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The Visualization of Knowledge: Researching for New Methods for Information Design in the Intercultural Field

Felsing, Ulrike[1] & Lüdi Kong, Eva[2]

Abstract

The aim of this research was to answer the following question: How can design provide access to visual sources of knowledge from other cultures? Diagrams from the Chinese visual encyclopedia *Sancai Tuhui* (1609) were exemplary of "foreign knowledge." This paper focuses on the ways of re-drawing these diagrams as "visual translations." The result of this research is the understanding that visible, visualized knowledge is always tied to cultural notions that are not always immediately visible. For a certain amount of time, these form the "reference system" for the images (see Goodman, 1968), in which social, ethical, historical, and media dimensions are linked. The research project, "The exploration of design methods in the area of cross-cultural visual communication. Case study 1B: The coexistence of Chinese and Latin visual cultures," was initiated by the Swiss National Science Foundation between 2010 and 2015. The research is in the field of communications design, and the field itself ranges from information design (practice) to visual studies (theory). In the practical area, our group based its research on works by Tufte (1983, 1990, 2005, 2006) and Bertin (1974); for the theory, we refer to Krämer (2009) and Goodman (1978). Adjacent disciplines are semiotics and Sinology.

1. The Idea of Universal Linguistics

Images from everyday life, advertising, illustrated textbooks, and scientific treatises are all characterized by the notion that they are easier to comprehend than language (see Schade, 2011: pp. 13). The notion that images are intuitively accessible assumes that the image and the object represented resemble each other strongly. It is also based on the differentiation between so-called natural—meaning, self-explanatory—visual signs and artificial language, which is an arbitrary construct and requires translation. In *Languages of Art* Goodman (1976) argues that even images are constructs, almost like language. He does not regard representation as imitation, but as an operative, productive act of *creating* reality. According to Goodman, there is almost no such thing as a natural relationship of the kind produced by similarities. In his eyes, even "realism is relative"; it is: "determined by the system of representation standard for a given culture or person at a given time." (Goodman 1968: p. 37). The idea that images can be immediately understood is based on the inability to see the gaping differences—even breaks—between various cultural reference systems. Nowadays, globalization suggests that there is one universal cultural space, yet at the same time, it sacrifices the diversity and distinctions of visual cultures. In the age of globalization, medialization, and digital networking, Chinese and western systems of reference are more and more interwoven. Our research aimed to answer the general question: Is it possible to depict information, structures, and images from different cultural contexts, with their various characteristic systems of representation, so that these systems can exist equally, side-by-side?

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[1] Geneva School of Art and Design, Bd James-Fazy 15, CH-1201 Genève, Switzerland.
Email: ulrike.felsing@multilingual-typography.com, Phone: 0041 (0)79 945 17 44
[2] China Academy of Art, Nanshan Rd. 218, Hangzhou 310002, China

This lead to a specific research question: How can design provide access to visual sources of knowledge from other cultures, without losing its own cultural characteristics?

2. The Chinese Visual Encyclopedia *Sancai Tuhui*

In this project, one of the examples of "foreign knowledge" was the Chinese visual encyclopedia known as *Sancai Tuhui*, or the *Collected Illustrations of the Three Realms*, one of modern western Sinology's most valuable sources. It was published toward the end of the Ming Dynasty, in 1609. In China itself, the encyclopedia enjoys somewhat less popularity than it does in western Sinology, since, as always, the value of the written material itself prevails. Even though illustrations from the *Sancai Tuhui* are often used to illustrate certain themes today in China, there have been few deeper scientific investigations of its visuals. This may have to do with the fact that scientific research of images concentrates on the high art of painting, while the illustrations from the *Sancai Tuhui* seem to be less worthy of attention, since they are merely illustrations produced by craftsmen. Our examination of the cultural connotations (of the reference system) of this valuable visual material is therefore unique and should also be of interest to Chinese researchers. The "Three Realms" (*Sancai*) refer to "heaven, earth, and man," (Fischer-Schreiber, 1997: p. 325) a phrase that described the entire world at the time. The work comprises around twelve thousand pages and is divided into fourteen subjects, covering themes from heaven and astronomy to geography, personalities, palaces, tools and implements, the human body, clothing, human affairs, rites and ceremonies, jewels, writing, and, finally, animals and plants. The core of the book is made up of countless illustrations, each of which is accompanied by an explanatory text. One part of this visual material consists of diagrammatic depictions, which were at the center of our research. The cultural frame of reference for the *Sancai Tuhui* is strongly influenced by the neo-Confucian concepts of the Song (960-1279) and Ming dynasties (1368-1644), which in turn refer to the canonical books of Confucianism such as the *Shangshu* or *Book of documents* (Legge, 1861), the *Yijing* or *Book of transformations* (Wilhelm, 1956), and the *Liji* or *Records of rituals* (Legge, 1885). The *Sancai Tuhui* was an extraordinarily good source for our research, because one can assume that the encyclopedia is essentially free of western influences.

3. Methods

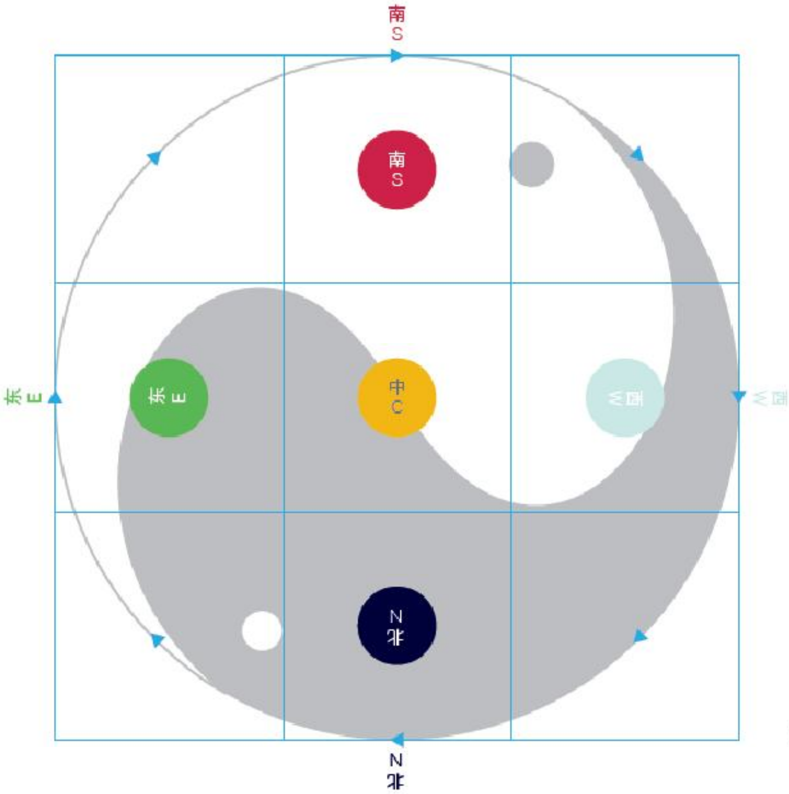
The illustrations of an encyclopedia are understood as "images of utilization" (Majetschak, 2005, p. 97) or as "scientific images (Boehm, 1999, p. 227), and due to their functionalism they are distinct from artistic images. In design, the term "Information graphics" or "infographics" has asserted itself, and we use this term to distinguish newly drawn graphics from the original diagrams in the *Sancai Tuhui*. The research followed the hypothesis that diagrams have their own inherent visual practice of producing knowledge and insight that cannot be showcased in a discursive way. In order understand the *Sancai Tuhui's* own visual potential as an episteme of the diagram, one needs both linguistic and visual analyses that can analyze the epistemic character of the illustrations and "translate" them visually, because in addition to the difference between image and text, there are also cultural differences. In these visual translations we developed our own interpretation more from an ethnographical standpoint than an art historical one. We oriented ourselves on the interpretive approach to "thick description" (Geertz, 1973), which plays a main role in ethnography. Here, the subject of investigation is the relationship between the phenomena visible on the surface and the notional structures beneath them. Clifford Geertz writes, "The whole point of a semiotic approach to culture is … to aid us in gaining access to the conceptual world in which our subjects live …" (Geertz, 1973: p. 39). For our research, this meant that we had to inquire into the ideas and concepts that formed the foundation of the diagrams. As a whole, we called these ideas and concepts the system of reference.

Based on the original diagrams from the visual encyclopedia, we drew new info graphics, which we supplemented with the part of the specific system of reference that is now missing, yet needed to understand the images. Among them are, for example, knowledge about the conditions under which the images were produced and received, such as the cardinal directions, the direction of reading, and the construction and functions of the graphics. The conclusions we drew from investigating the diagrams in the *Sancai Tuhui* have been interesting to us in terms of contemporary design, where various cultural reference systems are becoming more and more intermixed. Therefore, we also observed the Ming era system of reference in comparison to today's intercultural situation, where traditional and modern, Chinese and western visual cultures are interwoven and are sometimes amalgamated so that they are completely inseparable. To do this, we drew upon diverse western diagrams that offered thematic as well as formal points of contact for comparison. Without, however, having previously separately investigated the traditional Chinese system of reference and the modern western one, we were hardly able to make statements about "mixture ratios."

"Pure," "unmixed," and defined cultural systems, however, do not exist, but are constructed by comparing systems that contrast the so-called "other" and "the self." It was therefore important to keep in mind that the depiction of a "foreign" culture conveyed is firmly linked to the notion of "one's own" world (see Berg, 1993, p. 11).

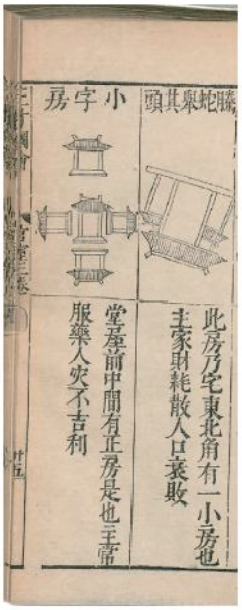
4. The Frame of Reference for Traditional Chinese Diagrams

The notions and concepts underlying the visual material under investigation can be summarized as follows: The visual frame of reference of traditional Chinese diagrams consists of a combination of the square ("earth," space, material) and the circle ("sky," time, the intangible). Circle and square are thought of as different manifestations of the same causal force—the Tao, so they are not irreconcilable opposites. The square is divided into nine sections ("nine palaces") while the circle usually goes in a definite direction, which represents time, also showing the temporal relationships of "yin and yang," the interplay between polar forces as they wax and wane. In addition, the four cardinal points and the center with their respective qualities—the "five phases of transformation"—are also depicted, whereas normally, south is at the top and north is at the bottom. These areas and the phases of transformation can also be represented by colors. Red represents south, summer and fire, white (now light blue) represents west, autumn and metal, black represents north, winter and water, green represents east, spring and wood and finally yellow represents the center, the midsummer and the element earth. This system of reference is shown here in a graphic depiction that illuminates the ideas and concepts that are the foundation for many Chinese diagrams. (fig. 1)



(fig. 1)

The following example demonstrates how we proceeded with a visual translation: the original version of the diagram from the *Sancai Tuhui* shows a rotated house. From the perspective of someone outside the cultural frame of reference, it looks puzzling. Why is it turned upside down? However, if the frame of reference is visualized, the viewer realizes that the image shows a building in a northeast position. The particularly relevant parts of the reference system here are as follows: the division of the square into nine fields ("nine palaces"), which clarify the order of the areas as well as the direction of the house; the qualitative correspondences linked to the areas, as well as the cyclical increase and decrease of the polar forces of yin and yang indicate the energies of the building complex, which can be interpreted as having a favorable or less favorable impact upon the residents. (fig. 2)



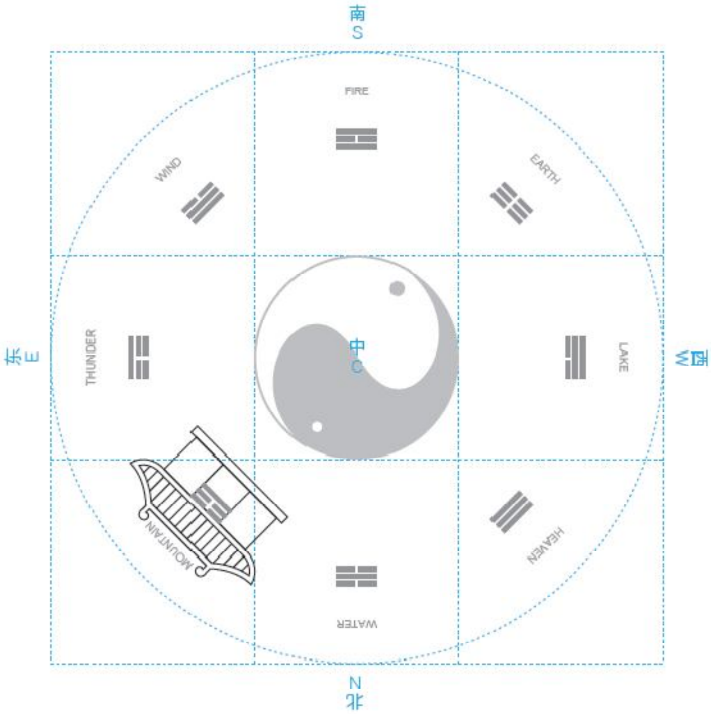
螣蛇梟其頭

此房乃宅東北角有一小房也
主家財耗散人口衰敗

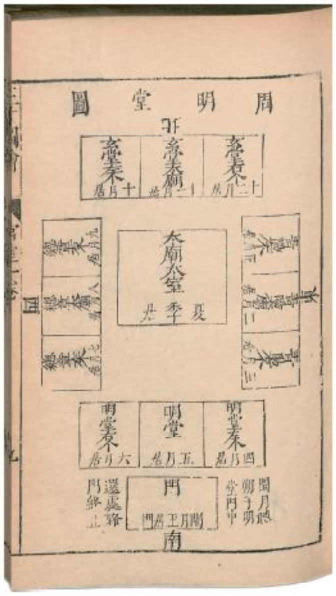
小字房

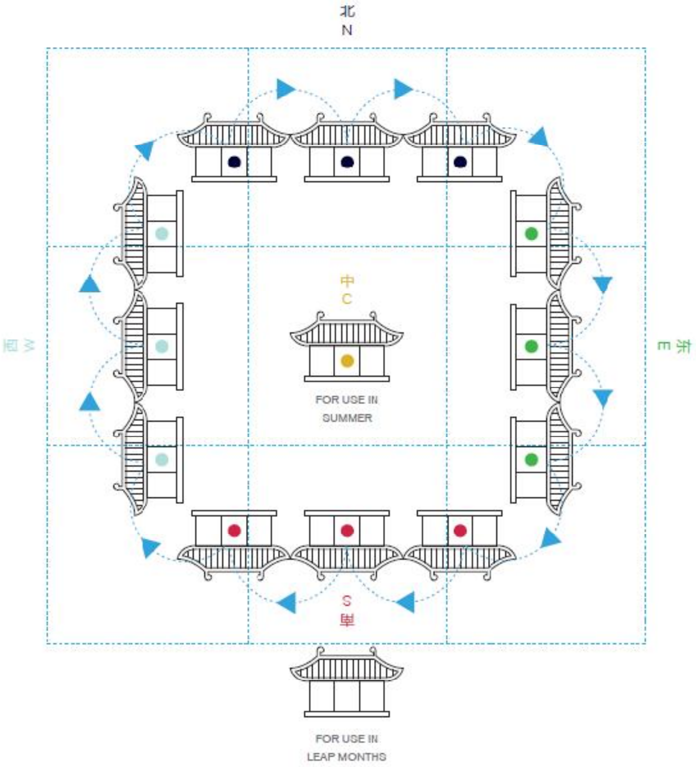
堂屋前中間有正房是也主常
服藥人灾不吉利

(fig. 2)



A further example can be seen here in the architecture of the *Ming tang*. The *Hall of Clarity* was regarded as a major architectural structure of the royal court during the Zhou (ca. 1100–256 B.C.) period. According to Marcel Granet, the *Ming tang* is: “a house of the calendar, in which one is able to perceive to a certain extent a condensation of the cosmos. … Every year, throughout the entire year, the emperor walks in a circle beneath this roof. When he takes his place at each of the possible cardinal points, he opens up the seasons of the year and the months in a steady sequence. When, in the second month of spring, he dresses in green and positions himself precisely at the easternmost point, without any error in location, this corresponds to the idea of completed visit to the east at the time of the spring equinox.” (Granet, 1971, p. 76). Nowadays, we would call this kind of choreography a “performative act” in which the emperor calibrates time—meaning, that his very active deed gives structure to time. In order to demonstrate how the plan of the *Ming tang* conveys knowledge, the newly drawn info graphic shows parts of the reference system, namely, the four directions and the cyclical motion [of the emperor] among the twelve palaces, or months. (fig. 3)





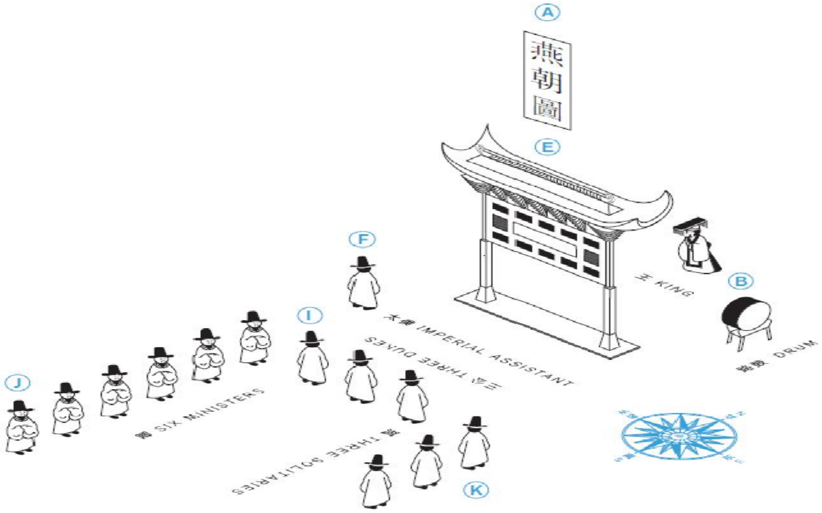
(fig. 3)

5. The Modern Western System of Reference Compared to the Traditional Chinese System

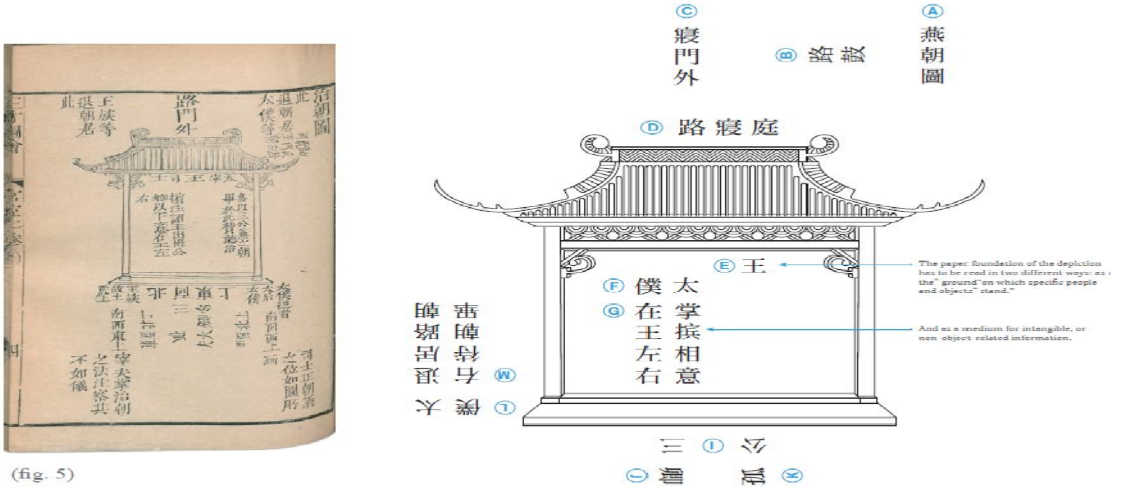
Modern western diagrams can be identified by five traits. They are two-dimensional, directional, graphic, syntactic and referential (Krämer, 2009: p.98). These elementary hallmarks are true of both Chinese and western diagrams. However, the clarity of these features is different. Two-dimensionality: western and Chinese diagrams are planar; they do not make any attempt at creating an illusionary sense of space or plasticity, as images that make use of perspective do. Direction: most of the western diagrams are read from left to right, or clockwise. In contrast, traditional Chinese diagrams are distinguished by the multi-directionalism of Chinese writing, which naturally makes the orchestration of typography more diverse than the uni-directional Latin script. The different directions are tied to the cardinal directions or the system of correspondence and therefore carry diverse meanings. The rotation, or the "sense of direction" in visual and written signs is one of the essential characteristics of Chinese diagrams. Unlike western images, the alignment of the Chinese images and characters can be compared to an almost physical *turn or tilt toward* the cardinal points and thus to the ref rences in the system of correspondences. Whereas, in Europe, "east" simply relates to geographical information, in China the concept of "east" is linked to a complex content of associations. "East" implies the morning (the time when the sun rises in the east), blossoming spring (the "morning" of the year), and growing plants (the phase of transformation is "wood") and even further extended associations.

Graphic quality: while pictures—paintings, for instance—work with continuous planes and gradients, Chinese and western diagrams are dominated by lines; they are graphic lines, according to Krämer, "the archetypal form of clear boundaries and definite shaping." (2009, p. 100) Syntacticism: Diagrams are defined by a form of visual syntactics specifically related to the image. We do not simultaneously perceive the individual elements of the diagrams, as is the case with pictures. We comprehend them just as discursively as we do a text. Diagrams are hybrids of visual and textual information. Yet another aspect of their syntactics is the way that symbols are arranged in positions. The authors Kirschbaum and Mahr call this "allocation" (Cancik-Kirschbaum, E. & Mahr, 2005: p. 97). Allocation makes it possible for isolated systems to be linked together in a spatial order. In order to accomplish this, three levels are allocated to each other: First, the level of symbolic relationships between the images and the character; second, the level of relationships among the positions; and third, the level of relationships within the leading cultural concepts of the various eras. Allocations form the basis of diagrams in both western and classical Chinese culture.

If one wants to distinguish in general pictorial, diagrammatic, and verbal representations, the following hypothesis can be made: Diagrams oscillate between pictorial and verbal representation, between the "presented" and "discursive symbolism," between the concrete and the abstract. They are not only observed, but they must also be read. Reading is linked to the ability to recognize things: we recognize a general type within a specific form. But our investigation shows that Chinese diagrams are more pictorial than western diagrams. This pictorial quality results from the compactness of the characters, which are not structured linearly, but organically. Their compactness is based on the quadratic conception of the characters, whose elements are attracted to an internal center. In diagrams, therefore, Chinese characters can represent people and objects far more directly and "concretely" than words composed of linear lettering. Also, they are easier to align in order to indicate spatial relationships. For example, the "Depiction of the Swallow Audience" clearly shows how the relationship of characters and visual elements form allocations while working together to help the reader receive them. The "king" (王 *wáng*) appears at the very top, beneath the portal. The "three dukes" (三公 *sān gōng*) are turned 180 degrees, so that they face north. (fig. 4)

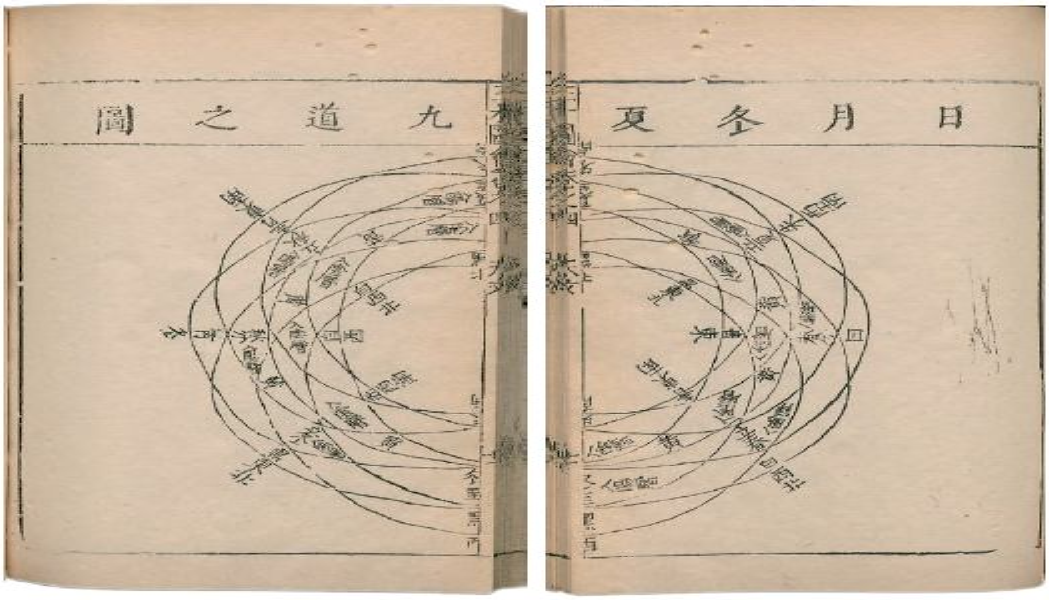

Ⓐ
燕朝圖
Ⓔ
Ⓕ
王 KING
Ⓑ
鼓 DRUM
Ⓘ
太僕 IMPERIAL ASSISTANT
三公 THREE DUKES
Ⓙ
SIX MINISTERS
THREE SOLITARIES
Ⓚ

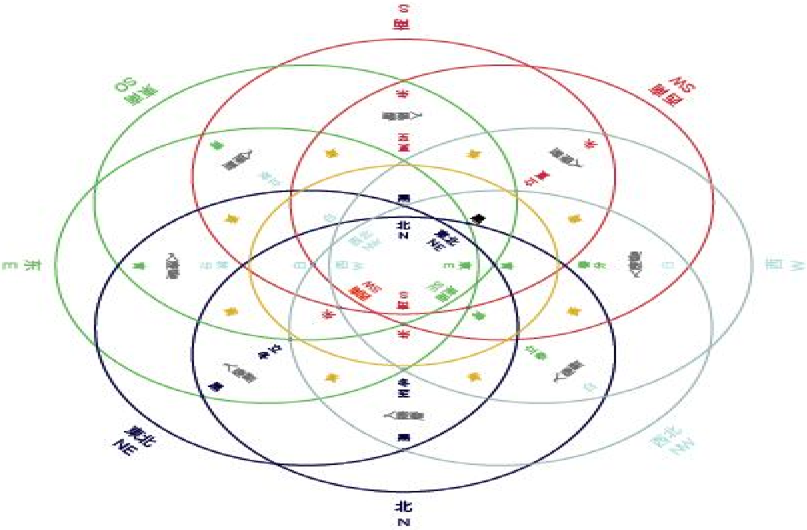
(fig. 4)


Ⓒ 寢門外
Ⓑ
Ⓐ 燕朝圖
Ⓓ 路寢庭
Ⓔ 王
Ⓕ 太僕
Ⓖ 在王左右
掌擯相意
Ⓜ
Ⓛ
三 Ⓘ 公
Ⓙ
Ⓚ
The paper foundation of the depiction has to be read in two different ways: as the" ground"on which specific people and objects" stand."
And as a medium for intangible, or non-object-related information.

(fig. 5)

Our interpretation shows that if we shift our visual interpretation toward the pictorial, the position and alignment of the persons in relation to the portal become even more obvious. Making it that concrete, however, has the disadvantage of suggesting a reality with which we are not precisely familiar. That's why we have developed a second interpretation, which makes it clear that it has to be a general typological depiction (fig. 5). This example points up a general problem: when developing an image, one always has to decide how far to go in abstracting the representation of reality. Here, Goodman's argument, that every representation is a construct, is quite obvious (see 1968, p. 20). The degree of simplification is also part of the graphic designer's decision-making process.

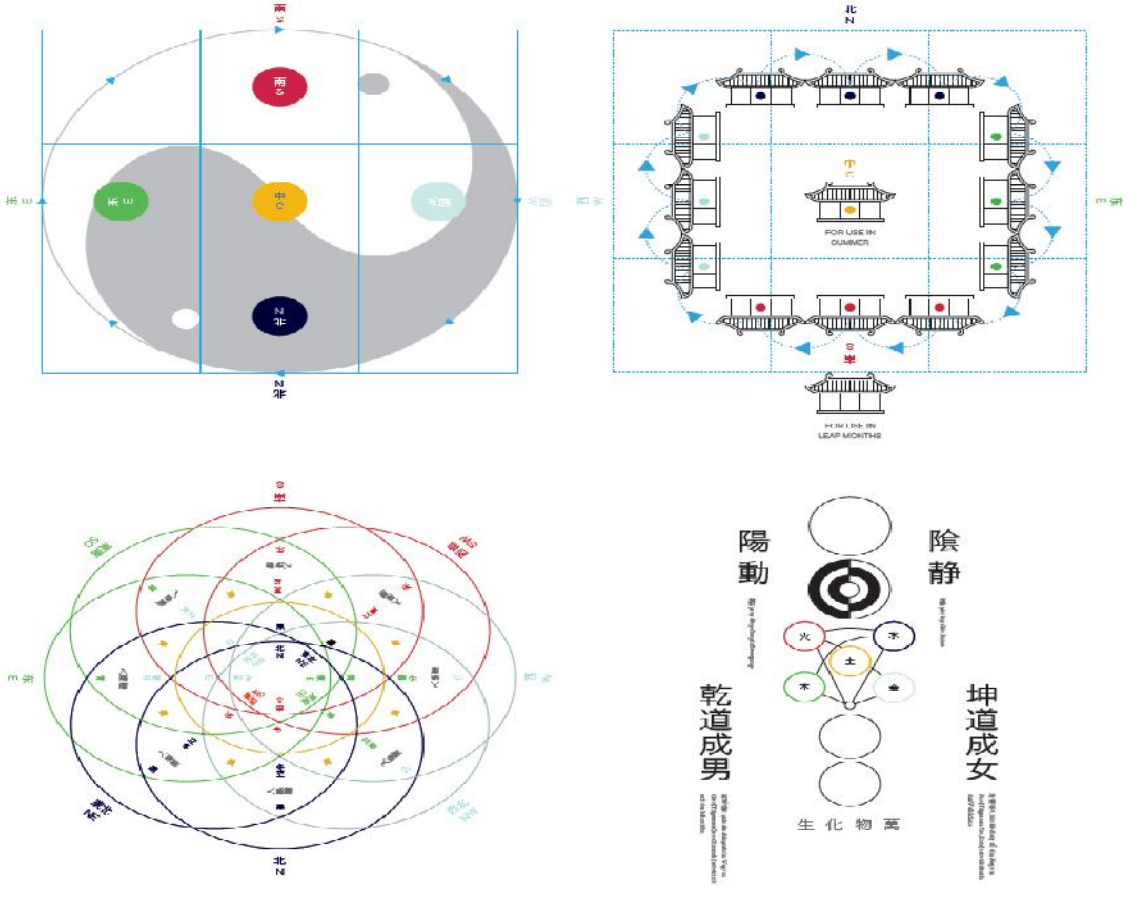




(fig. 6)

Another example of "visual translation" confronts the use of colors. Colors allow us to identify different levels of content, which are hard to distinguish in black-and-white print. Interestingly enough, in the *Sancai Tuhui* written characters identify colors, which means that the specific appearance of the color value remains ambiguous. (fig. 6) Since the system of corresponding colors runs through all of the thematic areas of the *Sancai Tuhui*, it makes sense to use the color in a unified manner, like a color code (fig. 7). Here, we also had to face culturally different conceptions of colors. 青 *qīng*, for instance, can mean "blue" or "green," sometimes even "black." As far as the colors of the cardinal points are concerned, the interpretation "green" seems logical, since here, the color is allocated to the east, which is associated with spring and plant growth. But the term is also open to being read as "blue," if you are interpreting east as the direction in which the East Chinese Sea lies. Because terms are more abstract than visual qualities, they stay open for several meanings. Visual qualities, on the contrary are more concrete and fixed. Therefore, the question arose for our research: How can we deal with this problem? Possible approaches are to either work with primary colors or apply a variety of different colors. In China the individual color is defined by the context or it will be individually interpreted according to the system of the "five phases of transformation." From a different cultural perspective, though, the same diversity of meaning may appear confusing and could even be mistakenly interpreted.

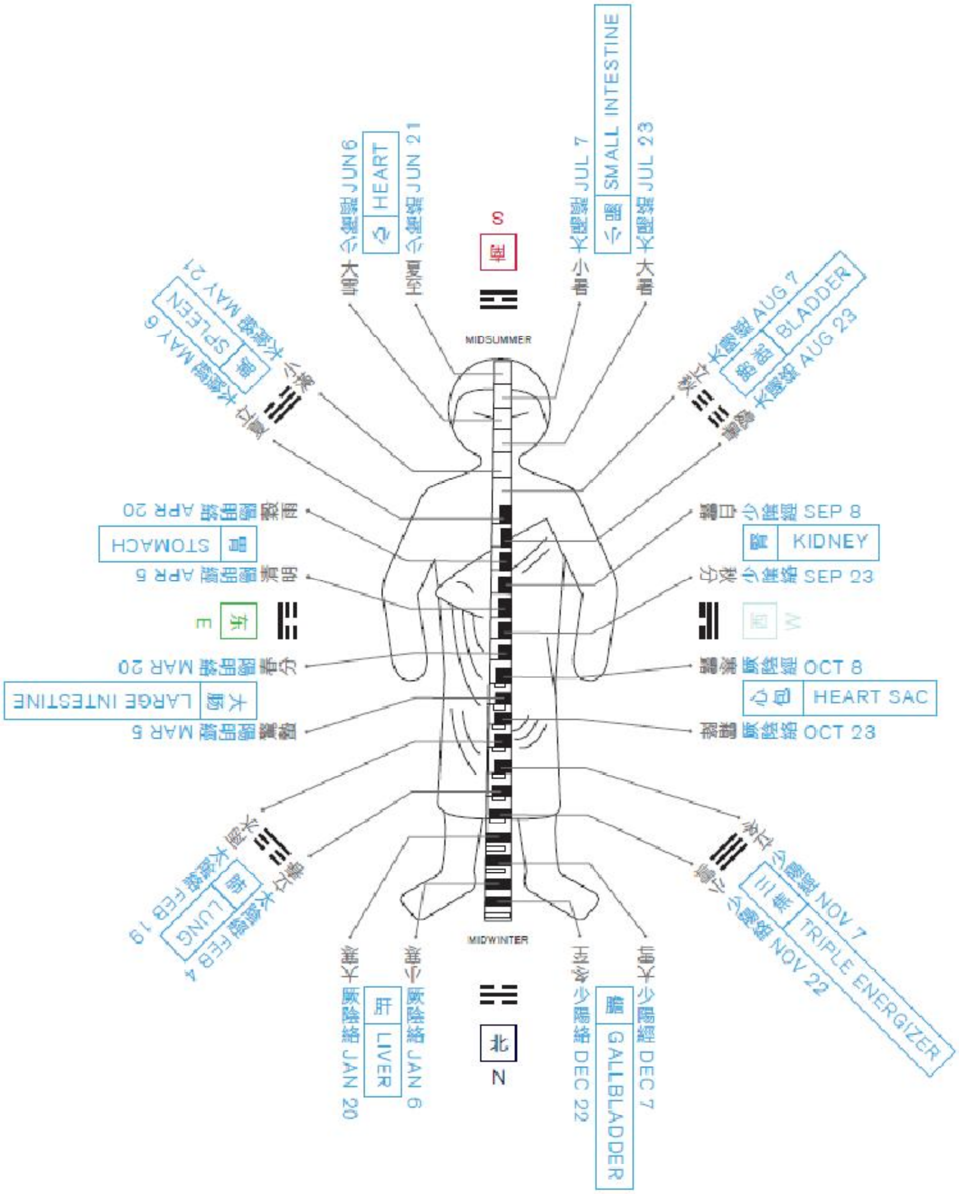
Referentialism: while artistic images are characterized by media-based references to art itself, diagrams always refer to something outside of themselves; they offer a reference. Modern western diagrams refer to empirical data or sets of data. Data are numerical values that are gotten through observations and measurements (empirical evidence). Depicting them in diagrams is described as proportional or true-to-life scale. Proportional data are “proportional,” meaning, one value arises from another by multiplying with a constant, real factor. In traditional Chinese diagrams, on the other hand, “space” and “time” do not describe measured dimensions, but qualitative relationships. In this context, the notion of an X axis and a Y axis, or the setting of a zero point are insignificant. Knowledge is not only shown and made comprehensible, but is also substantiated through acts of representation, especially in maps. Krämer emphasizes the constitutive function of diagrammatic representations of knowledge. “By making something visible, [they] also always imply the production of what is depicted. And this is particularly true for … theory.” (Krämer, 2009, p. 105) The images are not simply illustrations of objects of knowledge; they also have their own potential ability to constitute knowledge. This has hardly been noticed until now, because writing has always been regarded as the primary bearer of knowledge. Because visual knowledge can only be conveyed through visual means, we have redrawn the diagrams from the visual encyclopedia.



(fig. 7)

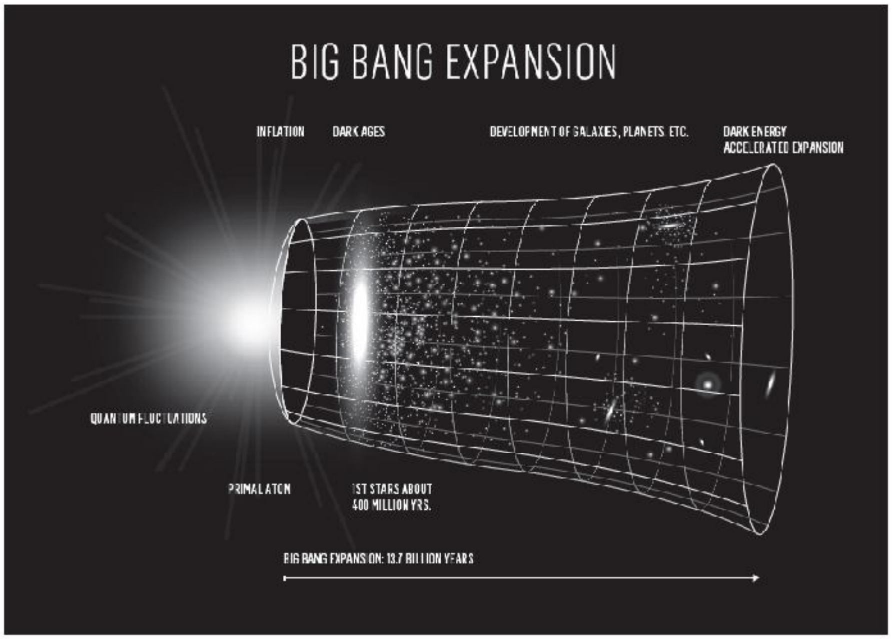
6. Examples of Differences in Chinese and Western Depictions of Time

Finally, we use examples of the theme of depicting time to show a few fundamental differences in Chinese and western graphics. In traditional Chinese diagrams, “time” does not refer to specific, measured amounts of time, but to the concept of “time.” Therefore, in referring to Chinese diagrams, we also talk about symbolic, qualitative relationships, such as spring/ blooming/green/morning/east. These relations are captured in cyclical depictions. Thus, for example, the “depiction of the human face’s resistance to cold,” puts the body with its organs and meridians in a correlation with the cardinal points, trigrams, and the twenty-four divisions of the year. So the human body is placed simultaneously in space (cardinal points) and in time (calendar) in order to show how the relationship between the polar forces of yin and yang function in the body. (fig. 8)


MIDSUMMER
S
JUN 6
心 HEART
夏至 JUN 21
小暑 JUL 7
SMALL INTESTINE
大暑 JUL 23
AUG 7
BLADDER
AUG 23
SEP 8
KIDNEY
秋分 SEP 23
W
OCT 8
HEART SAC
OCT 23
NOV 7
TRIPLE ENERGIZER
NOV 22
DEC 7
GALLBLADDER
DEC 22
MIDWINTER
北
N
JAN 6
肝 LIVER
JAN 20
FEB 4
LUNG
FEB 19
MAR 5
大肠 LARGE INTESTINE
MAR 20
东
E
APR 5
胃 STOMACH
APR 20
MAY 6
SPLEEN
MAY 21

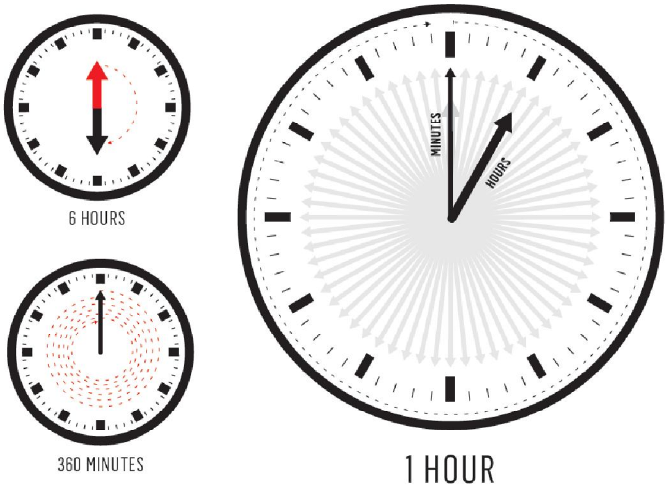
(fig. 8)

In the west, however, the passage of time is generally depicted in a linear fashion. The axis of time represents a notion of time that runs regularly and continually in one direction, for example, in the illustration of the universe's expansion since the big bang. (fig. 9) The phases of development here are depicted in terms of quality, not in terms of proportional time. It is shows that the creation of space does not occur continuously; at the beginning it happened very quickly, then remained stable for a long time, and is now accelerating again. The model is based on an axis of time from "nothing"—the big bang—to the end of time, which the physicist Roger Penrose calls "space forgetting itself." It shows the expansion of space in a perspectival, three-dimensional intimation. The vertical section indicates equal time; the horizontal lines indicate the size of expansion.

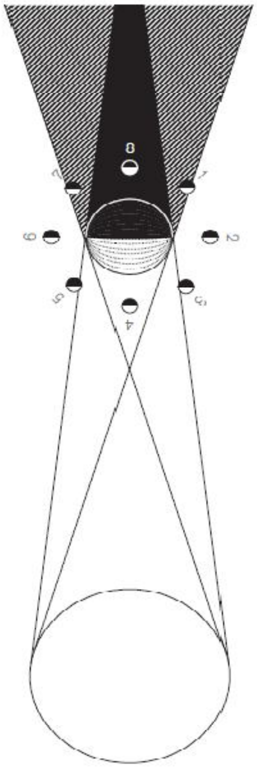

BIG BANG EXPANSION
INFLATION
DARK AGES
DEVELOPMENT OF GALAXIES, PLANETS ETC.
DARK ENERGY ACCELERATED EXPANSION
QUANTUM FLUCTUATIONS
PRIMAL ATOM
1ST STARS ABOUT 400 MILLION YRS.
BIG BANG EXPANSION: 13.7 BILLION YEARS

(fig. 9)

Specific events can be defined as points in time on the time axis, and sections of time can be entered as sequences, one after the next. As a rule, they are constructed from left to right, and read in the same direction. Sections of time are also depicted with definite beginnings and endings. Western diagrams thus also always refer to selected information, a section of reality. Traditional Chinese diagrams, on the other hand, always implement the whole. Cyclical concepts are met with more rarely in the west—examples would be the way a clock functions (fig. 10) or certain depictions of phases of the moon. (fig. 11) For example, we drew a diagram that depicts periodic changes and cycles in an info graphic about rice farming in Hunan province. The basic construction and functions are the same for graphics in the west and in China. (fig. 13) Here, one orients oneself on recurring phases, such as the new moon and the full moon; no consecutive counting—of years, for example—is performed. Each and every point on a cyclical image refers to the whole of the circle, its overriding period. Therefore, cyclical images always evoke a sense of "completeness." Thus, for instance, "9 o'clock in the morning" becomes a point on the recurring cycle of the day and is linked to the quality of "morning." In western diagrams, however, these kinds of time-related characteristics are not primarily depicted, but tend to be read out of the images. In the west, "time" is also thought of in terms of perspective, meaning, it is divided into fore- and background, so that the past is always behind us, and the future always in front of us.


6 HOURS
360 MINUTES
MINUTES
HOURS
1 HOUR

(fig. 10)


8
7
1
6
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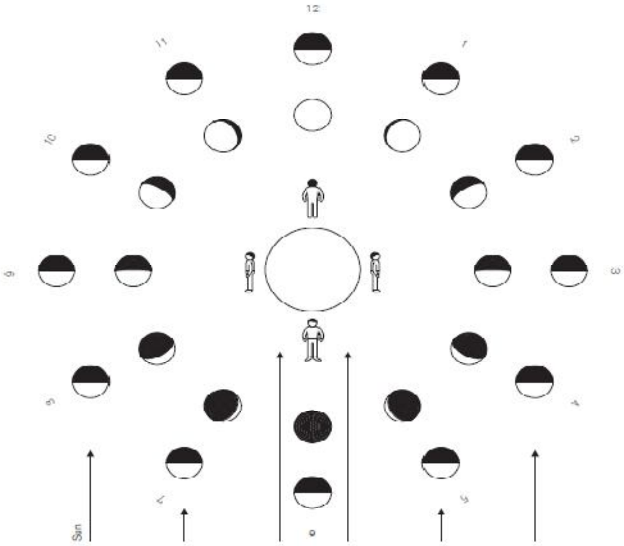
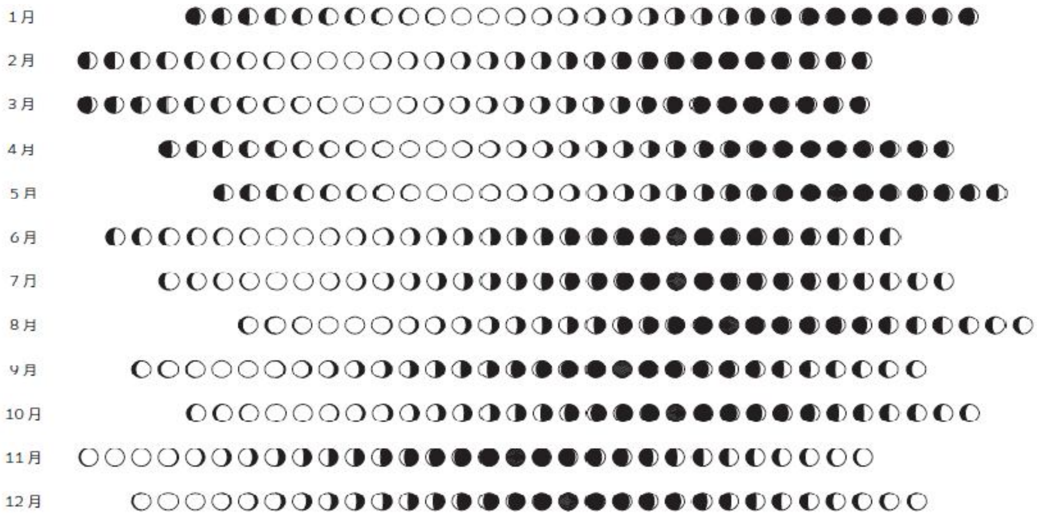
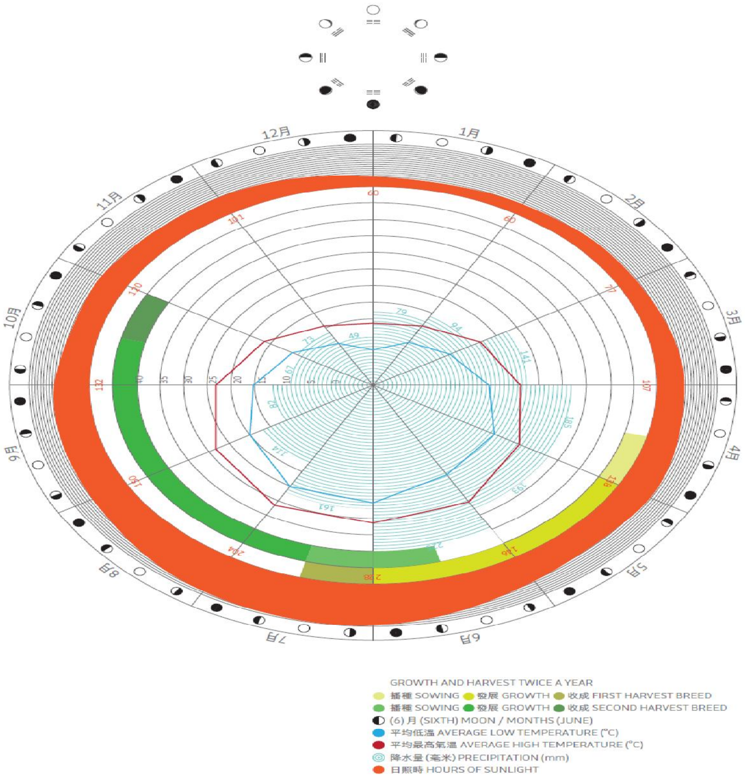
5
3
4


12
1
2
3
4
5
6
7
8
9
10
11
Sun

(fig. 11)


1月
2月
3月
4月
5月
6月
7月
8月
9月
10月
11月
12月

(fig. 12)

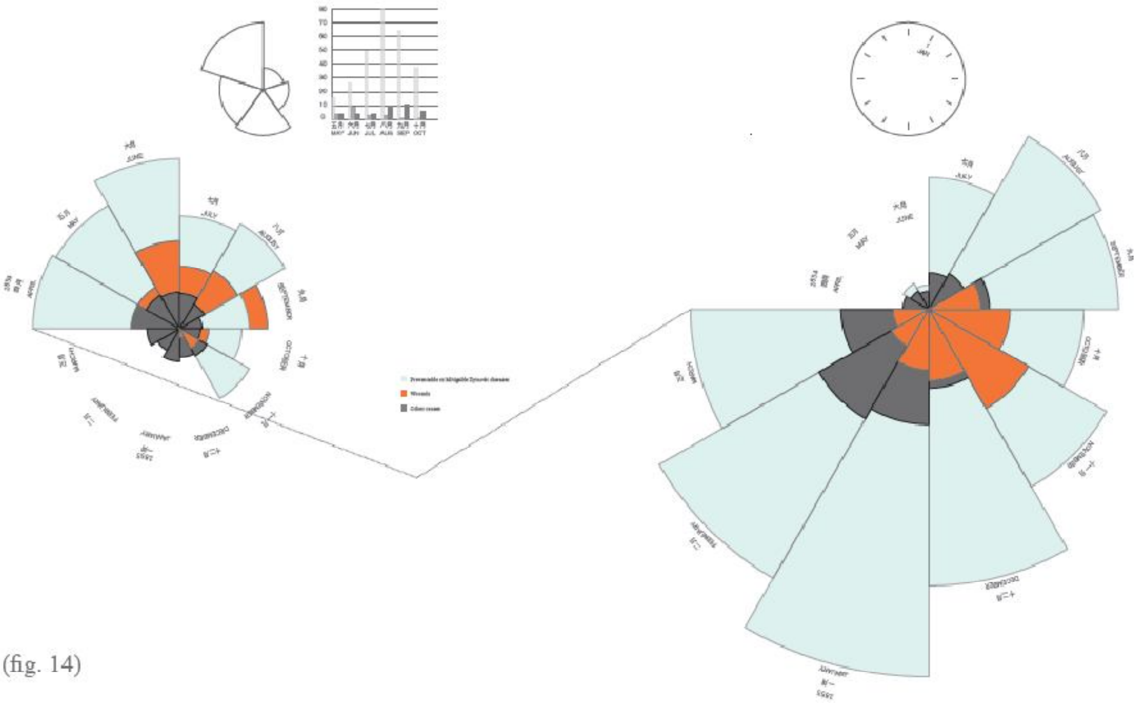


(fig. 13)

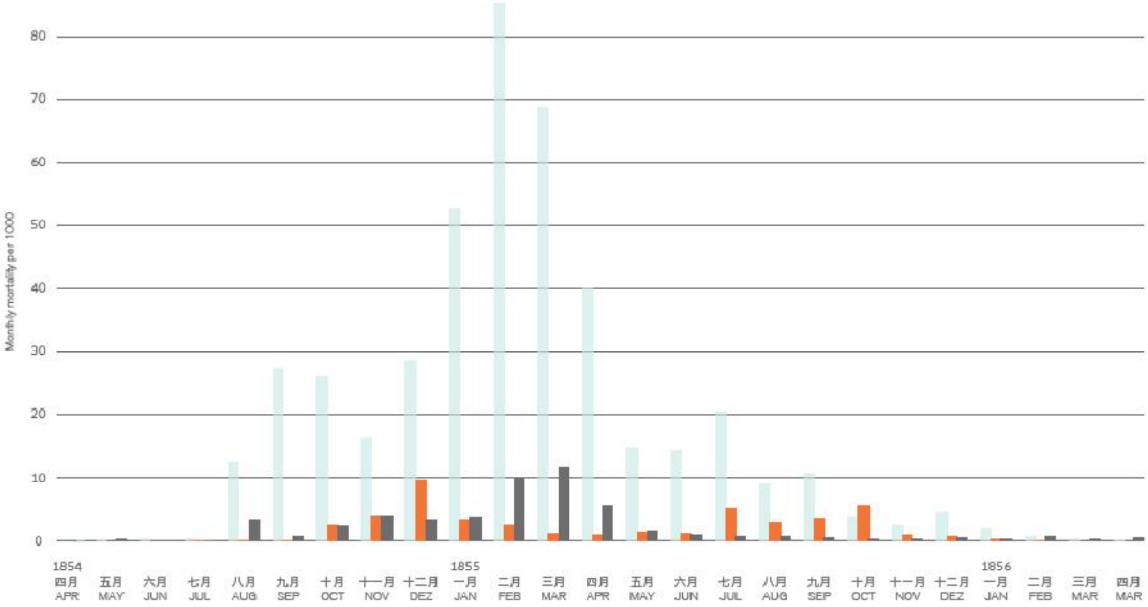
Information about time is also depicted in relation to other important things, as in the polar area diagram, for example. It is constructed to run clockwise (time) and from the inside to the outside (quantity). It evokes a cyclical course of events, since it refers to the months in a year. Florence Nightingale, founder of modern nursing in Great Britain, used a polar area diagram to visualize the relationship between fatalities and hygienic conditions (during the Crimean War, from 1855 to 1856) (fig. 14). Her greatest achievement here is that she was able to use this image to show that the major cause of death in war was not wounds, but infections. Nevertheless, even this type of diagram also shows the limits of depicting specific data in a cyclical diagram. In order to understand the event as a whole, two diagrams have to be used, connected by a line on which the continuum of time is carried on. Concretely, this also shows that the circle is not treated according to its cyclical logic: strictly speaking, “1” has to be the month of January, not July. This shows that the circle is not treated cyclically, but more like a timeline bent into a circle. To clarify, we have drawn a linear info graphic that shows the whole course of events and the decrease in war dead even more clearly expressed in a linear way than in Nightingale’s original circular diagram. (fig. 15)

7. Concluding Thoughts

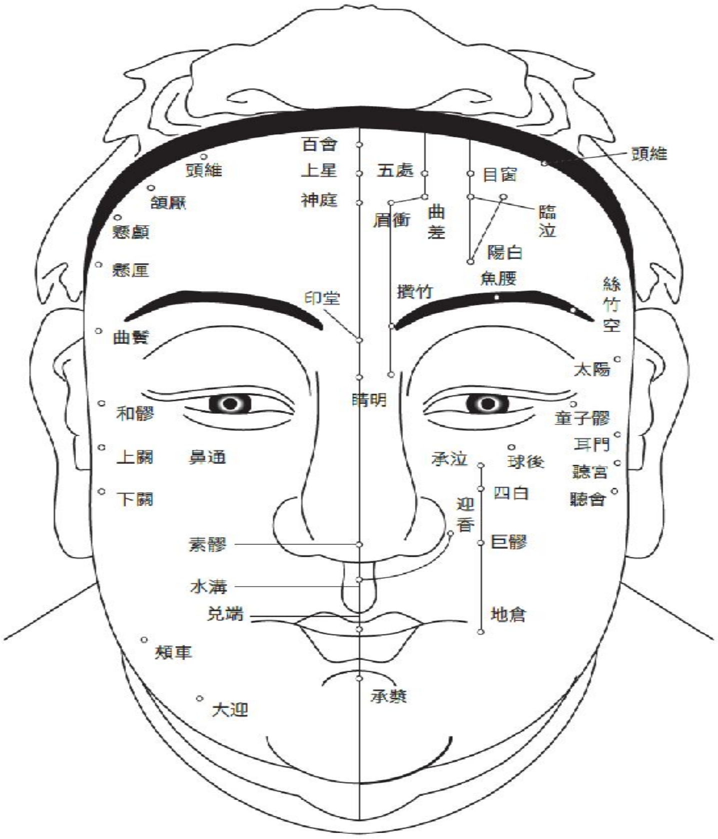
So how can the relationship between Chinese and western visual elements be depicted in respectful, equal ways? By focusing our research on the constitutive media conditions of conveying knowledge, rather than the media content, we attempted to make it possible to understand both the “other’s” as well as “the self’s” western frames of reference. In this way, it becomes clear that both the “other” images, as well as “the self’s” culture, are constructs that cannot be comprehended without specific, fundamental knowledge. Here, it also becomes obvious that the “other” is not only found in the “other” culture, but also in one’s own. In brief: “The other does not begin at the harbor wall, but at the boundary of the self’s skin.” (Bhaba, 2010, p. 27) Hence, instructions for acupuncture (fig. 16, 17) are intuitively as inaccessible as magnetic resonance imaging. (fig. 18) An open space for ideas between the two cultures was shaped, where various *Ways of World making* (Goodman, 1978) coexist on an equal level. For some of the content of this research, therefore, variations of depictions were redrawn (see linear variation of the Nightingale diagram [fig. 15]; linear phases of the moon, [fig. 12]) In this way we made it clear how reality is visually constructed and which cultural concepts and ideas are tied to each depiction. We show that there is not just “one” objective reality, but that each notion of reality is a unique achievement of a specific culture and is therefore bound to it. Here, it is very important to remember that the depictions themselves exercise great retroactive influence over the construction of our concepts of reality.


Preventable or Mitigable Zymotic diseases
Wounds
Other causes

(fig. 14)


Monthly mortality per 1000
80
70
60
50
40
30
20
10
0
1854
四月 APR
五月 MAY
六月 JUN
七月 JUL
八月 AUG
九月 SEP
十月 OCT
十一月 NOV
十二月 DEZ
1855
一月 JAN
二月 FEB
三月 MAR
四月 APR
五月 MAY
六月 JUN
七月 JUL
八月 AUG
九月 SEP
十月 OCT
十一月 NOV
十二月 DEZ
1856
一月 JAN
二月 FEB
三月 MAR
四月 MAR

(fig. 15)


百會
上星
神庭
五處
曲差
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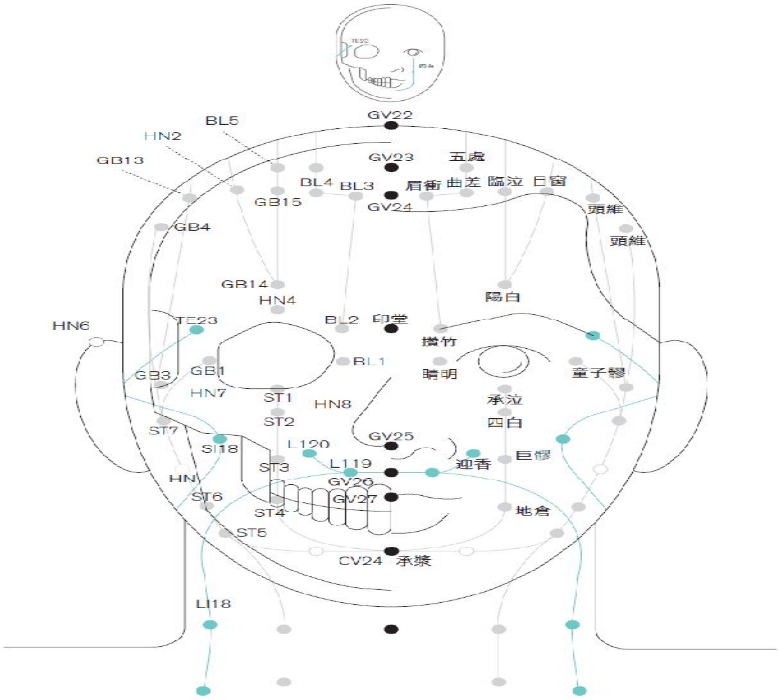
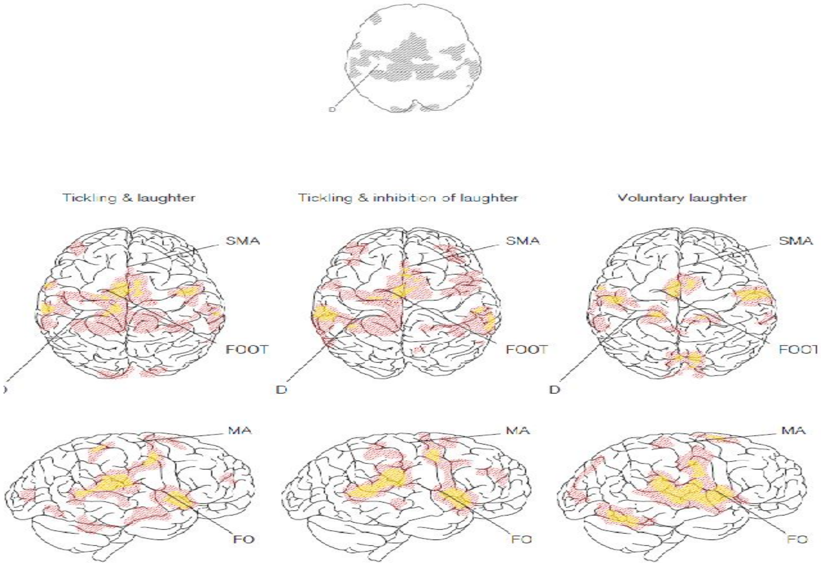
臨泣
頭維
眉衝
頭維
頷厭
懸顱
懸厘
陽白
魚腰
攢竹
印堂
絲竹空
曲鬢
太陽
睛明
和髎
童子髎
上關
鼻通
承泣
球後
耳門
聽宮
四白
下關
迎香
聽會
素髎
巨髎
水溝
兑端
地倉
頰車
承漿
大迎

(fig. 16)


GV22
BL5
HN2
GB13
GV23
五處
BL4
BL3
眉衝
曲差
臨泣
目窗
GB15
GV24
頭維
GB4
頭維
GB14
HN4
陽白
HN6
TE23
BL2
印堂
攢竹
BL1
GB3
GB1
睛明
童子髎
HN7
ST1
HN8
承泣
ST2
四白
ST7
GV25
SI18
L120
巨髎
L119
迎香
ST3
HN
GV26
GV27
ST6
ST4
地倉
ST5
CV24
承漿
LI18

(fig. 17)



(fig. 18)

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