

From Brunfels to Bauhin – The first 100 years of „botany” in the German-speaking area

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This article examines how Caspar Bauhin (1560–1624) became famous as a scientific author and University teacher in Basel focusing on the evolution of scientific practices such as botanizing and herbarizing in the German-speaking world. In the early 16th century German-speaking publishers were the first to sell well-illustrated books that would be of great help to readers in identifying plants. After 1550, Swiss and German physicians such as Felix Platter, Leonhard Rauwolf, Kaspar Ratzenberger and Johann and his brother Caspar Bauhin began collecting plants for their herbaria, some of which are among the oldest still preserved today. The Rauwolf herbarium, with its most „scientific” design, shows how plant identification was done in practice. Rauwolf also was the first to leave behind a comprehensive report of his fieldwork in Syria, Lebanon and Iraq, written in German. In Basel, Caspar Bauhin was to become a particularly influential academic teacher in the German-speaking world and beyond when he took over the newly established chair for Botany and Anatomy in 1589. He trained a total of nearly 800 students during his University career. Moreover, Bauhin’s extensive correspondence comprises over 2500 letters and provides insights into the lively discussions among the fellow botanists with whom Bauhin corresponded.

In the 16th century, at the beginning of the modern era, the science later called „botany” emerged from the subfield of pharmacy within the academic training of physicians. The present paper¹ focuses on scientific practices of botanizing and herbarizing, providing the context to understand the important role of Caspar Bauhin for the academic training of „botany” in the German speaking realm. The first medical chairs for herbal medicine and anatomy were established in northern Italy as part of medical studies, and the earliest *horti medici* or botanical gardens were likewise constructed around 1545 at the Universities of Pisa, Padua, and Bologna (Egmond 2021, 2022). For the German-speaking students, medical education in Montpellier in France also played an important role. When Caspar Bauhin (1560–1623) became prominent as a scientific author and University teacher in Basel around 1600, a new centre for training botany emerged in the German-speaking area itself.

Pre-Bauhinian botanical works – Text studies and empirical observations

Because of their essential publications in this field of knowledge, the Germans Otto Brunfels (1488–1534), Euricius Cordus (1486–1535), Hieronymus Bock (1498–1554), and Leonhard Fuchs (1501–1566) were referred to as the „fathers of botany”. Among them, Otto Brunfels and the Strasbourg publisher Johann Schott (1477–1548) were the first to publish a distinguished three-volume edition of „Herbarum vivae eicones” (Strasbourg 1530–1536) or ‚lifelike images of plants’ (Fig. 1). For systematic botanical identification it was particularly valuable,

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Fig. 1. Otto Brunfels: *Herbarum vivae eicones* (1530). Staatsbibliothek Bamberg, 70 B 1#1, urn:nbn:de:bvb:12-bsb1142431-o.



Fig. 2. Portrait of Leonhard Fuchs from: *De historia stirpium commentarii insignes* (1542). Staatsbibliothek Bamberg, 1 A 20, urn:nbn:de:bvb:12-bsb11394427-o.

because until then there was nothing comparable on the book market in terms of the quality of the illustrations. The woodcuts by Hans Weiditz (†1536) found at the very beginning of the articles on the respective plants had initially been financed by the publisher at great expense. As a philologically proven medical expert, Brunfels added to them compilations from ancient and medieval writings as well as from works of more recent humanist authors, such as the Italians Niccolò Leoniceo (1428–1524) and Giovanni Manardo (1462–1536).

Euricius Cordus, who was professor of medicine in Marburg, described in his „Botanologicon” (Cologne 1534) a learned conversation on botanical issues with friends in an idealized or fictional form, which included his brother-in-law, the pharmacist Johannes Ralla (1509–1560). Interspersed among the lively discussions of the names and effects of various medicinal plants there is a brief description of the methodology of botanical field research: the scholars used the book editions of the relevant ancient and modern authors as textual guides to help them identify the observed plant species on site during their excursions. In order to learn more about the possible healing effects, they interviewed local people, preferably old women (Egmond 2018; Marsh 2022). As a result of such field studies Hieronymus Bock, a Protestant pastor of the Hornbach parish and a medical layman, in his „New Kreütter Büch” (Strasbourg 1539) or ‚New herbal book’ listed nearly 250 medicinal plants or *simplicia* to be found in Germany, giving their species, identifying characteristics, names, and internal and external pharmaceutical effects.

Generally, in this era the medical literature of antiquity was given the highest rank in Renaissance medicine (Nutton 2022). In addition to Hippocrates and Galen, the most prominent ancient medical authors, Theophrastus, Dioscorides and Pliny the Elder were considered valuable with regard to herbal remedies. The botanical knowledge of the ancient writers referred to the Mediterranean region, and in the Early Modern Period many herbal medicines that were used north of the Alps were imported from this region via Venice. Against this background, Leonhard Fuchs (Fig. 2), who taught from 1535 as a professor of medicine at the University of Tübingen, like Cordus and Bock emphasized the importance of a detailed knowledge of local medicinal herbs. Therefore, he also botanized together with his medical students in his garden and in the surrounding area (Seybold 2001). In the eyes of early modern specialists like Brunfels and Fuchs, the study of useful plants ultimately aimed at the praise of God. Leonhard Fuchs added to this notion in his dedicatory letter to Elector Joachim of Brandenburg (1505–1571) for his „*De historia stirpium commentarii insignes*” (Basel 1542; Fig. 3) or ‚Commentary and illustrations on botany’, by stating that the observation of native plants in fields, forests, and mountains could also bring pleasure and enjoyment to humans. Fuchs’ Latin explanations of individual plant species were no longer limited to compendia from other authors, as was the case with Brunfels. Like Bock, he added infor-

mation on the various names, species, forms, habitats, times of flowering and seeding, as well as the „temperament“ of the plant species according to the humoral medicinal concept of his age.

Botanical fieldwork was also given great weight at the medical faculties of northern Italy (Egmond 2018; Zemanek 1998). The students, who were to study the Mediterranean flora there with their own eyes, gained first-hand knowledge not available to the German pioneers Brunfels, Bock, and Fuchs in their interpretation of ancient texts. Euricius Cordus had been fortunate to study with Leonicensio and Manardo in Ferrara, and among the first Germans to devote themselves to study the *res herbaria* or botanical issues in Italy, following his example, was his son Valerius Cordus (1515–1544). The younger Cordus had first learned pharmaceutical practice from his uncle, the aforementioned pharmacist Johannes Ralla. Initially a student of Philipp Melanchthon (1497–1560) at the University of Wittenberg where he also lectured about remedies, Valerius Cordus went to Italy in 1543, visiting Florence, Pisa and Lucca, but died soon after in Rome at a young age. His „Dispensatorium“ was posthumously printed in Nuremberg in 1546 as the first official pharmacopoeia and had a fundamental influence on the development of pharmacy in the following decades.

Medical professionals, who were particularly active in field research, such as Melchior Wieland (and Leonhard Rauwolf, whom we will hear about later), followed the ancient authors' information about healing plants as far as the Levant. The Prussian Melchior Wieland (c. 1520–1589), who came to live and work in Italy, can be called an early professional botanist, because he was employed as a prefect of the botanical garden in Padua from 1561 on (Trevisan 1995). Previously, Wieland also had traveled to Egypt, Palestine, and the Levant on behalf of the University of Padua and the Republic of Venice in search of herbal drugs and marketable medicines (Herrmann 2015). However, all scientific notes he had made during this journey (from which Wieland had hoped to be able to present a comprehensive work on natural history like that of Dioscorides or Pliny) were lost on the way (Fantuzzi 1774: 222). As Conrad Gessner reported about him, Wieland had also traveled to Germany, Italy, Greece, and Asia Minor for research purposes, which is why the Zurich naturalist held him in exceptionally high esteem for the knowledge Wieland had acquired while traveling in Europe and around the Mediterranean Sea (Wieland and Gessner 1557).

The Zurich physician Conrad Gessner (1516–1565; Fig. 4), who by his numerous publications was known as a connoisseur of ancient literature and an encyclopedist of the animal world, is also to be counted among the German-speaking botanists *avant la lettre* (Leu 2016; Leu and Opitz 2019; Nyffeler 2016). In 1541, he completed his medical studies in Basel, and later worked in Zurich, first as a lecturer, and from 1546 as *Professor physicae* at the *Collegium Carolinum*, Zurich's college for the education of its clergy, and from 1554 onward also as town physician. In the meantime, Gessner achieved great fame by publishing numerous philologi-



Fig. 3. Illustration „Acanthus / Teutsch bernklaw“ in: Leonhard Fuchs: *De historia stirpium commentari insignes* (1542). Staatsbibliothek Bamberg, 1 A 20, urn:nbn:de:bvb:12-bsb11394427-0.



Fig. 4. Tobias Stimmer (1439–1584): Conrad Gessner, portrait of the scholar at the age of forty-eight (1564), oil and tempera on canvas, Museum zu Allerheiligen Schaffhausen.



Fig. 5. Conrad Gessner: *Catalogus plantarum* (1542). Bayerische Staatsbibliothek München, 4 Phyt. 105, urn:nbn:de:hbz:12-bsb10166776-8.

cal and natural history works. As a trained physician, he never lost sight of the pharmaceutical value of plants. One example of this is that the young Gessner compiled a handy „*Historia plantarum*” (Basel 1541) from the classics, whose alphabetically-arranged articles with an attached index provided readers with information on the plants’ healing properties. Only one year later he presented a „*Catalogus plantarum*” (Zurich 1542; Fig. 5), which juxtaposed the Latin, Greek, German and French names of plants commonly used in pharmacies forming a multilingual dictionary. The edition of a „*Lexicon rei herbariae trilingue*” based on ancient and contemporary authors by the Hebraist David Kyber (1515–1553) was supplemented by Gessner in print (Strasbourg 1553) with advice and tables on how to collect plants with the greatest benefit according to the months they flower and bear fruits and seeds.

Conrad Gessner himself made regular botanical trips to the Alps. In „*De raris et admirandis herbis*” (Zurich 1555), a treatise on the genus *Lunaria* as well as luminescent plants and natural objects in general, taken from the literature, a personal report by Gessner on an exploration in the Pilatus region, which he had undertaken in the Alps accompanied by a wound surgeon, an apothecary and an artist, was added in print. The Zurich physician also made a name for himself among botanists with an edition of the Dioscorides commentary and unpublished botanical writings from the estate of the early deceased Valerius Cordus (Strasbourg 1561). The volume also contained the earliest printed illustration of a garden tulip with the first report by Gessner himself about the specimen in bloom, which he had visited in April 1559 in the Herwart family garden in Augsburg (Zäh 2022).

Another very influential figure in empirical botanical studies in the German-speaking area was the Dutch-born Carolus Clusius (1526–1609) from Arras. Under the influence of Melanchthon, he began to study medicine in Wittenberg and continued in Montpellier from 1551 to 1554. In the coming decades, Clusius made a name for himself throughout Europe with his own treatises on the flora of Spain and Austria and as a translator of works on herbal remedies of India and America (Clusius 1576, 1583; D’Orta 1567; Monardes 1574). His international correspondence of about 1500 letters² focused largely upon the exchange of knowledge about plants and also plants themselves which were sent by post (Egmond 2010; Egmond et al. 2007). Like Melchior Wieland, Clusius was employed for a time as a botanist in order to establish the imperial court garden in Vienna in 1574. Already at an advanced age, in 1593 Clusius finally became professor of Botany in Leiden and prefect of the botanical garden, positions in which he remained until the end of his life.

² <https://digitalcollections.universiteitleiden.nl/clusiuscorrespondence;>
<https://clusiuscorrespondence.huygens.knaw.nl/edition/> (visited 15. 8. 2023).

Meanwhile, the German book market was flooded by authors, compilers and printers with a plethora of more or less original herbals: Publishers like Christian Egenolff and Nicolaus Bassaeus in Frankfurt a. Main sold editions of numerous works by Eucharius Rösslin (1470–1526), Jacobus Theodorus Tabernaemontanus (c. 1522–1590), Adam Lonitzer (1528–1586) and others with pictorial material printed first by Brunfels and Fuchs. The practical value of illustrated herbals was emphasized already by Leonhard Fuchs in 1542: the illustrations were especially helpful for botanically-interested people to identify a plant as the full lifespan of the plant could be demonstrated (Fuchs 1542: β r–v). As a humanist, Fuchs believed that the knowledge of plants originated from antiquity: like all medicine, for him it came with the Greeks from Moses, the Chaldeans and the Egyptians. In the meantime, however, it had become so „plebeian” that it was only available among apothecaries or old women from among the common people. For the Tübingen professor of Medicine, the restoration of this knowledge by rereading the ancient texts was the task of book scholars like himself. In addition, sound knowledge about plants, as it could be acquired in the fields or on mountains and other remote areas, also belonged among the educated and not only among the common people.

From the perspective of the history of science, illustrations, which were created on the initiative of authors and publishers, also played an important role (e.g., Fig. 3). Images helped clarify the nomenclatural confusion. Without them, the essential question of whether the various words named in the texts referred to identical plants in nature could hardly have been settled with certainty. In fact, the illustrated herbals from Germany originated as much from the business acumen of printers as from the skills of draftsmen and woodcutters (Kusukawa 2012). As textual guides, multilingual plant catalogs printed in smaller book formats, such as those edited by Conrad Gessner (Fig. 5), were far more suitable for practical use in the field, as they were handier than unwieldy and expensive classic editions or illustrated herbals with their usually large formats. Likewise, a significant role in the production of all these books was played by the professional knowledge of pharmacists, as „botany” remained closely associated with medicine and pharmacology until the end of the 16th century. By elaborating on how apothecaries knew to distinguish genuine from adulterated medicinal plants, Euricius Cordus (1534: 53) also took a clear stand against the common attitude among humanists, who were often unwilling to question or add something new to what was found in ancient writings. As far as the empirical knowledge in the field of botany was concerned, local „Kräutler” or herbalists who were familiar with the conditions on site were indispensable as guides in the field for botanically-interested scholars – a fact that was emphasized by prominent field researchers of the time, such as Carolus Clusius and Leonhard Rauwolf.

Early herbaria and botanical field trips

Around the mid-16th century, a certain extension of botanical methods became widespread: the herbarium as a *hortus siccus* offered the possibility of studying plants in detail in a dried state even outside their vegetative periods (Baldini et al. 2022; Fleischer 2017; Thijsse 2016). Its inventor is considered to be Luca Ghini (1490–1556), professor of Medicine in Bologna, who started a collection of dried plants in the 1530s and in 1544 was commissioned to establish the very first botanical garden in Pisa. The oldest preserved specimens come from among his students, such as the herbarium owned by Gherardo Cibo (1512–1600), created by Francesco Petrollini, or the En Tibi herbarium (Stefanaki et al. 2019). The earliest herbaria preserved in the German-speaking world were in the possession of Felix Platter (1536–1614), Leonhard Rauwolf (1535?–1596), Kaspar Ratzenberger (1533–1603) and Caspar Bauhin (1560–1624), all candidates of medicine in Montpellier.

Platter started collecting dried plants about 1552, Ratzenberger about 1556, Rauwolf about 1560 and Caspar Bauhin about 1577. Felix Platter studied with Guillaume Rondelet (1507–1566) in Montpellier from 1552 and also made closer acquaintance with Carolus Clusius there. Here he lived in the house of the apothecary Laurent Catelan, whom he aided in his pharmacy to acquire knowledge of remedies (Platter 1976). Platter had begun his academic training in his hometown Basel, where he returned in 1557 and earned his medical doctorate. After years as a general practitioner, he was appointed city physician and professor of Medicine there in 1571. As part of his collecting activities, which served both scientific and representative purposes (Walter 2013), he supplemented the pages of his herbarium with artistic works and printed illustrations, including 79 originals of drawings by Hans Weiditz, which he had once made for the herbal of Otto Brunfels.

Leonhard Rauwolf from Augsburg matriculated at the University of Tübingen in 1554 and then went on to the University of Wittenberg in 1556. After 1560, he was to study in Montpellier. A few weeks after Rauwolf, Kaspar Ratzenberger also enrolled there. Ratzenberger had also studied in Wittenberg from 1548 and had moved to Jena in 1558. Before going to Montpellier in 1560, he had herbarized in Italy, Switzerland, and southern Germany. In 1561, he received his doctorate in Orange and went to Naumburg, where he became town physician. Unlike Rauwolf, both Platter and Ratzenberger did not publish on botanical matters.

The layout and production of Leonhard Rauwolf's prominent herbarium, now preserved in Leiden, appears particularly „scientific“ by today's botanical standards. It was begun in 1560 in France, as was noted on the title pages of the first two volumes (Stefanaki et al. 2021). After having completed his studies in 1562 with a doctorate from the University of Valence, Rauwolf traveled through Italy, where he collected the plants for the

third volume of his herbarium. On his way back home, Rauwolf visited Leonhard Fuchs in Tübingen in the fall of 1563 to show his dried plants to his former teacher. At that time, Fuchs added identifications to 162 specimens or tried to correct already noted plant names.

As the close examination of the handwritten entries in Rauwolf's herbarium has recently shown (Stefanaki et al. 2021), most of the plants in the first two volumes were identified by his fellow student Johann Bauhin (1541–1613) from Basel, the elder brother of Caspar Bauhin, whereas only a few entries in Rauwolf's hand can be found there. Therefore, it can be concluded that Rauwolf was still a beginner in the botanical field when he began his studies in Montpellier and that he had a more experienced fellow student help him with the entries. Together with Johann Bauhin, who had previously studied with Leonhard Fuchs in Tübingen as well, Rauwolf went on excursions in Languedoc and Provence. Having returned to his hometown of Basel, Johann Bauhin also embarked on a subsequent study trip to Italy. Rauwolf accompanied Bauhin on his return journey from Italy, and the two arrived together in Zurich, as Conrad Gessner noted in his *Liber amicorum* (Durling 1965). A lively correspondence developed between Bauhin and Gessner on botanical questions, which decades later also appeared in print (Bauhin 1591). In 1565, Bauhin lent his herbarium (which is lost today) to the Zurich scholar, from which the latter had drawings made of numerous plants (Gessner 1577: 121v).

Leonhard Rauwolf had become more confident in his botanical judgment, so that the third volume of his herbarium with plants from Italy only has entries by Rauwolf himself and subsequent corrections by Leonhard Fuchs (Stefanaki et al. 2021). After returning to Augsburg, Rauwolf reorganized his herbarium in 1564, adding missing entries and creating an index in which he also marked some plants whose previous identification seemed questionable to him. Financed by the Augsburg trading house Manlich, Rauwolf undertook an expedition to Syria, Lebanon, and Iraq from 1573 to 1576, during which he collected 200 plants, which can be found in the fourth volume of the herbarium (Ghorbani et al. 2018). Recent analyses of the fourth herbarium volume have shown that Rauwolf's botanical work met the highest methodological standards even by modern criteria: he identified the foreign plants by morphological comparisons with related species known to him in Europe, documented the local names for them, and brought everything in the herbarium together with their presumed names in antiquity.

Rauwolf's extensive travelogue from this trip, written in German and first printed in 1582 (Fig. 6), also deserves very special attention here, as it described in great detail his expedition to an unexplored area (from a European point of view), undertaken out of scientific interest in the natural world (Rauwolf 1582). The book chronicles how he observed and collected these and many other specimens during visits to ornamental and kitchen



Fig. 6. Leonhard Rauwolf: Aigentliche beschreibung der Reiß [...] inn die Morgenländer (1582). Staats- und Stadtbibliothek Augsburg, 4 Gs 1872, urn:nbn:de:bvb:12-bsb11212041-5.

gardens, markets for vegetables and fruits, and on his field trips guided by locals (Walter 2009; Walter et al. 2021). This scientific genre would later reach its literary heights with Alexander von Humboldt (1769–1859) and Charles Darwin (1809–1882).

Caspar Bauhin and the institutionalization of botanical education in the German-speaking area

The preceding sections reveal a slow development from a close association of medicine and botany to the study of plant diversity independent of their medicinal value. This development is epitomized by the works of Caspar Bauhin in Basel, where botanical education became prominently institutionalized in the late 16th century. His legacy allows well-founded insights into the history of botany. Bauhin had a very extensive letter network and left behind over 2500 preserved letters, the largest botanical correspondence of his time³, larger even than the Clusius correspondence. There were personal overlaps with the correspondences of his contemporaries Carolus Clusius and Joachim Camerarius (1534–1598), a Nuremberg doctor interested in botany who left behind a large collection of letters, due to their common field of interest.

After having studied in Basel and visiting Padua, Bologna, Montpellier, and Tübingen, in 1589, Caspar Bauhin assumed the newly established position of full professor of Anatomy and Botany at the University of Basel, where he was to become a particularly influential academic teacher within the German-speaking world (Benkert 2020; Fuchs-Eckert 1979, 1981, 1982; Stöcklin and de Vos 2023). Between 1581 and 1624, when Bauhin taught at the University, first as a lecturer, then as a professor, a total of 795 medical students were enrolled and 698 of them were awarded doctorates; no larger medical faculty existed in the German-speaking world (Burckhardt 1917). Caspar Bauhin and his colleague Felix Platter were both sons of immigrants in the city of Basel. Access to prominent and well-paid University posts was not a matter of course for these families. Concentrating on medical practice and teaching, the pride in their own achievements that corresponded to a meritocratic upward mobility mentality is easily recognizable in their publications.

Bauhin also saw to the establishment of a botanical garden in Basel in 1589, the oldest north of the Alps. For teaching purposes, especially during the winter months, he used his herbarium, which eventually contained more than 4000 plants, of which about 2330 specimens survived. Even as a lecturer, he was concerned about good teaching: for example, in 1586, he wrote to his student Sigismund Schnitzer (c.1560/1565–1622) that he had hesitated to use the works of Andrea Cesalpino (1519–1603) for teaching botany, because he found them difficult to understand himself due to its complicated Latin style⁴. Bauhin's own publications, on the other hand, were highly appreciated by readers like Schnitzer because they were so valuable not only to students but also to practicing physicians⁵.

³ <https://www.e-manuscripta.ch> (visited 15. 8. 2023).

⁴ Letter from Caspar Bauhin to Sigismund Schnitzer, 11. 12. 1586 (Hornung 1626: 334).

⁵ Letter from Sigismund Schnitzer to Jakob Zwinger, 27. 10. 1598 (UB Basel, Frey-Gryn Mscr I 12, Nr. 331).

In his early career, Caspar Bauhin only published works on anatomy, but soon he was to provide botanically-interested readers with his „Phytopinax” (Basel 1596), a list of the nomenclature used by 44 botanical authors for 163 plants, giving the genus, synonyms, and a list of species, each of which includes exact page numbers in the works cited (which makes it very valuable for today’s scholars as well; Fig. 7). As a handbook it could be easily carried into the field to identify plants; the idea for it (and the Greek-language title) had apparently been borrowed by Bauhin from Gessner’s plant catalog of 1542. For the systematics of the plant world, Bauhin’s order of species according to (presumed) genera was to have a lasting effect on later botanists. Carl von Linné (1707–1778) in particular made frequent use of Bauhin’s designations in the development of his classification system (Offerhaus et al. 2023; Selosse 2005).

In 1598, the Basel professor published an illustrated edition of Pietro Andrea Mattioli’s (1501–78) works and in 1601 corrections and additions to Jacques Daléchamps’ (1533–1588) „Historia plantarum universalis” (Lyon 1586/1587), according to the information given in his own „Phytopinax”. In these years, Bauhin was very productive as an author and editor: in 1609 he had eight different publications in preparation or in print at the same time. He could not afford more, he wrote to the medical professor and botanist Ludwig Jungermann (1572–1653) in Giessen, because of his University official business and domestic obligations⁶. While teaching botany, Bauhin never lost sight of pharmaceuticals, as evidenced by the publication „De compositione medicamentorum” (Offenbach 1610) based on his lectures. In 1622 Bauhin published a „Catalogus” (Basel 1622) of the flora around Basel for his medical students.

For many years, Bauhin endeavored to expand the beginnings laid out in his „Phytopinax” into a comprehensive botanical compendium. But, as in the case of Leonhard Fuchs and Conrad Gessner, a planned survey of all known plants from his pen remained unprinted during his lifetime. Like these two authors before him, the Basel professor included a stock of pictures with independent plant illustrations, taken as far as possible from nature⁷. As preliminary works, he published during his lifetime a „Prodromos theatri botanici” (Frankfurt a. Main 1620) and a „Pinax theatri botanici” (Basel 1623). But the first volume of Bauhin’s „Theatrum botanicum sive historia plantarum” (Basel 1658), which was printed posthumously, was to remain the singular published text of the entire work.

Having been a professor of medicine for many years, Bauhin was contacted by many of his colleagues and seen as a beacon for innovative science. Looking at the sheer number of letters, it is not very credible to see in him an „egocentric, introverted” character (Fuchs-Eckert 1982: 144), since he was well accessible as a „public” person and as a mentor for his former students. Yet, Bauhin also knew how to gain benefits from his correspondence (Benkert 2020: 129–133),



Fig. 7. Page 221 from the Phytopinax (1596) of Caspar Bauhin: Bayerische Staatsbibliothek München, 4 Phyt. 23, urn:nbn:de:hbz:12-bsb00022752-7.

⁶ Letter from Caspar Bauhin to Ludwig Jungermann, 24. 8. 1609 (Wein 1937: 159).

⁷ UB Basel, K IV 3, A–D:
<https://swisscollections.ch/Record/991170502487205501> (visited 15. 8. 2023).

such as when he sent a list of plants to Ludwig Jungermann, which the latter had mentioned in his „Catalogus“ of the flora around Nuremberg (Altdorf 1615). Bauhin asked his colleague in a rather direct or brusque manner to send him the plants on the list in a specific state – dried, with root and flower – or his herbarium⁸. And like Conrad Gessner before him, Bauhin held out the prospect of his contributor being mentioned in his works and receiving his books as gifts.

Bauhin’s numerous students in particular sought to maintain contact with their noted academic teacher. Among these, Leonhard Dold (1565–1611), who had received his doctorate in Basel in 1594 and who was also well acquainted with Joachim Camerarius in his hometown of Nuremberg, was particularly versed in botany. After the death of Camerarius in 1598, Bauhin turned to Dold when he needed a contact person in the Franconian trading metropolis for the exchange of seeds and plants, botanical information and illustrations⁹. As plants for Bauhin’s herbarium were concerned, Joachim Burser (1583–1639) from Kamenz became a particularly important contact. Burser had earned his doctorate in Basel in 1614 and had corresponded with Bauhin since 1615 as the town physician of St. Annaberg. After 1625, he was to teach at the Danish Knight’s Academy Sorø as professor of Medicine and Physics. Burser’s personal herbarium was destroyed by fire in Uppsala in 1702; what remained was used by Linné in writing his „Systema Naturae“ (Fuchs-Eckert 1982: 138). Another herbarium from the circle of Bauhin’s students, which has been preserved and is now kept in Basel, was begun by Jakob Hagenbach (1595–1649), a Basel native, who later taught at the University of Basel as a professor of Logic and Ethics (Stöcklin and de Vos 2022). Further prominent Bauhin students in medical circles were, for example, the Frankfurt physician Johann Hartmann Beyer (1563–1625) and Johann Rudolf Saltzmann (1574–1656), later professor of Medicine and, from 1619, also director of the botanical garden in Strasbourg. The correspondence with Saltzmann clearly proves that Caspar Bauhin permitted students from outside to visit his herbarium¹⁰.

Since they already have been researched in their entirety, letters from the Bamberg court physician Sigismund Schnitzer to Caspar Bauhin can give the best insight into the high scientific level of plant observation and description at the turn of the 16th and 17th centuries (Häberlein and Walter 2022). After becoming physician at the bishop’s court in the Franconian city of Bamberg in 1589, he reported to his teacher Bauhin on rare plants, for example in the court garden of the Bamberg bishops. Even decades later, detailed botanical information about the Bamberg gardens continued to arrive in Basel. The Bamberg doctor also thought about cataloging the flora of Franconia, although this apparently never happened¹¹. Meanwhile, Schnitzer had paid great attention to the individual peculiarities or special environmental conditions under which plants grew. In the Bamberg court garden, for example, never-before-seen cultivars of tulips and hyacinths could be admired, and a [*Dianthus*] *caryophyllus* had

⁸ „Fac rogo ut cum flore habeam“: letter from Caspar Bauhin to Ludwig Jungermann, 24. 8. 1609 (Wein 1937: 159).

⁹ Letters from Caspar Bauhin to Leonhard Dold, 1599–1611 (UB Erlangen, Trew, C. Bauhin Nr. 15–47).

¹⁰ Letter from Johann Rudolph Saltzmann to Caspar Bauhin, 29. 5. 1621 (UB Basel, G2 I 2, fol. 408); letter from David Schobinger to Caspar Bauhin, 4. 12. 1613 (UB Basel, G2 I 2, fol. 367).

¹¹ Letter from Sigismund Schnitzer to Caspar Bauhin, 28. 5. 1601 (UB Basel, Frey-Gryn Mscr II 1, S. 311).

developed quite differently from the parent plant¹². Regarding such natural phenomena, the Bamberg court physician asked himself, as Carl von Linné did later, whether the special colors and shapes of the blossoms of such „monsters” were a whim or a miracle of nature¹³.

Conclusion

After 1530, publications with high-quality illustrations provided a novel basis for pharmaceutical or botanical practice, since no text, no matter how sophisticated, could replace visual comparison. These prints from the German-speaking area were to become direct models for the illustrated Mattioli editions in Italy or the herbal book productions of Dutch publishers. Conversely, the educational paths of the German-speaking physicians who became known as „botanists” in the 16th century often point to international influences, first in northern Italy, Montpellier, and Tübingen, and later especially in Basel and Leiden. From the 1540s onward, medicinal gardens and herbaria provided methodological opportunities to study plants outside their distribution areas and growing seasons. The practice of botanical field research has been documented by many personal statements since the beginning of the 16th century, but it was first documented in print by Leonhard Rauwolf in 1582 in the form of a comprehensive 487-page German scientific travelogue. By the end of the 16th century, through research and trade journeys, scientific exchanges and commercial trade, the plants growing regionally in Europe were recorded and those outside Europe were increasingly known.

In 1596, Caspar Bauhin collected the plant names with their synonyms and provided usable literature references in his plant catalog „Phytopinax”, which he increasingly expanded until the end of his life. With his attempts at classification, however, Bauhin laid valuable foundations for botanical systematics. Of greatest importance was the systematic training of an entire generation of capable botanists by Caspar Bauhin, with the University of Basel being the undisputed leader as a location in the German-speaking world around 1600. The botanical discussions on plants and transfer of knowledge about morphology and variability of plants in gardens and in the field proved the attentiveness of his students as demonstrated here by the example of Sigismund Schnitzer. Observations on high variability as well as morphological dynamics, for example in the context of breeding, were to become the basis of scientifically-pursued observation of nature in the coming centuries, up to the foundation of modern evolutionary theory in Charles Darwin. Just as importantly, the scientific networks established by Basel students achieved an unexpected continuity, with sons even later standing in for their fathers once the latter had passed away. Further research into these large scientific correspondences promises to provide in-depth insights into the history of botanical practice and education.

¹² Letter from Sigismund Schnitzer to Andreas Libavius, 11. 8. 1611 (Hornung 1626: 84).

¹³ Letter from Sigismund Schnitzer to Caspar Bauhin, 24. 8. 1611 (UB Basel, Frey-Gryn Mscr II 1, S. 312).

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