Universitat Oberta de Catalunya

artnodes
REVISTA DE ARTE, CIENCIA Y TECNOLOGÍA

https://raco.cat/index.php/Artnodes

ARTÍCULO

La fotografía de plantas en la divulgación científica botánica (English Translation)

Lucía Moreno Diz
Universidad Complutense de Madrid

María Victoria (Toya) Legido García
Universidad Complutense de Madrid

Fecha de presentación: mayo 2024
Fecha de aceptación: febrero 2025
Fecha de publicación: junio 2025

Cita recomendada

Moreno Diz, Lucía; Legido García, María Victoria (Toya). 2025. «La fotografía de plantas en la divulgación científica botánica». *Artnodes*, no. 36. UOC. [Fecha de consulta: dd/mm/aa]. https://doi.org/10.7238/artnodes.v0i36.429204

Resumen

Este texto analiza el uso de la fotografía como medio para la representación de plantas a través del estudio de sus imágenes, refiriendo cómo la fotografía se ha usado para documentar la botánica por su presunta objetividad y cómo ha sido criticada por su detallismo. El texto muestra, a través del estudio de publicaciones, que la fotografía históricamente no ha sido tan utilizada como el dibujo en la representación científica, debido a su incapacidad para sintetizar. También estudia cómo la función de la fotografía ha evolucionado con el avance de las tecnologías digitales, permitiendo una síntesis comparable a la del dibujo gracias al uso de herramientas de edición. Por tanto, a través del estudio de una serie de obras, se defiende la idoneidad de la fotografía como material de referencia botánica, por su capacidad de visibilizar la diversidad de formas vegetales, describir tipos o mostrar varios estadios de desarrollo simultáneamente. El artículo concluye explicando que el uso científico de la fotografía aún no se ha profesionalizado completamente y subraya la necesidad de reconocer su valor en la ilustración botánica.

Palabras clave

fotografía botánica; herbarios; documentación científica; tecnologías digitales; dibujo

Plant photography in botanical scientific dissemination

Abstract

This text analyses the use of photography as a means to represent herbaria through the study of their images, referring to how photography has been used to document botany due to its alleged objectivity and how it has been criticized for its excessive detail. The text demonstrates, through the study of publications, that in scientific representation, photography has historically been used less frequently than drawing because of its inability to synthesize. It also explores how the role of photography has evolved with the advent of digital technologies, enabling a synthesis comparable to that of drawing thanks to the use of editing tools. Therefore, through the study of a series of works, the appropriateness of photography as botanical reference material is supported, owing to its capacity to reveal the diversity of plant forms, describe types or depict various stages of development simultaneously. The article concludes by elucidating that the scientific application of photography has yet to be fully professionalized and emphasizes the necessity of recognizing its value in botanical illustration.

Keywords

botanical photography; herbaria; scientific documentation; digital technologies; drawing

Note: In both the original Spanish text and in this English translation the use is the word herbarium does not refer to a *hortus siccus* or collection of dried plants. Here the term has a broader meaning and refers to plants or plant parts set against a plain background.

1. Origin of herbaria and their reproduction

Since ancient times, humanity has been fascinated by nature, constantly seeking to understand and catalog the plant world that surrounds us. This innate curiosity found one of its most beautiful and functional expressions in the practice of making herbariums, particularly beginning in the 16th century. Over time, these collections of dried specimens became an indispensable tool for completing the descriptions of ancient texts, which until then had been the sole source of knowledge about medicinal herbs (Thijsse 2022). In addition to being used as a medical and pharmaceutical reference, herbaria served as educational resources for the study of botany or as travel memos. During European expeditions in the 17th and 18th centuries, they played a fundamental role in the classification and documentation of plants. These botanical collections not only satisfied the thirst for scientific knowledge but also became symbols of economic power and luxury.

Collected plants, when pressed, lost their color and became difficult to reproduce. To facilitate their identification, dissemination, and trade, they had to be converted into precise and detailed images suitable for publication. From this need arose botanical illustration. In the pre-mechanical era, these reproductions of the natural world relied exclusively on artistic interpretation through drawing or direct printing of specimens. Traditionally, the use of hand-drawn illustrations has been the most widespread way to document botany and disseminate it through books. However, towards the second half of the 18th century, a technique originating in 13th-century Europe for creating botanical images, known as "printing from life," was revived. This procedure, the predecessor of photographic techniques for printing herbariums, consisted of applying ink or smoke to a plant specimen and then pressing it onto paper or other material, faithfully reproducing the plant's shape, size, and proportions. Designed to minimize artistic intervention and increase scientific objectivity, its use was mostly limited to botanists and amateurs seeking faithful representations without external aid, thus prefiguring the invention of photography.

The birth of lithographic printing marked a major advance in reproduction techniques, far surpassing its predecessors in speed, efficiency, and cost. During the 19th century, this method became the preferred method for illustrating books and magazines and was particularly suitable for botanical publications due to its ability to capture the softness of the line and gradations of tone (Gener 2023). However, Niepce's experiments with heliography and Daguerre's with the daguerreotype, followed by Talbot's advances in the calotype, were to revolutionize image production itself in the first half of the century.

2. The birth of botanical photography

Early approaches to botanical photography, such as Anna Atkins's photogenic drawings of plants or cyanotypes of algae,

heralded this tool as a promise of immediacy and mimesis, ideal for plant representation. In fact, Atkins's *British Algae* (1843–1853), although it did not have major photographic or scientific repercussions at the time, perfectly illustrates the most frequent use of photography in botany and, as Fieschi (2008) points out, already presents the main characteristics of this type of work, such as its herbarium-like form and publication in installments.

Talbot, understanding the potential of photography for both botanical study and reproduction, envisioned its use in the creation of facsimiles and, in 1844, published a book entirely illustrated with photographs called *The Pencil of Nature* (Talbot 1844–1846) in his own printing shop. He sought to promote the idea among friends and colleagues that this technique could be an excellent way to disseminate scientific and artistic work without having to rely on a publisher. Although the method was revolutionary, the cost and difficulty in achieving uniformity in the copies hampered the integration of photography into book publishing, but it laid the groundwork for future explorations in the field of photographic printing (Hannavy 2008). The 1850s saw a number of technical advances, such as the introduction of albumen paper by Louis Désiré Blanquart-Evrard (1850) and the wet collodion process by Frederick Scott Archer (1851). Despite all these advances, photography still failed to capture the details necessary to accurately represent plants, as the botanists Antonio Bertoloni and William Hooker had argued (Smith 1993). Nevertheless, photography eventually emerged as an imperfect but essential method of scientific botanical reproduction and documentation.

As collecting and cataloging techniques advanced, herbaria became increasingly detailed and diverse records, including not only the plant, but also elements such as labels, maps, or illustrations (Flannery 2021) (Figure 1).

At the same time, the progress of disciplines such as botany led to the development of specific visual conventions for scientific representation through photography. In his work *La photographie appliquée aux sciences naturelles*, naturalist Eugène Trutat (1844) encouraged the use of photography in fields such as zoology, geology, and biology, offering detailed knowledge of their procedures and establishing certain criteria that made a photograph useful to science. This visual approach would not only facilitate the categorization and analysis of specimens but also improve the dissemination and communication of research results. Once the framework for building scientific representations had been established, the demand for an efficient and economical photomechanical printing method capable of faithfully reproducing the nuances of images became a priority for the natural sciences.

The halftone printing process, invented in 1880, made it possible to print text and photography on the same page, an advance that transformed the publishing landscape, although it would take a decade for its use to become standard in scientific publications. This technological progress led to the emergence of botanical books aimed at a wider audience, with an informative tone and not intended to be decisive for specimen identification. In these cases, photography complemented or even replaced traditional illustrations, although such publications were not yet common. At the turn of the century, collotype emerged as a popular technique for printing botanical books. It was an economical process that allowed for smaller print runs and facilitated more affordable editions, which represented a crucial step in the democratization of botanical knowledge.

Figure 1. *Pterocarya caucásica* C. A. Mey (1877)
Source: Leo Grindon Herbarium (Reg. No. Kk. 570), Manchester Museum

Unlike painters, who were trained in art, many photographers used photography for practical purposes, as a recording tool, without delving into which photographic technique should be specifically applied to botany (Jeffrey, 1999). After learning about the different photographic inventions, and despite the technical skill involved in their use, the scientific community was quick to experiment with their various applications. For example, the use of the microscope for the study of botany, which had been disseminated thanks to Marcello Malpighi (1675) with the publication of *de Anatome plantarum* or Grew (1682) with his work *The Anatomy of Plants*, saw in photomicrography an excellent ally for recording biological research. Photography, therefore, not only established itself as a means of reproduction, but also as a valuable collaborator in the scientific and publishing worlds.

3. Photography vs. Drawing

Botanical illustration is a field that transcends mere objective representation, exploring idealized interpretations that offer a generalized view of flora. According to Daston and Galison (1992), these images are compressions of time and space, simultaneously presenting different stages of a plant's life on a single canvas, often highlighting deliberate manipulation to highlight specific characteristics.

In terms of botanical representation, photography could offer a more direct view than traditional illustrations. Unlike other disciplines such as drawing or painting, photography required a light source, not reality, for its creation. This meant that, from its invention in the mid-19th century until well into the 20th century, this type of image was considered "real" and "objective," compared to those generated using other media (Legido 2001).

The plants were photographed against plain backgrounds, imitating scientific drawings, but with a precision and detail that only this technique could provide. Photography became a complement to documenting dried plant herbaria, as it offered a stable alternative to working with the fragile original specimens. Photographic reproductions of herbaria were intended both for dissemination among scholars and amateurs and for the conservation of the sheets, thus avoiding the risk of deterioration or loss. Preserving a sample in an image, keeping it safe for subsequent study even outside the laboratory, seemed a practical solution; however, the high cost of these copies often limited their accessibility and, therefore, their primary usefulness. The immediacy of photographic herbaria also facilitated rapid comparison, avoiding confusion or the re-identification of already described species, something very important especially in the identification of exotic flora, where much remained to be discovered and described.

It was soon recognized that photography had limitations as a botanical description, and the context in which it was most useful was assessed, identifying situations where it was preferable to drawing and where it was beneficial to combine both methods for a more complete enunciation. Such was the case with the representation of plants in their natural habitat, as occurred in botanical expeditions or in landscape photography, since recording the immense detail of the environment was extremely complicated and time-consuming for drawing. Furthermore, "given the enormous difficulty involved in transporting the different specimens to the laboratory and the impossibility of collecting all the elements of the plant, the need arose to gather the maximum amount of information possible in their own habitat"…» (Casanova *et a*l. 2022).

Como señala Schwartz (2014):

> "Photography was transforming our way of understanding the world, and the development of new printing technologies made all that visual information more accessible, turning it into a key tool for showcasing and sharing botanical diversity."

A good example is *Site et végétaux du Canada* (Brunet 1866), the first photographic herbarium of Canada, created by the Livernois family's photographic studio and presented at the Canadian pavilion at the 1867 Universal Exposition in Paris (Cull 2016). The images depicted flora both in their natural environment and under study, showcasing a variety of approaches to botanical representation and presenting Canada as a clear setting for scientific research and experimentation.

Although the practice of documenting plants in their natural environment continued, the traditional aesthetic of representing the isolated herbarium persisted in most botanical publications. The albums of nurserymen, importers, and flower collectors used photography and functioned as both a record and a catalog of their best specimens (figure 2).

Figure 2. *New hardy plants from western China* (1913). James Veitch & Sons, Ltd. U.S. Source: Department of Agriculture, National Agricultural Library. Public Domain

But overall, for commercial purposes, illustration remained essential due to its ability to depict flora in a recognizable and detailed manner, as can be seen in the case of magazines. Published since 1787, *Curtis's Botanical Magazine* is the oldest periodical botanical journal still in print. With over 11,000 entries, it has been an essential source for botany and gardening and continues to offer the most comprehensive collection of plant portraits. As a hallmark, the illustrations were based on live plants, ensuring accuracy and fidelity to nature; in the rare cases when a

specimen was unavailable, reliable drawings were copied or based on photographs, such as the *Aloe bainesii* produced from an image by Samuel Baylis Barnard (Desmond 1987) (figure 3).

Figure 3. *Aloe bainesii*. Native of Natal and Kaffraria, Tab. 6848 (1885)
Source: *Curtis's Botanical Magazine*. Missouri Botanical Garden. Public Domain

As we have seen, the role of photography as a scientific tool had been recognized in fields such as biology, thanks to its ability to reveal details that elude the human eye. However, its acceptance in the scientific field did not mean a blind embrace of its capabilities, and it was soon realized that authenticity was not synonymous with accurate representation. Its use was constantly evaluated in scientific publications, especially compared to the synthetic capacity of drawing. While photography was promoted as an objective tool, necessarily dependent on a light source, illustration was still preferred for its ability to simplify and explain observations. In fields such as botany, this dichotomy became even more evident, and although photography was manipulated to represent a "type specimen," it was difficult to grant it the same level of interpretation achieved with drawing. Botanical illustration, although idealized, was accepted for its ability to facilitate species recognition. In contrast, photography was directly related to a representation of reality, so any manipulation of it could be considered deception.

Hence, photography was perceived more as a collaborator of science that complemented and expanded the possibilities of drawing for re-presentation, rather than completely replacing traditional illustration techniques. In botany, drawing and photography have played different, fundamental roles in choosing the method to illustrate major floras.

As Marta Chirino (2023) describes, "the objective of scientific illustration is to make a drawing that can replace theoretical description," and photography can capture the anatomical and morphological characteristics of a plant in detail, but it always presents a specific specimen and is not necessarily representative. In contrast, drawing offers a synthesis of multiple observations, focusing on constants and presenting us with an archetype of the species. Furthermore, this technique allows specific botanical details, such as flower dissections or the interior of seeds, as well as different stages of the plant, to be represented in a single image. We see that this same approach is followed in several cases of early photography. An example is Felix Morin's late 19th-century images (Figure 4), in which the photographer arranged branches with and without leaves, fruits, flowers, and young shoots in a single composition, thus mimicking this multifaceted characteristic of illustration. These images were likely intended as references for botanical drawings, as evidenced by the plates made by photographer Minna Keene (1903) (Figure 5). Keene captured branches at different stages of growth specifically intended to assist artists and for use in drawing instruction. Keene's nature studies were subsequently published in British schoolbooks until the 1920s (Corrigal 2018).

Figure 4. *Trinidad Fruits* (ca. 1880), albúmina. Felix Morin
Source: The Caribbean Photo Archive. Públic Domain

Photography had found a fundamental place in teaching and outreach. As Barber (1980) points out, many educational herbaria date back to the 19th century, a time when natural history was part of the school curriculum and the use of photography for botanical studies was booming. Gaston Bonnier (1906), for example, integrated photography

into his educational work on plants, showing how this medium could simplify species identification for students and specialists alike. He reduced the size of images and text to create manageable albums intended for practical use in the field, thus inaugurating pocket editions in 1864. Over time, illustrated monographs and field guides would become one of the most common genres in botanical literature, showcasing the potential of photography for species identification and bringing nature closer to the general public.

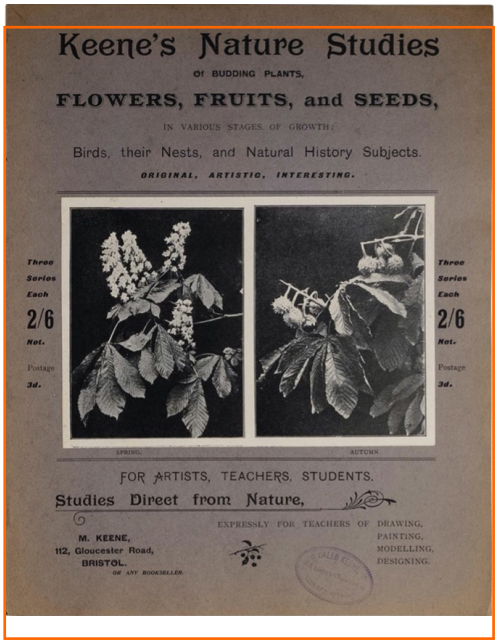

Figure 5. *Keene's Nature Studies* (ca. 1903), semitono. Minna Keene
Source: The Image Centre. Public Domain

4. Dissemination of photography through publications

The turn of the century saw the standardization of photomechanical processes and a greater inclusion of photographic images in books, which no longer differed much from those of today. However, the widespread use of halftones, the incorporation of cheaper papers, and, as noted above, the lack of professionalization of botanical photography resulted in lower image quality, especially noticeable in popular publications aimed at amateurs. In addition to field guides and plant encyclopedias, botanical photography flooded books aimed at students.

Ferdinand Faideau (1906), a secondary school teacher, published botany books in which he used photography to describe common plants of the French countryside, which were quite successful. Although the photographs were not of high quality, the design and layout of the books represented a significant innovation compared to other similar publications of the time.

Also noteworthy is the collection *Découvertes* (1947) by Jean-Michel Guilcher, featuring photographs by Robert Henri Noailles, and the importance of photography as an educational and awareness-raising tool, specifically in the field of botany and aimed at a young audience. These books describe in detail the reproductive process of flowers, from pollination to seed formation, to awaken curiosity and foster understanding of evolutionary processes. Both works are further examples of the educational value of photographic realism, which is highly suitable for education due to its ability to explain complex concepts.

At the end of the 20th century, the publishing landscape was filled with field guides, flower books, gardening manuals, and plant monographs illustrated with full-color photographs, allowing for improved species identification. These publications, which had large print runs and were highly popular, were oriented toward popularization and specifically aimed at an amateur audience. Despite the beauty and precision of scientific botanical plates, these works often reached only a specific audience, and it was necessary to provide more information when addressing a non-specialist audience. Two very illustrative examples of this trend are the more than thirty books on plants and gardens by photographer and horticulturist Roger Phillips (from 1977 onward) (Figure 6) and the plant guides by biologist and educator Jean-Denis Godet (1993) (Figure 7), which, since 1984 and to this day, remain bibliographic references for botanical identification in different regions of Europe. These works use photography for educational and educational purposes, presenting images of free-standing plants against neutral backgrounds, complemented by others in their natural habitats.

Figure 6. *Wild flowers of Britain* (1977). Roger Phillips
Source: collection of the V&A. © V&A

Figure 7. *Plants and flowers of Great Britain and Europe* (1993). Jean-Denis Godet
Source: © Mosaik

Today, scientific illustration remains essential for representing complex concepts in a clear and understandable way. Simple, detailed drawings are particularly useful for schematizing or highlighting specific aspects, providing insight that is often not possible through photography (Illustraciencia 2019). While drawing is certainly very effective at clearly depicting structures such as the interior of a cell, an animal in a specific pose, or an extinct specimen, photography faces fewer challenges when it comes to depicting plants.

Digital photography offers significant benefits compared to traditional methods. Despite its advantages, it is frequently observed that many digital images present technical problems, mainly due to the lack of professionalization in the field of botanical photography. While drawings are usually done by professional artists with the advice of scientific staff, photography, perceived as more accessible, is often done by the research team itself without training in this technique. Thus, unlike drawings, which are used as a general representation of a taxon, photography has established itself as a valuable complement to illustrate the habitat or in cases where collecting plants is not feasible due to their morphological characteristics, toxicity, or vulnerability. Photography alone can be used when it is impossible to collect the plant (photo voucher), or a partial plant can be combined with a photograph of the complete specimen on the same herbarium sheet (fusion voucher).

For these cases, Gómez-Bellver *et al*. (2019) suggest establishing a protocol that defines specific criteria for taking photographs so that they can be used as reference material and properly linked to a specimen, thus creating "testimonies" of the habitat where they live or of the plant's morphology in the event that they cannot be fully collected. This would include reflecting essential metadata such as the date and precise geolocation. The article discusses using photography as a complement to illustration, seeking to enhance the taxonomic and functional value of the records.

There are many early examples that are serious photographic attempts at creating a scientifically valid botanical print, albeit using a technique that could not yet offer the necessary precision. In the magnificent work *Icones Florae Alpinae plantarum*, the botanist Léon Marret (1911–1924) documented the Alpine flora with photographs by Louis Sohier and Borremans, who produced more than 250 scaled compositions of different specimens and detached organs, showing the influence of the environment on variations in shape or size within a single species (Fieschi 2008) (Figure 8).

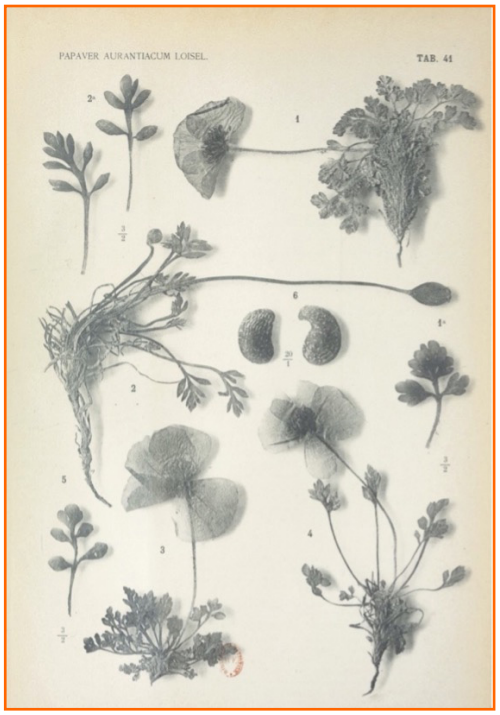

Figure 8. *Icones Florae Alpinae plantarum* (1911-1924) de Léon Marret
Source: NCSU Libraries. Public Domain

Scientific illustration has reached such levels of perfection that it seems difficult to compete with drawing. However, although photography initially could not assume a special role in plant representation, current techniques allow for the creation of images that have definitively overcome their limitations for botanical illustration, such as depicting a typical specimen or showing several stages of a plant simultaneously.

Throughout history, botanical illustration has adapted to technical innovations that have helped improve precision. It seems logical to also exploit the possibilities of current photographic technology beyond the simple digitization of sheets or its use to document the presence of a plant in a specific habitat.

Lankester slides represent an innovative methodology for documenting botanical collections, combining camera and scanner photography techniques to capture detailed images of plants in their natural state (Cires 2023). This technique was developed in the 2010s at the Lankester Botanical Garden of the University of Costa Rica, with the aim of overcoming the limitations of traditional illustrations and conventional photography in the scientific representation of botanical specimens. By bringing photographic equipment and portable scanners into the field, it is possible to document plants in their original environment, preserving morphological and contextual details essential for taxonomic and conservation studies (Figure 9). Similarly, Japanese fruit grower Masumi Shiohara (LensCulture 2024) uses high-resolution photography to record the fruits he grows himself before they are harvested. He uses black backgrounds to isolate each specimen and visually display all the characteristics necessary to identify each variety (Figure 10). Shiohara believes that, had modern photographic technology been available, early studies on plant taxonomy would have been conducted using this tool as well.

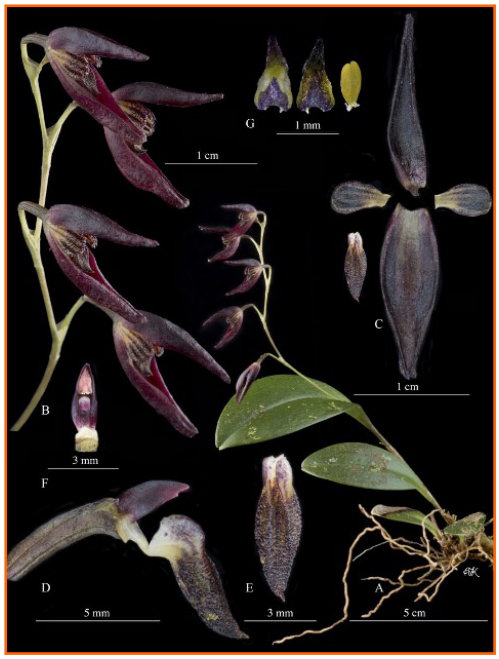

Figure 9. Lámina Lankester (LCDP) de *Stelis dies-natalis* (s.f.)
Source: A. Karremans y M. Díaz-Morales

Figure 10. *Pyrus communis* L. 'Conference' (s.f.)
Source: © Masumi Shiohara. Lensculture

In their article "Photography and Contemporary Botanical Illustration" (2008), Simpson and Barnes defend the use of photography as a natural evolution of drawing illustration and demonstrate that this tool allows for the creation of images valid as detailed scientific references. Thus, beyond the physical limitations of books and magazines, we find ourselves facing the versatility of online digital photographs. With the appropriate training and equipment, digital photographic technology allows for the creation of sophisticated and complex images, although in the field of botanical photography, there are still few examples in which its potential is fully exploited: flatbed scanner, microphotography, macrophotography, image stacking, post-retouching, clean collages, stable color references, metadata, and high resolution for large enlargements, among other advantages. Today, the botanical compositions of Niki Simpson, a member of the Linnean Society of London, combine artistic tradition with digital technology: each plate is a complete portrait of a species, showing its distinctive features—such as morphology, internal anatomy, and flowering patterns—but designed primarily for on-screen viewing and intended for interactive use (Figure 11). She presents all components to scale using a metric bar, in addition to other informative elements, such as a flowering timeline, descriptive titles, or symbols detailing biological aspects of the plant. The final images show not only the specimen itself, but also its habitats and behaviors, offering a complete and vivid view of the species. Simpson also incorporates a "color key" for a plant's dominant colors as an integral part of the illustration.

Thanks to digital photography, each piece can be easily cropped and the background modified as needed. Damaged areas can even be retouched without compromising the botanical information, and observed details can be added throughout the cycle before final approval, both botanically and artistically. Photographic techniques facilitate virtually unlimited hybridizations, and Niki Simpson's illustrations are a combination of digital photography, scanning electron micrographs, and scans that record the full range of data necessary for scientific use as a visual representation. Seeking to increase the amount of information presented to describe plant species, these illustrations achieve the precision and detail characteristic of modern traditional botanical art.

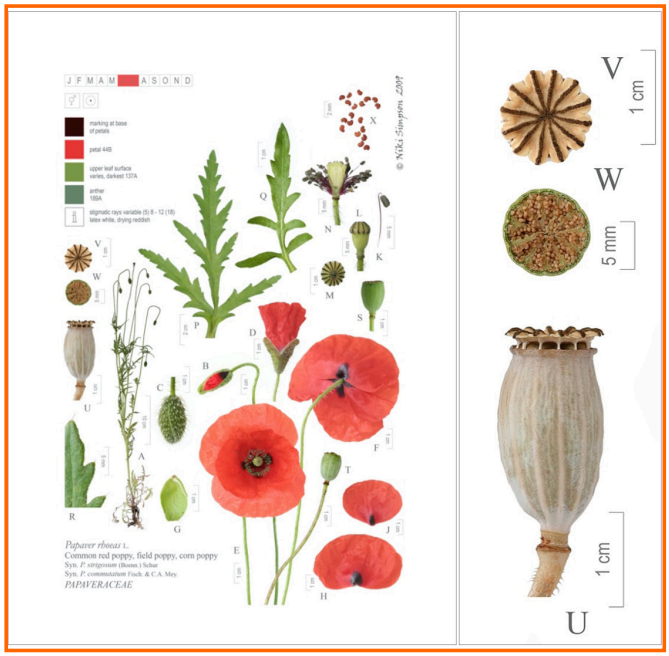

Figure 11: *Papaver rhoeas* L. (izda.), *Papaver rhoeas* L. (detalle) (dcha.), (2007)
Source: © Niki Simpson

Along the same lines, the *Fritillaria Icones* project by Laurence Hill (2023–2024), a botanical researcher and photographer, aims to provide detailed and standardized images of *Fritillaria* to improve understanding of the genus and facilitate its identification to the most diverse audience possible (Figure 12). The core collection, with more than 600 specimens, is continually enriched following taxonomic and phytogeographic criteria, making it possible to offer a set of images that represent the different varieties within a single taxon. An innovative aspect of this approach lies in how these images are structured for viewing in multiple browser windows, allowing users to easily compare and appreciate the differences between individuals or regions.

In the case of rare species, sharing images is essential for research. The website has a Creative Commons license that allows for non-commercial reuse of images, making it a useful resource for illustrating scientific articles. In some cases, these photographs serve as a starting point for new studies, thanks to the large zoom capabilities that allow for in-depth detail. Finally, the inclusion of botanical and common names reflects the heritage linked to traditional use while facilitating searches. It is also important to note that the metadata associated with digital images is crucial, as search engines do not read images directly, but they do interpret the accompanying data, increasing their visibility online.

Furthermore, it should be noted that today, most of the world's herbaria are digitized, such as the herbaria of France (e-ReColNat), becoming a key tool in the exchange of scientific knowledge and its dissemination, contributing significantly to the understanding and teaching of botany.

Figure 12: *Fritillaria Icones* (2023-2024)
Source: © Laurence Hill

Conclusions

Based on our analysis, botanical photography as a scientific illustration technique remains a largely unexplored practice, both in science and in the professional world. In many respects, the practice of botanical illustration remains rooted in its traditions, often overlooking the technical and expressive capabilities offered by photography. While drawing establishes a more interpretive relationship with its subject, photography possesses an "indexical causality" due to its direct connection with the subject it represents. And although the exact copy of flora is a utopia, illustration has sought a way to show us its archetype, summarizing the probable forms of a species in a single image to facilitate its identification. Although the photographic technique is available and highly suitable for botanical illustration, as we have seen, until now it has been excluded from this possibility because drawing was considered more synthetic, detailed, and precise.

The artistic aspect of the photographic representation of plants depends largely on the talent and skill of the photographer, but scientifically, the process is not very different from traditional drawing. In fact, as this text has demonstrated, botanical photography today offers numerous advantages in terms of precision, detail, and synthesis, which have come to light with digital technology and its great capacity to manipulate and reconstruct images.

Therefore, we can say that the current use of drawing in botanical illustration, as opposed to photography, is closer to a historical and cultural convention than a technical limitation. Likewise, we can affirm that photography is a suitable tool for scientific botanical illustration, capable of showing the diversity of plant forms, describing the type, and depicting various stages of the plant in a single image. Therefore, it is capable of serving as scientific reference material on the same level as a drawing. However, we believe this has not occurred widely due to the lack of professionalisation and the lack of mastery of new technologies by the authors, biologists, and artists who currently generate botanical images.

Referencias bibliográficas

Archer, Frederick Scott. «On the Use of Collodion in Photography». T*he Chemist*, vol. 2, n.º 19, (1851): 257-58.

Atkins, Anna. *Photographs of British Algae: Cyanotype Impressions*. Kent: Autopublicación, 1843-1853.

Barber, Lynn. *The Heyday of Natural History, 1820-1870*. Doubleday, 1980. https://archive.org/details/heydayofnaturalh0000barb Blanquart-Evrard, Louis Désiré. «Photographie sur papier. Formation instantanée de l'image la chambre noire». *Compte rendus des séances de l'Académie des Sciences*, vol. 30, n.º 21, (1850): 779.

Bonnier, Gaston. Album de la Nouvelle Flore. París: Librairie Generale de L'enseignement. 1906.

Casanova, Ramón, Ricardo Guixà y Pilar Rosado. «La imagen botánica en la era postfotográfica. ¿Cómo afrontar la crisis de biodiversidad? ¿Cómo puede contribuir el arte?». *Human Review*, vol. 15, n.º 6, (2022): 2-15. https://dialnet.unirioja.es/servlet/articulo?codigo=8840002

Chirino, Marta. «Qué es, cómo y por qué existe la ilustración científica botánica contemporánea». *Ellas ilustran botánica: Arte, ciencia y género*. Coordinado por Toya Legido. (Madrid: Editorial CSIC, 2023), 105-115.

Cires Rodríguez, Eduardo. «Láminas Lankester como metodología innovadora para la documentación de colecciones botánicas». *Colecciones científicas: patrimonio natural y cultural único para la investigación presente y futura: IV Simposio de la Sociedad Botánica Española*, 2023. Coordinado por Carmen Acedo, Estrella Alfaro Sáiz y Pablo Muñoz Rodríguez.

Corrigall, Malcolm. «Minna Keene: a neglected pioneer». *Image & Text, n.º 32*, (2018): 1-29. DOI: https://dx.doi.org/10.17159/2617-3255/2018/n32a13

Daston, Lorraine y Peter Galison. «The Image of Objectivity». *Representations*, n.º 40, (1992): 81-128. DOI: https://doi.org/10.2307/2928741

Desmond, Ray. *A celebration of flowers: Two hundred years of Curtis's Botanical Magazine*, 1987. Kew: Royal Botanic Gardens.

eRecolnat. MNHN Paris. Última modificación el 25 de abril de 2018. https://www.recolnat.org

Faideau, Ferdinand. *Nos plantes chez elles: leurs mœurs par l'observation, leur aspect par l'objectif, suivi d'un traité pratique de la photographie des plantes dans l'appartement et en plein air*. París: G. Taillandier, 1906.

Fieschi, Caroline. *Photographier les plantes au XIXe siècle: La photographie dans les livres de botanique*. París: Éditions du Comité des travaux historiques et scientifiques, 2008.

Flannery, Maura. «Herbaria and Material Culture». *Herbarium World*, (2021). Última modificación el 18 de enero de 2021. https://herbariumworld.wordpress.com/2021/01/18/herbaria-and-material-culture/

Gener, Mónica. «Origen y desarrollo de las técnicas gráficas a través de la obra de ilustradoras botánicas». *Ellas ilustran botánica: Arte, ciencia y género*, coordinado por Toya Legido, 35-53. Madrid. Editorial CSIC, 2023.

Gómez-Bellver, Carlos, Neus Ibáñez Cortina, Jordi López-Pujol, Neus Nualart y Alfonso Susanna de la Serna. «How photographs can be a complement of herbarium vouchers: A proposal of standardization». *TAXON*, vol. 68, n.º 6, (2019): 1321-26. DOI: https://doi.org/10.1002/tax.12162

Grew, Nehemiah. *The anatomy of plants*. Londres: W. Rawlins, 1682.

Godet, Jean-Denis. *Plants and Flowers of Great Britain and Europe*. Londres: Mosaik, 1993.

Guilcher, Jean-Michel y Robert H. Noailles. *L'Atelier du Père Castor présente Découvertes*. París: Flammarion, 1947.

Hannavy, John (ed.). *Encyclopedia of nineteenth-century photography*. Nueva York: Taylor & Francis Group, 2008.

Hill, Laurence. *Fritillaria Icones*, (2023-2024). http://www.fritillariaicones.com/

Ilustraciencia. «¿Qué tiene que envidiarle la fotografía a la ilustración científica?». *Ilustraciencia*, (2019). https://ilustraciencia.info/novedades/que-tiene-que-envidiarle-la-fotografia-cientifica-a-la-ilustracion-cientifica/

Jeffrey, Ian. *Revisions: An alternative history of photography*. Londres: National Museum of Photography, Film & Television, 1999.

Keene, Minna. *Keene's Nature Studies*. Bristol: Autopublicación, 1903.

Legido García, María Victoria. «Muerte de la fotografía referencial: de la imagen fotográfica como representación a la imagen fotográfica como herramienta discursiva». Tesis doctoral, Universidad Complutense de Madrid, 2001.

LensCulture. «Identification of fruits: As a fruit farmer and breeder». LensCulture, (2024). https://www.lensculture.com/solo-exhibition/masumi-shiohara-identification-of-fruits-as-a-fruit-farmer-and-breeder. [Fecha de consulta: 13 de febrero de 2024]

Malpighi, Marcelli. *Anatome plantarum*. Londres: Regiae Societati, Londini ad Scientiam Naturalem Promovendam Institutae, 1675. DOI: https://doi.org/10.5962/bhl.title.20220

Marret, Léon. 1911-1924. *Icones florae Alpinae plantarum*. París: Société d'édition des sciences naturelles. DOI: https://doi.org/10.5962/bhl.title.32958

Phillips, Roger. *Wild flowers of Britain*. Londres: Pan Books, 1977.

Smith, Graham. «Talbot and Botany: The Bertoloni Album». History of Photography, vol. 17, n.º 1, (1993): 33-48. DOI: https://doi.org/10.1080/03087298.1993.10442590

Schwartz, Joan M. «Science and Sentiment: The Work of Photography in Nineteenth-Century North America». *North American Odyssey: Historical Geographies for the Twenty-First Century*. Editado por Craig E. Colten y Geoffrey L. Buckley. (Lanham, MD: Rowman & Littlefield, 2014), 237-60.

Simpson, Niki y Peter G. Barnes. «Photography and contemporary botanical illustration». *Curtis's Botanical Magazine*, vol. 25, n.º 3, (2008): 258-280. https://www.jstor.org/stable/45065915

Talbot, William Henry Fox. *El lápiz de la naturaleza*. Londres: Longman, Brown, Green and Longmans, 1844-1846.

Thijsse, Gerard. «Everlasting gardens: origin, purpose, spread and use of the first herbaria». *The Green Middle Ages: The Depiction and Use of Plants in the Western World 600-1600*. Editado por C. A. Chavannes-Mazel & L. IJpelaar. (Ámsterdam: Amsterdam University Press, 2022), 72-107. DOI: https://doi.org/10.2307/jj.1231865.7

Trutat, Eugène. *La photographie appliquée aux sciences naturelles*. París: Gauthier-Villars, 1884.

CV

Lucía Moreno Diz
Associate Professor at the Faculty of Fine Arts of the Complutense University of Madrid
lucmoren@ucm.es
Orcid: https://orcid.org/0000-0003-4172-3304

Lucía Moreno Diz (Madrid, 1975) works as a photographer and designer in collaboration with agencies and publishers, and has participated as an editorial designer in several exhibition projects related to botany, such as Herbarios Imaginados (Imagined Herbals) and *Ellas Ilustran Botany* (They Illustrate Botany), of which she is also co-curator. A member of the research group Imagen, Patrimonio, Arte, Conservación y Tecnología (Image, Heritage, Art, Conservation and Technology), she is currently completing her doctoral thesis on photographic herbaria and botanical representation in art and science through photography.

María Victoria (Toya) Legido García
Professor at the Faculty of Fine Arts of the Complutense University of Madrid
mvlegido@ucm.es
https://toyalegido.com/
Orcid: https://orcid.org/0000-0002-7303-3298

María Victoria (Toya) Legido García (Albacete, 1968) is a full professor at the Complutense University, recognized as excellent by Docentia. She has served as academic secretary of the Department of Design and Image, director of the Art, Science and Nature research group, and a member of the ACADEMIA committee of ANECA. She has held three six-year research positions and one for knowledge transfer and is accredited as a professor. She has curated exhibitions such as *Ellas Ilustran botánica*. *Arte, ciencia y geénero* (2024) at the Royal Botanical Garden of Madrid, *Herbarios Imaginados* (2019) and *Zoologiías* (2011) at C arte C. For more than fifteen years her artistic work has focused on botany and zoology, holding exhibitions such as *Maravilla* at CDAN Centro de Arte y Naturaleza in Huesca in 2023, *Herbaria* at the Fundacioón Cristina Enea in San Sebastián in 2021 or *Botánica Secreta* at La Casa de las Ciencias in Logroño in 2019. She has published books in Ediciones Complutense and in the CSIC publishing house and articles in magazines such as *Archivo Platform, Arte, individual y sociedad or ÉXIT*.