Олимпиада НИУ ВШЭ для студентов и выпускников — 2019 г.

Направление «История искусства»

Профиль:
«История художественной культуры и рынок искусства» КОД – 321

Время выполнения задания –120 мин., язык – русский.

Задание для текста на английском языке:

I. Прочесть статью: Guth, Ch.M.E. Hokusai's geometry // Review of Japanese Culture and Society. — 2008. — Vol. 20. — P.120-132.

II. Дать развёрнутый ответ на следующие вопросы:

1. Какую цель ставит Кристин Гут в данной статье и чем обусловлен выбор объекта исследования?

2. Какие художественные средства использует Хокусай при создании своих «набросков» в «Руководстве по живописи»?

3. Назовите ключевые отличия между «Руководством по живописи» Хокусая и подобными изданиями западноевропейских авторов?

5. Хокусай начинал как резчик по дереву, как это повлияло на творческий метод художника?

6. С чем автор связывает появление правильных геометрических форм в композициях Хокусая?

Hokusai's Geometry

Christine M. E. Guth

Over the course of a career spanning seven decades, from the 1770s until his death in 1849, Katsushika Hokusai (1760-1849) created some twenty-five artists' manuals, many of which expanded and reinterpreted the genre in significant ways. Among these is *Quick Guide to Painting* (Ryakuga haya oshie), intended to teach aspiring artists how to paint by visualizing the world in a simple formal vocabulary of squares, circles, and triangles (Fig. 1). Hokusai's guide has long charmed viewers with the variety and playfulness of its forms, but it has been privileged by modern scholars both in Japan and abroad primarily because of its apparent indebtedness to European painting manuals introduced to Japan by the Dutch.[1] This reductive, influence-based model of studying the movement of artistic idioms across borders suggests an active originator (always the "modern" West) and a passive reception on the part of the Japanese artist. The availability of such publications alone does not explain why Hokusai took notice of them or what he did with them. He had the freedom to "read" them or not, and having chosen to do so, he had to translate them into an idiom his

Figure 1
Oxen and horse from Hokusai, *Ryakuga haya oshie*, 1812. The Trustees of the British Museum.

Japanese readers could understand. Vision, as W. J. T. Mitchell has written, is "a mode of cultural expression and human communication as fundamental and widespread as a language," and, its translation, far from being a transparent process, involves problems of context and readers' expectations.[2] In this article I hope to show that Hokusai's apprehension and translation of European manuals was not the direct process it is often made out to be, but complex, and heavily mediated by a host of local idioms and contingencies.

First published in 1812, Hokusai's *Quick Guide to Painting* is often linked with two later, equally ingenious "quick" guides, *Quick Lessons in Painting* (Ryakuga haya manabi, 1814) and *Quick Pictorial Dictionary* (Ehon hayabiki, 1817), with which it was reissued as a single edition in the 1890s.[3] The two later publications include rebus-like visualizations of things said in the form of pictures broken down into modulated calligraphic strokes, the units used in painting and writing. In so doing, they follow picture books in the "abbreviated style" (*ryakugashiki*) made popular by Keisai Masayoshi in the 1790s.[4] By contrast, the first publication, the focus of this study, uses geometric forms, whose precise, linear contours can only be produced with the aid of a compass and square (*kiku*), instruments used primarily by craftsmen. Each of its fifty-two pages features one or two motifs in their "visible" and "invisible" forms accompanied by a brief text explaining how, for instance, the complex shape of a grape leaf might be envisaged as a hexagon, or the body of a crane as a triangle. This novel manner of probing beneath the surface of things sets it apart from the language-based rebus-writing common among books in the "abbreviated style," where figures are formed from the Chinese characters or *kana* syllabary of the word itself.

Quick Guide to Painting may be situated within the flourishing literary genre commonly characterized today as *gesaku* (popular literature of the Edo period), whose irreverent style and attitude would have been familiar to an early nineteenth-century audience. Its appearance followed an explosion of publications parodying established instructional manuals on subjects ranging from etiquette in the brothel district to encyclopedic information. Notable successes among these included Santō Kyōden's *Elegant Chats on Fabric Designs* (Komongawa, 1784), a witty reinterpretation of the artist's pattern book, *The Brothel Attendant's New Encylopedia* (Shinzō zui, 1787), a humorous take on the *Illustrated Encylopedia* (Sansui zue) of Terajima Ryōan, and *Kimyō zui* (1803), a punning revision of the illustrated dictionary *Kinmō zui*.[5] While these earlier publications may have served as sources of inspiration for the *Quick Guide*, decoding their visual and verbal puzzles requires a relatively high level of cultural sophistication. Hokusai's more readily accessible manipulation of this ironic mode of discourse to expose the didactic pretensions of the conventional artist's manual—a process itself involving a kind of translation—was no doubt part of his book's appeal. The scholar of Japanese books Jack Hillier observed that Hokusai's *Quick Guide to Painting* appeared to be "no more profound than a modern 'painting by numbers' manual," but perhaps that was exactly the point.[6]

1. The Compass and the Square

Unlike many of his contemporaries who also published how-to books, Hokusai did not seek to promote specific motifs or personal brush styles through his *Quick Guide to Painting*. Instead, he asserted his professional authority in a highly competitive publishing milieu by introducing the public to the compass and square. This view is expressed clearly and forcefully in the brief introduction that opens the slender volume: "If a mountain is ten feet (one *shaku*), then a tree must be one foot, a horse an inch, and a man the size of a bean. So it is said about the laws [of proportions]. All things, however, originate in squares and circles. Here Old Hokusai will teach you how to become skilled in paintings of all kinds by using the compass and square. It is like learning to draw with a wooden brush. Having mastered these two instruments you can make precisely detailed (*saimitsu*) drawings on your own."[7]

Hokusai's emphasis on the primacy of mechanical determinants as the basis of representation is unusual. Some painters, of course, used the compass and rule, but they did not advocate them because of their association with manual skill. Such instruments did not have the same prestige as the brush, which was fundamental to painting and calligraphy and therefore linked to the culture of the literatus. They were primarily the tools of professional craftsmen, who relied on them to produce straight and curved lines of a precision impossible to achieve by the hand alone. While writing and painting required special training and education, the instruments introduced in the *Quick Guide* offer a technical mode of access to cultural attainment—one premised on manual dexterity.

If we may judge by the compass still employed by the *monsho uwaeshi*, the craftsman who hand paints family crests on the shoulders and back of formal kimono, the instrument Hokusai recommended was a slender brush attached to a bamboo compass with a tensile whale-whisker axle.[8] However, he also may have had in mind European versions that had recently come into his possession. An entry from 1810 in the diary of his friend Ryūtei Tanehiko recording Hokusai's demonstration of the use of a "Dutch mathematical device" indicates that Hokusai had access to an imported European square or drafting compass.[9] A 1794 engraving by Shiba Kōkan showing an imaginary view of a Western studio with a compass and square in the foreground underscores that these were recognized to be fundamental to artistic practice in Europe.[10]

The compass and square are instruments associated in Europe with geometry, a term whose Greek etymology comes from measuring the earth, and thus with mathematics, but this association did not hold true in Edo-period Japan where there existed a mathematical tradition independent of physics. Yet, as the scholar Mark Ravina has argued, even in the absence of physics, Japanese scholars developed techniques "approximating integral calculus, an algorithm resembling Horner's method for extracting irrational roots, work in indeterminate analysis, and a remarkable study of matrix determinants that anticipated the world of Leibniz."[11] The Japanese rhetorical disavowal of the practical applications of mathematics was informed by the Confucian

view that calculations lay in the utilitarian realm of merchants and therefore were beneath the scholar's dignity.

Given the primacy of the modulated line in the arts of calligraphy and painting, similar attitudes may have hindered appreciation of Hokusai's instrumentalist approach to pictorial instruction. While the public delighted in a *Quick Guide to Painting*'s playfulness, there is little evidence that his visual exercises had any impact among his students. The prevailing artistic hierarchy also may help to explain the cautionary note about exclusive reliance on the compass and rule in the introduction to the eighth volume of Hokusai's so-called *Random Sketches* (Manga, 1819), which opens with an illustration of deities holding the measuring strings used by craftsmen. Invoking a famous dictum of the Chinese philosopher Mencius, the author declares, "The great workman can teach people how to use compasses and squares, but he cannot impart skill to them.... It is something the heart must grasp and the hand respond to, though the heart and the hand are not conscious of it...."[12] Unlike the opening lines of Hokusai's *Quick Guide*, this passage stresses the widely held view that artistic quality is to be judged by the spirit brought to it, not by manual dexterity.

Hokusai's playful exploitation of the potential of the compass and square is an indication of the way a craft mentality brought to Western technologies spurred new thinking about the application of familiar tools. Ever mindful of the latest fashions, Hokusai was aware of the public fascination with Western imports and often adapted pictorial sources including Dutch copperplate prints, illustrated books, as well as Japanese compilations of European visual materials in his work. The appearance in his prints of scientific instruments such as orreries, telescopes, and microscopes testifies to a special preoccupation with the seeing eye. Like other artists of his day, he recognized these imported devices as improving vision by enabling the eye to see things outside the scope of human detection.[13] The compass and rule are instruments that extend the technical capabilities of the hand, making possible delicate detailing or decorative ornament of exceptional precision. Although these tools were already firmly established in the professional milieu of the craftsman, the self-conscious use to which Hokusai put them in his *Quick Guide* was novel.

2. Dutch Models

The art historian Tsuji Nobuo, extending the work of Ernst Gombrich, has argued that Hokusai drew inspiration for his *Quick Guide to Painting* from two seventeenth-century European painting manuals available in Japan in the early nineteenth century.[14] He draws particular attention to the close relationship between the oxen and horse shown in Figure 1 and the schematic drawings of a deer in Crispijn van de Passe's *The Use of Light in Painting and Coloring* (Fig. 2).[15] In addition, he suggests that the humorous masks of demons and the fat-cheeked Okame (Fig. 3) reveal the influence of the pudgy children's faces also figuring in this compilation. This same source was adapted earlier by

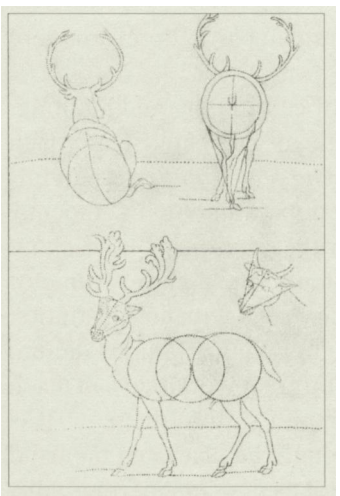

Figure 2
Deer from Van de Passe, *The Use of Light in Painting and Coloring*, 1643. After Ernst Gombrich, *Art and Illusion*, fig. 124.

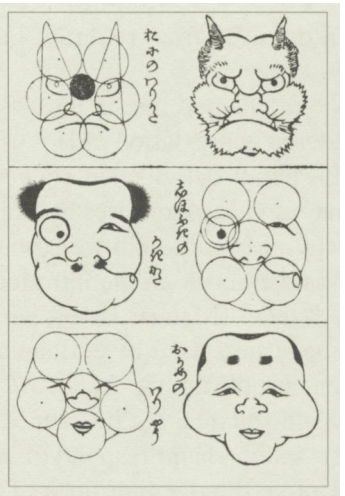

Figure 3
Demons and okame masks from Hokusai, *Ryakuga haya oshie*, 1812. The Trustees of the British Museum.

Figure 4
Putti from Frederik de Wit, *The Use of Light of Painting and Coloring*, 1660. Victoria and Albert Museum.

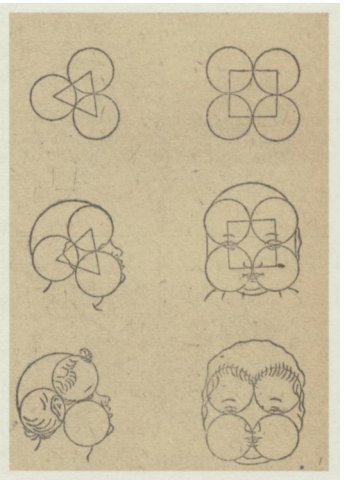

Figure 5
Putti from Moriyama Chūryō, *Kōmo Zatsuwa*, 1787. The Trustees of the British Museum.

Moriyama Chūryō for his *Dutch Miscellany* (Kōmō zatsuwa) of 1787, a book that Hokusai is likely to have known (Figs. 4 and 5).[16]

Tsuji's observations may be expanded by considering the degree to which the objectives of the European and Japanese representational exercises differ and Hokusai's designs were refracted through and modified by the local visual culture. Hokusai not only had the freedom to choose which Dutch books to read, but also the freedom to resist or alter their intended meanings. What he seems to want to demonstrate in his *Quick Guide* is the creative power of visual transformation itself. For all the cleverness and skill with which he disassembles each motif, Hokusai's treatment rarely coheres in such a way that it might actually serve as a guide to understand, much less recreate, three-dimensional form. The viewer has to make a cognitive leap to identify the relationship between the picture and the underlying structure because the units from which each is composed

and the viewpoint from which they are presented are inconsistent. The lateral orientation of the diagrams of the oxen and a horse in Figure 1 suggest some sensitivity to creating the illusion of volume and space by a cumulative building up of repeated circular forms in depth, in the manner of the stag depicted in Van de Passe, but in Hokusai's designs the children's heads are transformed into comic theater masks. Overall, his deconstructions are two-dimensional. The multiple circles, squares, and broken lines often result in humorously disjointed abstractions, each an autonomous visual gesture rather than the systematically articulated translation from outer form to inner structure.

Further distinguishing him from his European counterparts, Hokusai did not find source material for his illustrations in nature but primarily in pictures or other man-made constructs. Most of his subject matter is drawn from a repertory of flora and fauna, human figures and deities that would have been familiar to his audience through paintings, woodblock prints, and book illustrations. The man astride a donkey in Figure 8, for instance, would have been readily identified as the Chinese poet Su Dongbo, the popular subject of countless paintings and prints. Similarly, the crisp triangles of the body of the costumed performer in Figure 6, are more suggestive of an origami figure than of a palpable living being. At a time when the art of paper-folding was in great vogue, this external referent is likely to have produced appreciative recognition and amusement among Hokusai's readers.

European art instruction was premised on an understanding of anatomy, a reflection of the Greek belief that the body represented a natural ideal, but Hokusai and his contemporaries did not share this view. Although he no doubt was familiar with the *New Book of Anatomy* (Kaitai shinsho), a translation and adaptation of a Dutch book on anatomy published in 1774, he drew on other ways to understand and dissect the human body.[17] An illustration in *The Mountain of Cold: A True Life of Fukuzō* (Kagane no Yama Fukuzō no jikki), a comic novel of the late eighteenth century, throws light on the slippages in this dialogic conversation between Hokusai and his European sources. The protagonist Fukuzō, the son of a Dutch man and Japanese woman who has become a quack doctor, peers through the navel of a patient with an extendible microscope, exclaiming, "I can see the whole mechanics (*karakuri*) of the guts from one end to the other!"[18] As Timon Screech has observed, this image suggests how this Western instrument of knowledge was seen less as a medical tool than as a "piece of trumpery taken from the fairground."[19] But how might someone who has not studied anatomy visualize the internal workings of the body? The automaton, or *karakuri ningyō,* was already a familiar analogy for representing anatomy. Automatons were hugely popular during Hokusai's lifetime and figured often in publications his viewers are likely to have known. A scene of a performance of the play *Benkei's Boat* (Funa Benkei) by such mechanical dolls is included, for instance, in the popular *Illustrated Guide to Famous Places in Osaka* (Settsu meisho zue) of 1796, the same year that *Designs for Automatons* (Karakuri zui) also came out (Fig. 7).[20] One might well argue that it was just such mechanical models that Hokusai

had in mind when he represented the figure of a poet riding a donkey as so many cogs and pulleys (Fig. 8). For those with no understanding of human anatomy, this was a meaningful yet humorous way of conveying complex bodily movements.

This creative domestication of European technologies by translating the unfamiliar through the familiar is likely to have been informed by the craft milieu in which Hokusai lived and worked. Unlike many of the scholar painters of his generation who exploited the aesthetic currency of Western art and science, Hokusai had first-hand knowledge of the production techniques used in many crafts. As a print-designer who had first trained as a block cutter, he appreciated the skilled craftsmanship and tools required for a good woodcut. His own high standards led him to press his publisher to employ a master woodcarver whose skills he trusted to translate his drawings into the crisp raised lines that define a fine key block.[21] Hokusai was also accustomed to thinking in terms of the relationship between the part and the whole: in polychrome woodblock printing, each area of color is generally carved from a separate block, and these abstract components only form a meaningful, visible whole when the printing process is complete.

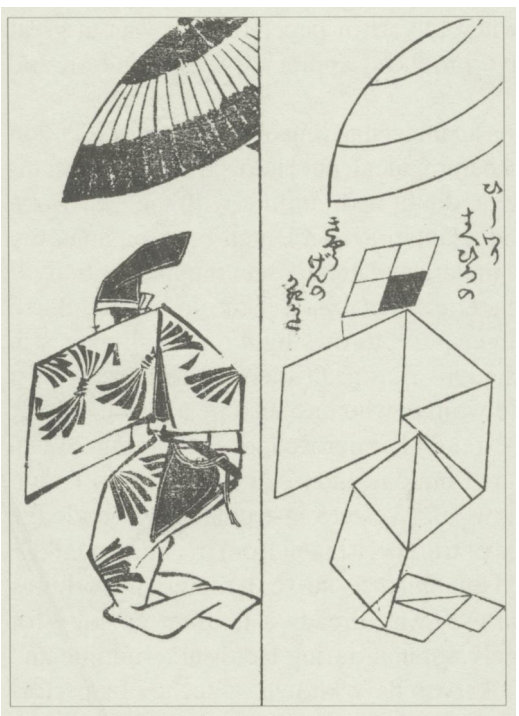

Figure 6
Costumed performed from Hokusai, *Ryakuga haya oshie*, 1812. The Trustees of the British Museum.

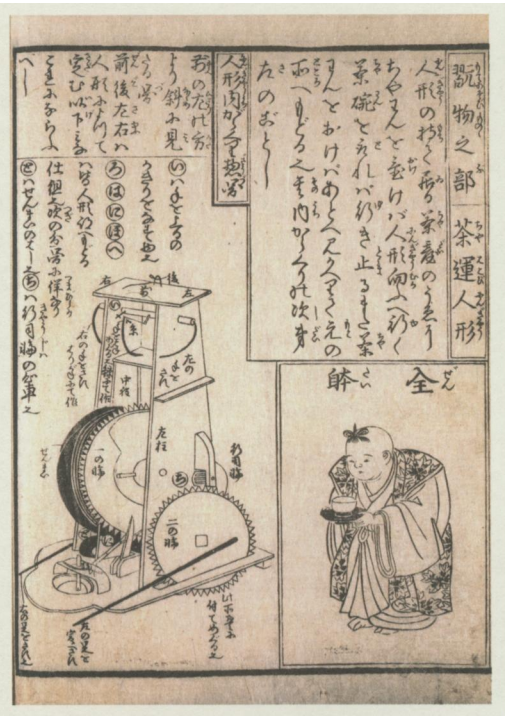

Figure 7
Automaton from Hosokawa Hanzō Yorinao, *Karakuri zui*, 1796. The Trustees of the British Museum.

In addition, as his design manuals for pipe-makers, comb-makers, carpenters, and textiles testify, Hokusai was intimately familiar with the disciplinary protocols of other crafts and was adept at reducing complex constructions to balanced, mathematically regular constituents that could be easily replicated. This balance of parts and perfection of the whole is evident in the intricate ornamental models he provided for textile designers in publications such as *New Patterns for Fabrics* (Shingata komonjo, 1824) where each roundel is accompanied by carefully labeled sectional diagrams (Fig. 9). Such two-dimensional, modular thinking may also be linked more broadly to the design of interior spaces where room area was measured in the unit of the *tatami* mat, a rectangle about one by two meters, and to the fabrication of kimono (*kosode*), which were made from six pieces of fabric of standardized length and width.

Hokusai's declaration that having mastered drawing with these instruments, "one can draw freehand and create precisely detailed pictures (*saimitsu no ga*)," verbally reinforces the mediating role of craft thinking in the cultural exchange carried out in his *Quick Guide to Painting*. The *sai* of *saimitsu* links these paintings to *saikumono*, the term used for a category of crafts distinguished by their intricacy and technical precision. At the same time, by his characterization of the kinds of pictures created using the compass and square as *saimitsu*, Hokusai was also linking them with the precision or *saiku* that was a perceived characteristic of the Dutch mind-set.[22] As Timon Screech has written of the late eighteenth and early nineteenth centuries, "*saiku* became a veritable synonym for Ran [Dutch] goods, as involvement with mechanical contrivances became the overarching concern of the Rangaku [Dutch studies] scholar."[23] Identification with "Dutch" precision did not alter the fundamental meanings of the pictures to be created with the compass and rule, or of the designation *saikumono* for fine crafts, but provided an additional, external form of validation.

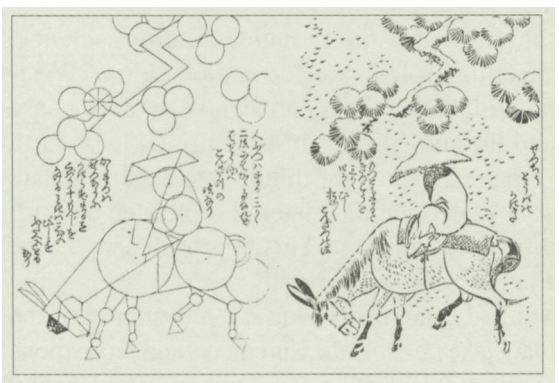

Figure 8
Man riding a donkey from Hokusai, *Ryakuga haya oshie*, 1812. The Trustees of the British Museum.

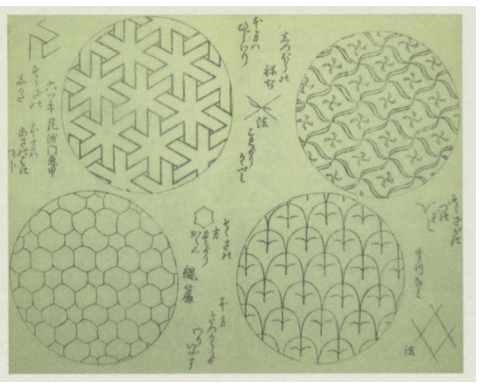

Figure 9
Textile designs from Hokusai, *Shingata komonjo*, 1824. The Trustees of the British Museum.

As I hope these examples make clear, rather than look to the West as the governing structure for Hokusai's geometry, I suggest that his professional background predisposed him to see these forms in the first place. The slippages between the visual language of Van de Passe and Hokusai's publications suggest that the value of the European referent was largely symbolic. The impulse for the seemingly new idiom developed in his *Quick Guide to Painting* was mediated by "thinking through craft."[24] Hokusai's formulations thus expose a dynamic in which Western knowledge did not function as an external dominant, but rather as an accommodation to preexisting practices and tacit knowledge systems.

3. *The Book of Changes*

When Hokusai carried out his "translation" of European painting manuals, Chinese mystical and cosmological thinking was deeply embedded in Japanese culture. This habit of mind is evident in Satake Shōzan's *Summary of the Laws of Painting* (Gahō kōryō), a treatise extolling the pictorial naturalism introduced from the West. In the opening lines of this text, the author turns to the principles of yin and yang to legitimate his introduction of new pictorial principles: "Everything in the universe was created with the principles of yin and yang. Different places have different things: what exists here does not exist in other places; what exists in other places does not exist here. We live by exchanging what we have with each other. This is a reasonable practice in the past and the present."[25] This referencing of Sinocentric foundational principles was not unique to Shōzan. Hokusai's own declaration that mastery of the compass and rule made possible detailed drawing of all kinds was itself an adaptation of the well-known dictum of the fifth-century Chinese painter Wang Wei: "pictures are not simply produced by the practice of artistic skill, they must also correspond to *I-ching*.... If one works with compasses and squares one can represent the forms of every kind...."[26]

In a recent study, Wai-ming Ng has elaborated on the impact of *The Book of Changes* (I-ching) in Tokugawa political and economic thought, religion, science, popular culture, and in particular, on its mediating role in the accommodation of Western science and technology. Efforts to deal with Copernican heliocentrism offer a case in point. The movement of the earth around the sun goes against the principle of earth (yin) being fixed, so Chinese scholars in Japan adapted their thinking to accommodate this by developing a relative yin-yang theory that when the material of heaven or earth was involved, heaven is yin and the earth moves around it. This approach shaped the direction of astronomy and physics in the late Tokugawa period.[27]

The Book of Changes both sanctioned and sanctified Hokusai's recognition of the compass and, especially the square, as tools that make possible measurements and proportions that are proper in both a physical and moral sense. It lays out a comprehensive philosophy that characterizes the cosmos as a unified system organized by the dialogical relationship between yin and yang, the female and male principles, identified with the quiescent square and the active circle.[28] These over-arching polarities are followed by secondary laws involving

numerical symbolism, geometries, and proportional relationships inherent in nature. Unlike the European system that saw the symmetry and proportionality of the human body as the ideal, *The Book of Changes* identifies the circle and square as organizational principles for the man-made universe. It is from these symbolic forms that one may understand the unity of the world through diversity and the relationship of the part to the whole. This is why the legendary ruler Fu Xi, who is said to have transmitted to mortals the principles of *The Book of Changes* and thus the divine patterns that regulate human society, is traditionally shown holding a carpenter's square, symbolic of his ability to regulate the world.[29]

Later Chinese writings, such as those of Mencius quoted in the introduction to the eighth volume of Hokusai's *Random Sketches*, reiterate the importance of the compass and square as tools essential to creating proportional relationships in architecture according to the rules of nature. An analogous, abstract proportional system is also stressed in the lines that open Hokusai's introduction to *Quick Guide to Painting* in which he reiterates, following the dictum of Wang Wei already mentioned, a proportional system in which a mountain measuring ten feet, determines that a tree must be one foot, a horse one inch, and a man the size of a bean.

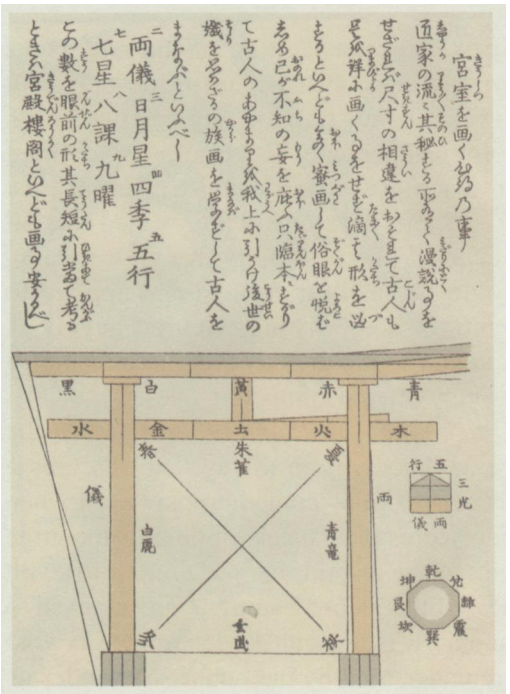

Figure 10
Torii, from Hokusai *Manga* vol. 5, 1816. The Trustees of the British Museum.

The extended commentary Hokusai attached to an illustration of the gateway of a Shinto shrine in the fifth volume of his *Random Sketches,* which focuses on architectural drawings, testifies to the way *The Book of Changes* informed spatial thinking in Tokugawa Japan (Fig. 10). Entitled "Things to remember when drawing temples and shrines," Hokusai declares that it is a simple task to draw these if one keeps in mind the signs of divination of *The Book of Changes* and applies them when selecting the proportions of the forms to be drawn. These proportions are as follows: the proportions of two derive from the female and male principles, yin and yang; those of three from the sun, moon, and stars; four, from the four seasons; five, from the five elements; (there is no six); seven, from the seven stars of the northern dipper; eight, from the eight points of the compass, and nine, from the nine stars. The drawing below puts these principles in practice: the two supporting

pillars represent yin and yang; the five parts of the lower cross beam, the five elements; the proportions between the four points of contact between the pillars and the crossbeam, the four seasons, and so forth.[30]

The degree to which this cultural mentality overrode Van de Passe's empirical objectives may be gauged by Hokusai's deployment of circles, squares, and triangles as the "natural" infrastructure of many of the views in his most celebrated print series, the "Thirty-Six Views of Mount Fuji." *Under the Wave off Kanagawa*, in particular, derives much of its visual power from the relationship between the dynamic circular movement of the wave in the foreground and the stable triangular cone of Mount Fuji in the distance. An analogous approach also informs *View of Mount Fuji from Owari Province*, another view in the same series, where the distant peak is seen through a cooper's barrel.[31] Even as the formal rigor of these geometric schemes, unusual in the Japanese landscape tradition, brings a seemingly modern design aesthetic to these prints, they are informed by deeper structures of meaning holding that "geometry" reveals cosmic architecture. Hokusai's vision was grounded in a natural philosophy that explained the world, and the genesis of art, in a mystical system of circles and squares. In this worldview, geometric forms were microcosmic symbols of macrocosmic forces rather than guides to the representation of the empirical world.

By drawing attention to its relationship to European painting manuals, previous scholarship has situated *Quick Guide to Painting* in a linear model of artistic development originating in Europe involving a move toward the abstraction and fragmentation identified with "modernity."[32] In this teleological scheme, Hokusai's deployment of simplified geometric forms is used to represent him as a proto-cubist, a heroic artist whose artistic preoccupations prefigure those of Paul Cézanne, who claimed that all forms can be reduced to cones, circles, and cubes.[33] The possibility that craft training stimulated modes of visual thinking that could be easily translated and applied to other contexts is overlooked. China, a country whose writings figured hugely in Japanese discursive formations, is also forgotten, despite the fact that these mediated the introduction of many new idioms, even as they offered competing ones.

A close, contextualized reading of *Quick Guide to Painting* underscores the dangers of conceptualizing Western science as "modern" in a way that obscures a whole range of attitudes, structures, and practices that may come into play even when European "modernity" is engaged. It also underscores the dangers of talking about the introduction and translation of Western art and science in terms of epistemic shifts, with the emphasis on breaks rather than continuities. Multivalent meanings were attached to geometric forms in nineteenth-century Japan, and it is difficult to determine on what level these complex cultural interactions were understood by the public. Yet under its playful façade, a *Quick Guide to Painting* embodies material and figurative operations of extraordinary texture and density.

Notes

This article is based on a paper presented at the Sawyer Seminar "Visualizing Knowledge from Alberti's Window to Digital Arrays," Stanford University, November 28, 2006.
I would like to express my thanks to Timothy Clark, Allen Hockley, and especially Miriam Wattles for their thoughtful critiques of earlier versions of this essay.

1.
These studies include: Togasaki Fumiko, "Hokusai sakuhin ni okeru kihonteki kōzu ni tsuite no sho kōsatsu," pts. I and II in *Ukiyo-e geijutsu* 50-51 (1976): 3-26 and 14-26. See also Kanō Hiroyuki, "Hokusai 'Garon'" no kentō," *Bijutsushi* 24 (March 1976): 32-42; Masatomo Kawai, "Hokusai and Western-Style Painting," in *Hokusai Paintings: Selected Essays*, ed. Gian Carlo Calza (Venice: The International Hokusai Research Centre, 1994), 149-63; Silvia Vesco, "Il Primo volume del *Ryakuga haya oshie* di Katsushika Hokusai (1760-1849)," *Annali di Ca'Foscari*, vol. 25 of *Serie orientale* (1994): 369-401; and Tsuji Nobuo, "The Impact of Western Book Illustration," in *Hokusai and His Age*, ed. John T. Carpenter (Amsterdam: Hotei, 2005): 341-51.

2.
W. J. T. Mitchell, "Interdisciplinarity and Visual Culture," *Art Bulletin* LXXVII, no. 4 (December 1995): 543.

3.
See Nagata Seiji, ed., *Hokusai no e-dehon*, 5 vols. (Iwasaki Bijutsusha, 1985), vol. I. Their collective publication history is discussed in Richard Lane, *Hokusai Life and Work* (New York: E.P. Dutton, 1989), 304-5.

4.
On Keisai Masayoshi's series see Jack Hillier, *The Art of the Japanese Book*, 2 vols. (London: Sotheby's Publications, 1987), vol. I, 472-78.

5.
See Tani Minezō, *Asobi no dezain: Santō Kyōden* Komongawa (Iwasaki Bijutsusha, 1984); Satō Yōjin, *Seirō wada* Shinzō zui (Miki Shobō, 1976); and Miriam Wattles, "The Longevity of a Dirty Little Dictionary," forthcoming in *Impressions* 30 (2009).

6.
Jack Hillier, *The Art of Hokusai in Book Illustration* (London: Sotheby Parke Bernet and Berkeley: University of California Press, 1980), 141.

7.
Quick Guide to Painting, in Nagata, ed., *Hokusai no e-dehon*, vol. 1, 85-86.

8.
My interpretation is based on the text and photographs in *Edo Craftsmen: Master Artisans of Old Tokyo*, text by Thomas F. Judge, photographs by Tomita Hiroyuki (New York and Tokyo: Weatherhill, 1994), 45-51.

9.
In his diary entry of Banka 7/2/1, Ryūtei Tanehiko notes that he attended a lesson on the use of a "Dutch mathematical device" that Hokusai gave on February 2. Asakura Haruhiko, comp., *Ryūtei Tanehiko nikki*, in *Tokyo koten bunko* (Kōten bunko, 1951), vol. I, 41. The suggestion that this was probably a drafting compass was made by Mark Sandler. See his *The Yomihon Illustrations of Katsushika Hokusai*, Ph.D. dissertation (University of Washington, 1977), 147.

10.
For a reproduction, see Doris Croissant, "Hokusai and Takahashi Yuichi: Changing Concepts in Still-Life Painting," in John T. Carpenter, ed. *Hokusai and His Age*, 227. Further evidence of this link can be found in the Rangaku scholar Satake Shōzan's comments about the value of Western techniques for creating perfect spheres, semi-circles and circles. See Hiroko Johnson, *Western Influence on Japanese Art; The Akita Ranga Art School and Foreign Books* (Amsterdam: Hotei, 2005), 159.

11.
Mark Ravina, "Wasan and the Physics that Wasn't: Mathematics in the Tokugawa Period," *Monumenta Nipponica* 48, no. 2 (Summer 1993): 206.

12.
Hokusai manga, 15 vols. and supplement with introduction by Kawakita Michiaki (Unsōdō, 1993), vol. VIII, 1-2. The Mencius passage is translated in Osvald Siren, *The Chinese on the Art of Painting: Translations and Comments* (New York: Schocken Books, 1969), 152.

13.
See Timon Screech, *The Lens within the Heart: The Western Scientific Gaze and Popular Imagery in Later Edo Japan* (Cambridge: Cambridge University Press, 1996).

14.
Tsuji, "The Impact of Western Book Illustration," 347-50, and Ernst Gombrich, *Art and Illusion: A Study in the Psychology of Pictorial Representation* (Princeton: Princeton University Press, 2000), 163-67.

15.
There are many editions of Crispyn van de Passe's *Lumen picturae et delineationes*. First published in 1643, it was expanded by Frederik de Wit, whose 1660 Amsterdam publication featured additional figures, including the putti illustrated here.

16.
This publication is discussed and reproduced in Ono Tadashige, ed., *Kōmō zatsuwa* (Sōrinsha, 1943).

17.
See Johnson, *Western Influences on Japanese Art*, 43-62.

18.
Cited in Screech, *The Lens within the Heart*, 203.

19.
Timon Screech, "Hokusai and the Microscope," in *Hokusai and His Age*, 335.
20.
On the relationship between the automaton and anatomy see Screech, *The Lens within the Heart*, 65-93.
21.
For the letter requesting the wood-cutter Egawa Tomekichi, see Kobayashi Tadashi, "Hokusai's Letters," in *Hokusai*, ed. Gian Carlo Calza (London and New York: Phaidon Press, 2003), 78.
22.
Although Screech does not discuss the compass and the rule, which in European thought were classified as mathematical rather than philosophical instruments, his analysis of precision and precision tools also applies. See *The Lens within the Heart*, 47-60.
23.
Ibid, 48.
24.
I borrow this phrase from the title of Glenn Adamson's *Thinking through Craft* (London: Berg Publishers, 2007).
25.
Translated in Johnson, *Western Influence on Japanese Art*, 157.
26.
Siren, *The Chinese on the Art of Painting: Translations and Comments*, 17.
27.
Wai-ming Ng, *The I Ching in Tokugawa Thought and Culture* (Honolulu: University of Hawai'i Press, 2000), 144-45.
28.
Ibid, 138.
29.
For a discussion of Fu Xi and reproduction of this image see Wu Hung, *The Wu Liang Shrine: The Ideology of Early Chinese Pictorial Art* (Stanford: Stanford University Press, 1989), 157-61.
30.
Hokusai manga, vol. V, 3.
31.
For illustrations, see Kobayashi Tadashi, *Fugaku sanjūrokkei*, in *Ukiyo-e taikei*, vol. XIII (Shūisha, 1976).
32.
Kanō Hiroyuki, in his "Hokusai *Garon* no kentō" is a rare exception. He emphasizes the importance of reading Hokusai in the context of his times rather than in the way he seems to anticipate modern-day artistic concerns.
33.
See Lane, *Hokusai Life and Work*, 116-17; Kawai Masatomo, "Hokusai and Western-style Painting," 150; and Hidemichi Tanaka, "Cézanne and "Japonisme," *Artibus et Historiae* 22, no. 44 (2001): 215.