

Artwork, Craftwork, Science – and Who Is the Author?

The Case of 18th-Century Botanical Illustrations

Abstract

18th-century botanical illustrations are, in a way, paradigmatic examples of a 'different aesthetics.' Their design reflected the inner logic of artistic processes, which themselves were shaped by the technical possibilities and aesthetic conventions of the time, while the images also had to meet the demands of a specific social function, namely, botanical teaching and research. The making of these illustrations required both botanical and artisanal knowledge and skills, and botanists often collaborated with one or several artists and craftspeople. In this respect, 18th-century botanical illustrations are exemplary instances of multiple authorship on an individual level. Closer inspection reveals furthermore that the images were integrated into a pictorial discourse that extended across Europe, far beyond their specific places of production. This directs our attention to an interesting additional aspect of multiple authorship, namely, the relationship between the individual and the collective in 18th-century natural history.

Keywords

Natural History, Botanical Illustrations, Artisanal Knowledge, Different Aesthetics, Multiple Authorship

1. Introduction

For a long time, botanical illustrations were excluded from the canon of art history; they were considered too factual and too unassuming to be interesting. In her (otherwise highly valuable) study of natural historical illustrations of the 16th to the 18th centuries, the art historian Heidrun Ludwig thus tried hard to sell the "aesthetics of botanical paintings" to art history. According to Ludwig, if we regarded the botanist as an art collector and appreciated the artistic value of botanical paintings, then "the somewhat dry flavour that is apparently adherent to botanical depictions quickly subsides."¹ It seems that only when one ignored the scientific context of the illustrations did they become relevant and interesting to art history. Yet the history of science too was uninterested

* Translated by Alexander Wilson. Quotations for which no other translation is cited have also been translated by Wilson.

1 Ludwig 1998, p. 152.

in natural historical illustrations for a long time; here, they were considered to be too representational and ostensibly trivial. This attitude has changed in both disciplines over the last decades – and rightly so, as I will show in this chapter.²

These illustrations are complex in both content and design. In a certain way, they are paradigmatic examples of a ‘different aesthetics.’³ Their design followed an inherent artistic logic and was shaped by the artisanal possibilities and conventions of the time. Equally important, however, were the demands of their specific botanical function. To camouflage botanists as art collectors, as Ludwig suggested with the best of intentions, fails to recognize the high standards of these images in terms of their content. In 18th-century Europe, on which I concentrate here, they were a vital element of botanical research and teaching alongside herbaria and gardens. Their production demanded the collaboration of actors with botanical as well as artistic and artisanal knowledge and skills. In this respect, precisely who should be criticized or praised as the ‘author’ of an illustration is unclear. Printed works appeared almost exclusively under the name of the botanist. If all those who contributed decisively to the production and design are considered as ‘authors,’ however, the images are undoubtedly the result of multiple authorship and also offer an interesting perspective on the relationship between the individual and the collective in the natural history of the 18th century.

In the following, I will first outline the dual nature of plant illustrations. I suggest that they should be addressed as functional art: as art that had to be useful but was allowed to be beautiful. I will subsequently take a look at the making of botanical illustrations and examine which people with which competencies were involved in the illustrations’ production and how the collaboration can be described. A relevant finding here is that both botanists and artists strove to avoid collaboration and rather tried to acquire the necessary competencies themselves: as botanist-artists, or *vice versa*, in a personal union. Finally, I will show from a broader perspective how botanical illustrations were integrated via numerous, complex copying links into a visual discourse that extended across all of Europe.

- 2 The scholarly literature on illustrations in natural history has multiplied since the 1990s; it is impossible to present even a cursory overview in the present context. Important inspiration for the understanding of so-called ‘atlases’ was provided by, among others, Daston / Galison 2007 and developed further in e.g. Daston 2015; for (subjectively) selected examples of widely received studies on botanical illustrations more recently, see O’Malley / Meyer 2008; Bleichmar 2012; Kusukawa 2012; Egmond 2017. Klonk 2003 provides an overview that is still worth reading; more recently and with a more analytic approach, see Marr 2016. For a handbook, see Hentschel 2014.
- 3 See the research programme of CRC 1391 *Different Aesthetics*: <https://uni-tuebingen.de/en/research/core-research/collaborative-research-centers/crc-different-aesthetics/> (last accessed: 16 December 2024).

2. Botanical Illustrations as Functional Art

In the spring of 1731, Christoph Jacob Trew (1695–1769), a town physician and naturalist in Nuremberg, received some plant drawings from a young friend and colleague in Regensburg.⁴ They came from the hand of a gardener with a talent for drawing who was working on a *herbarium vivum*, a collection of 600 images of primarily native plants. Trew was both delighted and interested and agreed to buy two or three drawings a week from the gardener-artist at the price of one guilder per piece.⁵ At the same time, however, Trew asked that his requirements for botanical illustrations be clearly communicated: “My dear cousin would be so kind to remind the artist that I set great store on everything being drawn true to nature, because I need it not only for decoration, but also for practical purposes.”⁶ Thus began Trew’s longstanding and successful co-operation with Georg Dionysius Ehret (1708–1770), who would eventually become one of the most famous plant illustrators of the 18th century.⁷

In his note to the artist, Trew encapsulated the twofold expectation of botanical images: they should be useful and pleasing, *prodesse et delectare*. Botanical illustrations were permitted to be beautiful, and sometimes they were even supposed to be; floral works and *florilegia* with splendid furnishings could serve representative purposes, even on a national or imperial level. This was the case, for instance, with the *Flora Danica* and *Flora Batava*, produced on lordly commission, in which the botanical scope also marked territorial claims.⁸

Above all, however, botanical illustrations served concrete purposes in research and teaching wherever plants and botanical knowledge played a role, including in natural history, medicine, pharmacy, forestry, and agriculture. The latter fields became the focus of state interests in the 18th century and were fundamentally reformed in many places, including through professionalized education and instruction.⁹ A number of 18th-century plate works were expressly intended as textbooks and manuals in precisely these

4 For Trew, see, for example, Pirson 1953; Schug 1978. On Trew as an editor of volumes of botanical plates, see Schnalke 1995; Nickelsen 2006a, chapter 2.

5 There is an extensive collection of letters by Trew, which can be viewed in the manuscript collection of Universitätsbibliothek Erlangen (hereafter cited as: UBE Briefsammlung Trew). The letters are cited according to their numbering in the collection; see Schmidt-Herrling 1940. Here: Johann A. Beurer to Trew, letter no. 22, 26 February 1731, and letter no. 23, 5 December 1731; Trew to Beurer, letter no. 34, 17 January 1732.

6 Trew to Beurer, letter no. 33, 22 December 1732 (UBE Briefsammlung Trew).

7 On Ehret, see, for example, Schnalke 1996; Kastinger Riley 1996; Calmann 1977.

8 See also Nickelsen 2018a; Nickelsen 2021. For the named works, see Oeder: *Abbildungen der Pflanzen* (*Flora Danica*); Kops: *Flora Batava*.

9 See, for example, the contributions in Popplow 2010. For Preußen, see also Klein 2015; Klein 2016.

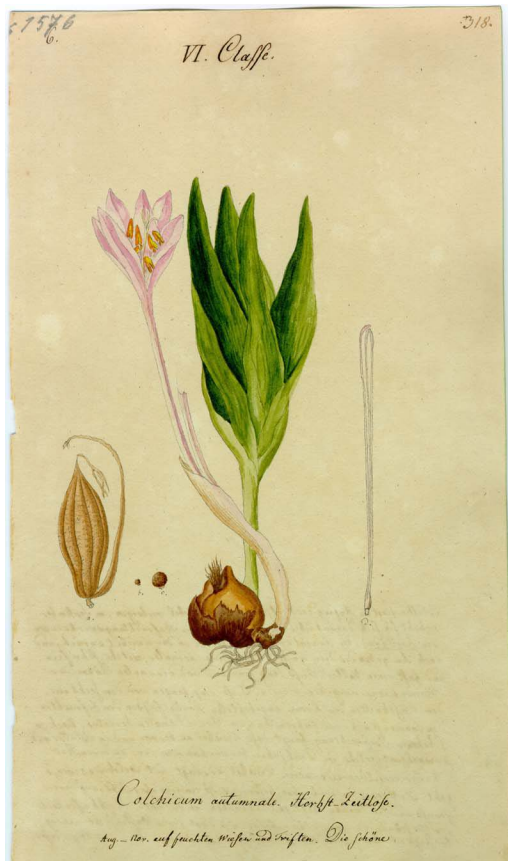


Fig. 1. Autumn crocus (Lat. *Colchicum autumnale*), Landesmuseum Wiesbaden, Sandberger collection, no. 1576 (watercolour painting).

contexts.¹⁰ This squares with the finding that native species with functional values, such as coltsfoot, hazelnut, and autumn crocus, were depicted much more frequently than exotic, magnificent plants, such as amaryllis, aloe, and pineapple.¹¹

Figure 1 shows one such rather inconspicuous drawing: a watercolour of the autumn crocus (*Colchicum autumnale* L.). It derives from the estate of Johann Philipp Sandberger (1783–1844), a Hessian teacher and plant lover who compiled an extensive

10 These include the works by Kerner: *Abbildungen oekonomischer Pflanzen*; Hayne: *Getreue Darstellung und Beschreibung der in der Arzneykunde gebräuchlichen Gewächse*; and Schkuhr: *Botanisches Handbuch*, which play a role in the later sections of this chapter.

11 For details, see, for example, Nickelsen 2000; Nickelsen 2006a; for an overview catalogue: Dickel/Uhl 2019. Cooper 2007 explains that regional floral works also experienced an upsurge in the 18th century.

collection of plant drawings for his own use.¹² The sheet is undated – it is estimated to date from the 1820s – and clearly shows the conventions for the design of botanical illustrations. For all the variance, from the unpretentious apothecary's textbook to the sumptuously coloured coffee-table folio, the form of these plates was highly standardized from the 18th century at the latest. Typically, an individual specimen was depicted against a neutral, bright background, on which all the organs were clearly recognizable, often in various stages of life: leaves, flowers, stem, roots. In addition, there appeared detailed drawings of the flower and the fruit, and sometimes of their components.

The pictures were thus reminiscent of herbarium sheets, which in the 18th century became even more important than in earlier times and were increasingly standardized.¹³ Like illustrations, also herbarium sheets communicated knowledge about plant species; the mode of representation, however, was fundamentally different. In herbaria, individual exemplars of the species were conserved with each of their contingent properties. By contrast, botanical illustrations displayed synthesizing, comprehensive descriptions of species, that is, the typical, defining properties of an entire class according to the conventions of the time. They were therefore highly sophisticated in form and in content. Only a few artists and craftspeople mastered this art to the satisfaction of naturalists, and these were known and recommended in all of Europe.¹⁴ In this respect, the circle around Trew enjoyed particular recognition. It was widely known that Trew devoted considerable time and effort to educating and training talented draughtsmen and engravers in Nuremberg according to his ideas. Besides the standards of the genre, this also included an introduction to the principles of botany, so that the artists knew to what they should pay particular attention when depicting a species of plant.¹⁵ Trew also was in close exchange with the director of the Nuremberg Academy of the Arts, where some of his draughtsmen received their artistic education.¹⁶

Ehret equally spent some time in Nuremberg, where he was instructed by Trew in the principles of botany and the conventions of botanical illustrations. In his very first letters, Trew outlined some details of how he envisioned a botanical illustration:

12 The Sandberger collection can be viewed at the Landesmuseum Wiesbaden. It comprises around 2500 watercolours, ca. 20 × 35 cm, as loose sheets in 14 portfolios. The sheets are numbered and arranged by family (presumably in retrospect). No index exists. The museum dates the collection to the period 1820–1827.

13 See, for example, Müller-Wille 1999; Müller-Wille 2002a. For a comparison of different forms of representation: Nickelsen 2006b.

14 See Nickelsen 2006a, pp. 35–39.

15 This is also documented for the Berlin Akademie der Wissenschaften in the 18th century; see Nickelsen 2018b.

16 See Müller-Ahrndt 2021, chapter 3.

As to the background, I leave this to the judgement of the artist, but for those plants that have pale-green leaves or a white flower, I am of the opinion that a brown background will make the painting clearer. In any case, however, I will ask again for nature to be expressed as clearly as possible and, wherever possible, for the fruit or the seed to be added. [...] On each sheet of paper, there should be no more than a single plant, and, if it is small, it shall be placed right in the centre. If, however, there are some species of small plants that vary only in the colour of the flower, e.g. in the case of the violet, *Bellis hortensis*, etc., one could be placed at the top and the other at the bottom of a sheet, and they should be paid, nonetheless, as two items. But I do not want to have two plants entwined together, as in some already drawn paintings of *Paraveribus* and *Caryophyllis*.¹⁷

Trew had very set ideas not only of what a picture had to look like to meet his demands, and he was also clear on the different roles of draughtsman and botanist. He left purely aesthetic questions, such as the colour of the background, to the artist and merely noted that a contrasting colour would make the illustration easier to grasp. By contrast, the composition of the plant depiction itself was entirely up to the botanist. Details of the fruit and seeds were always to be included as essential characters of the species; furthermore, each species was to be drawn on an individual sheet of paper. Only variations in colour of the same plant species were permitted to appear on the same sheet.¹⁸ Even in this case, however, they were also to be drawn neatly separated from one another, probably in order to present the morphology of the variants as clearly as possible. Decoratively intertwined plants were unacceptable to Trew, although this was a popular method of representation at the time. Even when, a little later, Ehret delivered an illustration in which the two sexes of a plant species were drawn on one sheet, Trew advised him to be notified in the future “when two [plants] should appear on one sheet.”¹⁹

Artistic creativity was of secondary importance to successful botanical illustration. This is apparent, for example, from a letter of the draughtsman Andreas Friedrich Happe (1733–1802) to the Berlin Academy of Sciences from September 1769. In the letter, Happe asked for an official diploma as a painter of natural history from the Academy, for whose members he had already worked on several occasions. He enclosed some examples of his work with his letter, presumably as evidence of his expertise (Fig. 2).²⁰ It can be assumed that Happe wanted to show his best side with these exam-

17 Trew to Beurer, letter no. 35, 16 February 1732 (UBE Briefsammlung Trew). This letter responded to an inquiry by Beurer to Ehret, “whether, then, your Excellency also requires some to be painted on a brown ground, for although this painter learned drawing and painting from a famous Dutchman and can thus deal with both brown and white grounds, he still thinks it better and more artful to depict a flower on a white ground than on a brown.” See Beurer to Trew, letter no. 27, 23 January 1732 (UBE Briefsammlung Trew).

18 The isolation of the species on individual sheets offered the advantage of classifying them according to their taxonomic position or other criteria in a compilation system, if necessary, even in a suitably constructed cabinet, as Müller-Wille 2002a shows for Linnaeus.

19 Trew to Beurer, letter no. 38, 21 June 1732 (UBE Briefsammlung Trew).

20 ABBAW: PAW (1700–1811), I–III-81, leaf 81^v. The drawings are filed as leaves 82–86.

ples in order to demonstrate his qualifications convincingly. It is thus highly interesting that the drawing was not his own design but a copy. Happe even explicitly indicated the source on the sheet: he copied the motif from the renowned *Plantae Selectae*, probably the most magnificent volume of plates to result from the collaboration between Trew and Ehret (Fig. 3).²¹

We know that copying prestigious and well-known pieces was part of the training of draughtsmen at academies of art and in workshops.²² Yet naturalists like Trew also made recourse to this technique: the eye and the hand were trained on the model.²³ Trew regularly had copies drawn up of particularly successful (or particularly rare) illustrations. This served the purpose of training, while Trew also let the engravers work from copies in order to protect the valuable originals. Trew also gave away copies of drawings of rare plant species to friends and colleagues and, conversely, had copies made for himself of images that colleagues had sent him for this purpose. Yet even the draughtsmen trained in this way were subject to close control by the botanist, especially in view of the scientific content of the plates: the characteristics of plant species were defined in botany, not in art. What these characteristics were was discussed extensively in the 18th century; at the same time, people contended over suitable standards for species descriptions, both in word and image.

The system and principles of the Swedish botanist Carl Linnaeus (1707–1778) ultimately prevailed. In the *Genera Plantarum* (1737), Linnaeus had determined how the diagnosis of plant genera should be undertaken; in the *Philosophia Botanica* (1751), he outlined the same for plant species.²⁴ This primarily concerned the form and content of the text; however, in the appendix to the *Philosophia Botanica*, there were also a series of model plates on simple and compound leaves, leaf positions, root organs, etc. Figure 4 shows an example. Arranged in rows, small and schematic sketches visualized different leaf forms, and a legend provided each of these forms with a technical term (Fig. 5). In this way, Linnaeus laid down which terms were to be used for which leaf forms and how

- 21 Trew: *Plantae Selectae*. On the production of this work, see Nickelsen 2006a, chapter 2; Schnalke 1996. In Trew's estate, there is Ehret's original drawing of the buckthorn, which looks even more like Happe's sheet than the slightly different printed version. It is unclear, however, how Happe could have known the original drawing.
- 22 The educational paths of artists in the early modern period were extremely diverse; see, for example, Dickel 1987; Boerlin-Brodbeck 2004/2005. For universities, as well as the 19th century, see Schulze 2004.
- 23 This was not only the case in Europe. Raj 2005 shows, through the example of a 17th-century floral work produced in India and belonging to a French surgeon, that the draughtsmen, who were not familiar with European botanical conventions, oriented themselves using the plates of the renowned *Hortus Malabaricus*.
- 24 Linnaeus: *Genera plantarum*; Linnaeus: *Philosophia botanica*. See also Müller-Wille 2002b; Müller-Wille 2007; as well as Müller-Wille/Reeds 2007; on Linnaeus, see further, for example, Koerner 1999.



Fig. 2. Drawing of a boxthorn branch by Andreas F. Happe (ABBAW: PAW 1700–1811, I–III–81, leaf 81^v).



Fig. 3. Coloured copperplate engraving following a sketched original by Georg D. Ehret: *Lycium foliis linearibus, flore fructuque minori*, in: Christoph Jacob Trew: *Plantae Selectae*. Dec. III 1752, Tab. XXIV. Universitätsbibliothek Erlangen-Nuremberg, 2 RAR.A 51.

one should represent these forms pictorially. He defined a technical vocabulary in word and image, almost in the sense of a scientific notation. Botanical texts should be plain and unambiguous, and the same applied to the visual language of botanical illustrations: they should present the characteristics in a clearly recognizable fashion and in accordance with the textual description of the same plant species. This was a challenge, especially in view of the often delicate parts of the flower and the fruit, and Linnaeus' model plates provided assistance.

Against this background, let us consider anew the illustration of the autumn crocus from Sandberger's collection (Fig. 1). It shows the plant in two life stages: the leafstalk as it is seen in spring on lush meadows; and the flower with root tuber as it appears in autumn. To the right are the three free pistil branches of the autumn crocus, separated from the flower. On the left, we see the capsule fruit and the seeds as they can be seen in summer. The capsule of the autumn crocus forms in the funnelled leaves and opens upwards when the fruit has ripened. Rarely are they seen in the form shown here, that is, brown and ripe, but closed.

How did the draughtsman know what an autumn crocus looked like? The obvious answer is from observing nature, and this is what many botanists claim in the introductions to their volumes of plates. We can safely assume that botanical illustrations did in fact rely on extensive observation, but not always outside in the fields. More often, the images would be drawn on the basis of collected specimens at home, and usually, botanists and draughtsmen would examine more than one exemplar. For his illustration of the fine-leaved water-dropwort (*Oenanthe aquatica*, etc.), which later appeared in the *Philosophical Transactions* of the Royal Society, Ehret had so many fennel plants brought to him that he became ill from the essential oils that this species secretes. After this experience, Ehret changed to examining one specimen at a time.²⁵ In addition to fresh material, herbarium sheets were also regularly consulted. This was particularly important for processing species collected on research expeditions when only brief sketches could be produced on site, while the illustrations had to be finalized at home.²⁶

Finally, botanical illustrators used the available specialist literature for their work. This becomes clear if one compares the autumn crocus from the Sandberger collection with the printed plate (Fig. 6, 1797) in the multi-volume work *Deutschlands Flora in Abbildungen* (Germany's Flora in Illustrations) by Jacob Sturm (1741–1848).²⁷ The flower and leaves differ, but the freestanding pistils are similar, and the capsule and seeds

25 Watson: *Critical Observations*, pp. 239f. The illustration can be found in table IV of the same volume of the *Transactions*.

26 See Nickelsen 2000, p. 87. Hans Walter Lack and David Mabberley have also reconstructed impressive examples of this practice for the production of the grandiose *Flora Graeca*; see Lack / Mabberley 1999.

27 Sturm: *Deutschlands Flora in Abbildungen*.

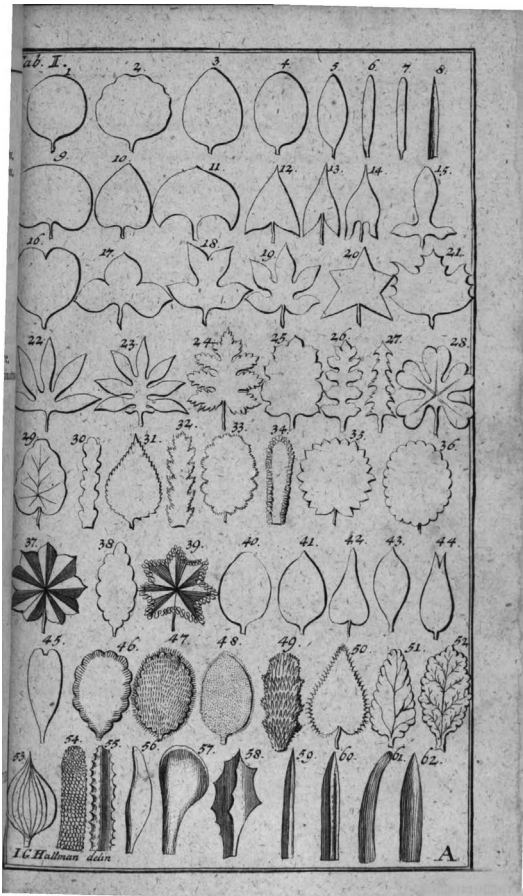


Fig. 4. Sample board from Linnaeus: *Philosophia botanica*, plate 1 (simple leaves). Bayerische Staatsbibliothek Munich, Phyt. 386.

are almost identical. Figure 7 shows these details in comparison: the original on the left, the copied version on the right. Almost everything has been faithfully copied over; only the proportions of the capsule and seeds have been selected somewhat differently. The draughtsman of the sheet copied these details from Sturm's work, as Happe did in his version of the buckthorn from the *Plantae Selectae*. The reason is unclear; maybe the draughtsman had no ripe fruit of the autumn crocus at hand (or none in a suitable condition) and thus resorted to other sources. In any case, the example shows that, in addition to real plants, specialist literature was consulted for the illustrations and used as a model. I will return to this finding later.

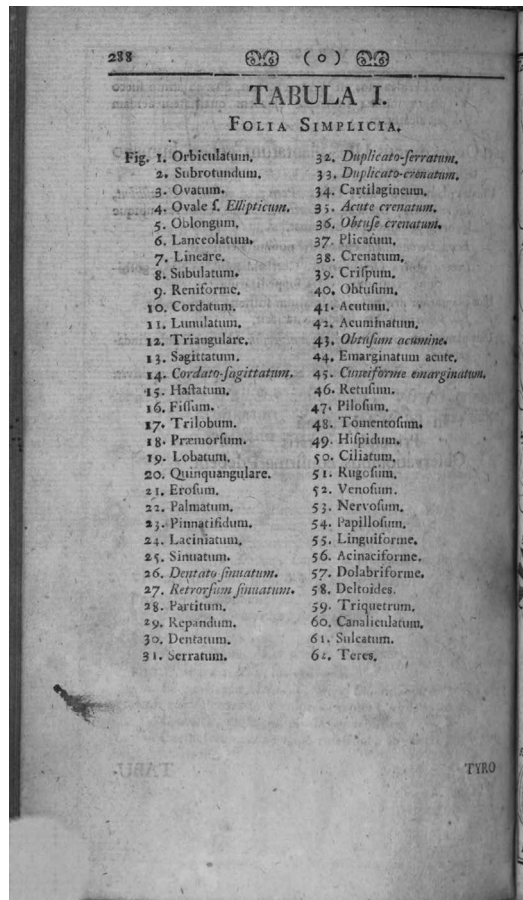


Fig. 5. Sample board from Linnaeus: *Philosophia botanica*, legend to plate 1 (simple leaves). Bayerische Staatsbibliothek Munich, Phyt. 386.

3. Botanical Illustrations and Their Authors

Before we examine the practice of copying, however, we need to move from drawings to printed plates. In the 18th century, these mostly appeared as copper engravings, as is also the case for the plate in Sturm's work. Producing these engravings required a whole series of steps, and this increased the number of actors involved considerably. The drawings made under the supervision of the botanist were generally available as aquarelle or in watercolours. These were transferred to copper plates and engraved in outline; the plates were then printed and finally, in many cases, 'illuminated,' as it was called at the time, that is, hand-coloured. As a rule, the process was designed on a division of labour, meaning that each step was carried out by a different person, sometimes by several people alternately and in different workshops. At times, the only constant in this process was the botanist, who endeavoured (not always successfully) to control

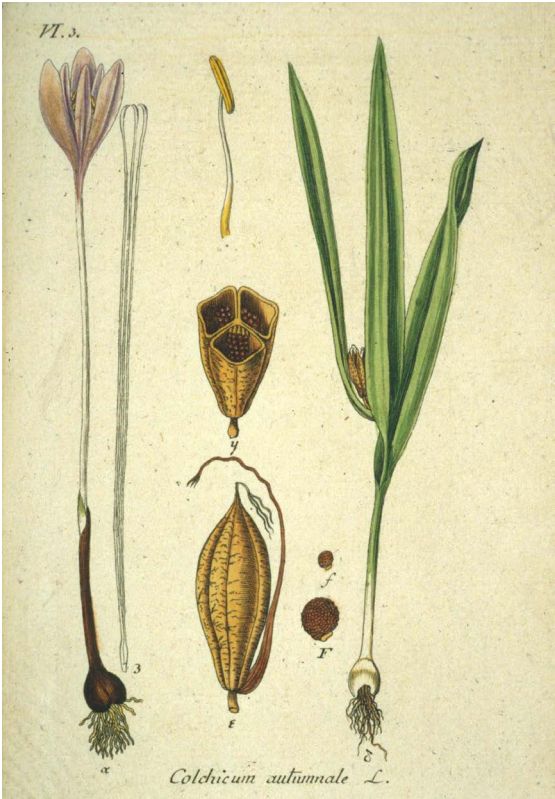


Fig. 6. Autumn crocus (Lat. *Colchicum autumnale*), Sturm: Deutschlands Flora in Abbildungen, vol. 1 (1797), book 3, p. 8, Staats- und Universitätsbibliothek Göttingen; 8 HN Bot V, 2110.



Fig. 7. Autumn crocus (Lat. *Colchicum autumnale*), details of the fruit in comparison. Left: depiction by Sturm (1797); right: depiction by Sandberger.

each step as closely as possible, so that everything was implemented as he wanted.²⁸ Linnaeus had already encapsulated the challenges of this configuration: “A draughtsman, an engraver, and a botanist are equally necessary for a praiseworthy image; if one of them errs, the image will be flawed.”²⁹

In an ideal situation, all contributors involved were eminently qualified and worked without mistakes, with continuous payment of wages and without disruptive interferences. In reality, this was rarely the case; in fact, all sides regularly suffered for some reason. Complaints from botanists about the alleged incompetence and unreliability of their draughtsmen, engravers, and illuminators are commonplace in printed works and in correspondence. As early as in the 16th century, the botanist Otto Brunfels complained about the unauthorized decisions of the draughtsmen and woodcutters of his herbal books.³⁰ Two hundred years later, Nikolaus Joseph Jacquin (1727–1817) made a similar complaint in the preface to his *Hortus Botanicus Vindobonensis* (1770–1776):

Very often, I spent several hours, sometimes whole days, at the painters’ sides, instructing them or comparing all my plant descriptions with the illustrations. I swallowed this disgust with pleasure. Nobody would believe what I experienced in vexation in earlier years from many colourists of both genders.³¹

Botanists tried everything to maintain control over the execution of the details.³² The ‘painter of natural history’ (“Naturahlien-Mahler”) of the Akademie der Wissenschaften in Berlin, for example, appointed at the end of the 18th century, was contractually obliged to be instructed and corrected by his commissioners, that is, the members of the academy, and to restore incorrect drawings as they demanded.³³ Jan Kops, editor

28 A detailed reconstruction of the practices can be found in Nickelsen 2006, chapter 2.

29 Linnaeus: *Philosophia botanica*, § 332: “Pictor, Sculptor & Botanicus aequae necessarii sunt ad figuram laudabilem; Si alter horum peccet, evadit figura vitiosa.” Unless otherwise noted, translations from Latin sources correspond to the author’s translations in the German original of this chapter. Pamela Smith coined the term ‘artisanal knowledge’ for the indispensable technical knowledge that e.g. draughtsmen and engravers brought to the production of botanical illustrations; see, for example, Smith 2008.

30 See Brunfels: *Contrafayt Kreüterbuch*, preface.

31 Jacquin: *Hortus botanicus vindobonensis*, preface.

32 This is the case regardless of the fact that the draughtsmen played an essential role in the process. The scrutiny will also have served to confirm social hierarchies, but concerns about flawed execution were not unfounded. There were outstanding, exceptional talents who were thus particularly sought after, but as a rule, botanical expertise could not be assumed among draughtsmen and engravers.

33 See ABBAW: PAW (1700–1811), I–III-81, fol. 88: *Conditionen unter welchen dem Dessinateur Hopfer die Bestallung als Dessinateur der Academie der Wissenschaft zu geben* [undated, unsigned]. For a transcription, see Nickelsen 2000, p. 82.

of the magnificent *Flora Batava*, emphasized that he had explained all the plants to his draughtsman beforehand and had made the dissections himself so that the details could be depicted correctly in their natural size.³⁴ This work was particularly difficult with small flowers, and Kops obviously did not want to take any risk. After the drawing, it was necessary to check its implementation in the engraving. “I have supervised the engravers with the greatest precision,” assured Jacquin in the preface to another of his works: “In this way, I ensured that the engravings correspond to the drawings.”³⁵ The English botanist William Curtis apologized for the delayed publication of his *Flora Londinensis* by referring to time-consuming correction processes. Like Kops and Jacquin, Curtis considered these steps indispensable – also in the future, if necessary – in order to ensure the quality of the work: “[The author] is however determined never to sacrifice the accuracy or utility of the work to hurry – on this principle he has been at the expense of having some of his plates engraven twice, and even three times over before he could venture to publish them.”³⁶ These are only a few examples of recurrent complaints that botanists brought forward.

In light of this situation, some botanists decided from the outset to forego collaboration with artists and craftsmen and to produce the plates for their works themselves.³⁷ This was also Linnaeus’ preferred option, as he noted in the same paragraph of the *Philosophia Botanica* quoted above.³⁸ The botanist Johann Jacob Dillenius (1684–1747), for example, proceeded in this way: in the preface to his *Hortus Elthamensis* (1732), Dillenius explained that he had taken on not only the drawings but also the engraving himself, so that the plates would perfectly correspond to his ideas.³⁹ Fifty years later, this served as a model for the botanist Johann Daniel Leers (1727–1774). Leers was so dissatisfied with the engraver of the plates of his regional flora that he (with reference to Dillenius) learned the craft specifically for this purpose and asked the public for forbearance with regard to any aesthetic deficits: “Since this is the case, you will not expect artfully elab-

34 Kops: *Flora Batava*, preliminary report, vol. 2 [without pagination].

35 Jacquin: *Selectarum Stirpium Americanarum Historia*.

36 Curtis: *Flora Londinensis*, preface [without pagination].

37 Kemp 1979 shows that drawing lessons were increasingly part of the educational canon in the 18th century.

38 Linnaeus: *Philosophia botanica*, § 332: “Hinc Botanici, qui una exercuere artem & pictoriam & sculptoriam, pastantissimas figuras reliquerunt” (‘Thus, those botanists who have also practiced drawing and engraving have left behind the most outstanding illustrations’). Linnaeus himself was excellent in drawing; see Charmentier 2011. In addition, it may be that Linnaeus is referring here to his knowledge of the practice of Dillenius (explained in the text), with whom he maintained a very good relationship.

39 Dillenius: *Hortus Elthamensis*, preface, p. VII: “Me quidem, ut essent accuratae, omnem adhibuisse operam, mihi conscius sum: sane quum eas accurate designatas persuasus essem, ut & tales curae prostarent, me non piguit calchographiae laborem, quamvis molestum, subire.”

orated samples from me, an autodidact in the art of copper engraving, but will rather, I hope, be satisfied with these drawings, which represent nature at its simplest.”⁴⁰

Draughtsmen and engravers, for their part, were not always happy with their commissioners either. In Trew’s correspondence, there are numerous letters from artists and craftsmen who complained bitterly about his practice of repeatedly correcting drafts and printing proofs; they found Trew’s demands excessive and claimed that the required degree of precision could not be realized with existing techniques. Trew was also tardy in his co-operation. Engravers and publishers regularly waited for his response (sometimes for years). As a result, the progress of the publications came to a standstill – at the expense of the publishers, who had to pay for proofs in advance and rely on being able to recoup the expenses later on through sales. The procrastination of his commissioner Trew drove the engraver and publisher of the *Plantae Selectae*, Johann Jacob Haid (1704–1767), to the brink of financial ruin. It is therefore unsurprising that botanically knowledgeable draughtsmen and engravers in return attempted to do without the botanist and publish their own plates themselves. These included, for example, the engraver John Miller (1715–1790), who primarily worked as an illustrator but also published a volume of plates on his own authority (*Illustratio systematis sexualis Linnaei*, 1777). Jacob Sturm also initially made a name for himself as a botanical draughtsman and engraver in the Nuremberg area before publishing the aforementioned *Deutschlands Flora in Abbildungen*.

Botanical illustrations, it can be summarized, required both botanical expertise and artistic as well as technical skills and talent. They were often the result of close, rarely seamless collaboration between botanists, draughtsmen, and engravers. As Linnaeus emphasized, these groups were equally responsible for the result, for both content and aesthetics; and in this sense, we should certainly speak of multiple authorship here. There were exceptions, as I have mentioned: some illustrated works in botany were made and published by one person only. In this case, it was necessary to combine the various roles and to acquire all necessary competencies in a personal union; one might therefore consider this a form of multiple authorship, too.

Different skills and kinds of expertise were required in order to do justice to these illustrations’ dual nature, as described above. The same dual nature requires a view beyond local contexts and direct collaboration. What the relevant characteristics of plant species were and how they were depicted rested not (only) on the individual decision of draughtsmen and botanists but referred to the collective. Botanical illustrations were part of a wide-ranging pictorial discourse that remains hidden if one confines

40 Leers: *Flora Herbornensis*, preface [without pagination]: “Quae cum ita sint, [...], non a me, ut autodidacto in arte Chalcographica, artificiosa specimina multaque arte exornata exspectabis, sed histce iconibus, simplicissimam naturam repraesentantibus, ut spero, contentus eris.”

oneself to the analysis of individual plates and works. This practice is not mentioned or discussed in textual sources but only is apparent in the images themselves. This is why I will now return to the example of the autumn crocus.

4. Pictorial Discourse in the Collective

The draughtsman of the Sandberger collection, as mentioned, had consulted Sturm's work and adopted its depiction of fruit and seed (see Figs. 1, 6, 7). In this regard, he was no exception. Copying was a widespread practice in 18th-century botanical illustrations.⁴¹ Figure 8, for example, shows the depiction of autumn crocuses by the renowned French artist Pierre-Joseph Redouté (1759–1840) in his splendid work on the lily family. The work appeared in folio format and was produced using the then new technique of colour printing; and nearly all of France's prestigious engravers were involved in transposing the drawings into copper engravings.⁴² At first glance, the ornate plate bears no resemblance at all to Sturm's modest illustration, which appeared in the small duodecimo format. The flower and leaves of the autumn crocus look rather different, but the depiction of the fruit is strikingly similar. Both plates portray the closed capsule identically, and the same applies to the cross-section of the fruit. The version of an autumn crocus' capsule that is open at the top is equally recognizable.

Let us compare this with the illustration of the autumn crocus in a handbook of medicinal plants by Friedrich Gottlob Hayne (1763–1832), botanist and apothecary from Berlin (Fig. 9, 1817). The pointed, opened capsule and the cross-section on Hayne's plate are very similar to the motifs in Redouté's plate. Yet Hayne shows the closed capsule not as a detail but inserted into the leaf funnel, as one often sees the plant in the meadow. Did Hayne copy the fruit capsule from Redouté's work? This seems rather unlikely if we include the illustration of the autumn crocus (Fig. 10, 1791) in the botanical handbook by Christian Schkuhr (1741–1811). Schkuhr was a trained gardener but worked as a university mechanic in Wittenberg. Nevertheless, Schkuhr pursued botanical studies throughout his life and, for the publication of his book, learned not only to draw, engrave, and use a microscope (with instruments he made himself), but also to print: he was one of those botanically proficient artists who decided against collaborating with a naturalist. Here, we see not only the capsule and the seed of the autumn crocus in the same form as in Hayne's work, but also the leaf funnel with the embedded fruit, the strangely defoliated depiction of the bulb and shoot axis, and finally the detail of the flower petals. The flower itself is varied: in Schkuhr's work, it opens to the front, while Hayne shows it

41 I am basing this statement on a systematic analysis of the illustrations of ten plant species in the period from 1700 to 1830; see Nickelsen 2000.

42 See Nissen 1966.



Fig. 8. Autumn crocus (Lat. *Colchicum autumnale*),
Redouté: Les Liliacées, vol. 4, plate 228 (1808).
Staats- und Universitätsbibliothek Göttingen;
2 Bot IV, 3692, Rara.

from the outside. Nonetheless, there is no doubt that Hayne copied the image, even if, at first glance, his picture looks completely different from Schkuhr's.

Yet perhaps Hayne did not use only Schkuhr's version as a model. The most probable origin of the capsule and the seed's depiction is found elsewhere, namely in a standard work on fruit and seeds (Fig. 11, 1788) by Joseph Gärtner (1732–1791). Gärtner was the first botanist to occupy himself in detail with the morphology of seeds and fruit, and to work out the systematic value of these organs.⁴³ Gärtner lived to see the publication of the first part of his carpology; the second part appeared posthumously, edited by his son (who even wrote a supplementary third part). It seems that all depictions of the capsule in the plates shown so far trace back to Gärtner's motif of the autumn crocus, either through direct adoption or mediated through the copies of other works (for instance, via Schkuhr's version), but this can no longer be determined on the basis

43 While renowned botanists before Gärtner, e.g. John Ray, Joseph Pitton de Tournefort, Linnaeus, and others, had also taken into consideration the character of the fruit in their taxonomy, they always subordinated it to the flower, and above all for the determination of species, not for higher taxa.



Fig. 9. Autumn crocus (Lat. *Colchicum autumnale*), Hayne: Getreue Darstellung und Beschreibung der in der Arzneykunde gebräuchlichen Gewächse, vol. 5, plate 45 (1817). Staats- und Universitätsbibliothek Göttingen; 4 Mat med 170/5.

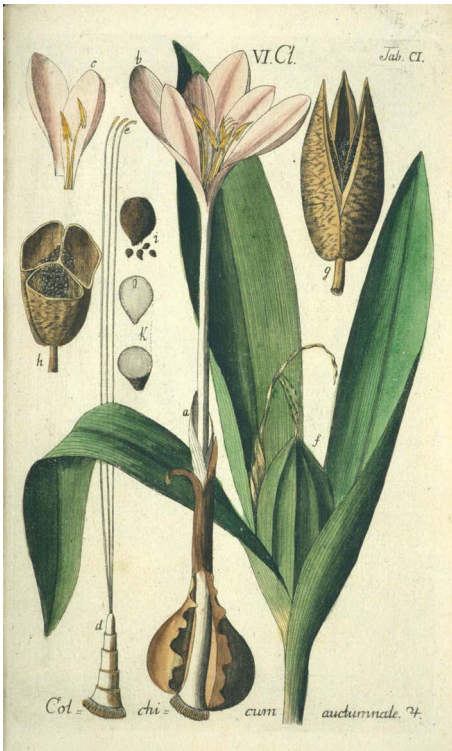


Fig. 10. Autumn crocus (Lat. *Colchicum autumnale*), Schkuhr: Botanisches Handbuch, vol. 1, plate 4 (1791). Staats- und Universitätsbibliothek Göttingen; 8 Bot IV, 1000.

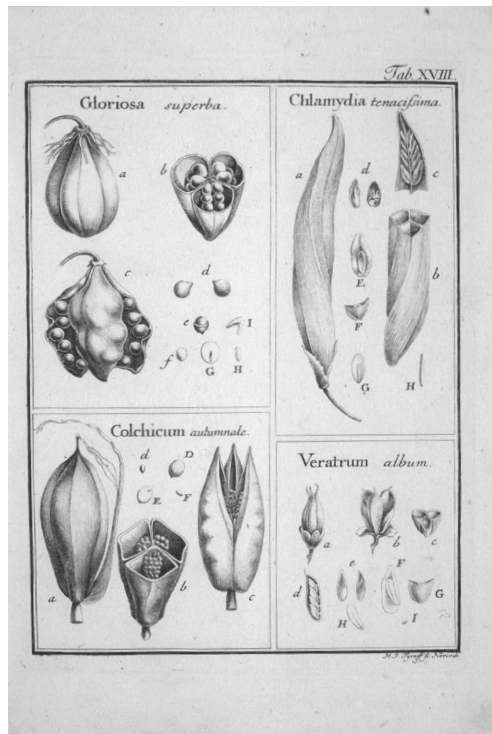


Fig. 11. Autumn crocus
(Lat. *Colchicum autumnale*), Gärtner:
De fructibus et seminibus plantarum, vol. 1,
plate 18 (1788). Staats- und Universitäts-
bibliothek Göttingen; 4 Bot II, 3060.

of the sources established thus far. Not one of these copying links was commented on or even referenced in the text.

We find the copying of individual elements from earlier plates very often in botanical illustrations from the 18th century, and not only in depictions of the autumn crocus. Yet the extensive copy of the autumn crocus in Hayne's work is an exception. On the one hand, entire panels were rarely copied. On the other hand, it is unusual that the motif be given more space in the copy than in the model. Typically, the motifs of the original were condensed, and often also simplified, in later versions. Hayne, by contrast, clearly takes more space for his autumn crocus than Schkuhr and does not draw the pictorial elements in a staggered manner but rather next to one another. Furthermore, Hayne adds the whole root tuber beside the unfurled version. A look at two illustrations of the vine stock is instructive here. Let us compare, for instance, the large-format depiction from a volume of plates by the aforementioned botanist Jacquin with the portrayal of the same species in an illustrated work on economic plants by the less famous Johann Simon Kerner (1755–1830), teacher of botany and plant illustration in Stuttgart (Fig. 12, 1781; Fig. 13, 1796). At first glance, nothing seems to connect the plates. At second glance, however, we see that Kerner copied from Jacquin, but in a very intelligent



Fig. 12. Grapevine (Lat. *Vitis vinifera*), Jacquin: *Icones plantarum rariorum*, vol. 1, plate 51 (1781). Staats- und Universitätsbibliothek Göttingen; 2 Bot III, 855.

manner. In contrast to Jacquin, Kerner refrained from redundancy, instead showing each element only once: only one forked branch, only one leaf from above and from below, only one inflorescence, and only one grapevine. In contrast to Hayne's expansion of his model of the autumn crocus, Kerner's work condensed the earlier version without losing information. Kerner also intervened by rotating the motif of the grapevine. In his version, the vine now (correctly) hangs downwards, whereas on Jacquin's panel, it (strangely) grows upwards. Presumably this was a mistake that occurred in the printing of the copper plates, which Kerner corrected in his adaptation. Clearly, Kerner did not mechanically copy the model version, but he used Jacquin's book in a highly intelligent manner.

Botanical illustrations of the 18th century were integrated into a wide-ranging network of copying links along these lines. If we consider how carefully the elements for copying were selected, examined, and sometimes even corrected, incompetence or laziness on the part of later actors can be discarded as an explanation. Rather, the deliberate use of copying techniques can be understood as part of the endeavour for the best possible botanical illustration: copying was undertaken for epistemic reasons. Difficult or rarely available details of the flower and fruit were copied especially frequently, and



Fig. 13. Grapevine (Lat. *Vitis vinifera*),
Kerner: Abbildungen oekonomischer
Pflanzen, vol. 8, plate 751 (1796). Staats-
und Universitätsbibliothek Göttingen;
4 Oec I, 1045.

standard works, such as Gärtner's carpology, often served as models. Yet the elements were not copied unaltered but were aesthetically adapted and newly inserted into one's own image. Like in Kerner's case, the motifs were often condensed, so that the characteristics of the plant species were depicted more efficiently and clearly, without the content being lost.

This practice was not explained, reflected upon, or even criticized, either in publications or in the (surviving) correspondence of the botanical protagonists. There is no reference at all to the works from which copies were made. On the contrary, it was often asserted that the illustrations were entirely new and produced according to nature. It seems unlikely that these assertions were intended to deceive the public. Copying was so prevalent, and motifs were adopted from especially renowned (standard) works: experts with a rich library would most probably have recognized the copied elements. I rather interpret these statements as evidence of the fact that copying was a widely accepted practice: apparently it was well known that, in addition to fresh and dry material, specialist literature as well as earlier illustrations served as sources of information as a matter of course, so that even illustrations that contained copied elements were (often justifiably) perceived as "new." As with textual descriptions, botanical illustra-

tions emerged in a process of collation,⁴⁴ on the shoulders of giants, so to speak: in the interplay of individual and collective achievement.⁴⁵

5. Conclusion: Who is the ‘Author’ of a Botanical Illustration?

Who, then, is the author of a botanical illustration? As this contribution shows, the question is not simple to answer. The botanist was and is mostly addressed as the ‘author’ of printed plates, and the works are still found today under this name in the catalogue. If one conceives as ‘author’ all those who made an essential contribution to the production and design of the work and plates, however, we must define the answer more broadly – in many cases, also for unprinted sheets.

This applies initially at the level of the actors. Draughtsmen and botanists worked closely together, or at least engaged intensively with one another. Both sides contributed knowledge and skills that were indispensable for the design and content of the illustrations: botanical knowledge on the one hand, artistic and artisanal knowledge on the other. In the case of printed plates, there also came into play engravers, publishers, printers, and, where appropriate, illuminators, whose contributions to the image significantly influenced its aesthetics and value. Botanical illustrations emerged in a collective based on the division of labour, even if it was not always formally indicated.⁴⁶ Within this collective, the social hierarchy was clear: academically trained botanists and naturalists were superior to craftsmen and artists. In the few cases where the source situation allows for a reconstruction of these practices, as in the case of Trew, this is documented, for example, in the salutation at the beginning and ending of a letter. Furthermore, the naturalists were often the commissioners; they thus always retained the final say, as they were responsible for approving the proofs for distribution.

At the same time, naturalists were reliant on the expertise of the draughtsmen, engravers, and publishers – at least when they did not master the craft themselves. Even Trew was prepared to leave aesthetic decisions to the artists, as long as they did not alter the botanical content of the image. This collaboration corresponded to the dual purpose of the genre as a form of functional art. The images were permitted to be

44 Analogous to Linnaeus’ ‘collation’ on the definition of plant species; see Müller-Wille 1999; Müller-Wille 2007. For the transposition of this term to the illustration of species, see Nickelsen 2006a.

45 This is not only the case for illustration. Bettina Dietz has instructively elaborated the character of botanical literature in the 18th century; see Dietz 2012; Dietz 2017.

46 Draughtsmen, engravers, and printers often belonged to the group of ‘invisible technicians’; see Shapin 1989; Hentschel 2008. There are certainly works, however, in which the artists and artisans made an appearance alongside the botanists, either through being mentioned in the preface or by their signature on the plates. In Trew’s *Plantae Selectae*, all three main actors, i.e. Trew himself, Haid, and Ehret, are depicted in portraits.

beautiful, and talented artists were highly sought out as a result; above all, however, the images had to be useful, and artistic talent alone was therefore not sufficient. The illustrations primarily had to be botanically correct in their content and purposive in their design.

How the images were to be designed to meet these criteria, however, was not decided by the botanist alone, but rather by part of the scientific community. The collective relevant to the design of botanical illustrations went far beyond the persons directly involved in them. The comparison of depictions of one species proves that there was an intensive pictorial discourse about how one should represent bodies of botanical knowledge in an appropriate manner. Especially in the case of demanding and complex motifs, the invention of original modes of representation harboured a considerable risk of error; by contrast, the copying of proven elements, sometimes adopted from several works and newly constituted, offered a safe alternative. If we compare the illustrations of one species with another, we can see how virtuously copied pictorial elements were combined with new observations and perspectives: this can also be interpreted as a variety of multiple, perhaps even “collective,”⁴⁷ authorship in the image. The “artistic worth of botanical painting”⁴⁸ invoked by Ludwig is only the smallest part of what comprises the content and the aesthetics of these illustrations; and perhaps even the least interesting one.

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47 Mader 2012; see especially the introduction, pp. 7–19.

48 Ludwig 1998, p. 152.

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