

Essay Review

Picturing Knowledge in the Sixteenth Century

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Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-Century Human Anatomy and Medical Botany

Sachiko Kusakawa. Chicago and London: University of Chicago Press, 2012, pp. xvii +331, Price \$50 Cloth, ISBN 0-226-46529-2

1. From “illustrations” to “arguments”

Very few historians and philosophers of science nowadays would question the centrality of images as integral components of scientific practice. Yet, even in a time when references to the “visual cultures” of science proliferate in the literature, very few historians and philosophers of science can prove to have genuinely departed from a view of images as “mere illustrations” subservient to scientific texts to one of images construed as complex arguments in need of epistemic investigation in their own right. Sachiko Kusakawa’s most recent book is a rare and extremely successful scholarly investigation heading in this direction.

Picturing the Book of Nature tells the story of the interplay between botany and anatomy in the sixteenth century through two key figures: Leonhardt Fuchs and Andreas Vesalius. It advances a simple and compelling argument: both cases exemplify the emergence of a new approach to the formation and establishment of new knowledge about nature – one that placed pictures at the centre of claims and arguments about the natural world. From the outset, Kusakawa acknowledges the fact that Fuchs and Vesalius were not the first authors to include pictures in botanical and medical texts. They were, however, the first to develop a “visual argument” as part and parcel of their inquiries into nature: “What was remarkable about these books was the extent to which the authors made pictures central to their understanding of nature such that without the images, their claims to knowledge would not have made sense” (p. 3). This thrust also explains the author’s choice to focus specifically on Fuchs and Vesalius, as opposed to a broader sample of illustrated botanical and anatomical texts of the time. The choice does not entail, however, the neglect of works that were parallel to those by

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Fuchs and Vesalius; to cite just one example, chapters 7 and 8 present a detailed discussion of Conrad Gessner's unpublished *Historia Plantarum*, to which I will return later on. But Kusukawa suggests that the specific ways in which Fuchs and Vesalius handled pictures in constructing their arguments, and particularly their articulated and explicit explanations about the role and usefulness of these pictures, is a clear indication of the distinctiveness of their approaches. Thus, the choice to limit the scope of the book to Fuchs' and Vesalius' works fulfills a particular methodological and historiographical purpose: That of fleshing out, as specifically and clearly as possible, how images became part and parcel of the objects, modes of inquiry, and ultimately of the authority of scholarly knowledge in the sixteenth century.

2. "Books cannot be treated as mere containers of ideas"

Picturing the Book of Nature is a book about books. Materiality matters a great deal in Kusukawa's account, for a number of complex and interrelated reasons. First, despite the fact that knowledge circulated in several different ways in the sixteenth century, books were the primary point of reference for learned physicians. They were both the sources from which physicians would acquire knowledge as novices in the discipline, and the main channels through which they would disseminate new knowledge once they had gained an established position. Second, it was the material nature of the book, along with the constraints that it imposed, that eventually affected the ways in which authors like Fuchs and Vesalius conceptualised and developed the particular relationship between text and image that would become characteristic of their practice.

The first four chapters of the book introduce the reader to the material dimension of images in the broader context of printing techniques, methods, and financial constraints. In chapter 1, Kusukawa examines the two main techniques for replicating images in printed books: woodblocks and metal (usually copper) plates. The former technique's more affordable costs, coupled with a relative easiness in incorporating both text and images on the page, explains its success over engraving and etching in the sixteenth century (pp. 29-31). It is therefore no wonder that both Vesalius and Fuchs privileged woodblocks for their illustrations. But Kusukawa also shows that printing techniques, at the time, did not constitute a major rupture with the manuscript tradition that preceded them. Instead, they developed along parallel lines, borrowing pre-existing methods, division of labor and craftsmanship skills (pp. 41ff).

Chapter 2 deals with the financial and economic expectations involved in publishing, and the constraints publishers placed on the production and circulation of printed books. By the sixteenth century, printing and trading books had developed into two different activities, and it was mainly the publisher that dealt with distribution and sales. As the main financial force behind books, publishers could heavily influence the selection of texts to be printed. The major costs involved in producing books were associated with paper, and this factor – rather than the costs of printing techniques such as woodblocks – partly contributes to explain why illustrated books were far more expensive than non-illustrated ones. Kusukawa explains that it is difficult to pin down a single factor that determined higher prices for illustrated books, however (p. 50). Other financial considerations, besides the actual cost of paper, directly affected the production of books by the likes of Vesalius and Fuchs. A major problem was the relatively small size of the market for scholarly editions. Whereas smaller and less ambitious publications such as missals, books of hours and calendars had an easier and more

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guaranteed diffusion, the expensive, illustrated editions would often drag their own publishers into bankruptcy. Various strategies were put into place to face this financial pressure. Some publishers established various subscription systems, which later on, in the seventeenth century, became popular especially to subsidise the costs of scientific illustrations. Other publishers tried to optimise the use of woodblocks by producing different editions – some exclusively pictorial – of the same book for different audiences. Given these constraints, it is rather surprising that both Fuchs and Vesalius managed to convince their publishers about the viability of their respective works, especially as far as the illustrations were concerned. Even more surprising is the fact that both authors convinced publishers who were not involved in the business of publishing scholarly editions to support their work. Kusakawa explains that partly this success was due to the authors themselves financing production. But behind this move, both Fuchs and Vesalius were motivated by a more important goal: that of protecting and maintaining broader control of their books and their arguments (pp. 49-61).

Chapter 3 deals with an important consequence of the control that publishers had over the presence or lack of images in printed books. The impact of cost calculations over the production of images had resulted in two seemingly contradictory practices in image-making: Copying and colouring. Copying images across texts generated some kind of uniformity, even convergence, in imagery across printed texts. But this practice came at the price of an extremely loose relation between text and images – a consequence that both Fuchs and Vesalius intended to avoid in their own publications. Colouring, on the other hand, aimed at creating diversity against the uniformity produced by copying. In most cases colouring was applied after the printing of images – colour printing as such did not become widespread at least until the nineteenth century. But there was more to colouring than just overcoming uniformity: In the case of Fuchs, for example, colouring was fundamental for the purpose of classifying plants (p. 79). Kusakawa shows that coloured pictures, in addition, present a number of important interpretative issues. Fuchs is again a case in point here. For example, given the instability of colour pigment, there is no certainty over who actually did the colouring and when; indeed, some of the colour might have been applied by later owners of Fuchs' texts. Nor is there clarity over colour terminology: While Fuchs felt the need to explain botanical terms in detail, he gave no unified definition of his colours. It thus seems that some acquaintance with colours was somehow a prerequisite for Fuchs' readers, who were expected to grasp the vocabulary of colour at least as well as they were capable of grasping Latin or Greek terms (p. 79).

In chapter 4, Kusakawa addresses issues of patronage, authority and control over printed books in the sixteenth century. Both Vesalius and Fuchs' books were covered by privilege, a legal instrument that guaranteed particular rights, monopoly or exemptions from duties for particular individuals within the jurisdiction of particular legislating authorities. Privilege covered texts that were published for the first time, but it was not uncommon for authors to claim privilege for texts that were "newly revised" (p. 85), thus portraying as novel texts that underwent only minor revisions. Privileges mainly prevented the reproduction and reprint of books, and their infringement resulted in fines and confiscation of any illegal copies. If a book was protected by papal privileges for instance, the penalty for infringement could be as serious as excommunication. Usually it was authors and publishers who benefited from privilege, but the process was not free from contradictions. The question of who could claim privilege for natural representations is a case in point – one that shows that political and economic interests in the sixteenth century were profoundly intertwined with epistemological and even metaphysical questions. Was it possible at all to plagiarise pictures of objects that existed in nature, and how would privilege cover such instances?

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Kusukawa opens the chapter with a fascinating digression on the dispute between Fuchs and the Frankfurt publisher Christian Egenolff over the infringement of privilege covering some of the illustrations of *De Historia Stirpium*. The controversy discloses two philosophical attitudes toward nature more broadly: Where Fuchs defended the uniqueness of each specimen illustrated in his text, Egenolff argued that all natural images inevitably would resemble each other by virtue of the fact that they were all instances of a common form. Here Kusukawa implicitly puts forward an important addendum to what Lorraine Daston and Peter Galison have presented as the epistemic virtue of “truth-to-nature”: the drive towards producing visual displays consisting of general, idealised types, rather than particular instances found in nature (Daston and Galison 2007, pp. 59ff). Daston and Galison place truth-to-nature as the epistemic ideal governing especially image-making in the eighteenth century and most of their case studies are indeed from botany and medicine. Kusukawa in contrast, shows that the pursuit of ideal types is clearly to be found well before the starting point of Daston and Galison’s narrative, and at the same time she shows that, even as a representative ideal, truth-to-nature was by no means uncontroversial. Some botanists, such as Fuchs, firmly believed in, and indeed pursued, the power of differentiating between individual instances of the same species. The case of Vesalius, in chapter 10, complicates the idea of truth-to-nature even further, showing that, at least prior to the eighteenth century, the notion of “ideal” often implied extremely different, and often irreconcilable, commitments among practitioners even in the same field (pp.210-221).

3. Arguments through pictures

Part 2 of the book (chapters 5 through 8) focuses on a critical comparison between the works of Fuchs and Conrad Gessner. It is here that Kusukawa’s first example of the use of images as visual arguments begins taking shape. She introduces Fuchs’ *De Historia Stirpium* as a Renaissance enterprise revolving around the retrieval and reinterpretation of classical medical sources, and aimed at recovering and promoting a pristine knowledge of plants. Fuchs achieved this goal in two ways. First, and perhaps philosophically most interestingly, he developed a reinterpretation of the Aristotelian notion of “accidents”, usually referred to transient properties of particular subjects. Contrary to his contemporaries, Fuchs argued that certain features, such as the colour of stems, roots, leaves and flowers were “inseparable” or “native” accidents (two terms respectively borrowed from Porphyry and Agricola) inherent in the substance of particular plants, and thus, indispensable for their identification. This line of investigation led to the second key feature of Fuchs’ attempt of recovering a pristine knowledge of plants: namely the idea, portrayed visually in the illustrations of his book, that this method of identification should be supported by an equally comprehensive method of illustration, which he called “pictura absolutissima”. Identifying the “inseparable” accidents of plants for Fuchs went hand in hand with the visual rendering of those features in the most complete (“absolutissima”) way. Kusukawa describes the images as “composites” (p. 118), and this characterisation conveys in the clearest and most compelling way Fuchs’ intention of constructing ideal representations that would nevertheless be grounded in actual direct observations.

The relationship that authors like Fuchs and Vesalius established between their images and the observations that made them possible in the first instance offers the opportunity for more general critical considerations about Kusukawa’s work and its place in the literature. Representations, and more broadly the visual cultures of science, are at present the topic of lively scholarly work. At least

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since Martin Rudwick's appeal to pay attention to the visual languages of science (Rudwick, 1976), historians have begun to recognise the importance of the visual as complementary to the evidence and narratives that could be fleshed out from written texts. More recently, Lorraine Daston has advocated a similar move to retrieve the yet unwritten history of observation, a category which is at the same time pervasive and greatly overlooked in the history of science (Daston, 2008; see also Daston and Lunbeck, 2011). Yet, the relationship between observing and representing has so far remained unexplored – or at least been taken somehow for granted – in these recent developments in the history of science. Kusukawa's book provides just this missing link, and her conclusions extend well beyond the Renaissance period. She emphatically states that an increased number of illustrated publications in a certain field should not be interpreted as an increased number of observations in that field (p.2). Yet, her book clearly shows that the controversies and conversations surrounding particular images and their uses as part of complex arguments do, in fact, disclose a series of commitments about what should be observed at certain time, how certain phenomena should be approached observationally, and how those observations could correct and supplement the authority of classical texts without necessarily undermining their power.

Controversy is a central aspect of Kusukawa's narrative, and indeed Fuchs' use of images as arguments in their own right did not remain uncontroversial among his contemporaries. The physician Janus Cornarius, for example, was a staunch defender of the authority of the written text over visual representations, and he initiated an open and heated polemic against Fuchs. Kusukawa insightfully observes that, despite sharing the common pursuit of retrieving classical knowledge, the line of argumentation that both authors pursued against each other reveals deeply different epistemological commitments (pp. 125-131). Where Cornarius defended the need of an observant and literal interpretation of classical authorities, primarily Dioscorides' *De Materia Medica*, Fuchs' proposed a revival of Galenic medical practice through reason and experiment. For Cornarius images were only redundant additions to the text, which would not bring any additional knowledge than the one that could be obtained primarily by direct observation. For Fuchs, on the other hand, observation and depiction were two complementary ways of exercising reason, and images were indeed the primary mode of supplementing, and even correcting, possible gaps in Galenic practice (pp. 125-129).

Kusukawa's ambitious study shows that pictures were indispensable for the study and investigation of nature independently of publication. In chapters 7 and 8, she draws on the case of Conrad Gessner to argue that her views on the function of pictures as arguments extend beyond the scope of the published book: Images were indeed a way of producing knowledge in their own right in the sixteenth century. The chapters revolve around a set of notes and drawings that formed the basis of Gessner's *Historia Plantarum*, a project that remained largely incomplete. A glimpse at Gessner's rich correspondence, which included exchanges with Fuchs, conveys a clear sense of the requirements he had for the images to be included in his work: The plants had to be rare or unpublished, and they had to be rigorously painted *ad vivum*. Indeed, Gessner would request seeds or entire plants from his correspondents, so that he could grow them himself before having them painted. But *ad vivum* did not simply mean "from life" for Gessner. He promoted a strong sense of seeing, one in which sight would be conducive to triggering other senses (such as taste, smell, and even motion), usually not involved in contemplating pictures. As Kusukawa explains: "'seeing' alone became sufficient for the viewer to recognise the object and all its attendant qualities that were in fact non-existent or invisible" (p. 175). Along with hiring artists, Gessner would draw some of the pictures himself, and Kusukawa gives plenty of details (including visual illustrations) of his distinctive style (pp. 140-159). Gessner

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focused primarily on clear outlines, colouring the illustrations only partially in watercolour, so as to preserve the details of the lines. His use of images condensed his research on specimens over time, and this is its most interesting feature. Using the label “Icon Absoluta” to refer to his method for representing plants, Gessner created composites that would incorporate the totality of knowledge acquired over time on a certain specimen. Each image was thus in dialogue with Gessner’s own annotations, detailing when each feature (roots, stem, leaves, flowers, etc.) was added. Where Fuchs’ composite images were somehow static in their completeness, I argue that Gessner’s articulation of image and text added a dynamic, temporal dimension to his illustrations, which also provided a glimpse at the process of inquiry involved in the study of each plant.

4. Picturing the body

Part 3 of the book extends the common quest for generality, pursued visually through botanical representation by Fuchs and Gessner, to the field of anatomy. Here Kusukawa’s second main actor, Andreas Vesalius, features as a key figure advocating the use of images as arguments – this time in the process of producing and stabilising anatomical knowledge. In chapter 9, Kusukawa offers some useful background on how Vesalius came to develop the powerful approach to images that eventually converged in his major work, *De Fabrica Humani Corporis*.

Even before the publication of *De Fabrica*, Vesalius displayed a distinctive use of images in the context of pursuing precise lines of argumentation within specific controversies. One such case is his contribution to the debate around bloodletting, which divided learned physicians in Europe in the 1530s. The controversy revolved around the choice of the vein to be cut for bloodletting in case of “pain in the side”. Rising above the two opposite camps dominating the debate at the time, Vesalius argued for the distinctive position that the axillary vein of the right elbow should be cut. He supported his position with a sophisticated use of visual evidence, constructed in continuity with his work in the dissection hall (pp. 184-190). Drawing on an analogy with Euclidean geometry, Vesalius constructed his visual arguments in the manner of diagrams, in which conclusions could be inferred visually from the illustrations (pp. 193-194). The relationship between anatomy and geometry is one of the most illuminating passages in Kusukawa’s book, and her arguments about the epistemic status of diagrams and diagrammatic knowledge extend well beyond the scope of her work on the sixteenth century.

Chapter 10 centers on the distinctive use of images in Vesalius’ 1543 *De Humani Corporis Fabrica Libri Septem*. A most interesting feature highlighted by Kusukawa is Vesalius’ ambivalent attitude toward the epistemic role of images in the book. On one hand, he stressed that the efficacy of images consisted precisely in not being identical with their objects, thus breaking away from a mimetic tradition that dated back at least to Plato. In line with this approach, Vesalius appealed to treating anatomical images in analogy with the use of diagrams in mathematics and geometry, as a means of generating visual inferences about the objects in the representation independently of an exact correspondence between images and what they represented (p. 213). On the other hand, however, Vesalius also stressed the indispensable continuity between his drawings and his dissections. Indeed, the illustrations in *De Fabrica* followed quite precisely the order of Vesalius’ dissections in Bologna and Padua. Kusukawa explains that the illustrations were constructed and ordered in the book specifically for the purpose of displaying layer under layer of muscles and tissues. The order of the images invited a comparison between different stages and layers, and Vesalius precisely instructed his

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readers to engage with what was above and below the image they would be focusing on at a particular time (p. 210).

A further comparison with diagrams in geometry is in place here. Vesalius probably needed that comparison to insure the generality of his anatomical images, while maintaining continuity with actual observed bodies in the dissection hall. The ideal behind this approach was to represent the *homo absolutus*, whose body was not only complete, but perfect in all its parts. Interestingly, almost exactly two centuries later, the anatomist Bernhard Siegfried Albinus would question through geometry and a strict system of measurements just how much Vesalius had in fact accomplished such an ideal (Albinus 1747).

Another way in which Vesalius supported his quest for generality was in continuity with classical sculpture. Kusukawa indulges in an enlightening discussion of Vesalius' representation of the torso in *De Fabrica*, clearly modelled on the then much discussed Belvedere Torso. The sculpture, a representation of Hercules, was said to have been praised by Michelangelo as the "most perfect" sculpture in Rome. The lack of features essential to the sculpture's identification, such as the head, arms and most of the legs, was what mostly attracted artists and writers, and this fascination continued well beyond Vesalius' time. Indeed, in 1764 Johan Joachim Winkelmann wrote of it: "Abused and mutilated to the utmost, and without head, arms or legs, as this statue is, it shows itself even now to those who have the power to look deeply into the secrets of art with all the splendour of its former beauty" (Winkelmann, 1764, p. 264). And in his recent *Aisthesis* (2013), Jacques Rancière turned the Belvedere Torso into a paradigmatic example of how art that accomplishes the aesthetic aim of producing a "redistribution of the sensible": "The accidental lack of the statue manifests its essential virtue" (Rancière, 2013, p. 3). Kusukawa shows how Vesalius adopted the Belvedere Torso to fulfil the double aim of establishing some continuity with the classical *canon*, and (perhaps upon initiative of the draftsman in charge of the illustration) displaying a sophisticated antiquarian taste, especially for a figure where the full body was not required: the abdomen of Vesalius' rendition of the torso is open as to show the renal and seminal veins. But in adopting, and adapting, the Belvedere Torso for this purpose, Vesalius seemed to accomplish for anatomy what Rancière claims the original sculpture accomplished for art: a reconfiguration of the original experience of the statue that carries with it novel knowledge.

In chapter 11, Kusukawa speculates on the intricate relationship between text and images in Vesalius' work. Consistent with the Humanist tradition, Vesalius subscribed to the view that a match had to exist between *res* (things) and *verba* (words). However, a distinctive trait of his humanist approach was that pictures could help adjudicate when *res* fitted a particular set of *verba* or classical texts better than another. Interestingly, he did not dismiss the role of text altogether; without an explanation of what readers should see in the pictures the images would remain perfectly useless. A central aspect of Vesalius' *De Fabrica* is the laborious system of keys linking the text to the images, which provides unity and coherence to the work as a whole. While linking text and images was not unusual in Vesalius' time, the extent to which he pursued his visual commentary was quite extraordinary in comparison to similar texts published around that time. Despite all this effort, which was coupled with a close control on the publication of the book, Vesalius' work did not immediately revolutionise anatomy. Instead, his approach to the relationship between *res* and *verba* sparked a number of controversies, particularly around the status of images in his works. In surveying three key critics of Vesalius – his own teacher Jacques Dubuois, Bartolomeo Eustachi and Felix Platter – Kusukawa

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shows that a rejection of the images did not always result in a rejection of Vesalius' anatomical claims (pp. 232-247). Similarly, a rejection of the key anatomical claims advanced by Vesalius was occasionally articulated, as in the case of Eustachi, precisely through the use of images. Vesalius' three critics had very different assumptions about how knowledge of the body should be conveyed, and their arguments indeed reveal a broad range of positions around the how text, images and actual observations performed in the dissection hall should be articulated to qualify as reliable anatomical knowledge.

Kusukawa's book is a rich and compelling journey through the philosophical assumptions underpinning botanists and learned physicians' use of images for the purpose of generating knowledge in the sixteenth century. *Picturing the Book of Nature* book was recently awarded the Pfitzer Award for the best history of science publication in 2014, and the award stands as a celebration of lucid and persuasive scholarship, in which sophistication and clarity are pursued as complementary, rather than mutually exclusive virtues. The coherence of Kusukawa's arguments matches perfectly her own use of images as arguments, which render her book a carefully curated publication, with images genuinely contributing to the narrative and line of argumentation pursued in the text.

Picturing the Book of Nature will fascinate and enrich even those readers who – like the author of this review – are not experts in Renaissance studies. For anyone interested in the epistemic role of images in the history of science and in scientific practices, this book is a necessary reading. It is so precisely in light of the general claims it advances about the argumentative function of pictures, claims that will certainly make an impact on the study of visual culture more broadly.

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