The world's oldest profession: indexing?

Nancy K. Humphreys

A closer look at the 3,000-year-old I Ching, or Book of changes, *from China, yields some surprising conclusions about the origins of indexing. This ancient book of hexagrams contains the world's oldest table of contents and index.*

A rose by any other name would smell as sweet.

Shakespeare, *Romeo and Juliet*

We all think we know what an index is, but defining that is not easy. Perhaps that is why G. Norman Knight, in his *Indexing, the art of* (1979), is so reluctant to name a particular title when he discusses the earliest indexes in Western culture:

> It is sometimes thought that the earliest index (in the correct meaning of the word) to an English book is that to Alexander Cruden's *Concordance* (1737), but there had been earlier examples, often called 'tables'. H. B. Wheatley instances Sir Thomas North's translation of Plutarch's *Parallel lives* (1595) – a book of which Shakespeare made full use for his classical plots. Again, Scobell's *Act and Ordinances of . . . Parliament* (1658) is 'An Alphabetical Table of the most material contents of the whole book', preceded by 'An index of the general titles comprised in the ensuing Table'.

Even Cruden had been preceded by a number of Jewish authors. For instance in 1691, according to M. Z. Barkai, Shmuel ben Alexander published an index to the legal book *Hoshen u-mishpat* with the explanation: 'these keywords simplify locating the point for which the judges are searching'. (Knight, 1979: 18).

Hazel Bell, following up on research about the origin of indexes and indexers by Bella Hass Weinberg in *The Indexer*, suggests in her introduction to *From flock beds to professionalism: a history of index-makers*, that Ptolemy was the earliest named indexer:

> The origins and early development of indexing are outlined by Bella Hass Weinberg in a series of papers in *The indexer*, and in the introduction to *Indexers and indexes in fact and fiction*. This volume will consider the practitioners themselves, the makers of indexes, their working methods, techniques, training and remuneration – and their lives.
>
> Alas, the names of indexers are rarely known, from the earliest times to the present day; makers of indexes are little credited. In the histories, the names of the authors and publishers of early indexed works are given, with details of the content and structure of the indexes, but not the names of their compilers. Occasionally we can grasp at an early name: perhaps the first known indexer is Ptolemy, who produced an index to his first world atlas

c. AD 150. Then, it has been claimed, Robert Grosseteste, Bishop of Lincoln from 1235–53. He was a prolific, scholarly writer, who 'needed to recall his reading at will. So he made a subject-index of works read in the 1220s, using, to mark the passages in the books, a set of symbols'. Cardinal Robert Kilwardby, who died in 1279, synthesized and indexed the literature of theology.

(Bell, 2008)

(Note: Bell added in an email to me (23 November 2010) that she probably took the reference for Ptolemy from *Longitude* by Dava Sobel.)

As Nancy Mulvany's review of Bell's *Flock beds* on Amazon.com makes clear, indexers still remain a largely invisible group (Mulvany, 2009).

In *Indexers and indexes in fact and fiction* (2001), Hazel Bell took a more comprehensive look at the origins of indexing and the oldest printed indexes. She concludes here that 'the art of indexing was not very highly developed before 1550; the alphabetical arrangement of entries rarely if ever extended beyond the second letter of the first word'. Bell adds that indexing was not always seen as desirable: 'in 1554 the first man to prepare a concordance to the Bible was sentenced to be burned at the stake for heresy' (Bell, 2001).

Fascinating as this all is, I fully intend to avoid jumping into this fray. Instead I want to look to the East – the Far East – for inspiration. Because there was indexing in Asia far prior to the examples cited above, and it was the most sophisticated indexing I have ever seen.

The oldest index and earliest indexer in the world

As many before me have pointed out, it is not easy to define what an index is. Maybe that is why the first index in the world has passed unrecognized for over three millennia. This index did not have a name, and it was not placed in the back of the book.

According to Chinese legend, around 1150 BC a wise and beloved ruler named Wen created a 'book of wisdom'. He did so by using eight different three-line symbols for natural phenomena. These three-line geometric symbols were called 'trigrams' (see Figure 1).

Trigrams consist of combinations of solid and broken lines. Wen combined the eight possible trigrams into groups of two. The six-line figure that results when combining two trigrams together, one over the other, is called a hexagram.
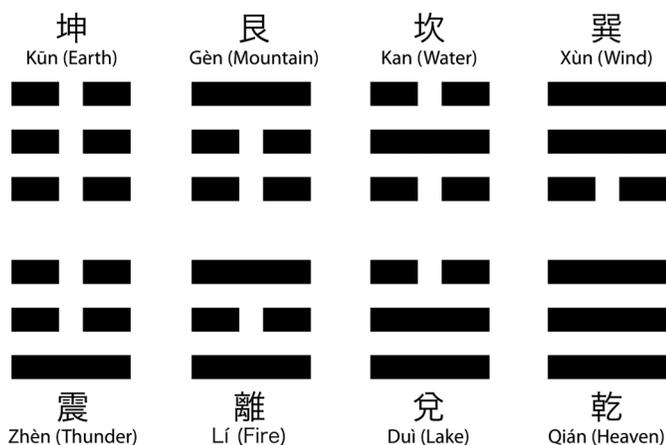
坤 Kūn (Earth)	艮 Gèn (Mountain)	坎 Kan (Water)	巽 Xùn (Wind)

震 Zhèn (Thunder)	離 Lí (Fire)	兌 Duì (Lake)	乾 Qián (Heaven)

Figure 1 The eight trigrams

Here, for example (from Wilhelm, 1977: 231) is hexagram 60, Limitation (*Mist over the lake*):

How Wen created the *I Ching*

Wen's permutations formed an 8x8 matrix of doubled trigrams and resulted in a total of 64 possible hexagrams. (See the table of trigrams in Figure 2 for a look at how 64 hexagrams are derived from only eight trigrams.) Each six-line hexagram represents one of the 64 topics symbolized by the hexagrams in Wen's *I Ching,* or translated into English, his *Book of changes.*

While imprisoned by the emperor who ruled China, Wen, a philosopher and a provincial ruler, arranged these 64 hexagrams in a certain order. The resulting Wen sequence of symbols formed the basis for all the commentaries about the *I Ching* that have come down to us today.

Coded into Wen's original arrangement of hexagrams in his book was advice about leadership and military strategies. Wen passed on the *I Ching* to his son, the Duke of Chou. Chou used it to overthrow the emperor who had imprisoned his father. Chou also set up a Chinese dynasty that lasted nearly a thousand years. To honor his father, the Duke gave him the title King Wen. This is the ancient legend of the *I Ching*'s origin.

The table of contents and index to the *I Ching*

King Wen created a table of contents (TOC) to his book. Wen's TOC consisted of 64 'main headings' for what could have been an obvious index for the book as well — *if* those 64 headings from the TOC were put into alphabetical order. Of course, Chinese is not a language that has an alphabet or alphabetical order. It is a language that uses characters called ideograms rather than letters of an alphabet.

Furthermore, Wen's headings were not labelled as either a table of contents or an index; instead, they came from the first part of a three-part summary called a 'judgment'. As is the case with all TOCs (and indexes), a list of Wen's descriptive names within his judgments forms a derivative work that depends for its existence on a prior creative work (that is, the *I Ching* hexagrams) for meaning.

These descriptive names from Wen's judgments were rendered in Chinese ideograms that have been translated into English by Western scholars. One edition for example is Cary F. Baynes's translation of Richard Wilhelm's German version (Wilhelm, 1977: xlv).

Each of King Wen's 64 judgments had three parts: a descriptive name, a favorable or unfavorable prognosis, and some qualifying information about the hexagram. For example, the judgment for symbol 60 is (in English): 'Limitation. Success. Galling limitation must not be persevered in' (Wilhelm, 1977: 231). 'Limitation' is the descriptive name for this hexagram. It tells us what the hexagram is about. The number that is attached to this hexagram, number 60, is the locator for this discussion about limitation.

If all 64 descriptive names for the hexagrams are extracted from the Wen judgments and then put into alphabetical order and placed at the end of the *Book of changes,* it forms a perfectly modern-looking index. For example, here is the 'D' section of a hypothetical index for the *I Ching* (transliterated Chinese ideograms are in parentheses):

> Darkening of the light (Ming I), 36
> Decrease (Sun), 41
> Deliverance (Hsieh), 40
> Development (Chien), 53
> Difficulty at the beginning (Chun), 3
> Dispersion (Huan), 59
> Duration (Héng), 32

Following King Wen's lead, his son, the Duke of Chou (Zhou), created additional judgments for each of the six lines that made up each of the 64 unique hexagrams in the *I Ching*. The Duke's 384 'line-judgments' (6 lines *x* 64 hexagrams = 384) tended to be wordy and prescriptive, but they were in essence the first subentries for an index.

Defining what an index is

Section 2.5 of BS ISO 999, 1996, defines an index as an:

> Alphabetically or otherwise ordered arrangement of entries, different from the order of the document or collection indexed, designed to enable users to locate information in a document or specific documents in a collection.

This definition describes exactly what the descriptive English names within Wen's ordered list of judgments do if they are placed in alphabetical order. Wen systematically arranged his judgments by their descriptive names, and he made all of the judgments accessible via their locators. Instead of page references, the locators in his book were hexagram numbers. But we don't see an alphabetical list of hexagram names in the back of *I Ching* commentaries. What we see instead is that Wen's descriptive names are used in hexagram number order

as a table of contents in the front of many books about the *I Ching*.

A table of contents is in locator order; hence it is distinguished from an index, which by definition must be in a different order than locator order. But in the case of this book, its table of contents is the exact same thing as its index. The difference is purely in the order of elements in each thing, hexagram number order or alphabetical order. Why are the table of contents and index the same? The hexagrams, when ordered by Wen, were numbered from 1 to 64. The table of contents and any index generated from it all point to the same 64 hexagrams by hexagram number.

This makes the wording of the main headings for Wen's table of contents identical to that of the main headings which an index to this book would use. It is the arrangement, or order, of main headings that makes the difference between these two types of access points in this book.

The *I Ching* is an indeed an organized information source, and it contains a table of contents and an implied index that has been preserved and expounded on for over 31 centuries. But this alone is not what makes it so amazing. And before you protest that a table of contents and an index should not be worded the same, or that a language without an alphabet cannot be used to create an index as we know it, let us look at the true index to the *I Ching*.

The 'other' index to the *I Ching*

There is a second index to the *I Ching*, a graphical, non-alphabetical index.

First, let us ask, 'Why would a book need more than one index?' One answer is that this book had two audiences: one literate and able to write and read ideograms, the other not able to do that. For the second group, Wen created a special kind of index that they, too, could use. Instead of ideograms, Wen's index used the trigrams. These were simple symbols that anyone, even if they could not read or write, could understand.

King Wen created a table of trigrams, which can also be seen as an index to the *I Ching* (see Figure 2). As you study the table in Figure 2, you will see how the 64 hexagrams are derived from eight trigrams in an 8x8 matrix. This table contains 64 boxes, numbered from 1 to 64. The trigrams along the left side of this box represent the bottom trigram within each hexagram. The identical trigrams along the top of the box represent top trigram within each hexagram.

By drawing a finger on your right hand downward from one of the trigrams on the top of the table while moving a finger from your left hand starting from one of the trigrams on the left of the table and going to the right, you will wind up with both fingers in a box with a number. Wherever your two fingers meet in a box, you have the number of the hexagram that is created when these two trigrams are combined in that order. For example, Mountain (Kên ☶) at the top and Heaven (Chi'en ☰) on the left of the table lead you to hexagram number 26, 'The taming power of the great' (see the fourth column and the first row for hexagram number 26).

As another example, for the hexagram shown earlier,

Mist (K'an ☵) above Lake (Tui ☱) is hexagram 60, 'Limitation' (see the third column and bottom row for hexagram number 60).

The post-coordinate index

This technique of finding something by searching for it from two directions is what Hans Wellisch calls post-coordinate indexing in his *Glossary of terminology in abstracting, classification, indexing, and thesaurus construction* (Wellisch, 2000: 52). Many years ago, I observed this method of information access being used by library circulation desk staff. When staff checked out a book to a patron, they notched a hole on the edge of a card taken from a pocket pasted onto the back inside cover of a book. Staff notched the card next to the date that the book would become overdue. This card was placed in a drawer and held there until the book was returned. Every day staff would use a long metal spindle or rod to lift cards out of the drawer, leaving behind any that had become overdue (that is, had holes punched) on that particular day. Patrons with overdue books would then be notified (Cleveland and Cleveland, 2001: 51).

Here is another example of post-coordinate searching. Before widespread use of the Internet, publishers created and sold to libraries post-coordinate indexes for many bound volumes of subject indexes and abstracts to articles in periodicals. For example, in *Psychological abstracts* (print editions in the 1980s), the student could use post-coordinate searching to find articles about 'females' and 'anxiety'. If the same abstract number appeared under both of those descriptors in the index to *Psych abstracts*, the student had a match; that article that was about female anxiety.

While most indexing for books and journals today is 'pre-coordinate' indexing that gives you the whole phrase (such as 'female anxiety'), post-coordinate indexing is still a dominant feature of computer databases and is an aspect of taxonomy-building.

In this way, Wen's post-coordinate index, his table of trigrams, is quite modern, and it has possible implications for the future of the field of indexing as well as its past.

The *I Ching* as a library system

Although it looks like a haphazard collection of 'folk sayings' on its surface, all the parts in this ancient book were carefully constructed by a Chinese philosopher to work as an interlocking whole to encapsulate a world of human knowledge in one tiny cube.

The elegance and power of this amazing ancient book of wisdom about human society lies in its succinct mathematical conceptualization of the changeability of human experience through the permutations of eight pre-historic three-line symbols, the trigrams, that depicted changes in natural phenomena.

One last item about the *I Ching*. In addition to having the earliest recorded index in human history, the *I Ching* itself is the earliest known syndetic (that is, closed) classification system. It is also an example of a faceted index and faceted classification system.

TABLE OF TRIGRAMS

Upper → / Lower ↓	☰ Ch'ien Hea-ven	☳ Chên Thun-der	☵ K'an Mist	☶ Kên Moun-tain	☷ K'un Earth	☴ Sun Wind	☲ Li Fire	☱ Tui Lake
☰ Ch'ien Hea-ven	1	34	5	26	11	9	14	43
☳ Chên Thun-der	25	51	3	27	24	42	21	17
☵ K'an Mist	6	40	29	4	7	59	64	47
☶ Kên Moun-tain	33	62	39	52	15	53	56	31
☷ K'un Earth	12	16	8	23	2	20	35	45
☴ Sun Wind	44	32	48	18	46	57	50	28
☲ Li Fire	13	55	63	22	36	37	30	49
☱ Tui Lake	10	54	60	41	19	61	38	5

Figure 2 Table of trigrams

The *I Ching* predates by three millennia the Dewey Decimal system (the syndetic classification system widely used by 200,000 public libraries worldwide) and the UDC (Universal Decimal Classification), an enumerative (or open) decimal system derived from Dewey's system for use in specialized European libraries.

Wen's system is the first known instance of classification systems now used for modern large-scale library databases called OPACs (Online Public Access Catalogs). Yet Wen's unique combination of a table of contents and graphical index remains today a simple system that is more sophisticated than any current library or Internet search engine classification system in the world.

Notes

The original discussion of syndetic (open) and enumerative (closed) classification schemes may be found in Ranganathan (1951). Ranganathan has been called the father of library science.

For more about the UDC system, see the discussion in Wikipedia: `http://en.wikipedia.org/wiki/Universal_Decimal_Classification`

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Nancy K. Humphreys is the author of the forthcoming book The I Ching circles *and the owner of WordmapsIndexing.com. She is an active member of the Indexing Society of Canada/Société canadienne d'indexation. Email:* `nancykemail@gmail.com`