

· 科学技术史 ·

## 为植物制表：罗伯特·莫里森对植物分类的视觉呈现

### Charting Plants: Robert Morison's Visualisation of Botanical Classification

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**摘要:** 作为视觉技术的图式在现代早期博物学中起着重要作用。一个值得注意的早期历史案例是17世纪末的苏格兰植物学家、牛津大学的第一位植物学教授罗伯特·莫里森尝试在植物分类学中应用图式。莫里森把图式视为他植物学专著的核心, 颠倒了文本和图式的阅读次序, 使图式不再是文本的简单附属物。同时, 他有意识地使分类学图式与他的种子收藏及牛津植物园的空间布局相一致, 从而图式可作为枢纽连通起不同层面的植物学实践, 检索不同层面的信息。莫里森挪用和改造了自中世纪发展起来的图式技术, 最终推动图式成为一种近代博物学家所习用的、居于文本和图像之间的视觉语言。

**关键词:** 分类学 植物学 图式 罗伯特·莫里森 博物学

**Abstract:** Diagrams as a visual technique played a key role in early modern natural history. Robert Morison, a Scottish botanist and the first Professor of Botany at Oxford University, made a noteworthy early attempt in the 17th century to promote the use of diagrams in plant taxonomy. By pioneering the use of diagrams as the core of his botanical monographs, Morison inverted the order in which text and diagrams are read in natural history books and made diagrams more than a mere adjunct to the main text. Morison also consciously aligned the structure of the diagrams with the spatial arrangement of his seed collection and the Oxford Botanic Garden, so that the diagrams functioned productively as a means of bridging different botanical practices and retrieving information from multiple aspects. Morison's appropriation and mobilisation of the diagrammatic mode of representation that originated in the Middle Ages helped pave the way for the diagram, as a visual language between textuality and pictoriality, to become prevalent amongst early modern naturalists.

**Key Words:** Taxonomy; Botany; Diagram; Robert Morison; Natural history

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### Introduction

The practices of visualisation and representation are so widely used in early modern natural history

that their significance scarcely escape the notice of contemporary readers as well as present-day historians. Recently, historians of science have called for a typological investigation of early modern scientific images, or "epistemic images," on the grounds that

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their types are extremely diverse, and there is a rather complex relationship between their meanings and forms.<sup>1</sup> Among some similar efforts, a notable trend is the adoption of charts, tables, and diagrams as objects of study.<sup>2</sup> In an exemplary study, Staffan Müller-Wille makes a strong case that Carl Linnaeus and his contemporary peers had subtly different theoretical conceptions of the use of images in natural history, and that Linnaeus himself, in the tension between textuality and pictoriality, developed a new regime of representation (*Repräsentationsregime*) that could be labelled “diagrams,” where a “quasi-pictorial understanding of texts” emerged.<sup>3</sup>

There is, however, no doubt that Linnaeus’s practice was part of a genealogy that preceded him. Before Linnaeus, naturalists had long vacillated between pictoriality and textuality and made several attempts at visualising their notions of the natural order. They drew different types of diagrams to represent the relationships between natural objects, as Giulio Barsanti shows in an earlier article.<sup>4</sup> In these attempts, the Scottish botanist Robert Morison (1620–1683) occupies a noteworthy position. In order to understand Morison’s place in the history of natural history, it will be helpful to examine what Linnaeus wrote about him.

In 1736, the young Linnaeus published a work entitled *Bibliotheca Botanica*, which was a bibliography for the botanists of his time and constituted the first part of Linnaeus’s botany. In his preface, Linnaeus gave a sketch of the history of botany before him. Linnaeus, in rhetorical Latin prose, compared the development of botany to a tree that had taken root in glorious antiquity, and had once been carried to Asia, then the first flowerlet bloomed at the end of the sixteenth century, which was an obvious reference to the natural historian Andrea Cesalpino. In the seventeenth century, botany celebrated a “Golden Age” that had its own heroes:

Now when that day, long promised by the Gods, had dawned at last, lo and behold, in the early spring of this Golden age and before the snows were well thawed out, a single FLOWER, so long and fervently desired! It emerged from the stem, much like the preceding flower, though

its fruit hardly reached maturity.<sup>5</sup>

John L. Heller, the English translator and commentator on this preface, indicates that the “flower” here refers to the Scottish botanist Robert Morison, for he “revived the true Theory of Science, which had died out for a whole century after Caesalpinus.” (5, p.395) Two points are worth noting here. Firstly, Linnaeus clearly had a high opinion of Morison because he limited the central taxonomic characters of plants to the parts of fruitification. Secondly, the form of Linnaeus’s expression here cannot be ignored either. Writing in the eighteenth century, Linnaeus has become accustomed to presenting materials with the metaphor of a “tree,” even if the objects in question are not plants themselves, but botanists. In the latter part of the *Bibliotheca*, Linnaeus continued to present the “classes, orders, genera and species” of all important botanists in the visual form of tree-like diagrams that were common in his time.<sup>6</sup> This fact is noteworthy because diagrams, as demonstrative instruments of natural objects, have at the same time become a historiographical principle, employed reflexively to construct a narrative of the history of botany. Linnaeus and his readers have taken it for granted, and even have preferred it among the various means of historical writing. The universality of this visualisation practice requires us to be mindful of two types of landmarks in the history of botany: firstly, the landmarks in terms of the contents of certain botanical doctrines, and secondly, the ones in terms of the forms in which these doctrines are expressed.

Linnaeus mentioned Morison more than once in his writings and correspondence. In his botanical textbook, *Philosophia Botanica* (1751), Linnaeus approvingly labelled Morison as a “universal describer” (§12) who had finely classified the class of Umbellates (§34). What Linnaeus most admired, to be sure, was the fact that Morison was a “fructist” (§28) and could thus be classified as an “Orthodox systematist” (§53). Linnaeus displayed Morison’s system in tabular form (§55) and mentioned that he was the Professor of Botany at Oxford University (§34).<sup>7</sup> Linnaeus and his correspondents made many references to Morison, in most cases using plates of Morison’s books to identify plants. However, in a long

letter to Albrecht von Haller, Linnaeus remarks that Morison is “vain” (*vamus*) and “puffed up” (*inflatus*), and Morison’s efforts to pursue the natural affinities of plants are indebted to Cesalpino, while Joseph Pitton de Tournefort indecently owes much to Morison.<sup>8</sup> In some other place, Linnaeus seems to speak in a disgruntled tone about the fact that Morison “maintains a deep silence about Cesalpino, not at all surprising to those who have looked into how much he derived from him,” and Cesalpino’s legacy was just “luckily first resuscitated by Morison.”<sup>9</sup> These highly reserved, if not negative, comments by Linnaeus, in contrast to the laudatory opinions he expresses in the *Bibliotheca* and *Philosophia*, poses the first puzzle for us.

Furthermore, if we compare Linnaeus’s brief history of botany with today’s works on the history of botany, we can again see a stark contrast in the assessment of Robert Morison, for he has been largely neglected by today’s scholarly community. Most studies or monographs on the history of botany only mention Robert Morison passingly. In particular, he is largely eclipsed by John Ray, a contemporary of Morison. The most basic research literature on Morison to date remains the biographical sketch written by Sydney Howard Vines in the *Makers of British Botany* (1913).<sup>10</sup> Vines published the following year, in collaboration with G. Claridge Druce, a book on the Morisonian Herbarium in the Oxford University collection with short biographies of Morison himself and his collaborators.<sup>11</sup> Some of the early monographs on the history of British botany would devote slightly more space to Morison.<sup>12</sup> A few studies of our time have focused on the visual materials in Morison’s works. In the aforementioned article written in Italian, Giulio Barsanti noted that the diagrams in Morison’s books were an early attempt to move from “scales” to “maps” in early modern natural history, but again, this is only a passing remark. Scott Mandelbrote is the foremost contemporary researcher on Morison. He has written a biography of Morison for the *Oxford Dictionary of National Biography*<sup>13</sup> and, in addition, an article he authored in 2015 examines the publication of botanical illustrations of Morison’s most prominent book.<sup>14</sup> Mandelbrote believes that Morison’s book was one of the most complex illustrated books published in late

seventeenth-century England. He uses plant specimens and copperplates to reconstruct how the images of the plants were produced in the interaction between the author, artists, and publisher, but does not specifically address Morison’s diagrams, which will constitute the subject of this essay.

These two differences, one between Linnaeus’s publications and private discourses, and another between Linnaeus’s history of botany and contemporary historiography, invite us to propose a reflection on Morison’s botany: Why was such an author important to Linnaeus and his contemporaries? And further, in what respect was he important, given that Linnaeus had already questioned Morison’s priority in taxonomic thought? I shall argue in this essay that Morison was important not only because he had revived a certain taxonomic principle, as Linnaeus openly claimed, but also because Morison had forcefully championed a visual language for early modern plant taxonomy—diagrams, and in this way he contributed to the so-called “regime of representation” of early modern natural history.

## I. Robert Morison and His Botanical Legacy

The most significant biographical source on Robert Morison is *Vita Roberti Morison M.D.* attached to his the third part of his *Plantarum historiae universalis Oxoniensis*, which was published posthumously.<sup>15</sup> We know from it that Robert Morison was born in Aberdeen in 1620 and that his main interest as a student was botany. He moved to Paris in the 1640s and took his MD degree at the University Angers in 1648. He then studied botany as a physician to Gaston, duc d’Orléans, and in particular he used Gaston’s garden at Blois for his extensive studies of plants. In his writings, Morison mentions more than once the patronage he received from Gaston, and in 1660 he returned to London to serve the newly restored Charles II as royal physician and professor of botany. In 1669 Morison published three works in one volume to which he gave the title *Praeludia Botanica* (*Botanical Preludes*): first, a catalogue of the plants of the Blois Garden, entitled *Hortus Regius Blesensis Auctus*; second, a polemical work sharply critical of

Caspar Bauhin's botany; and finally, an interesting dialogue with the title *Dialogus Inter Socium Collegii Regii Gresham dicti et Botanographum Regium*. The general title of the work, *Praeludia*, suggests that Morison did not complete his botanical project in detail; it was instead an outline of a preparatory nature. In the *Dialogus*, Morison, as a "*botanographus*," comments on the principles of plant classification with a member ("*socius*") of the Gresham College, and he attempts to formulate the characteristics of his own plant taxonomy. We do not know whether this is an actual conversation or a hypothetical one, but its content touches on many noteworthy aspects.

Morison became Professor of Botany at Oxford on 16 December 1669, the first professorship of botany at Oxford. During this professorship, he published *Plantarum Umbelliferarum Distributio Nova, per Tabulas Cognationis et Affinitatis, ex Libris Naturae observata et detecta* in 1672. The book was later cherished by botanists such as Linnaeus, and Morison's fame owes a considerable degree to it. In this monograph, Morison published a fragment of his botanical classification: a system of the umbelliferous plants. As was customary at the time, Morison wrote a preface to the monograph ("*Praefatio ad Lectorem*"), laying out his main ideas. Morison's taxonomic principle is to use the seeds and fruits of plants as the defining characters, and on this point, he followed Cesalpino and was followed partly by Linnaeus. The aim of Morison's botanical work was certainly not merely to establish a fragmental method of plant classification; he intended to propose a universal classification of all plants. Such an ambition is planned to be fulfilled in his *Plantarum historiae universalis Oxoniensis*. However, the publication of this *magnum opus* did not go smoothly: as Morison tried to attach costly engraved plates to it, he had to collect subscription fees from members of the Royal Society and some other noblemen, and this effort did not entirely succeed. In 1680, Morison published the "second part" of this work, which dealt with some herbaceous plants. The programmatic preface to this book presents his main taxonomic ideas. Morison was in a very impoverished state in his later years due to debt problems. As a result, the planned *Historia* was not published in its entirety during his lifetime.

He died in a traffic accident caused by a coach on 10 November 1682. After his death, Jacob Bobart the Younger, the keeper of the Oxford Physic Garden, acquired and collated his papers, and finally published the third part of *Historia* in 1699, which dealt with other herbaceous plants. The so-called "first volume" was actually the last to be published, not appearing until 1715. This part includes the umbelliferous plants for which Morison had already given a synopsis of classification before.

Morison left few manuscripts or papers. In the Sherardian Library at Oxford, there remains a list of plants collected by him and two books from his library: a copy of Cesalpino and one of *Hortus regius Blesensis* which he annotated in the margins. In addition, the Oxford University Archives contains a number of documents on the publication of his works. The fact that the central difficulty in publishing the *Historia* was the engraving and printing of the plates attracted the attention of Scott Mandelbrote, who has done the most conclusive research to date on this matter. In the following sections, I shall focus on the published form of Morison's works (or Morison's own desired form), placing the diagrams therein at the centre of the examination because of Morison's own emphasis on them.

## II. Morison's Conception of Diagrams

The rationale for my approach comes from the pioneering works of Müller-Wille and others—as previously stated, these studies show that in Linnaeus's time, texts, images and diagrams in natural history writings were in a complex dynamic. In this period, issues such as how a naturalist should present his texts and diagrams and how a reader should read them were not entirely fixed.

In Morison's view, the fruits of his work should be made available in the form of tables, or *tabulae cognationis et affinitatis*, as he called them in the titles of his books and elsewhere. Both his monograph on umbelliferous plants and his planned general history of plants are subtitled "*per tabulas cognationis et affinitatis*" (through tables of cognation and affinity). It is important to emphasise that these tables are not a companion chart attached to the "main text"; rather,

the production of the tables is Morison’s goal, and the following texts appears as the interpretation of these tables. The audience Morison has in mind is reading the table before consulting the text. This could be supported by the fact that Morison consciously entitled the textual part of his book “*Explicatio Tabulae praecedentis*” (Explication of precedent Tables). This arrangement was always carried through by Morison in his writings, even when there were so few species of plants in a given group that it appeared redundant to draw a diagram. What is clearly evident here is that the order in which the reader reads is reversed from the natural history texts we know today. In a sense, one analogy might be the dichotomous key attached to the front of a group in some modern zoological or botanical monographs, but the form of these tables or diagrams is quite different from that of the keys. This difference in form necessitates that we cannot simply assume that the Morisonian diagrams have the same function as the modern keys, which means that we should analyse what role diagrams play for Morison beyond being an information retrieval tool.

The diagrams designed by Morison are not diverse in type, but they have their clear characteristics. These diagrams can be divided into two categories: the first type is the horizontal tree diagram, and the second is the family tree diagram. The former appears most often, and Morison draws it for each of the groups he deals with (Figure 1). The second type appears as “*Tabula umbellarum generalis*”



Figure 1. A horizontal tree diagram of “the eighth genus of Umbellates” used by Robert Morison. From Robert Morison, *Distributio*, p. 44

in his monograph on umbelliferous plants. Eight plates are devoted to this type of diagram, and these plates were reprinted in the first volume of *Historia generalis*, which was published posthumously, but they were not drawn for other plant groups (Figure 2).

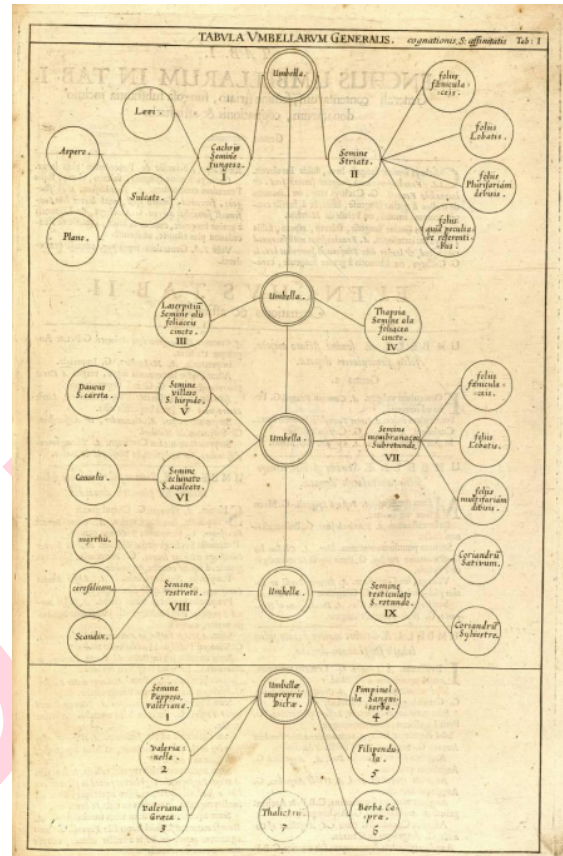


Figure 2. A genealogy-like diagram drawn by Robert Morison, From Robert Morison, *Distributio*, Tab. I.

Unlike modern keys, Morison’s diagrams were not intended to present characteristics for identification purposes, but instead defining characteristics. This can be seen in connection with his explanatory texts. For the first type of diagrams, the so-called “explications” actually appear in the leftmost columns of these diagrams as the headwords, and further elaborate on the subclasses in the texts. The terms used to refer to these subclasses in diagrams are not accidental conventions, but, in Morison’s words, specific “tokens” (*tesserae*) of the plants in question. Thereby, the text throughout the diagram is a condensed summary for the detailed text that follows. If a reader tries to read aloud the words on these different branches in sequence, then they will get a rough outline of the “explications.” Another difference from modern keys

is that Morison consciously used a special set of symbols to give non-morphological characteristics of plants. For example, ☉ is used to denote perennial plants; annual plants are labelled with ☿<sup>16</sup>. Sometimes Morison also writes in the table synonyms used by other botanical authors, and in most cases these are names used by Caspar Bauhin or Pliny the Elder. The second type of diagram is similarly accompanied by supporting text on the previous page. However, these texts are much briefer, being simply a linear rendering of the words appearing in the diagrams, supplemented by the vernacular names of the plants in English and French. Morison aptly calls these texts “*elenchus*” (list). In short, these so-called “tables of cognation and affinity” are the most compact list of the diagnoses of a group of plants on paper, which serve to organise and structure the text of his book.

Already in the *Praeludia*, Morison talks about these tables with great pride. In *Hallucinationes Caspari Bauhini*, the treatise against Bauhin’s botany, he mentioned these “*tabulae*” several times. Every reference to them is almost always accompanied by the Latin adverb “*clarius*” (much more clearly). What is important here is the rhetorical point: Morison was clearly emphasising the polemic connotations. In the *Dialogus* that followed *Hallucinationes*, Morison fiercely criticised the methods of Caspar Bauhin, Jacques Daléchamps, and John Parkinson, in a tone that could hardly be called modesty. He saw this “table of cognation and affinity” as his true innovation and discussed its novelty with great enthusiasm.

Robert Morison promised to his readers:

[...] denique omnino novam condam & componam methodum, meliorem, facilioremque.

(And finally, I shall create and compose a completely new method, which is better and easier.)<sup>17</sup>

The “*socius*” with whom he conversed likewise considered this method to be novel, then Morison, or the “*botanographus*,” proceeded to indicate that the structure of the Table had already existed in nature, but that he had first discovered it:

**Socius.** *Quid tibi vis per Tabulas cognationis seu affinitatis; nunquam ego legi de tali methodo apud Authores.*

**Botan.** *Nec ego: ergo non esset nova; etiamsi fuit ab incunabulis mundi (ut imposterum audies) sed nemini adhuc detecta ante me: & neutiquam dubito, quin illa methodus, & tibi & aliis omnibus φιλοβότανοις; (ubicunque locorum viventibus) satis grata futura sit.*

(**Socius:** What do you want by the Tables of cognation and affinity? I have never read of such a method among the Authors.

**Botanographus:** Nor have I. Otherwise it would not be novel. Although it has existed since the cradles of the world (as you will hear later), it has not yet been revealed to anyone before me. And I doubt not at all that this method will be quite agreeable to you and to all other φιλοβότανοι [plant-lovers], wherever they may live.) (17, pp.484–485)

In the preface to the *Historia*, Morison repeated a similar statement and compared himself to Columbus: in his view, Columbus discovered the West Indies, which had previously been created, while he too, through his “tables of cognation and affinity,” discovered the order of plants arranged by God on the third day of creation.

This method, according to Morison, is not an artificial invention, but corresponds directly to the Book of Nature, which Morison repeatedly underlined:

*Ego appello Librum naturae, id quod omnibus innotescet. Quam facillime postquam praeludia mea diligenter evolverint, & historiam universalem plantarum seu stirpium meam methodice dispositam; viderint.*

(I call it the Book of Nature, which will be known to all. They will see how easy it would be after my preludes have been carefully developed, and my universal history of plants has been methodically arranged.) (17, p.484)

Morison uses the example of *Ranunculus* to illustrate the advantages of his classification method. According to him, Parkinson had wrongly separated plants belonging to the same genus of *Ranunculus* because he used habitat as the principle of classification. However, Morison’s “table of cognation and affinity” succeeded in finding the “token” or “symbol” common to this group of plants. This token or symbol, as defined by Morison, is “*nota Generica*

& *essentialis*” (generic and essential character), which is primarily morphological in nature rather than ecological or biological. In his botanical practice, Morison placed great emphasis on the taxonomic value of seeds. As Linnaeus has realised long ago, this is not Morison’s original idea. Before him, Cesalpino had already asserted the same principle in his *De plantis* and put it into taxonomic practice.

Then why does Morison claim so vehemently the novelty of his ideas? The answer lies not in the theory itself, but in the whole process of practice that harbours it. It should be noted that for Morison, seeds are not only objects of theorising but also of collecting. We can infer from his writings that he had a very extensive seed collection. The “*socius*” mentioned enviously in their dialogue that Morison had collected at least 2,500 seeds from Blois’s garden as well as from all over Europe, and then stored them in a “*promptuarium*” (storeroom). Morison addressed his seed collection again in the preface to the *Distributio*. What appears to be interesting here is the association of the seed collection with his tables, as we read:

*Promptuarium meum seminarium bis mille diversarum specierum seminibus, et amplius, singulis speciebus, singulis pixidibus inclusis ornatum est. Eodem ordine in loculamentis disponuntur, quo in tabulis offeruntur, atque ut in horto publico Botanico Unversitatis impraesentiarum collocantur umbellae.*

(My seed storeroom is furnished with seeds of more than two thousand different species, and each species is stored in individual boxes. They are arranged in the same order in the cases as they are arranged in the tables, and as the umbelliferous plants are placed in the public botanical garden of the University at present.) (16, pp.viii–ix)

We should note the existence of congruence here: the tables have the same structure as his “*loculamenta*” (cases) of “*pixides*” (boxes). As a technique of spatialising knowledge on paper, these diagrams have real counterparts that exist in space. It might be reasonable to presume that seeds, as lesser objects, can be more easily arranged and disposed

in smaller spaces than herbaria or real plants in botanical gardens. Thus, seeds as a criterion for plant classification have not only theoretical merit, but are equally convenient in a practical sense. While it may be difficult for us to reconstruct Morison’s workflow with precision, it is clear that the diagrams here serve more than just the purpose of guiding the reader through the book; they are also linked to the practices of both seed collecting and organising a botanical garden. In this sense, diagrams are an instrument of early modern taxonomists that mediates different levels of spatial disposition. At the same time, there is an asymmetry between these two levels. Botanical gardens require far more real estate, money, relationships and effort than “boxes” and “cases,” and large botanical gardens often belong to institutions (such as universities) rather than individuals. It is also conceivable that the reorganisation of a botanical garden is by no means as facile as the rearrangement of boxes. For this reason, one might not unreasonably conjecture a closer correspondence between Morison’s taxonomic diagrams and his seed storeroom. This connection suggests that arranging boxes and drawing diagrams was the *hands-on* experience upon which early taxonomists like Morison depended most. In this complex of several practices, the seed, as the smallest (and therefore most easily movable and arrangeable) plant part, also took precedence in Morison’s plant taxonomy.

In addition to collectors and gardeners, at the other end of the spectrum of early modern botanical practice were students and physicians, and Morison commented likewise on the usefulness of his diagrams for both groups. As a professor of botany, Morison saw the merit of his diagrams being easy to memorise and being able to minimise the difficulty that the great number of plants brings. Secondly, Morison adds information about duration of plants to his tables, which is clearly aimed at readers with a medical interest. In these terms, Morison reiterated the benefits of his classification in the usual rhetoric of the botanists of his time: because he classified plants according to nature, it was possible to “contain an infinite number of plants under ordered genera,” so that when one saw a plant that had not been named, one could at least refer to it by its generic name;

in addition, physicians also needed to know the properties of plants from nature, and plants within the same genus should possess similar virtues. In short, a good classification helps students and medical practitioners to approach the nature of plants with short, lapidary descriptions. What is unusual here, however, is Morison's starkly expressed distrust of both image and text, arguing that "images would not make it any more certain," and the same is true of the text.<sup>18</sup> The diagram undoubtedly occupies a central place in Morison's botany, owing to the fact that Morison believed that almost all the needs of his botanical practice could be succinctly expressed as or via diagrams, and that diagrams could thus effectively unify different aspects of botanical knowledge.

### III. Morison's Diagrams in Comparison

It would be instructive to compare Morison's diagramming practice with that of other scholars of his contemporaries and those who preceded him, which can shed light on the specificity of his work.

As a starting point, we may attempt to understand the problem that, at the same time as the diagram makes a certain kind of reading possible, it also substitutes for other kinds of reading. Here the writings of Cesalpino and those of Morison form a striking contrast. We know that the very copy of Cesalpino's *De plantis* used by Morison still survives in the library of Oxford University. The profound influence of Cesalpino can undoubtedly be detected in Morison's writings, as Linnaeus commented nearly three centuries ago. However, the form of exposition of Morison's and Cesalpino's works differs significantly: Cesalpino still uses the traditional genre of philosophical treatise, and his *De plantis* consists entirely of textual paragraphs without using any diagrams or images. Readers of the scholastic philosophy sometimes draw horizontal tree diagrams in the margins to summarise what they have read. However, it is not clear to what extent Cesalpino's book were treated in the early modern period in the same way. But we can at least see clearly that Morison has reversed the traditional relationship between the main text and the diagram by placing the diagram at

the centre of his work.

The Oxonian professor of botany is not the only one who uses tables to chart the classification of plants at that time. Peter Ramus and Ramism, with which he was associated, popularised the use of horizontal tree diagrams in the early modern period. We know that Ramus attempted to develop a non-Aristotelian logic that emphasized the use of dichotomies to draw diagrams or bracketed tables in order to display the material that needed to be taught.<sup>19</sup> Before Morison, Adam Zalužanský (c. 1555–1613), a Bohemian physician and botanist, was already working on such diagrams in his *Methodi herbariae libri tres*. However, I would like to stress that his influence is not comparable to that of Robert Morison in two respects. Firstly, Zalužanský's writing is less known and read by early modern naturalists. This may be supported by the fact that Linnaeus's earliest biographer, Dietrich Heinrich Stöver, misspelled Zalužanský's name and misrepresented him as "a Polish scholar."<sup>20</sup> In a letter to Hans Sloane on 24 August 1686, John Ray said that he had received a copy of *Methodi herbariae* from Sloane, but that he had not had time to look through it and seemingly did not care. We have good reason to doubt the place Zalužanský's book occupied in the libraries of naturalists. Secondly, Ramist diagrams are only used in a very limited way in Zalužanský's book: throughout the book, there are only ten diagrams for teaching the knowledge of plants. Morison's project of seeking to order plants universally by means of diagrams did not occur here.

However, one of Morison's contemporaries cannot be overlooked, namely John Ray. In his *Dialogus*, Morison once remarked on John Ray's tables of plants:

*Et ego hoc observavi in multis Authoribus scribentibus aliquot abhinc annis, imo non ita pridem, in Libro quodam ab Authore, vestri Collegii Socio edito, in quo exhibetur methodus, per Tabulas, disponentes classes plantarum, a similitudine foliorum, sumptarum.*

(And I observed this in many authors writing several years ago, and not so long ago, in a certain book by an author, a Fellow of your College, in which a method is presented by means of Tables arranging the classes of plants,

based on the similitude of leaves.) (17, p.476)

What Morison refers to here should be *An Essay Towards a Real Character, and a Philosophical Language* written by John Wilkins (1614–1672). In this book, Wilkins attempted to propose a universal language scheme that had the ability to refer to any concept and natural object, and John Ray, a friend of Wilkins, helped him draw up tables of plants. Later, Ray also published his plant classification in independent books such as *Methodus plantarum nova*. At first glance, Morison appears to use the same diagramming techniques as Ray. However, we must not let this superficial similarity mislead us. Morison's diagrams differ from Ray's in at least three respects.

Firstly, Morison's diagrams have only a limited number of ranks, whereas Ray's tables could be divided indefinitely. Morison referred to the ranks he established as “subaltern species” and “intermediate genera” and designated them with specific names. Even in some extremely large and complex genera (such as *Gramen cyperoides* in the third volume of his *Historia*), Morison seemed to have made a conscious effort to limit the hierarchy of diagrams to four or five. For this very reason, Morison's books are very cleanly laid out compared to Wilkins's or John Ray's, and there are never bulky, lengthy tables spanning several pages. Secondly, Morison's tables are not dichotomous, but Ray's practice relies heavily on the dichotomy advocated by Ramism. On the other end, Morison's tables do not directly lead to the dichotomous keys commonly used in modern taxonomic literature.<sup>21</sup> Thirdly, Morison's tables contain more information than Ray's, such as the duration of the plants along with the authors involved and the names they used. In this sense, Morison established a more integrated and informative instrument for naturalists. These differences cannot be ignored for the very reason that on precisely the first two points, Linnaeus is an outspoken critic of John Ray. In his *Philosophia botanica*, Linnaeus asserts that the “Ariadne's thread” of botany is the “system” rather than the “synopsis.” The so-called “synopsis” is the “arbitrary dichotomy” employed by John Ray and some other botanists, which does not define boundaries, creates confusion, and should be rejected by botanists. A “system,” on the other hand, separates

the classes into “five appropriate divisions” and breaks the quantitative rigidity of the dichotomy, allowing for a classification with a greater information capacity. (7, pp.111–113) Morison apparently shares more common ground with Linnaeus on these points.

If we look beyond natural history itself, it is discernible that these diagrams are rooted in a broader visual culture that originated in the Middle Ages, where there was a high diversity of diagrams. The preceding studies suggest that Morison may have been very concerned with the presentation of his work in the printed form, but the diagramming techniques he employed were inherited from medieval manuscript culture. In a book published in 2021, Ayelet Even-Ezra convincingly demonstrates that the horizontal tree diagram is a technique widely used in medieval scholastic contexts, and is a technique that further fostered a visual habit, which had a profound influence on the early modern period: “The roots of this habit penetrated so deeply into Western minds that during the sixteenth, seventeenth, and eighteenth centuries, publishers printed more and more embedded HTs [i.e. horizontal trees] and annotators continued composing them in the margins of their printed books.”<sup>22</sup> The visual techniques mobilised by Morison, who is beyond doubt a pioneer in the field of natural history in the production of diagrams, are a subset of the techniques that emerged in the Middle Ages—this included not only horizontal, multi-level tree diagrams that were so prevalent in the early modern period, but also Morison's use of some of the visual elements and their names. The terms “*cognatio*” and “*affinitas*” are also found in medieval legal vocabulary, and such kinships were also often visualised in medieval legal texts (especially in the canon law) with the name of “*arbor affinitatis*” (tree of affinity) or “*arbor consanguinitatis*” (tree of blood relationship). The most prominent example of such tree motif can be found in Gratian's *Decretum* (1140). In the early modern period, Nicasius de Voerda's *Lectura arborum trium consanguinitatis, affinitatis, cognationisque spiritualis* was published in 1502, containing similar tree diagrams of kinship.<sup>23</sup> This sort of legal diagrams is characterised by circles framing the kinship identities and connecting them with lines, which is also the practice of Morison in drawing the *Tabulae*

*Umbellarum generalis*. It is certainly presumptuous to conclude that such legal diagrams are the only source of Morison's diagrams. However, we can at least observe the parallel that exists here: both kind of diagrams are using the same elements as their visual language.

## Conclusion

As we have seen, Robert Morison was one of the first botanists to consciously utilise late medieval and early modern visual techniques for presenting plant classifications, and he consciously placed the production of diagrams at the heart of his botanical project, associating them with other botanical activities such as collecting plants and organising botanical gardens. Diagrams act as an intermediate hub connecting several aspects: the natural objects themselves (especially lesser natural objects such as seeds), information about the "nature" of plants, the order and structure of natural history books, and the pedagogical practices in universities. Morison transformed this attempt of spatialising knowledge on paper into a comprehensive and productive instrument of natural history, turning the private behaviour of a medieval reader into a public one. In a broader perspective, what does this contribute to the intellectual structure of early modern natural history, exactly?

In their influential article, Christoph Lüthy and Alexis Smets remarked, "[a]s a vacuum pump creates the void of which it is at the same time the principal scientific investigator, so a taxonomic tree is the mental instrument that guides research, for example, into missing branches and links. And, incidentally, just as the vacuum pump could become one of the visual emblems of the new science, so the taxonomic tree could become the icon of an evolutionary worldview." (1, p.438) This assessment undoubtedly applies to the metaphor of "tree" in post-nineteenth-century or post-Darwinian biology. But the tree diagram serves in early modern natural history as an essential mental instrument as well. Such diagrams have a more complex history. As we move deeper into this complexity, we may understand many of the scientific practices of the early modern period, as exemplified

by Robert Morison's case.

Here I would like to draw my conclusion. At the outset, the "opaqueness" of Morison's diagrammatic work deserves clarification. More than one scholar has commented on the vagueness and lack of content of Morison's expressions. A typical criticism is that Morison himself is far from being a true philosopher, and that his taxonomic principles are not clearly deduced or demonstrated as a philosopher would do. As Barsanti observes, "there were no precedents for the *tabula generalis*, and Morison does not spend a word on it, nor on the seven particulares that accompany it, either in this text or in subsequent ones — where, moreover, no similar tabulae appear. It is therefore an experiment conducted in silence and, for reasons we do not know, it never repeated. It could perhaps be thought of as the technical landing place for the 'map,' while still lacking theoretical awareness." (4, pp. 82–83) It seems that a concomitant question is: why didn't Morison articulate the principles of drawing such diagrams? A short and perhaps not embarrassing answer might be that diagrams themselves do not need to be problematised, for they can ground themselves. Indeed, his diagrams are opaque in verbal forms, but they are at the same time lucid enough as visual forms. The visual habit of drawing and reading diagrams has the ability of explaining itself, without any other lengthy verbal or written descriptions. This is a meaningful epistemological inversion and should be regarded as a milestone in early modern natural history.

Morison himself never hid this. In the *Dialogus*, he opposes Bauhin's practice by emphasising the futility of "the said and the written [texts]" (*dicta & scripta*):

*Tediosum ipsum puto in hoc, ipsumque dum dicta & scripta aliorum, in medium producit; citando dicta, & allegando scripta Mattheoli, Gusch Lob. Dod. Clus. & coeterorum tam, veterum quam Neotericorum scriptorum, in tria immensa volumina seu (si mavis) tres Tomos, ejus Historia universalis accrevit.*

(I think he is very tedious in bringing forth the sayings and writings of others, and by quoting the sayings and by selecting the writings of

Mattioli, de Lobel, Dodoens, Clusius and others, both ancient and recent writers, his *Universal History* has grown into three immense volumes, or [if you prefer] three Tomes.) (17, p. 481)

Again, in the preface to his *Historia*, he insisted that he wouldn't describe plants in a "lengthy speech":

*In describendis hisce nostris de stirpibus Tabulis quid praestitum sit observabunt Botanici; licet plerique fortassis a nobis prolixa oratione enarratas plantas existiment, maluimus tamen, imo elegimus id aliorum versatorum in arte Botanica ac aequi cujuslibet iudicio potius deferre, quam de nostris lucubrationibus multa predicare.*

(Botanists will observe what to be offered in the Tables of those plants that should be described by us. It is possible that most people may think that we have described the plants in a lengthy speech. Nevertheless, we preferred and chose to offer it to the judgment of others who are experienced in the art of botany, and anyone alike, rather than to preach much about our lucubrations.) (18, p.iii)

It seems that Morison was convinced that the visual culture and prevailing visual metaphors of the period had given naturalists a sound intuition to understand Morison's tables quickly as self-explanatory, so that superfluous textual or theoretical explanation would become a cumbersome and useless "speech" (*oratio*). This visual-centric approach is a hallmark of Morison's botanical project.

It is also noteworthy that Morison's practice, like that of medieval diagrams, goes beyond the commonly understood "representation" in the sense of pictorial depiction. Imagery of natural objects was not the only visual technique used in early modern natural history. A number noteworthy recent attempts have enlightened us that it would be instructive to introduce the discussion of diagrams into the traditional text-image issue.<sup>24</sup> Isabelle Charmantier has insightfully noted, "one cannot understand Linnaeus's use of drawings without considering the other kinds of visual representations in his work, such as tables, maps, and diagrams."<sup>25</sup> As the example of Robert Morison

suggests, between pictoriality and textuality, or more precisely, above them, the diagrammatic mode of representation is expected to display, mediate, and unify the knowledge of plants. The use of such visual techniques in botany entails, of course, certain epistemic presuppositions. Morison's diagrams are dependent on a set of conventions developed since the Middle Ages. This very visual language used by Morison—and to a large extent, he was one of its earliest advocates in natural history—became the lingua franca of naturalists in Linnaeus's time.

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