation, it could be dangerous.

6. *Tun*[bv], Retreat (33). When the obstacles begin to appear, their nature will be clearly delineated before they become a direct threat. Since he is not strong enough to face them directly he retreats to strengthen himself, keeping the threatening forces at a distance until he can deal with them.

7. *T'ung Jên*[bw], Fellowship with Men (13). The most obvious way to gain strength is to gather other people around him to support his defense.

8. *Shih*[bx], The Army (7). The people must be well organized to be an effective force; a mob is a useless, and in fact dangerous, weapon. For this reason he must take care that he is strong enough to control the people he has gathered.

9. *Sheng*[by], Pushing Upward (46). When the proper preparations have been made, action is easily successful, and he gains a position wherein he is respected even by those in higher positions.

10. *Wu Wang*[bz], Innocence (25). When outside threats have been eliminated, he can turn his attention to within his own society, working to benefit his people.

11. *P'i*[ca], Standstill (12). It is well that his attention has been turned to within his own society, for it is from there that the next problem arises. Inferior men gain power, and he is unable to prevent it or do anything to remedy the situation. All he can do is to sit tight and wait for the situation to resolve itself.

12. *T'ai*[cb], Peace (11). Waiting eventually ends, and he is once again in control. The situation here strongly resembles that of #10; once again he

devotes himself to the welfare of his people. The difference is that here there is a very strong warning that his character and his actions must be proper.

13. *Ming I*[cc], Darkening of the Light (36). Again the situation changes as his authority in society is no longer respected. His only course of action is to try to continue to work, but to do so quietly, without drawing attention to himself; otherwise he may be considered a threat by those in power.

14. *Sung*[cd], Conflict (6). The situation worsens; this is why the previous hexagram recommended continuing to act in whatever manner possible, unlike the nonaction suggested in No 11. In that hexagram the situation would resolve itself; here just the opposite happens: the evil forces become stronger, and it takes strong action even to achieve a compromise.

15. *Lü*[ce], Treading (10). Under the compromise, it is possible to gain power; however, to do so he must show himself totally worthy of authority by absolute blamelessness and humility. With any wrong move there will be evil men ready to grab at any excuse to throw him down. The idea expressed here is similar to our modern aphorism that a politician must be "like Caesar's wife." It was in anticipation of this that the warning was attached to No. 12 that he should carefully watch his actions and character. Power can be gained this way.

16. *Ch'ien*[cf], Modesty (15). Having gained power through his own humility, he now seeks to establish this order among the rest of society, giving power to the humble, and taking power away from those who are too boastful.

17. *Hsiao Kuo*[cg], Preponderance of the Small (62). His power continues to increase, but he is still hampered by the evil men in strong positions, therefore, it is a good time to concentrate his attention on less important matters. As always, he must pay close attention to his appearance.

18. *Chung Fu*[ch], Inner Truth (61). The power of the evil men is nearing an end, but for the moment he must continue to try to work against them in small, unnoticed ways. The Image reads, "Thus the superior man discusses criminal cases in order to delay executions." Richard Wilhelm interprets this as an indication of the care which should be taken in the administration of justice, but in the light of the sequence it seems more likely that the superior man here is simply stalling to prevent an injustice within the system being perpetrated by those in power.

19. *Huan*[ci], Dispersion (59). Finally the evil men have lost power and he is once again able to exercise his authority freely. The period under poor leadership has led to disunity among the people; his job now is to bring them together again through a common purpose, such as participation in the religious rites.

20. *Fêng*[cj], Abundance (55). Having reached again a position of high authority, he should exercise it strongly, standing as an inspiration to his people and being thorough in his administration of justice.

21. *Ta Chuang*[ck], The Power of the Great (34). He must take care, however,

that he uses his power wisely. He has gained so much power that the potential for abuse is great, and he must be very careful that his actions are in accord with what is right.

22. *Kuan*[cl], Contemplation (20). He must also watch over the people and correct them when they are not in accord with what is right.

23. *I*[cm], Increase (42). He continues to work at improving himself, looking within himself to find faults so that he can get rid of them, and watching others to find good points to imitate.

24. *Hêng*[cn], Duration (32). Thus he acquires the inner strength necessary to stand firm and not be discouraged or distracted by obstacles which may come up.

25. *Hsieh*[co], Deliverance (40). That inner strength is not based on hardness, but rather on being in harmony with the time. He takes the actions appropriate to the situations he encounters and does not dwell on the past.

26. *Chia Jên*[cp], The Family (37). His attitude toward his people is like that of a mother toward her family, offering steady support and nourishment.

27. *Chien*[cq], Development (53). He learns the importance of slow, carefully studied action. He does nothing in haste, and thus stands as an example to the people.

28. *Kuei Mei*[cr], The Marrying Maiden (54). He arrives at a situation in which it seems as if it is a favorable time for action, but to be successful he must think ahead, and think always in terms of the final outcome. A seemingly auspicious situation may suddenly turn bad.

29. *Chên*[cs], The Arousing (51). The sudden change in the situation takes place, but since he has looked ahead and prepared himself, he is not disturbed, but uses the situation as a chance to examine himself.

30. *Sun*[ct], The Gentle (57). When the time comes for action again, he is ready, and achieves success, by first making sure that his command of the people is based on the wisdom of his rule, and that the people realize it.

31. *Hsiao Ch'u*[cu], The Taming Power of the Small (9). By learning the power of gentleness, he is prepared to handle a situation in which simple force is insufficient. He continues to be careful of his outward appearance, for when working by means of nonforceful methods, such as persuasion, appearance is of primary importance.

32. *Yü*[cv], Enthusiasm (16). By making sure that his own merit is clear to others, and by recognizing merit in others, he has no difficulty in gathering people around him for whatever task may be necessary.

33. *Ts'ui*[cw], Gathering Together (45). In gathering the people, he develops their characters so that they will provide better support for him.

34. *Ta Ch'u*[cx], The Taming Power of the Great (26). The time for action approaches, and he prepares himself by strengthening his character through the lessons of history.

35. *Ku*[cy], Work on What Has Been Spoiled (18). A problem which has been

developing for a long time suddenly becomes apparent, but he has the support of the people in working to remedy the situation.

36. *Sui*[cz], Following (17). His talents as a leader bring about success in his endeavors, but he realizes that he cannot lead at all times, and takes time out to rest.

37. *Tui*[da], The Joyous (58). His leisure time includes gathering with his friends, but even in such social gathering he includes time for practicing, in order to be constantly prepared.

38. *Kên*[db], Keeping Still (52). He remains constantly calm, and does not worry about problems which are outside his ability to correct, but concerns himself with the immediate situation only.

39. *Pi*[dc], Grace (22). He decides minor matters on the basis of appearances, acting according to what is considered proper. Thus he conserves his energy so that he may devote as much attention as is necessary to the important problems without being distracted by the minor matters.

40. *K'un*[dd], Oppression (47). When a time of adversity arises, he is prepared, and can deal with it without being discouraged by the helpless appearance of the situation.

41. *Ta Kuo*[de], Preponderance of the Great (28). Even when he stands alone, he has the inner strength necessary to persevere and attain success.

42. *I*[df], The Corners of the Mouth (27). To remain prepared, he is careful to nourish himself, but exercises temperance.

43. *Po*[dg], Splitting Apart (23). Unworthy men gain power within the society. He does not have the power openly to dismiss them, but they are weak-willed men whom he can prevent from causing trouble by simple payoffs.

44. *Kuai*[dh], Breakthrough (43). The situation improves slightly so that he can begin to take quiet action, but he does not yet have strength enough to start an open conflict. As he begins this quiet action, he continues the payoffs, so that the evil men will not realize that he is working against them.

45. *Ko*[di], Revolution (49). When the time for action comes, he is successful because he has been making preparations, and the positions of authority are purged of unworthy men.

46. *Mêng*[dj], Youthful Folly (4). Having brought society back to its proper state, he once again turns his attention to his own development and becomes more mature.

47. *Sun*[dk], Decrease (41). When faced with a time of scarcity, he remains calm and uses this position of adversity to develop his character.

48. *Hsien*[dl], Influence (31). It is now an auspicious time for gathering together with other people, that he may learn from them.

49. *Chien*[dm], Obstruction (39). When faced with troubles, however, he does not look to others for answers, but seeks the source of the problems which are within himself.

50. *K'uei*[dn], Opposition (38). In this way, while remaining among other

people, he retains his individuality. When he finds himself in the company of inferior people, he keeps his own superior character, even if the setting prevents him from behaving in a proper manner.

51. *Wei Chi*[do], Before Completion (64). When about to take a major step, he first seeks to understand all the factors in the situation, so that he can deal with them properly. In seeing all of the factors, he can then understand the situation as a whole.

52. *Chi Chi*[dp], After Completion (63). Having attained success, he realizes that this success is only temporary, as some new problem will arise, so he begins to prepare himself for whatever may confront him next.

53. *Hsü*[dq], Waiting (5). Meanwhile he strengthens himself through nourishment and waits cheerfully.

54. *Chin*[dr], Progress (35). His position is strong enough that, unlike the situation in No. 15, he can let his greatness be apparent.

55. *Shih Ho*[ds]; Biting Through (21). He lets his strength show in the administration of justice. This is not a time for a show of mercy.

56. *Ching*[dt], The Well (48). He organizes the people in their work, for the benefit of all.

57. *K'an*[du], The Abysmal (29). He also devotes himself to the education of the people, since this helps to bring about harmony in society.

58. *Li*[dv], The Clinging (30). One way of teaching is by example, and so he lets his greatness be not only apparent, as suggested in No. 54, but in fact shining forth like a light. The idea here is very much like that of Christ's "You are the light of the world." (Matt. 5:14–16)

59. *Lü*[dw], The Wanderer (56). Just as the previous hexagram carries forward the idea of No. 54, this one develops the idea of No. 55. There the main point was that the administration of justice should be strict; here the point is made that it should not be overly severe, and should be taken care of quickly.

60. *Chieh*[dx], Limitation (60). In all these matters, he should determine the proper limits of conduct, taking care that they are firm but reasonable, the same qualities necessary to good justice.

61. *Chun*[dy], Difficulty at the Beginning (3). It is not now a time for action, but rather for planning. After determining what the proper limits of conduct should be, he now considers what the proper places of people within society should be. This is analogous to the situation in No. 16. There he decided what places people should occupy on the basis of a simple factor: humility. Here he is deciding on the basis of the proper limits of conduct, which he has worked out on his own, because the more complex a situation gets, the less applicable are simple cut-and-dried rules; now he must go by rules which are particularly appropriate to the society which has been developed.

62. *Ting*[dz], The Caldron (50). Before he can put others in their proper places, he must first make sure his own position is correct.

63. *Ta Yu*[ea], Possession in Great Measure (14). He brings about a state of peace and harmony by encouraging good and doing his best to get rid of evil influences, because a peaceful society is necessary in order to set all men in their proper places. Evil influences which remain would attempt to interfere with the proper ordering of men which he hopes to set up.

64. *Pi*[eb], Holding Together (8). Having finally made all the necessary preparations, he can now set up the ideal society, with all men occupying their proper places in it. This is the logical place to end the series of hexagrams, for the ideal society is what he has been striving for. This is also a logical finishing point in a geometrical sense. The fifth place in the hexagram is the position of the ruler,[26] and it is logical that this should be the only position occupied by a strong line.

The final hexagram in the sequence should ideally be the best possible combination of strong and weak lines, incorporating the best aspects of the two basic hexagrams *K'un* and *Ch'ien*. The *Wen-yen* of the hexagram *Ch'ien* says, "How great indeed is the Creative! It is firm and strong, moderate and correct, pure, unalloyed and spiritual."[27] The word *chung*[ec] translated here as "moderate" by Wilhelm is translated more literally as "central" by Wei Tat. With respect to this he makes a note of the uniqueness of the fifth line of *Ch'ien*:

> As the constituent parts of the *Ch'ien* hexagram, the six lines naturally share the qualities attributed to *Ch'ien* as a whole, but it should be noted that of the six lines only Line 5 can be credited with the joint qualities of centrality and correctness, "centrality" meaning being in the central position of either the upper or lower trigram, and "correctness" meaning being a Yang line occupying a Yang position.

He then goes on to explain why the other five lines in the hexagram do not fit these criteria.[28]

Thus, one can consider the sequence as it develops from its starting point, *K'un*. It goes through all the hexagrams and finally finishes on a hexagram which differs from *K'un* in only one line; in that one line, however, which it has taken from *Ch'ien*, it has acquired the most important element of *Ch'ien*, and has become the ideal hexagram.

Another factor which justifies the position of *Pi* as the last hexagram is contained in the Judgment on the hexagram. This is the only hexagram in which the Judgment contains the instruction to inquire of the oracle again. We consider this an argument in favor of the assertion that this ordering may have been in use before the Chou ordering. The Judgment reads, "Inquire of the oracle once again whether you possess sublimity, constancy, and perseverance."[29] This does not make sense. If the second consultation of the oracle is simply for the purpose of learning whether one possesses the requisite character traits, why is this the only hexagram to contain such an instruction?

Surely in any situation one would want to know if one has the necessary qualities, and there is no reason to single *Pi* out in this respect.

On the other hand, when the hexagrams are arranged so that *Pi* comes last in the sequence, there is a clear reason why such an instruction would appear: here is the only case among the sixty-four hexagrams in which there is no logical subsequent step. A second consultation of the oracle is necessary to answer the question, "Whither next?"

THE PHILOSOPHY BEHIND THE PROPOSED ORDERING

We believe some justification of this ordering regarding the philosophy behind it is appropriate. In the first place, it fits in remarkably well with the dominant theme in Chinese thought of Order and Pattern, referred to by Joseph Needham in the second volume of *Science and Civilisation in China* as Organism. It would also appear to be compatible with a dialectic principle similar to that put forth by Hegel and used frequently by Marx and Engels. Hegel's theory on the development of ideas begins with an initial idea called the thesis.[30] This thesis produces its opposite, the antithesis. The thesis and the antithesis interact to produce the synthesis, a combination or compromise of the two. This synthesis can then be considered as a thesis, which gives rise to a new antithesis, and then a new synthesis. The process continues until some final synthesis is reached. The correspondence between this dialectic method and the proposed ordering is apparent. The sequence begins with the most immediately obvious thesis and antithesis, the two primary hexagrams, *K'un* and *Ch'ien*. The first synthesis is *Kou*, which represents the first mixture of strong and weak lines. This then produces its own antithesis, *Fu*, and so the "dialogue" continues. Each progression from one pair of hexagrams to the next involves a mixture of the two hexagrams in the first pair, for when one line changes in the hexagram, it is equivalent to having acquired one line from the other hexagram in the pair. Thus in *Kou*, the five strong lines come from *Ch'ien*, while the bottom weak line comes from *K'un*.

In this dialectical development, the last synthesis is *Ta Yu*, which then produces its antithesis *Pi*. However, the philosophy of Hegelian dialectics does not preclude the possibility of the final synthesis being the antithesis of the most recent thesis or synthesis. The hexagram *Pi* does describe the ideal combination of strong and weak lines, as has already been shown, the ultimate synthesis. It is interesting to note that an etymologically literal definition of the word "synthesis" (from the Greek σύν and θήσις) is very close to "holding together," the translation of *Pi* given by Wilhelm. It means, literally, "together-placing."[31]

CONCLUSION

We have presented here an ordering system which we believe to be useful for

better understanding the *I Ching*. It is also hoped that, with this essentially polar arrangement of the hexagrams, some new insights into the dominant mode of thought in China around the time of the formation of the early versions of the *I Ching* might be gained. On the question of whether this ordering may have existed previously, we can only speculate. But, regardless of its historicity, we do hope that the validity of this ordering as a way of viewing the system of the sixty-four hexagrams has, at least, been demonstrated and that it may be of some use to individuals who wish to do more detailed analyses of the hexagrams.

NOTES

1. "In general it can be said that the hexagrams *arranged in their proper order* symbolize the entire sequence of changes through which everything in the universe, at all levels from the microcosmic to the macrocosmic, passes in continuous cycles." John Blofeld, *I Ching (The Book of Change)* (New York: E. P. Dutton and Co., 1968), p. 48 (italics ours).

2. Ibid., p. 52.

3. Hellmut Wilhelm, *Change: Eight Lectures on the I Ching*, trans. Cary F. Baynes, Bollingen Series 62 (Princeton, New Jersey: Princeton University Press, 1960), pp. 84–85. H. Wilhelm, *Heaven, Earth, and Man in the Book of Changes* (Seattle, Washington: University of Washington Press, 1977), pp. 108–114.

4. Kuo Mo-jo[d], *Chou-i te kou-ch'eng shih-tai*[e] (*De L'époque à Laquelle fut élaboré Le Tcheou Yi*) (Changsha: Commercial Press, 1940), pp. 20–28 (French and Chinese). Joseph Needham, *Science and Civilisation in China* (Cambridge: At the University Press, 1965), 2: 306–309, provides a very useful survey of scholarly opinion on the dates and origins of the various parts of the *I Ching*. For an interpretation of the ultimate origin of divination in China, see Taguti Hukusirō[f] [Taguchi Fukushiro], *Shūeki no kigen*[g] [*The origin of the Chou-i*] (Tokyo: Meiji shoin, 1960). It is impossible for us here to got into such important but difficult questions as the relationship between oracle bone and milfoil stalk divination, the difference between the *Fu-hsi*[h] (*hsien-t'ien*[i], "prior to heaven") and King Wen[j] (*hou-t'ien*[k], "subsequent to heaven") arrangements of the trigrams, and so forth, which are peripheral to our enterprise.

5. Confer Hellmut Wilhelm, "I-ching Oracles in the *Tso-chuan* and the *Kuo-yü*," *JAOS*, 79, 4 (October–December, 1959): 275–280 and Li Ching-ch'ih[l], "I chuan t'an-yüan[m]" ["An inquiry into the origins of the appendices to the *Book of Changes*"], originally published in the 1930 *Shih-hsüeh nien-pao*[n] [*Yearbook of historical studies*] of Yenching University and reprinted in Ku Chieh-kang[o], ed., *Ku-shih pien*[p] [*Discussions of ancient history*] (Peiping: P'u she, 1932; 2d ed.), 3: 95–132.

6. "The Book of Changes," *BMFEA*, 5 (1933): 141. It should be noted that Waley, following the lead of iconoclastic Chinese scholars of the twenties and thirties, regarded the earliest layers of the texts of the *I Ching* as folk proverbs dealing with prescience. A similar view is held by Nathan Sivin, "Review of Blofeld, *The Book of Change*," *HJAS*, 26 (1966): 290–298: "There is by now a consensus that the *I ching* is a jumble of straightforward divination judgments ('Profitable if to the southwest, unprofitable if to the northeast') and rhymed but often truncated proverbs or sayings ('When the wild goose skims [? or advances] over the land, the husband will go to war and not return; the wife will be gravid but will not deliver')" (p.293). Such a view neither substantiates nor invalidates our attempt to find a more logical ordering for the hexagrams which could have existed independently of any of the texts. The date at which the texts became attached to the hexagrams, while highly significant, is not crucial insofar as the basic question of arrangement is concerned. Indeed, an examination of the oracles mentioned in the *Tso-chuan* seems to indicate the existence of a different scheme, the nature of which it is impossible to determine precisely. Confer Tanigawa Ryūzan[q] (1774–1831), *Sa koku eki ikkagen*[r] [*A personal

view of the references to the Book of Changes in the Tso-chuan and in the Kuo-yü] (Kyoto: Yamashiroya, 1818) and Mao Ch'i-ling[s] (1623–1716), *Ch'un-ch'iu chan-shih shu*[t] [*Oracles in the Spring and Autumn Annals*], in *Ts'ung-shu chi-ch'eng ch'u-pien*[u] [*Assemblage of collectanea—First series*] (Shanghai: Commercial Press, 1935–40), *ts'e* 707. Hu Tzu-feng[v], *Hsien-ch'in chu-tzu i-shuo t'ung-k'ao*[w] [*A thorough examination of the explanations of pre-Ch'in philosophers regarding the Book of Changes*] (Taipei: Wen shih che ch'u-pan she, 1974) is a helpful collection of early references to the *I Ching* in various Chou texts.

7. The descendants of the Hsia were supposed to have settled in Ch'i during the Chou dynasty.

8. Following K'ung Ying-ta[y] (574–648) who, in the subcommentary, glosses *cheng*[z] as *cheng-yen*[aa] (21.9a—see note 12). Confucius was unable to *verify* what he had gone to investigate.

9. The descendants of the Shang house settled in Sung during the Chou.

10. Cheng Hsüan's commentary (21.8a) states that Confucius "obtained the book on *yin-yang* of the Shang dynasty. This book survives as the *Kuei-ts'ang*[ab] [*Return to the hidden*]." The *Kuei-ts'ang* is mentioned in the *Chou-li*[ac] [*Ritual of the Chou*], in *Thirteen Classics*, 24.11b: "(Grand Diviner). He is in charge of the three methods for determining changes. The first is called *Lien-shan*[ad] [*Connected Mountains*], the second is called *Kuei-ts'ang*, and the third *Chou-i*[ae] [*Chou Changes*]." Confer Édouard Biot, trans., *Le Tcheou-li ou Rites des Tcheou* (Paris: Imprimerie Nationale, 1851), 2:70. The commentary (24.11b) of Cheng Hsüan[af] (127–200) explains the title *Kuei-ts'ang* as meaning that "all things *return* and *hide* in its center." By "it," Cheng probably intended that which encompasses change or is beyond change. The subcommentary of Chia Kung-yen[ag] (fl. 650–655) confirms the meaning of the title given by Cheng Hsüan but specifies that it is the earth to which all things revert. The earth being *k'un* (female principle), it makes eminent sense for the "*Kuei-ts'ang* Changes to give the foremost position to pure *k'un*[ah]". One is reminded of the frequent references to "the Mother" in the *Tao-te ching* (1, 20, 25, 52, and 59) as the origin of the phenomenal world. The two fragmentary *Kuei-ts'ang* in *Yü-han shan-fang chi i-shu*[ai] [*Lost books collected at the jade case retreat*], compiled by Ma Kuo-han[aj], (Changsha: Lang-huan kuan, 1883), *ts'e* 1 and in *Han-wei i-shu ch'ao*[ak] [*Copies of lost books from the Han and Wei dynasties*], compiled by Wang Mo[al], (Chin-hsi: Wang shih, 1798), *ts'e* 1 are forged and are of no value in discussing the pre-Chou ordering of the hexagrams. See *Hsü-hsiu ssu-k'u ch'üan-shu t'i-yao*[am] [*A continuation of the synopsis of the catalogue to the library in four branches of literature*] (Taipei: Taiwan Commercial Press, 1972), 1: 1–2 and, for a very full account of the subject, Chang Hsin-ch'eng[an], *Wei-shu t'ung-k'ao*[ao] [*A thorough examination of forged books*] (Shanghai: Commercial Press, 1957; originally published 1939), 2: 39–45.

11. Cheng Hsüan's commentary (21.8a) implies that he observed the way of the Hsia and the way of the Shang through the two books.

12. *Li chi*[ap] [*Records of ritual*], in *Shih-san ching chu-shu*[aq] [*The thirteen classics with commentaries and sub-commentaries*] (Kiangsi: Nan-ch'ang hsüeh-t'ang, 1815 [actually Hunan: Pao-ch'ing wu-pen shu-chü, 1896 recutting]; (Taipei: I-wen, 1976, facsimile reprint), 21.8a. Confer James Legge, trans., *The Li Kî* (Oxford: Clarendon Press, 1885), 1:368. A similar passage occurs in *Analects*, III.ix but no mention is made of the *Hsia Calendar* and the *K'un-ch'ien*. See Legge, *The Chinese Classics*, 5 (Hong Kong: Hong Kong University Press, 1960), p. 158. See also *Analects*, III.xiv (Legge, p. 160) for a related passage. The appearance of the specific titles in the *Li chi* and their absence in the *Analects* makes them suspect. However, in the *Doctrine of the Mean*, XXVIII.v (Legge, *Classics*, 5:424), we read: "The Master said, 'I may describe the ceremonies of the Hsiâ dynasty, but Chî cannot sufficiently attest my words. I have learned the ceremonies of the Yin dynasty, and in Sung *they still continue*. I have learned the ceremonies of Châu, which are now used, and I follow Châu'" (italics ours). While the evidence is not conclusive, the references (see note 11) in the classics to a Shang manual of change indicate either that the compilers of the classics knew firsthand of such a work or that there was a strong tradition for the earlier existence of such a work that persisted into the late Chou and Han. Even Ch'ing commentators did not call the *Li chi* reference to a *K'un-ch'ien* into question. See, for example, Liu Pao-nan[ar] (1791–1855), *Lun-Yü cheng-yi*[as] [*The correct interpretation of the Analects*] (Shanghai: Commercial Press, 1930; 2d ed., 1934), 1:62–63.

13. The subcommentary (21.9a), citing a Mr. Hsiung[al], says that "The Shang dynasty *Changes* gave precedence to the female principle. Therefore they put *k'un* first and *ch'ien* after it."

14. By no means do we assert that there was an established conception of *yin-yang* cosmology before the "Ten Wings" and the *Tao-te ching* came into being. On this subject, we are in complete agreement with Li-Han-san[av], *Hsien-ch'in liang-Han chih yin-yang wu-hsing hsüeh-shuo*[aw] [*Theories on yin-yang and the five phases during the pre-Ch'in period and the Western and Eastern Han dynasties*] (Taipei: Chung-ting wen-hua ch'u-pan kung-ssu, 1968). On the precedence of the female in early Chinese philosophy, see Ellen Marie Chen, "Tao as the Great Mother and the Influence of Motherly Love in the Shaping of Chinese Philosophy," *History of Religions* 14, no. 1 (August-January, 1974): 51–64. The matriarchal nature of early Chinese society is well established. See, for example, Ho Ping-ti, *The Cradle of the East* (Chicago, Illinois: The University of Chicago Press, 1975), pp. 274–281; Kuo Mo-jo, *Chung-kuo shih kao*[ax] [*Draft history of China*] (Peking: Jen-min ch'u-pan she, 1962), 1:15–47; Marcel Granet, *Chinese Civilization* (London: Routledge and Kegan Paul, 1930), p. 185; Granet, *La polygynie sororale et le sororat dans la Chine féodale. Étude sur les formes anciennes de la polygamie chinoise* (Paris: Leroux, 1920), reproduced in *Études sociologiques sur la Chine*, Bibliothèque de Sociologie Contemporaine (Paris: Presses Universitaires de France, 1953), pp. 28–30; and Granet, *The Religion of the Chinese People*, trans. and ed. Maurice Freedman (New York: Harper and Row, 1975; originally published 1922), pp. 39, 51, 85, 87, 114, and 52, where we read: "Since women conceived in their natal homes, reincarnation must be in the uterine line: a newborn child was none other than an ancestor who, after a stay in Mother Earth, the stuff common to maternal forbears, took on individual life again and reappeared within the living section of the family. At the same time as the idea of Mother Earth was elaborated—basis of kinship in a family attached to a plot of land of its own and organized according to the system of descent through women—the belief was formed, in the family groups fixed to domestic Soil and confident in their perennity, that the family substance was as eternal in the same way as was their Soil and like it ever unchanging."

15. In Lucius Chapin Porter, comp., *Aids to the Study of Chinese Philosophy* (Peking: Yenching University, 1934), p. 72, note 4 (italics ours).

16. *The I Ching*, or *Book of Changes*, The Richard Wilhelm translation rendered into English by Cary F. Baynes, 3d ed., Bollingen Series 19 (Princeton, New Jersey: Princeton University Press 1967), p. 260; hereafter cited as Wilhelm-Baynes, *The I Ching*.

17. *I Ching: Book of Changes*, trans. James Legge, eds. Ch'u Chai and Winberg Chai (New York: University Books), p. 54.

18. *Chou-i* (*SPTK* ed.), 9.6b.

19. There have, of course, been numerous other systematic arrangements of the hexagrams which are useful for sorting them, such as Ching Fang's[bb] (77–37 B.C.) grouping "by houses," but none of which we are aware involve a logical concept of development that can generate all sixty-four of the hexagrams.

20. On the subject of Leibniz and Shao Yung, see Joseph Needham, *Science and Civilisation in China*, 2:340–345; Hellmut Wilhelm, *Change*, pp. 89–91; H. Wilhelm, *Heaven, Earth, and Man*, pp. 6–10. Two recent studies of the relationship between Leibniz and Chinese philosophy are David E. Mungello's *Leibniz and Confucianism: The Search for Accord* (Honolulu, Hawaii: The University Press of Hawaii, 1977) and Gottfried Wilhelm Leibniz', *Discourse on the Natural Theology of the Chinese*, translated and with an introduction and commentaries by Henry Rosemont, Jr., and Daniel J. Cook, Monograph No. 4 of the Society for Asian and Comparative Philosophy (Honolulu, Hawaii: The University Press of Hawaii, 1977). Both of these books discuss the correspondences between Leibniz' binary notation and the *I Ching*. Additional references may be found in H. Wilhelm, "The Book of Changes in the Western Tradition: A Selective Bibliography," *Parerga* 2 (Seattle: Institute for Comparative and Foreign Area Studies, University of Washington, 1975), pp. 13–14. Also see the first note in R. F. Merkel, "Leibniz und China," *Leibniz zu seinem 300. Geburtstag, 1646–1946* (Berlin: Walter de Gruyter & Co., 1952), No. 8. Since Leibniz, numerous individuals have attempted to elucidate the mathematics of the *I Ching*. Among the more recent attempts are René Barde, "Recherches sur les Origines Arithmétiques du Yi-King," *Archives Internationales d'Histoire des Sciences* (continuation of

Archeion), 5, no. 21 (July-December, 1952): 234–281, and Leo Reisinger, *Das I Ging: Eine formalwissenschaftliche Untersuchung des chinesischen Orakels*, Acta Ethnologica et Linguistica, no. 25 (Vienna: Engelbert Stiglmayr, 1972), who, on page 96, states that "an irreducible ergodic Markov-chain can be constructed" from the sixty-four symbols. Li K'ai-hsüan[bd], *I-shu ch'ien-shuo*[be] *An Elementary Explanation of the Mathematics of the Book of Changes* (Taipei: Ming-shan ch'u-pan she, 1975) contains several essays dealing with the *I ching* and basic principles of computer science. However, so long as the existing order of the hexagrams is not challenged, any attempts to apply mathematical logic to the *Book of Changes* are doomed to end in failure. At best, they serve only to specify the probabilities involved in divining with the received text. As Martin Gardner has said in "Mathematical Games," *Scientific American* (January, 1974): 108–113, "From time to time a student of the *I Ching* announces his discovery of a mathematical scheme underlying the arrangement of pairs, but on closer inspection it turns out that so many arbitrary assumptions are made that in effect the order must be assumed before it emerges from the analysis. As far as anyone knows, the pairs of the King Wen sequence are in random order, and there is no known basis for determining which member of a pair precedes the other" (p.108).

21. Wilhelm-Baynes, *The I Ching*, p. 378.

22. Consult the first diagram of "I-t'u lüeh[bh]" ["A synopsis of the diagrams of the changes"], in *I-hsüeh san shu*[bi] [*Three treatises on studies of the Book of Changes*], preface 1813, from *Chiao shih ts'ung-shu*[bj] [*Collected works of Chiao Hsün*] (Tiao-ku lou ed. of 1876), ts'e 4–5, 1.1a–8a. Confer Wei Tat, *An Exposition of the I Ching or Book of Changes* (Taipei: Institute of Cultural Studies, 1970), pp. 302–303 and Thomé H. Fang (Fang Tung-mei[bk]), "I chih lo-chi wen-t'i[bl]" ["The problem of logic in the *Book of Changes*"], in *Che-hsüeh san hui*[bm] [*Three types of wisdom in philosophy*] (Taipei: San-min shu-chü, 1971), pp. 109–143, where (p. 133) *p'ang-t'ung* is defined as looking at the hexagrams in units of two in which the *yin* and *yang* lines are paired against each other. Before Chiao Hsün, whom Wei Tat and Thomé Fang rely on, Yü Fan[bn] (164–233) had earlier gained a partial understanding of the concept of *p'ang-t'ung*. He applied it, however, to only twenty-eight of the hexagrams and stopped short of developing it into a principle for explaining one aspect of the entire set of hexagrams as did Chiao Hsün. For a detailed comparison of the contributions of Chiao Hsün and Yü Fan in the matter of the *p'ang-t'ung* pairing of hexagrams, see Ch'eng Ch'i-p'an[bo], *Tiao-ku lou i-i*[bp] [*The purport of studies on the Book of Changes from the Tiao-ku studio of Chiao Hsün*] (Changsha: Commercial Press, 1940).

23. In general, the ordering worked out by Chiao Hsün to illustrate the concept of *p'ang-t'ung* resembles the reordering proposed below in one aspect only—both consist of thirty-two pairs of hexagrams which, line for line, are exact opposites.

24. Frank Gray, U.S. Patent No. 2632058, listed in *Official Gazette of the United States Patent Office*, vol. 668, no. 3 (Washington, D.C.: U.S. Government Printing Office, March 17, 1953), pp. 823–824. The Gray code is explained in Montgomery Phister, Jr., *Logical Design of Digital Computers* (New York and London: John Wiley and Sons, 1958), pp. 232–234 and Robert Baron and Albert Piccirilli, *Digital Logic and Computer Operations* (New York: McGraw-Hill, 1967), pp. 115–116. Martin Gardner has written a fascinating essay in which he describes the applications of the Gray code to the solution of various ancient puzzles, among them the "Chinese rings" and the Tower of Hanoi puzzle. See his "Mathematical Games," *Scientific American* (August, 1972): 106–109, in which he gives other important references to the Gray Code and its applications. In the same issue of *Scientific American*, pp. 76–83, there is an article by F. G. Heath entitled "Origins of the Binary Code" in which the Gray Code is discussed on pp. 81–82.

25. Wilhelm-Baynes, *The I Ching*, p. 274.

26. Wilhelm-Baynes, *The I Ching*, p. 292.

27. Ibid., p. 378.

28. Wei Tat, op. cit., pp. 300–301.

29. Wilhelm-Baynes, *The I Ching*, p. 36.

30. The terms "thesis," "antithesis," and "synthesis" are not Hegel's but were used by later commentator to clarify his theories. See John McTaggart, Ellis McTaggart, *Studies in Hegelian Dialectic* (Cambridge: Cambridge University Press, 1922), I.1, pp. 1–2, and G. W. F. Hegel, *Encyclopedia of the Philosophical Sciences*, trans. William Wallace as *The Logic of Hegel*, 2d ed. (London: Oxford University Press, 1892), §81, pp. 147–152.

31. We are indebted to David Aronson, who first noted the correspondence with Hegelian dialectics.

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a 易經
b 潛卦
c 旁通
d 郭沫若
e 周易的構成時代
f 田口福司朗
g 周易の起源
h 伏羲
i 先天
j 文王
k 後天
l 李鏡池
m 易傳探源
n 史學年報
o 顧頡剛
p 古史辨
q 谷川龍山
r 左國易一家言
s 毛奇齡
t 春秋占筮書
u 叢書集成初編
v 胡自逢
w 先秦諸子易說通考
x 坤乾
y 孔穎達
z 徵
aa 徵驗
ab 歸藏
ac 周禮
ad 連山
ae 周易
af 鄭玄
ag 賈公彥
ah 歸藏易以純坤爲首
ai 玉函山房輯佚書
aj 馬國翰
ak 漢魏遺書鈔
al 王謨
am 續修四庫全書提要
an 張心澂
ao 僞書通考
ap 禮記
aq 十三經注疏
ar 劉寶楠
as 論語正義

at 熊氏
au 陰
av 李漢三
aw 先秦兩漢之陰陽五行學說
ax 中國史稿
ay 序卦
az 晉
ba 韓康伯
bb 京房
bc 邵雍
bd 黎凱族
be 易數淺說
bf 文言
bg 焦循
bh 易圖略
bi 易學三書
bj 焦氏叢書
bk 方東美
bl 易之邏輯問題
bm 哲學三慧
bn 虞翻
bo 程啓槃
bp 雕菰樓易義
bq 坤
br 乾
bs 姤
bt 復
bu 臨
bv 遯
bw 同人
bx 師
by 升
bz 无妄
ca 否
cb 泰
cc 明夷
cd 訟
ce 履
cf 謙
cg 小過
ch 中孚
ci 渙
cj 豐
ck 大壯
cl 觀

cm 益
cn 恆
co 解
cp 家人
cq 漸
cr 歸妹
cs 震
ct 巽
cu 小畜
cv 豫
cw 萃
cx 大畜
cy 蠱
cz 隨
da 兌
db 艮
dc 賁
dd 困
de 大過
df 頤
dg 剝
dh 夬
di 革
dj 蒙
dk 損
dl 咸
dm 蹇
dn 睽
do 未濟
dp 既濟
dq 需
dr 晉
ds 噬嗑
dt 井
du 坎
dv 離
dw 旅
dx 節
dy 屯
dz 鼎
ea 大有
eb 比
ec 中

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