

Images as documents for the history of science: some remarks concerning classification

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Abstract

Studies on history of science are increasingly emphasizing the important role that, since ancient times, images have had in the processes of shaping concepts, as well as registering and transmitting knowledge about nature and the arts. In the past years, we have developed at Center Simão Mathias of Studies on the History of Science (CESIMA) inquiries devoted to the analysis of images as forms of registering and transmitting knowledge about nature and the arts – that is to say, as documents pertaining to the history of science. These inquiries are grounded on the assumption that all images derive from the interaction between the artistic technique used in their manufacture and the concept intended to be expressed by them. This study enabled us to analyze distinct roles that images have had in different fields of knowledge at various ages. Some of the results obtained so far are summarized in the present article.

Keywords: History of science, Images, Recording knowledge, Classification

Imagens como documentos para a história da ciência: algumas considerações acerca da classificação

Resumo

Os estudos sobre a história da ciência vêm cada vez mais enfatizando o papel importante que, desde épocas antigas, as imagens tiveram nos processos de modelar conceitos, assim como de registrar e transmitir conhecimentos sobre a natureza e a arte. Nos últimos anos, no Centro Simão Mathias de Estudos em História da Ciência (CESIMA) temos desenvolvido pesquisas dedicadas à análise de imagens como formas de registrar e transmitir conhecimentos sobre a natureza e a arte, vale dizer, como documentos para a história da ciência. Essas pesquisas se baseiam no pressuposto de que todas as imagens derivam da interação entre a técnica artística utilizada na sua produção o conceito que se procura expressar através delas. O nosso estudo nos permitiu analisar diversos papéis que as imagens tiveram em diversas áreas do conhecimento em períodos diferentes. Alguns dos resultados obtidos até o momento são sintetizados no presente trabalho.

Palavras-chave: História da ciência, Imagens, Registro de conhecimentos, Classificação

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Studies on history of science are increasingly emphasizing the important role that, since ancient times, images have had in the processes of shaping concepts, as well as registering and transmitting knowledge about nature and the arts.¹

Drawings, sketches, miniatures, paintings, woodcuts, metal etchings, and photographs are just a few examples of the many forms making up the realm of visual expression. More importantly, each of these forms has possibilities and limitations inherent to the technique used in its production. Yet, regardless of their peculiarities, different kinds of images are usually grouped under the broad class of 'iconography' by the standards conventionally adopted in libraries, archives and museums.

Traditionally, the word 'iconography' refers to collections of portraits or representations of royal dignitaries, mythological heroes and divinities, as well as Christian saints. Nowadays, this word is sometimes associated to different kinds of collections and studies, as long as they include some type of image. In the routine of classifying texts and documents, the rubric 'iconography' refers to the image holdings of an institution. Specialized divisions in such holdings are indispensable parts of libraries, archives, and museums. These divisions are important because they comprise documents demanding distinct forms of preservation and investigation. On the other hand, they often lack parameters of organization of their own, as they usually tend to be mere adjustments of the classificatory systems used in collections of books and textual documents.

By the way, recent studies based on the science of information are pointing out the limitations of the criteria ordinarily used in classifying images. For instance, in a dissertation submitted a few years ago for a Master's degree, its author proposed the inclusion of a new descriptor for photographic images. Called 'expressive dimension,' this descriptor was intended to take into account, on top of the photographic technique itself, the manipulation of images made possible by this technique.²

Paying attention to the determinants dictating the possibilities and limitations inherent to the technique used in manufacturing images has been seriously considered since the 1930s, in pioneer studies such as those of W. Ivins Jr. and A. Arber.³ Coincidentally, both scholars also focused on the role that images have had in the development of concepts, as well as in the registration and transmission of visual information regarding nature and the arts.

¹ Two authoritative references are M. Norton Wise et al., "Focus: Science and Visual Culture," *Isis* 97 (2006): 75-120; and Sachiko Kusukawa, *Picturing the Book of Nature: Image, Text, and Argument in Sixteenth-century Human Anatomy and Medical Botany* (Chicago: University of Chicago Press, 2012). A recent study focusing on reconstructions of two ancient Greco-Latin, anatomical diagrams of the uterus is Vera C. Machline, "As Primeiras Imagens Greco-latinas Exibindo Partes do Útero," *Domínios da Imagem*, 10, n° 19 (Jul.-Dec. 2016): 8-39.

² Miriam P. Manini, "A Dimensão Expressiva na Indexação de Documentos Fotográficos," in *Anais do 1º Encontro Nacional de Estudos de Imagens* (Londrina: Universidade Estadual de Londrina, 2007), accessed October 2009, <http://hdl.handle.net/10482/1012>.

³ William M. Ivins Jr., *Imagem Impressa y Conocimiento: Análisis de la Imagen Prefotográfica* (Barcelona: Gustavo Gili, 1975); Agnes Arber, *Herbals: Their Origin and Evolution; A Chapter in the History of Botany 1470-1670* 2nd ed. (Cambridge: Cambridge University Press, 1953).

Finally, one must add that, after E. Panofsky's studies about meaning within the visual arts, 'iconography' – in the sense of description and classification of images – has gained a new implication: it is now regarded as an indispensable, even though circumscribed, step toward 'iconology,' which is the interpretation of visual documents grounded on their historical context.⁴

In the past years, we have developed at Center Simão Mathias of Studies on the History of Science (CESIMA) inquiries devoted to the analysis of images as forms of registering and transmitting knowledge about nature and the arts – that is to say, as documents pertaining to the history of science. In these studies, we are considering images from various time periods, manufactured by means of different techniques, intending to express distinct conceptions. Even though working with case studies, we ultimately aim to establish possible more generic relationships between the intellectual concepts and the techniques under investigation.

These inquiries are grounded on the assumption that all images derive from the interaction between the artistic technique used in their manufacture and the concept intended to be expressed by them.⁵ This interaction has been the focal point of a number of M.A. and Ph.D. dissertations developed in our Program of Graduate Studies on the History of Science, headed by CESIMA. Some of these dissertations center on techniques and materials, while other ones focus on topics such as optical instruments, the epistemological status of images, and theories about eyesight. A third group of dissertations concentrates on the symbolic and emblematic attributes of images.⁶

Inquiries carried through our Program of Graduate Studies have enabled us to analyze distinct roles that images have had in different fields of knowledge at various ages. Some of the results obtained so far are summarized in the following pages.

To make a long story short, by the middle of the fifteenth century, thanks to the establishment of the printing press with movable types in Europe, images attained a more relevant role in texts dealing with science and the arts. Even though the printing press alone cannot be accounted for the high esteem ascribed to images, their presence in the first printed books indicates that the clientele aimed at by the editors included a semiliterate, if not entirely illiterate, public.⁷ For this matter, "figures are nothing more than a feast for the eyes, and for the information of those who cannot read or write," noted Hieronymus

⁴ Erwin Panofsky, *Significado nas Artes Visuais* (São Paulo: Perspectiva, 1976), 47-86.

⁵ Maria H.R. Beltran, *Imagens de Magia e de Ciência: Entre o Simbolismo e os Diagramas da Razão* (São Paulo: Educ/Fapesp, 2000), 18-9.

⁶ Some of these dissertations are: Reno Stagni, "Imagens Alquímicas Renascentistas como Documentos para História da Ciência" (PhD dissertation, 2013); Regiane A.C. da Silva, "A Imagem Impressa nos Livros de Botânica no Século XIX: Cor e Forma" (PhD dissertation, 2014); Fabiana D. Klautau, "Bestas e Maravilhas: A Visão Emblemática dos Animais na Obra *Historia animalium* de Conrad Gesner e Algumas de suas Fontes" (MA dissertation, 2014); and Fumikazu Saito, *O Telescópio na Magia Natural de Giambattista della Porta* (São Paulo: Educ/Livraria da Física/Fapesp, 2011).

⁷ Paul F. Glender, "Form and Function in Italian Renaissance Books," *Renaissance Quarterly* 64 (1993): 551-85.

Brunschwig (c. 1450-1512) in his *Book of the Art of Distillation*. Published for the first time in 1500, this work was plentifully illustrated with woodcuts.⁸

The images that appeared in the first printed books were woodcuts. They came from woodblocks, which were cut in such a way that the lines to be printed were left in relief. Furthermore, woodcut images could be printed together with the text made up by movable types. This feature fostered new relationships between image and text. For example, as shown in Figure 1, it enabled that the same image could be reproduced in other parts of the text referring once more to a specific subject. Serving as a visual reference, such images allowed even an illiterate public to follow the content of the text.

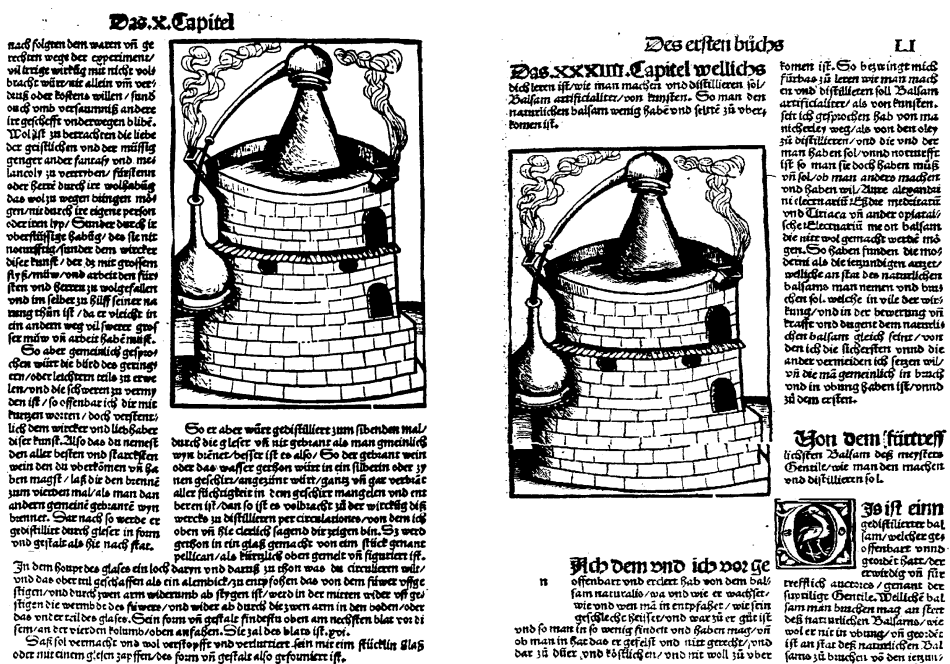


Figure 1. Hieronymus Brunschwig, *Liber de arte distilandi de compositis*, ff. xvii v and li r⁹

The use of woodcuts facilitated the migration of images not only throughout the same text, but to other texts as well. Owing to this, even when the images under discussion here appearing in the first printed books were not intended to convey visual information, they contributed to the establishment of visual standards denoting practical processes and

⁸ The passage quoted above comes from Arber, p. 201. It is based on the first edition published in Germanic vernacular. In Hieronymus Brunswig, *Book of Distillation* (New York/: Johnson Reprint Corporation, 1971), 11 (which reproduces the English translation of 1530 of Brunswig's *Liber de arte distilandi de compositis*) one reads the following observation regarding images: "I will to you declare / to the entente that the operation of distillation may be accomplysshed/ and openly shewed in figures as herafter foloweth. Because it may be knowen to all maner of people."

⁹ Hieronymus Brunschwig, *Liber de arte distilandi de compositis* (Strassburg: J. Grüninger, 1512).

concepts, as detailed elsewhere.¹⁰ This fact explains why certain images in early modern printed books were later on copied in manuscripts.

Throughout the sixteenth century, the use of images as a means of transmitting visual information seems to have increased. Georgius Agricola (1494-1555), for instance, appears to have intended that the illustrations printed in his *De re metallica* were supposed to provide knowledge about the arts concerning metals right “before the eyes of the reader”¹¹. Likewise, in herbals and books concerned with human anatomy, images began to have a major function in conveying visual information.¹²

Parallel to this new role assigned to visual representations, the pursuit of more precise images was another innovation. This goal was achieved with metal engraving – a technique which produces images made up of lines which are both very fine and extremely rich in details. At that time, however, copper plates were more expensive than woodblocks, and could not be printed together with movable types. Consequently, metal engravings had to be printed in another kind of press. Owing to this, images and texts were separated from each other. Tables, figures, and captions remained alluded to in the text. But now, as exemplified in Figure 2, readers had to look for such visual aids elsewhere: among the images usually bound at the end of the book, or inserted in large, folded leaves inside the book; or else, among the images grouped in individual volumes, which was the case of the *Encyclopédie*.

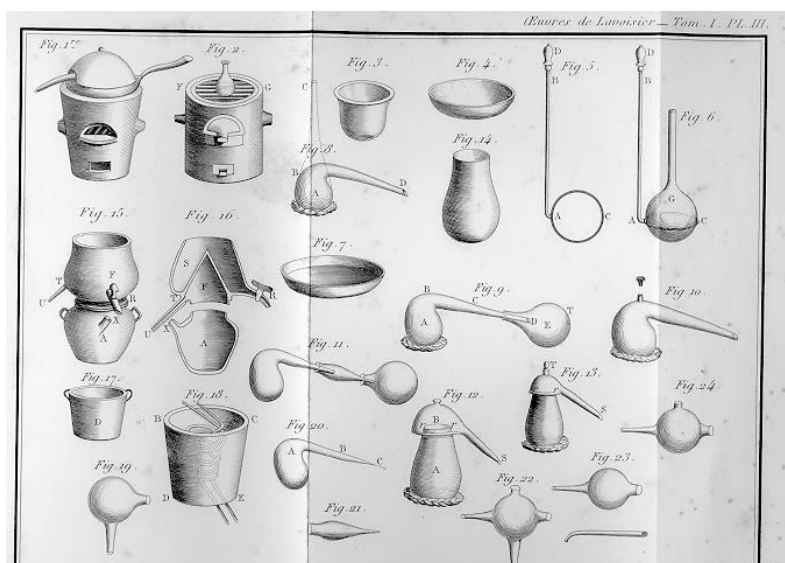


Figure 2. Antoine L. Lavoisier, *Oeuvres*, I: Pl. III¹³

¹⁰ Maria H.R. Beltran, “Sixteenth-Century Books of Distillation and Materia Medica: A New Means to Disseminate Chemical Practices to Prepare Traditional Medicines,” in Patricia Aceves Pastrana, & Gérard Emptoz, ed., *Between the Natural and the Artificial: Dyestuffs and Medicines* (Turnhout: Brepol, 2000), 145-55.

¹¹ Georgius Agricola, *De re metallica*, transl. H. Hoover, & L.C. Hoover (New York: Dover, 1950), xix.

¹² Ivonete D. Lucírio, “Visões do Corpo Humano: Ilustrações de Anatomia e Cirurgia nos Séculos XV e XVI” (MA dissertation, Pontifical Catholic University of São Paulo, 2001).

¹³ Antoine L. Lavoisier, *Oeuvres*, vol. I (Paris: Imprimerie Impériale, 1862-93).

The pursuit of techniques providing precise images at a lesser cost intensified in the nineteenth century, during the so-called 'second printing press revolution.' Favored by a significant increase of literacy rates, the reduction of book costs thanks to the use of pulpwood, and the emergence of new rotating presses powered by steam engines, the publication of books off all kinds escalated. Practical manuals were among the most wanted books. In these works, very different arts were described, ranging from letter writing to metal assaying. As shown in Figure 3, many of these manuals were accompanied by woodcuts or metal engravings. Other ones, even though not carrying illustrations, equally intended to transmit practical knowledge.¹⁴

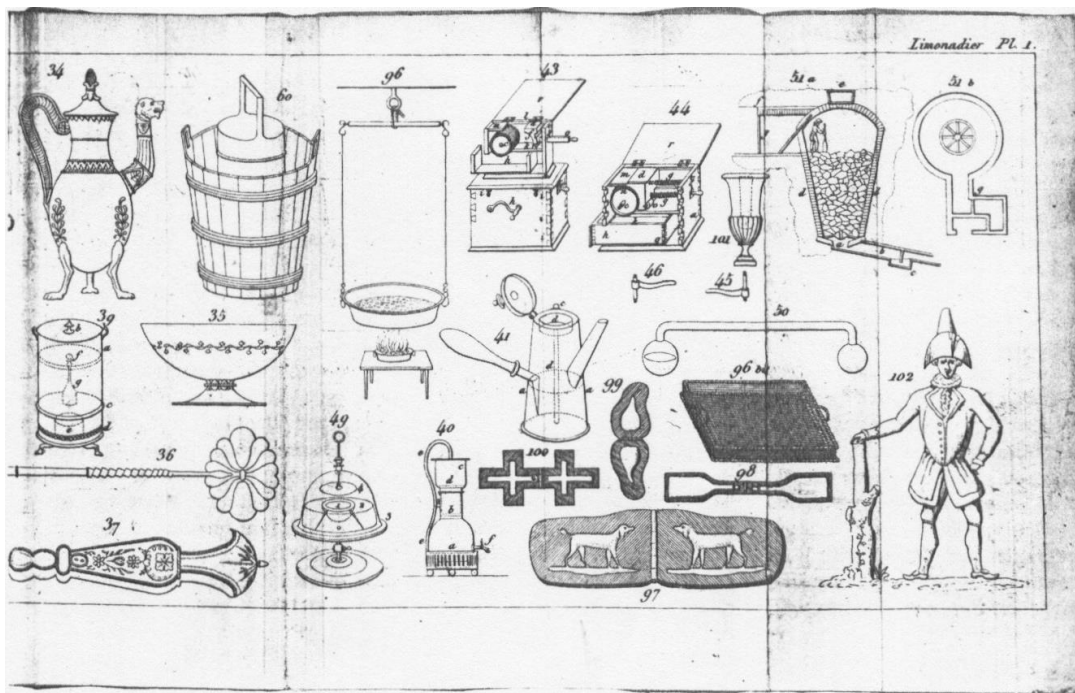


Figure 3. M. Cardelli, Lionnet-Clémantot Cardelli, & Julia de Fontenelle, *Nouveau Manuel du Limonadier, du glacier, du chocolatier et du confiseur*¹⁵

At the turn to the twentieth century, textbooks became a relevant branch of the editorial business. Aiming especially at school students, these books also brought detailed images of equipment and experiments. Even though photography was already current, the technique mostly used for producing images in textbooks was top woodcut. In this procedure, woodblocks are engraved with a burin on the counter thread (or top) of the block.

¹⁴ Maria Helena Roxo Beltran, "Divulgação de conhecimentos sobre as artes e as ciências os manuais práticos", in M. H. Beltran & J. L. Goldfarb, eds., *Ambiente, natureza e cultura na perspectiva da história e da epistemologia da ciência: ciências naturais e suas interfaces. XIV Reunião da Rede de Intercâmbios para História e Epistemologia das Ciências Químicas e Biológicas. Anais* (São Paulo: CESIMA/Editora Livraria da Física/GaleThomson, 2004), 40-46.

¹⁵ M. Cardelli, Lionnet-Clémantot, & Julia de Fontenelle, *Nouveau Manuel du Limonadier, du glacier, du chocolatier et du confiseur* (Paris: Roret, 1838).

Such technique enabled the impression of lines as fine and detailed as those obtained from metal engraving, but at a much lesser cost. In other words, the faithfulness of the images reproduced by top woodcut in relation to the actual objects serving as models was extremely high. This allowed students to have in their textbooks very good reproductions of phenomena, equipment, and experiments – thus satisfying the taste of the Positivist thinking of the age.¹⁶

From what has been seen so far, it seems clear that the class ‘iconography’ – in the way it has been usually applied in the cataloguing of images – needs to be re-examined. This is especially true to images referring to theoretical concepts, as well as nature and the arts, which may be regarded as documents for the history of science. Illustrating manuscripts and printed books, these images demand special attention, including the relationships between text and image.

In an earlier work,¹⁷ we have proposed some criteria for the study of images grounded on the three analytical spheres comprising the History of Science, as originally propounded by A.M. Alfonso-Goldfarb. Such spheres comprise internal, historiographical, and contextual factors.¹⁸ The scheme in Figure 4 shows some of the items that should compose an analysis of images in history of science, in each of these spheres.

¹⁶ Luciano de A. Tavares, “Imagem Impressa e Ciência: Ilustrações em Livros Didáticos de Física (Séculos XIX e XX)” (Master dissertation Pontifical Catholic University of São Paulo, 2005).

¹⁷ Maria H.R. Beltran, “A Produção do Salitre ‘Diante dos Olhos’: Análise de Imagens em Tratados Renascentistas de Metalurgia,” in *Centenário Simão Mathias: Documentos, Métodos e Identidade da História da Ciência*, ed. A.M. Alfonso-Goldfarb et al. (São Paulo: PUC-SP, 2009), 225-36.

¹⁸ Ana M. Alfonso-Goldfarb, “Centenário Simão Mathias: Documentos, Métodos e Identidade da História da Ciência,” *Circumscribere* 4 (2008): 5-9. See also Ana M. Alfonso-Goldfarb, Márcia Ferraz, & Maria H.R. Beltran, “A Historiografia Contemporânea e as Ciências da Matéria: Uma Longa Rota Cheia de Percalços,” in *Escrevendo a História da Ciência: Tendências, Propostas e Discussões Historiográficas*, ed. A.M. Alfonso-Goldfarb, & M.H. R. Beltran (São Paulo: Educ/Fapesp/ Livraria da Física, 2004), 49-73.

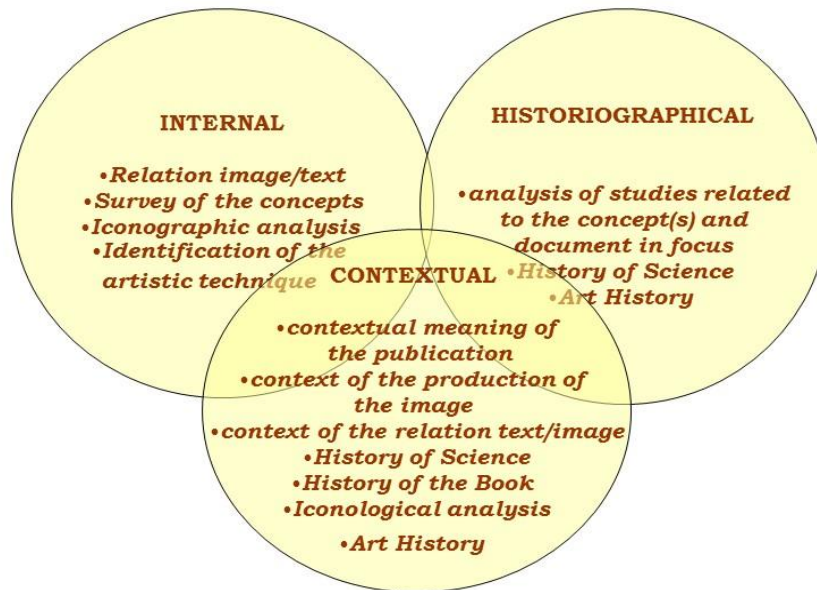


Fig. 4. Items to consider in image analysis in history of science

All the factors in the above scheme are considered fundamental in the analysis of images. In the light of this, when considering images as documents for the history of science, their analysis should involve interfaces with other fields of study, in particular, history of art and artistic techniques, as well as history of the book.

On second thought, these factors could be extended to the classification of images in the history of science. Hopefully, if such step is taken, images will be considered, rather than mere “illustrations” or simply “a feast for the eyes”, legitimate documents for the history of science.